

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549**

FORM 10-K

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended **September 30, 2018**

OR

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____ to _____

Commission file number 333-211719

ASHLAND GLOBAL HOLDINGS INC.

Delaware

(State or other jurisdiction of incorporation or organization)

81-2587835

(I.R.S. Employer Identification No.)

50 E. RiverCenter Boulevard
Covington, Kentucky 41011
Telephone Number (859) 815-3333

Securities Registered Pursuant to Section 12(b) of the Act:

<u>Title of each class</u>	<u>Name of each exchange on which registered</u>
Common Stock, par value \$.01 per share	New York Stock Exchange

Securities Registered Pursuant to Section 12(g) of the Act: None

Indicate by check mark if the Registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the Registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the Registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the Registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the Registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the Registrant was required to submit such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of Registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the Registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large Accelerated Filer

Accelerated Filer

Non-Accelerated Filer

Smaller Reporting Company

Emerging Growth Company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes No

At March 31, 2018, the aggregate market value of voting stock held by non-affiliates of the Registrant was approximately \$4,338,042,000. In determining this amount, the Registrant has assumed that its directors and executive officers are affiliates. Such assumption shall not be deemed conclusive for any other purpose.

At October 31, 2018, there were 62,487,188 shares of Registrant's common stock outstanding.

Documents Incorporated by Reference

Portions of Registrant's Proxy Statement (Proxy Statement) for its Annual Meeting of Stockholders are incorporated by reference into Part III of this annual report on Form 10-K to the extent described herein.

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PART I

ITEM 1. BUSINESS

GENERAL

Ashland Global Holdings Inc. is a Delaware corporation, with its principal executive offices located at 50 E. RiverCenter Boulevard, Covington, Kentucky 41011 (Telephone: (859) 815-3333). Ashland Global Holdings Inc. was incorporated in 2016 as the successor to a Kentucky corporation named Ashland Inc. organized in 2004 (now known as Ashland LLC), which was itself organized as the successor to a Kentucky corporation of the same name organized in 1936. The new holding company structure was put in place to allow Ashland Inc. to reincorporate in Delaware and to help facilitate the separation of the Valvoline business from the specialty chemicals businesses, creating two independent, publicly held companies (the Reorganization). As a result of the Reorganization, Ashland Global Holdings Inc. replaced Ashland Inc. as the publicly held corporation, and Ashland Inc. was converted to a Kentucky limited liability company and is now an indirect, wholly owned subsidiary of Ashland Global Holdings Inc. The terms “Ashland” and the “Company” as used herein include Ashland Global Holdings Inc., its predecessors and its consolidated subsidiaries, except where the context indicates otherwise. As a result of the Reorganization, Ashland is the successor issuer to Ashland Inc. pursuant to Rule 12g-3(a) under the Securities Exchange Act of 1934, as amended (the Exchange Act) and will file periodic and other reports required by the Exchange Act.

Ashland is a global leader in providing specialty chemical solutions to customers in a wide range of consumer and industrial markets, including adhesives, architectural coatings, construction, energy, food and beverage, nutraceuticals, personal care and pharmaceutical. With approximately 6,000 employees worldwide, Ashland serves customers in more than 100 countries.

Ashland's operations are managed within the following three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents. In previous years, Composites and Intermediates and Solvents were reporting units included within the Ashland Performance Materials reportable segment. On November 15, 2018, Ashland announced it had signed a definitive agreement to sell its Composites segment and the Intermediates and Solvents facility in Marl, Germany to INEOS Enterprises in a transaction valued at \$1.1 billion. The transaction is expected to close prior to the end of the June 2019 quarter, contingent on certain customary regulatory approvals, standard closing conditions and completion of the required employee information and consultation processes. Ashland will retain the Intermediates and Solvents facility in Lima, Ohio.

Specialty Ingredients is a global leader in cellulose ethers, vinyl pyrrolidones and biofunctionals. It offers industry-leading products, technologies and resources for solving formulation and product-performance challenges. Specialty Ingredients uses natural, synthetic and semisynthetic polymers derived from cellulose ethers, vinyl pyrrolidones, acrylic polymers, polyester and polyurethane-based adhesives, and plant and seed extract. Specialty Ingredients' end markets offer comprehensive and innovative solutions for today's demanding consumer and industrial applications. Key customers include: pharmaceutical companies; makers of personal care products, food and beverages; makers of nutraceuticals and supplements; manufacturers of paint, coatings and construction materials; packaging and converting; and oilfield service companies. On May 17, 2017, Ashland completed its acquisition of the stock of Pharmachem Laboratories, Inc. (Pharmachem), a leading provider of quality ingredients to the global health and wellness industries and high-value differentiated products to fragrance and flavor houses. See Note C of the Notes to Consolidated Financial Statements in this Annual Report on Form 10-K for more information.

Composites is a global leader in unsaturated polyester resins, vinyl ester resins and gelcoats. The Composites business manufactures and sells a broad range of general-purpose and high-performance grades of unsaturated polyester and vinyl ester resins, gelcoats and low-profile additives for the reinforced plastics industry. The products in the Composites business provide an array of functional properties including corrosion resistance, fire retardance, ultraviolet resistance, water and chemical resistance, high mechanical strength, impact and scratch resistance and high strength-to-weight ratios. Key end markets include transportation, construction, marine and infrastructure. In addition, the business manufactures and sells molten maleic anhydride for the manufacture of a variety of products such as unsaturated polyester resins, copolymers, lubricating oil additives, alkenyl succinic anhydrides, malic acid, fumaric acid and numerous derivative chemicals. Key markets include composites, personal care, dispersants and combustion engine oil.

Intermediates and Solvents is a leading producer of 1,4 butanediol (BDO) and related derivatives, including tetrahydrofuran and n-methylpyrrolidone. These products are used as chemical intermediates in the production of engineering polymers and polyurethanes, and as specialty process solvents in a wide array of applications including electronics, pharmaceuticals, water filtration membranes and more. Butanediol is also supplied to Ashland's Specialty Ingredients business for use as a raw material.

Unallocated and Other generally includes items such as certain significant company-wide restructuring activities, including internal separation costs, and legacy costs or adjustments that relate to divested businesses that are no longer operated by Ashland.

Available Information - Ashland's Internet address is <http://www.ashland.com>. On this website, Ashland makes available, free of charge, its annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and any amendments to those reports, as well as any beneficial ownership reports of officers and directors filed on Forms 3, 4 and 5. All such reports are available as soon as reasonably practicable after they are electronically filed with, or electronically furnished to, the Securities and Exchange Commission (SEC). Ashland also makes available, free of charge on its website, its Corporate Governance Guidelines, Board Committee Charters, Director Independence Standards and global code of conduct that applies to Ashland's directors, officers and employees. These documents are also available in print to any stockholder who requests them. Information contained on Ashland's website is not part of this annual report on Form 10-K and is not incorporated by reference in this document. The SEC maintains an Internet site (<http://www.sec.gov>) that contains reports, proxy and information statements and other information regarding issuers that file electronically with the SEC.

SPECIALTY INGREDIENTS

Specialty Ingredients offers industry-leading products, technologies and resources for solving formulation and product-performance challenges. Using natural, synthetic and semisynthetic polymers derived from cellulose ethers, vinyl pyrrolidones, acrylic polymers, polyester and polyurethane-based adhesives, and plant and seed extract, Specialty Ingredients offers comprehensive and innovative solutions for consumer and industrial applications.

Key customers include pharmaceutical companies; makers of personal care products, food and beverages; makers of nutraceuticals and supplements; manufacturers of paint, coatings and construction materials; packaging and converting; and oilfield service companies. Certain customer relationships are significant, and the loss of any one of those customers could have a material adverse effect on the Specialty Ingredients reportable segment.

Specialty Ingredients' areas of expertise include: organic and synthetic chemistry, polymer chemistry, surface and colloid science, rheology, structural analysis and microbiology.

Specialty Ingredients' solutions provide an array of properties, including: thickening and rheology control, water retention, adhesive strength, binding power, film formation, conditioning and deposition, colloid stabilization and suspension.

Specialty Ingredients is composed of various end use markets. Many of the products of the end markets are produced in shared manufacturing facilities, to better manage capacity and achieve desired returns.

Oral Care - Specialty Ingredients' portfolio of oral care products delivers active ingredients in toothpaste and mouthwashes; provides bioadhesive functionality for dentures; delivers flavor, texture and other functional properties; and provides product binding to ensure form and function throughout product lifecycle.

Hair Care - Specialty Ingredients' portfolio of hair care products includes advanced styling polymers, fixatives, conditioning polymers, emulsifiers, preservatives and rheology modifiers.

Skin Care - Specialty Ingredients' portfolio of skin care products helps to firm, nourish, revitalize and smooth skin. The Skin Care line also provides sun care products, including UV filters, water-resistant agents and thickeners. Emulsifiers, emollients, preservatives and rheology modifiers complete the Skin Care product line.

Home Care - Specialty Ingredients' portfolio of products and technologies is used in many types of cleaning and fragrance applications, including fabric care, home care and dishwashing. Specialty Ingredients' products are used in a variety of applications for viscosity enhancement, particle suspension, rheology modification, stabilization and fragrance enhancement.

Health and Wellness - Specialty Ingredients is a leading supplier of excipients and tablet coating systems to the pharmaceutical and nutraceutical industries. Excipients include a comprehensive range of polymers for use as tablet binders, superdisintegrants, sustained-release agents and drug solubilizers, as well as a variety of coating formulations for immediate, delayed, and sustained release applications. The portfolio also includes expertise in nutraceutical formulation and blending. Its nutrition portfolio provides functional benefits in areas such as thickening, texture control, thermal gelation, structure enhancement, water binding, clarification and stabilization. Its core products include cellulose gums and vinyl pyrrolidone polymers which are used in a wide range of offerings for bakery, beverage, dairy, desserts, meat products, pet food, prepared foods, sauces and savory products.

Adhesives - Specialty Ingredients manufactures and sells adhesive solutions to the packaging and converting, building and construction, and transportation markets and manufactures and markets specialty coatings and adhesive solutions for use across multiple industries. Key technologies and markets include: acrylic polymers for pressure-sensitive adhesives; urethane adhesive for flexible packaging applications; aqueous and radiation-curable adhesives and specialty coatings for printing and converting applications; emulsion polymer isocyanate adhesives for structural wood bonding; elastomeric polymer adhesives for commercial roofing applications; acrylic, polyurethane and epoxy structural adhesives for bonding fiberglass reinforced plastics, composites, thermoplastics and metals in automotive, marine, recreational and industrial applications; specialty phenolic resins for paper impregnation and friction material bonding. Adhesive's products provide an array of functional properties including high-strength bonding, ease and speed of product assembly, heat and moisture resistance and design flexibility.

Coatings - Specialty Ingredients is a recognized leader in rheology solutions for waterborne architectural paint and coatings. Products include hydroxyethylcellulose (HEC), which provides thickening and application properties for interior and exterior paints, and nonionic synthetic associative thickeners (NSATs), which are APEO-free liquid synthetics for high-performance paint and industrial coatings. The Coatings Specialties market complements its rheology offering with a broad portfolio of performance foam-control agents, surfactants and wetting agents, dispersants and pH neutralizers.

Construction - Specialty Ingredients is a major producer and supplier of cellulose ethers and companion products for the construction industry. These products control properties such as water retention, open time, workability, adhesion, stabilization, pumping, sag resistance, rheology, strength, appearance and performance in dry-mortar formulations.

Energy - Specialty Ingredients is a leading global manufacturer of synthetic- and cellulosic-based products for drilling fluids, oil-well cement slurries, completion and workover fluids, fracturing fluids and production chemicals. Energy Specialties offers the oil and gas industry solutions for drilling, stimulation, completion, cementing and production applications.

Performance - Specialty Ingredients provides products and services to over 30 industries. Ashland offers a broad spectrum of organo- and water-soluble polymers that are derived from both natural and synthetic resources. Product lines include derivatized cellulose polymers, synthetics, and vinyl pyrrolidone polymers that impart effective functionalities to serve a variety of industrial markets and specialized applications. Many of the products within Performance Specialties function as performance additives that deliver high levels of end-user value in formulated products. In other areas, such as plastics and textiles, Performance Specialties' products function as a processing aid, improving the quality of end products and reducing manufacturing costs.

For fiscal 2018, the following Specialty Ingredients products were 10% or greater of Ashland's total consolidated sales:

Product	% of Specialty Ingredients sales	% of Ashland total consolidated sales
Cellulosics	34%	22%
PVP	17%	11%

Specialty Ingredients operates throughout the Americas, Europe and Asia Pacific. It has 43 manufacturing and lab facilities in ten countries which serve its various end markets and participates in one joint venture. Specialty Ingredients has manufacturing facilities in Huntsville, Alabama; Anaheim, California; Wilmington, Delaware; Calumet City, Illinois; Calvert City, Kentucky; Freetown, Massachusetts; Chatham, Kearny, Parlin, Paterson, S. Hackensack (two facilities) and Totowa, New Jersey; Monroe and Ossining, New York; Merry Hill, North Carolina; Ashland, Columbus, Dublin and Hilliard, Ohio; White

City, Oregon; Piedmont and Summerville, South Carolina; Kenedy and Texas City, Texas; Hopewell, Virginia; and Menomonee Falls, Wisconsin within the United States and Doel-Beveren, Belgium; Cabreuva and Sao Paolo, Brazil; Jiangmen, Nanjing and Shanghai, China; Alizay and Sophia Antipolis, France; Dusseldorf and Memmingen, Germany; Dublin, Ireland; Tamaulipas, Mexico (two locations); Zwijndrecht, the Netherlands and Bradford, Kidderminster, Newton Aycliffe and Poole, United Kingdom.

Specialty Ingredients markets and distributes its products and services directly and through third-party distributors in the Americas, Europe, the Middle East, Africa and Asia Pacific.

COMPOSITES

Composites is a global leader in unsaturated polyester resins, vinyl ester resins and gelcoats. The Composites business manufactures and sells a broad range of general-purpose and high-performance grades of unsaturated polyester and vinyl ester resins, gelcoats and low-profile additives for the reinforced plastics industry. The products in the Composites business provide an array of functional properties including corrosion resistance, fire retardance, ultraviolet resistance, water and chemical resistance, high mechanical strength, impact and scratch resistance and high strength-to-weight ratios. Key end markets include transportation, construction, marine and infrastructure. In addition, the business manufactures and sells molten maleic anhydride for the manufacture of a variety of products such as unsaturated polyester resins, copolymers, lubricating oil additives, alkenyl succinic anhydrides, malic acid, fumaric acid and numerous derivative chemicals. Key markets include composites, personal care, dispersants and combustion engine oil. On November 15, 2018, Ashland announced that it had signed a definitive agreement for the divestiture of its Composites segment and the Intermediates and Solvents manufacturing facility in Marl, Germany.

Key customers include manufacturers of residential and commercial building products, industrial product specifiers and manufacturers, wind blade manufacturers, pipe manufacturers, automotive and truck Original Equipment Manufacturers (OEMs) suppliers, boatbuilders and chemical producers.

The Composites product lines can be broken into two categories: Core and Specialties. Many of the products of the two categories are produced in shared manufacturing facilities, to better manage capacity and achieve desired returns.

Core - The Core products include mostly unsaturated polyester resins (UPR) products, which are used for applications requiring durability and stain resistance, efficient processing and manufacturability and high-gloss appearance. Ashland sells core products under the Aropol™, Arazyn™, Polaris™ and Envirez™ brands. Examples can be found in a wide range of end use products from recreational boats to tub and shower surrounds and spa tubs, to counter tops, window lineals, and doors, among thousands of other applications. Customers may be a component manufacturer, general job shop or OEM, such as a branded boatbuilder.

Specialties - The Specialties products include epoxy vinyl ester resins and gelcoats. Ashland's epoxy vinyl ester resins (VER) have higher strength and better corrosion resistance and durability compared to unsaturated polyester resins and compared to many traditional materials such as steel, wood and concrete. Ashland's gelcoats products have superior gloss and depth of color, UV resistance, weather-ability and consistency. Epoxy vinyl esters are sold under the Derakane™, Hetron™, Arotran™ and AME brands. Examples can be found in high performance recreational boats, composite parts for automotive and heavy truck, very corrosive environments in large chemical processing plants, water treatment facilities, and mines. Gelcoats are also a key component of recreational boat manufacturing as well as in the RV market, construction panels and bath products.

Composites' UPR/VER products were approximately 85% and 21% of Composites' sales and Ashland's total consolidated sales, respectively, for fiscal 2018.

Composites operates throughout the Americas, Europe and Asia Pacific. It has 16 manufacturing and lab facilities in seven countries. Composites has manufacturing plants in Fort Smith and Jacksonville, Arkansas; Commerce, California; Bartow, Florida; Dublin, Ohio; Neville Island and Philadelphia, Pennsylvania; and Neal, West Virginia within the United States; Aracariguama, Brazil; Changzhou (two plants) and Shanghai (lab), China; Porvoo, Finland; Etain, France; Miszewo, Poland; and Benicarló, Spain.

Composites markets and distributes its products directly and through third-party distributors in the Americas, Europe, the Middle East, Africa and Asia Pacific. Additionally, Composites has a joint venture agreement through which it manufactures products in two manufacturing plants in Saudi Arabia.

INTERMEDIATES AND SOLVENTS

Intermediates and Solvents is a leading producer of 1,4 butanediol and related derivatives, including tetrahydrofuran and n-methylpyrrolidone. These products are used as chemical intermediates in the production of engineering polymers and polyurethanes, and as specialty process solvents in a wide array of applications including electronics, pharmaceuticals, water filtration membranes and more. Butanediol is also supplied to Ashland's Specialty Ingredients business for use as a raw material. On November 15, 2018, Ashland announced that it had signed a definitive agreement for the divestiture of its Composites segment and the Intermediates and Solvents manufacturing facility in Marl, Germany.

Key customers include general industrial manufacturers, plastics and polymers producers, pharmaceutical companies, agricultural firms and producers of electronic components and systems.

Intermediates and Solvents has manufacturing facilities in Lima, Ohio and Marl, Germany, while some smaller volume derivatives are produced at Specialties Ingredients facilities in Texas City, Texas and Calvert City, Kentucky. Intermediates and Solvents' markets and distributes its products directly and through third-party distributors in the Americas, Europe, the Middle East and Asia Pacific.

MISCELLANEOUS

Environmental Matters

Ashland maintains a companywide environmental policy overseen by the Environmental, Health, Safety and Quality Committee of Ashland's Board of Directors. Ashland's Environmental, Health, Safety, Quality and Regulatory Affairs (EHSQ&RA) department has the responsibility to ensure that Ashland's businesses worldwide maintain environmental compliance in accordance with applicable laws and regulations. This responsibility is carried out via training; widespread communication of EHSQ&RA policies; information and regulatory updates; formulation of relevant policies, procedures and work practices; design and implementation of EHSQ&RA management systems; internal auditing by a separate auditing group; monitoring of legislative and regulatory developments that may affect Ashland's operations; assistance to the businesses in identifying compliance issues and opportunities for voluntary actions that go beyond compliance; and incident response planning and implementation.

Federal, state and local laws and regulations relating to the protection of the environment have a significant impact on how Ashland conducts its businesses. In addition, Ashland's operations outside the United States are subject to the environmental laws of the countries in which they are located. These laws include regulation of air emissions and water discharges, waste handling, remediation and product inventory, registration and regulation. New laws and regulations may be enacted or adopted by various regulatory agencies globally. The costs of compliance with any new laws or regulations cannot be estimated until the manner in which they will be implemented has been more precisely defined.

At September 30, 2018, Ashland's reserves for environmental remediation and related environmental litigation amounted to \$187 million, reflecting Ashland's best estimates of the most likely costs that will be incurred over an extended period to remediate identified conditions for which the costs are reasonably estimable, without regard to any third-party recoveries. Engineering studies, historical experience and other factors are used to identify and evaluate remediation alternatives and their related costs in determining the estimated reserves for environmental remediation. Environmental remediation reserves are subject to numerous inherent uncertainties that affect Ashland's ability to estimate its share of the costs. Such uncertainties involve the nature and extent of contamination at each site, the extent of required cleanup efforts under existing environmental regulations, widely varying costs of alternate cleanup methods, changes in environmental regulations, the potential effect of continuing improvements in remediation technology and the number and financial strength of other potentially responsible parties at multiparty sites. Although it is not possible to predict with certainty the ultimate costs of environmental remediation, Ashland currently estimates that the upper end of the reasonably possible range of future costs for identified sites could be as high as approximately \$430 million. No individual remediation location is significant, as the largest

reserve for any site is 14% of the remediation reserve. Ashland regularly adjusts its reserves as environmental remediation continues. Environmental remediation expense, net of insurance receivables, amounted to \$65 million in 2018, compared to \$24 million in 2017 and \$40 million in 2016.

Product Control, Registration and Inventory - Many of Ashland's products and operations are subject to chemical control laws of the countries in which they are located. These laws include regulation of chemical substances and inventories under the Toxic Substances Control Act (TSCA) in the United States and the Registration, Evaluation and Authorization of Chemicals (REACH) regulation in Europe. Under REACH, additional testing requirements, documentation, risk assessments and registrations are occurring and will continue to occur and may adversely affect Ashland's costs of products produced in or imported into the European Union. Examples of other product control regulations include right to know laws under the Global Harmonized System (GHS) for hazard communication, regulation of chemicals used in the manufacture of pharmaceuticals and personal care products and that contact food under the Food, Drug and Cosmetics Act in the United States, the Framework Regulation in Europe and other product control requirements for chemical weapons, drug precursors and import/export. New laws and regulations may be enacted or adopted by various regulatory agencies globally. The costs of compliance with any new laws or regulations cannot be estimated until the manner in which they will be implemented has been more precisely defined.

Remediation - Ashland currently operates, and in the past has operated, various facilities at which, during the normal course of business, releases of hazardous substances have occurred. Additionally, Ashland has known or alleged potential environmental liabilities at a number of third-party sites. Federal and state laws, including but not limited to the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and various other remediation laws, require that contamination caused by hazardous substance releases be assessed and, if necessary, remediated to meet applicable standards. Some of these laws also provide for liability for related damage to natural resources, and claims for alleged property and personal injury damage can also arise related to contaminated sites. Laws in other jurisdictions in which Ashland operates require that contamination caused by such releases at these sites be assessed and, if necessary, remediated to meet applicable standards.

Air - In the United States, the Clean Air Act (CAA) imposes stringent limits on facility air emissions, establishes a federally mandated operating permit program, allows for civil and criminal enforcement actions and sets limits on the volatile or toxic content of many types of industrial materials and consumer products. The CAA establishes national ambient air quality standards (NAAQS) with attainment deadlines and control requirements based on the severity of air pollution in a given geographical area. Various state clean air acts implement, complement and, in many instances, add to the requirements of the federal CAA. The requirements of the CAA and its state counterparts have a significant impact on the daily operation of Ashland's businesses and, in many cases, on product formulation and other long-term business decisions. Other countries where Ashland operates also have laws and regulations relating to air quality. Ashland's businesses maintain numerous permits and emission control devices pursuant to these clean air laws.

The United States Environmental Protection Agency (USEPA) has increased its frequency in reviewing the NAAQS. The USEPA has stringent standards for particulate matter, ozone and sulfur dioxide. Throughout 2018, state and local agencies continued to implement options for meeting the newest standards. Particulate matter strategies include dust control measures for construction sites and reductions in emission rates allowed for industrial operations. Options for ozone include emission controls for certain types of sources, reduced limits on the volatile organic compound content of industrial materials and consumer products, and requirements on the transportation sector. Most options for sulfur dioxide focus on coal and diesel fuel combustion sources. It is not possible at this time to estimate the potential financial impact that these newest standards may have on Ashland's operations or products. Ashland will continue to monitor and evaluate these standards to meet these and all air quality requirements.

Solid Waste - Ashland's businesses are subject to various laws relating to and establishing standards for the management of hazardous and solid waste. In the United States, Ashland's facilities are subject to RCRA and its regulations governing generators of hazardous waste. Ashland has implemented systems to oversee compliance with the RCRA regulations. In addition to regulating current waste disposal practices, RCRA also addresses the environmental effects of certain past waste disposal operations, the recycling of wastes and the storage of regulated substances in underground tanks. Ashland has the remediation liability for certain facilities subject to these regulations. Other countries where Ashland operates also have laws and regulations relating to hazardous and solid waste, and Ashland has systems in place to oversee compliance.

Water - Ashland's businesses maintain numerous discharge permits. In the United States, such permits may be required by the National Pollutant Discharge Elimination System of the Clean Water Act and similar state programs. Other countries have similar laws and regulations requiring permits and controls relating to water discharge.

Climate Change and Related Regulatory Developments - Ashland has been collecting energy use data and calculating greenhouse gas (GHG) emissions for many years. Ashland evaluates the potential impacts from both climate change and the anticipated GHG regulations to facilities, products and other business interests, as well as the strategies commonly considered by the industrial sector to reduce the potential impact of these risks. These risks are generally grouped as impacts from legislative, regulatory and international developments, impacts from business and investment trends and impacts to company assets from the physical effects of climate change. Current North American, European and other regional regulatory developments are not expected to have a material effect on Ashland's operations, although some facilities are subject to promulgated rules. Business and investment trends are expected to drive an increase in the demand for products that improve energy efficiency, reduce energy use and increase the use of renewable resources. At this time, Ashland cannot estimate the impact of this expected demand increase to its businesses. Physical effects from climate change have the potential to affect Ashland's assets in areas prone to sea level rise or extreme weather events much as they do the general public and other businesses. Due to the uncertainty of these matters, Ashland cannot estimate the impact at this time of GHG-related developments on its operations or financial condition.

Competition

Ashland competes in the highly fragmented specialty chemicals industry. The participants in the industry offer a varied and broad array of product lines designed to meet specific customer requirements. Participants compete with service and product offerings on a global, regional and/or local level subject to the nature of the businesses and products, as well as the end-markets and customers served. Competition is based on several key criteria, including product performance and quality, product price, product availability and security of supply, responsiveness of product development in cooperation with customers, customer service, industry knowledge and technical capability. Certain key competitors are significantly larger than Ashland and have greater financial resources, leading to greater operating and financial flexibility. The industry has become increasingly global as participants have focused on establishing and maintaining leadership positions outside of their home markets. Many of these segments' product lines face domestic and international competition, because of industry consolidation, pricing pressures and competing technologies. To improve its competitive position, as Ashland narrows its focus on specialty chemicals, the company is building and more strongly leveraging the Ashland corporate brand as a differentiator to create value and better communicate the capabilities, promise and scale of the company, making it easier to introduce new product lines and applications.

Intellectual Property

Ashland has a broad intellectual property portfolio which is an important component of all of Ashland's reportable segments. Ashland's Specialty Ingredients, Composites and Intermediates and Solvents reportable segments rely on patents, trade secrets, formulae and know-how to protect and differentiate their products and technologies. In addition, these reportable segments own valuable trademarks which identify and differentiate Ashland's products from its competitors. Ashland also uses licensed intellectual property rights from third-parties.

Raw Materials

Ashland purchases its raw materials from multiple sources of supply in the United States and other countries and believes that raw material supplies will be available in quantities sufficient to meet demand in fiscal 2019. All of Ashland's reportable segments were impacted to varying degrees in fiscal 2018 by the volatility of raw materials costs, and these conditions may continue in fiscal 2019.

Research and Development

Ashland's program of research and development is focused on defining the needs of the marketplace and framing those needs into technology platforms. Ashland has the capability to deliver and develop the intellectual property required to grow and protect those platforms. Ashland is focused on developing new chemistries, market-changing technologies and customer driven solutions at numerous technology centers located in the Americas, Europe and the Asia Pacific region.

Seasonality

Ashland's business may vary due to seasonality. Ashland's business units typically experience stronger demand during warmer weather months, which generally occur during Ashland's third and fourth quarters.

Forward-Looking Statements

This annual report on Form 10-K contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). These forward-looking statements are not historical facts and generally are identified by words such as "anticipates," "believes," "estimates," "expects," "is likely," "predicts," "projects," "forecasts," "may," "will," "should," and "intends" and the negative of these words or other comparable terminology. Although Ashland believes that its expectations are based on reasonable assumptions, such expectations are subject to risks and uncertainties that are difficult to predict and may be beyond Ashland's control. As a result, Ashland cannot assure that the expectations contained in such statements will be achieved. Important factors that could cause actual results to differ materially from those contained in such statements are discussed under "Use of estimates, risks and uncertainties" in Note A of Notes to Consolidated Financial Statements in this annual report on Form 10-K. For a discussion of other factors and risks that could affect Ashland's expectations and operations, see "Item 1A. Risk Factors" in this annual report on Form 10-K.

ITEM 1A. RISK FACTORS

The following discussion of “risk factors” identifies the most significant factors that may adversely affect Ashland’s business, operations, financial position or future financial performance. This information should be read in conjunction with Management’s Discussion and Analysis and the consolidated financial statements and related notes incorporated by reference into this annual report on Form 10-K. The following discussion of risks is designed to highlight what Ashland believes are important factors to consider when evaluating its expectations. These factors could cause future results to differ from those in forward-looking statements and from historical trends.

Ashland has set aggressive growth goals for its businesses, including increasing sales, cash flow and margins, in order to achieve its long term strategic objectives. Ashland’s successful execution of its growth strategies and business plans to facilitate that growth involves a number of risks.

Ashland has set aggressive growth goals for its businesses in order to meet long term strategic objectives and improve shareholder value. Ashland’s failure to meet one or more of these goals or objectives would negatively impact Ashland’s potential value and the businesses. One of the most important risks is that Ashland might fail to adequately execute its business and growth plans, by optimizing the efficient use of its physical and intangible assets. Aspects of that risk include changes to global economic environment, changes to the competitive landscape, attraction and retention of skilled employees, the potential failure of product innovation plans, failure to comply with existing or new regulatory schemes, failure to maintain a competitive cost structure and other risks outlined in greater detail in this Item 1A.

Ashland faces competition from other companies, which places downward pressure on prices and margins and may adversely affect Ashland’s businesses and results of operations.

Ashland operates in highly competitive markets, competing against a number of domestic and foreign companies. Competition is based on several key criteria, including product performance and quality, product price, product availability and security of supply, responsiveness of product development in cooperation with customers and customer service, as well as the ability to bring innovative products or services to the marketplace. Certain key competitors are significantly larger than Ashland and have greater financial resources, leading to greater operating and financial flexibility. As a result, these competitors may be better able to withstand changes in conditions within the relevant industry, changes in the prices of raw materials and energy and changes in general economic conditions. In addition, competitors’ pricing decisions could compel Ashland to decrease its prices, which could negatively affect its margins and profitability. Additional competition in markets served by Ashland could adversely affect margins and profitability and could lead to a reduction in market share. Also, Ashland competes in certain markets that are declining and has targeted other markets for growth opportunities. Competitive and pricing pressures could also impact Ashland’s production volumes, which can in turn reduce cost efficiency. If Ashland’s strategies for dealing with declining markets and leveraging opportunity markets are not successful, its businesses and results of operations could be negatively affected.

Ashland’s success depends upon its ability to attract and retain key employees and the identification and development of talent to succeed senior management.

Ashland’s success depends on its ability to attract and retain key personnel, and Ashland relies heavily on its management team. The inability to recruit and retain key personnel or the unexpected loss of key personnel may adversely affect Ashland’s operations. Also, a substantial portion of Ashland’s U.S.-based employees will be retirement-eligible within the next five years. That, combined with the relatively small number of middle tier managers with substantial experience in place to replace this group of retirement eligible employees, increases the potential negative impact of the risk that key employees could leave the Company. Additionally, the Company’s redesign and cost reduction program may result in key employees departing who may not be replaced. This risk of unwanted employee turnover also is substantial in positions that require certain technical expertise and geographically in developing markets which Ashland has targeted for growth, especially in Asia, India, South America and Eastern Europe. In addition, because of its reliance on its management team, Ashland’s future success depends, in part, on its ability to identify and develop talent to succeed its senior management and other key positions throughout the organization. If Ashland fails to identify and develop successors, the company is at risk of being harmed by the departures of these key employees.

The competitive nature of Ashland's markets may delay or prevent the Company from passing increases in raw materials or energy costs on to its customers. In addition, certain of Ashland's suppliers may be unable to deliver products or raw materials or fulfill contractual requirements. The occurrence of either event could adversely affect Ashland's results of operations.

Rising and volatile raw material prices, especially those of hydrocarbon derivatives, cotton linters or wood pulp, may negatively impact Ashland's costs, results of operations and the valuation of its inventory. Similarly, energy costs are a significant component of certain of Ashland's product costs. Ashland is not always able to raise prices in response to such increased costs, and its ability to pass on the costs of such price increases is dependent upon market conditions. Likewise, reductions in the valuation of Ashland's inventory due to market volatility may not be recovered and could result in losses.

Ashland purchases certain products and raw materials from suppliers, often pursuant to written supply contracts. If those suppliers are unable to meet Ashland's orders in a timely manner or choose to terminate or not fulfill contractual arrangements, Ashland may not be able to make alternative supply arrangements. Also, domestic and global government regulations related to the manufacture or transport of certain raw materials may impede Ashland's ability to obtain those raw materials on commercially reasonable terms. Certain Ashland businesses rely on agricultural output of clary sage, aloe, guar, and cotton linters, and the availability of these materials can be severely impacted by crop yields, weather events, and other factors. If Ashland is unable to obtain and retain qualified suppliers under commercially acceptable terms, its ability to manufacture and deliver products in a timely, competitive and profitable manner or grow its business successfully could be adversely affected.

Failure to develop and market new products and production technologies could impact Ashland's competitive position and have an adverse effect on its businesses and results of operations.

The specialty chemical industry is subject to periodic technological change and ongoing product improvements. In order to maintain margins and remain competitive, Ashland must successfully develop and introduce new products or improvements that appeal to its customers and ultimately to global consumers. Ashland plans to grow earnings, in part, by focusing on developing markets and solutions to meet increasing demand in those markets, including demand for personal care and pharmaceutical products which are subject to lengthy regulatory approval processes. Ashland's efforts to respond to changes in consumer demand in a timely and cost-efficient manner to drive growth could be adversely affected by difficulties or delays in product development, including the inability to identify viable new products, successfully complete research and development, obtain regulatory approvals, obtain intellectual property protection or gain market acceptance of new products. Due to the lengthy development process, technological challenges and intense competition, there can be no assurance that any of the products Ashland is currently developing, or could develop in the future, will achieve substantial commercial success.

Ashland's business exposes it to potential product liability claims and recalls, which could adversely affect its financial condition and performance.

The development, manufacture and sale of specialty chemical and other products by Ashland, including products produced for the food, beverage, personal care, pharmaceutical and nutritional supplement industries, involve an inherent risk of exposure to product liability claims, product recalls, product seizures and related adverse publicity. Ashland also produces products that are subject to rigorous specifications and quality standards, with an expectation from its customers around these strict requirements. A product liability claim, recall or judgment against Ashland, or a customer complaint on product specifications, could also result in substantial and unexpected expenditures, affect consumer or customer confidence in its products, and divert management's attention from other responsibilities. Although Ashland maintains product liability insurance, there can be no assurance that this type or level of coverage is adequate or that Ashland will be able to continue to maintain its existing insurance or obtain comparable insurance at a reasonable cost, if at all. A product recall or a partially or completely uninsured product liability judgment against Ashland could have a material adverse effect on its reputation, results of operations and financial condition.

Imposition of new taxes, disagreements with tax authorities or additional tax liabilities could adversely affect Ashland's business, financial condition, reputation or results of operations.

Ashland's products are made, manufactured, distributed or sold in more than 100 countries and territories. A significant portion of Ashland's revenues are generated outside the United States. As such, Ashland is subject to taxes in the United States as well as numerous foreign countries. Ashland's future effective tax rates could be affected by changes in the mix of earnings in countries with differing tax rates, changes in the valuation of deferred tax assets and liabilities, changes in liabilities for uncertain tax positions, cost of repatriations or changes in tax laws, regulations, administrative practices or their interpretation. Moreover, because Ashland is subject to the regular examination of its income tax returns by various tax authorities, the economic and political pressure to increase tax revenues in these jurisdictions may make resolving tax disputes even more difficult, and the final resolution of tax audits and any related litigation may differ from our historical provisions and accruals resulting in an adverse impact on our business, financial condition, reputation or results of operations. The Tax Cuts and Jobs Act (the Tax Act), enacted in December 2017, made significant changes to US tax law; many other countries or organizations, including those where Ashland has significant operations, are actively considering or enacting changes to tax laws which could significantly impact our tax rate and cash flows. The increasingly complex global tax environment, including changes in how United States multinational corporations are taxed, could adversely affect Ashland's business, financial condition or results of operations.

Our accounting for the Tax Act is incomplete and provisional in nature; we expect our accounting for the Tax Act to be complete in December 2018. During the fiscal year ended September 30, 2018, we recorded provisional estimates of the transition tax and the remeasurement of our U.S. deferred taxes at the lower rate. Ashland is not expected to be subject to the Global Intangible Low Tax Income (GILTI), the Base Erosion Tax (BEAT), or Foreign Derived Intangible Income (FDII) until the year beginning October 1, 2018. During the quarter ended December 31, 2018 Ashland will continue to analyze and finalize our calculation of the transition tax including foreign earnings and profits subject to the transition tax, our foreign tax pools, and any issued regulations or administrative practices; when our tax return for the year ended September 30, 2018 is finalized, Ashland may also have additional changes to remeasurement of deferred taxes.

Other than the one-time transition tax, Ashland will continue to be indefinitely reinvested in our foreign earnings. As such, Ashland has not accrued income taxes or foreign withholding taxes on undistributed earnings for most non-US subsidiaries because those earnings are intended to be indefinitely reinvested in the operations of those subsidiaries. If these earnings are needed for Ashland's operations in the United States, the repatriation of such earnings could adversely affect its business, results of operations or financial condition.

The IPO of Valvoline and final distribution of its shares could result in significant tax liability to Ashland and its stockholders.

Ashland believes that the Valvoline IPO and certain related internal transactions should be nontaxable transactions for U.S. federal income tax purposes and has obtained written opinions of counsel to that effect. Ashland also obtained a written opinion of counsel to the effect that the final distribution should qualify for non-recognition of gain and loss under Section 355 of the Internal Revenue Code of 1986, as amended (the "Code"). The opinions are based on certain assumptions and representations as to factual matters from Ashland and Valvoline, as well as certain covenants by those parties. The opinions cannot be relied upon if any of the assumptions, representations or covenants is incorrect, incomplete or inaccurate or is violated in any material respect, or if there are changes in law with retroactive effect. The opinions are not binding on the IRS or the courts, and it is possible that the IRS or a state or local taxing authority could take the position that the internal transactions, the final distribution or the receipt of proceeds from the Valvoline IPO resulted in the recognition of significant taxable gain by Ashland, in which case Ashland may be subject to material tax liabilities.

If the final distribution were determined not to qualify for non-recognition of gain and loss, Ashland stockholders that received Valvoline common stock in the final distribution could be subject to tax. If the final distribution were determined not to qualify for non-recognition of gain and loss, then Ashland would recognize gain as if it had sold Valvoline common stock in a taxable transaction in an amount up to the fair market value of the Valvoline common stock it distributed in the final distribution. The tax liability resulting from such gain could have a material impact on Ashland's operations.

Section 355(e) of the Code generally creates a presumption that the final distribution would be taxable to Ashland, but not to its stockholders, if Ashland or Valvoline or their respective stockholders were to engage in transactions that result in a 50% or greater change (by vote or value) in the ownership of the respective common stock of Ashland or Valvoline during the four-year period beginning on the date that begins two years before the date of the final distribution, unless it were established that such transactions and the final distribution were not part of a plan or series of related transactions. An acquisition that occurs during the four-year period beginning on the date that begins two years before the date of the final distribution is presumed to occur pursuant to a plan or series of related transactions, unless it is established that the acquisition is not pursuant to a plan or series of transactions that includes the final distribution.

The final distribution would not qualify for non-recognition of gain and loss to Ashland and its stockholders if it were determined to be a “device” for the distribution of earnings and profits. An acquisition of Ashland’s or Valvoline’s common stock might be considered to be evidence that the final distribution was a “device”. The tax liability to Ashland that would result from a determination that the final distribution is a “device” could have a material impact on Ashland’s operations.

The potential tax liability to Ashland described above may limit Ashland’s ability to pursue strategic transactions of a certain magnitude that involve the issuance or acquisition of Ashland common stock. This restriction may also limit Ashland’s ability to raise significant amounts of cash through the issuance of common stock, especially if Ashland’s stock price were to suffer substantial declines.

Ashland’s substantial global operations subject it to risks of doing business in foreign countries, which could adversely affect its business, financial condition and results of operations.

Greater than half of Ashland’s net sales for fiscal 2019 are expected to be to customers outside of North America. Ashland expects sales from international markets to continue to represent an even larger portion of the Company’s sales in the future. Also, a significant portion of Ashland’s manufacturing capacity is located outside of the United States. Accordingly, Ashland’s business is subject to risks related to the differing legal, political, cultural, social and regulatory requirements and economic conditions of many jurisdictions.

The global nature of Ashland’s business presents difficulties in hiring and maintaining a workforce in certain countries. Fluctuations in exchange rates may affect product demand and may adversely affect the profitability in U.S. dollars of products and services provided in foreign countries. In addition, foreign countries may impose additional withholding taxes or otherwise tax Ashland’s foreign income, or adopt other restrictions on foreign trade or investment, including currency exchange controls. The imposition of new tariffs or trade quotas, or an impairment of existing trade agreements is also a risk that could impair Ashland’s financial performance.

Certain legal and political risks are also inherent in the operation of a company with Ashland’s global scope. For example, if the United States fails to implement the United States-Mexico-Canada Agreement (USMCA) to replace the North American Free Trade Agreement (NAFTA), or the United Kingdom’s exit from the European Union moves forward without an intermediate agreement, Ashland’s ability to do business and execute its growth strategies could be adversely affected. Ashland could also be impacted negatively if the United States more aggressively prosecutes trade disputes with countries like China. In addition, it may be more difficult for Ashland to enforce its agreements or collect receivables through foreign legal systems. There is a risk that foreign governments may nationalize private enterprises in certain countries where Ashland operates. In certain countries or regions, terrorist activities and the response to such activities may threaten Ashland’s operations more than those in the United States. In Europe, the effect of economic sanctions imposed on Russia and/or Russia’s reaction to the sanctions could adversely impact Ashland’s performance and results of operations. The risks associated with localized or regional armed conflict in many parts of the world remain high and could disrupt and/or adversely impact Ashland’s businesses. Social and cultural norms in certain countries may not support compliance with Ashland’s corporate policies including those that require compliance with substantive laws and regulations. Also, changes in general economic and political conditions in countries where Ashland operates, particularly in Europe, the Middle East and emerging markets, are a risk to Ashland’s financial performance.

As Ashland continues to operate its business globally, its success will depend, in part, on its ability to anticipate and effectively manage these and other related risks. There can be no assurance that the consequences of these and other factors relating to its multinational operations will not have an adverse effect on Ashland's business, financial condition or results of operations.

The impact of changing laws or regulations or the manner of interpretation or enforcement of existing rules could adversely impact Ashland's financial performance and restrict its ability to operate its business or execute its strategies.

New laws or regulations, or changes in existing laws or regulations or the manner of their interpretation or enforcement, could increase Ashland's cost of doing business and restrict its ability to operate its business or execute its strategies. This includes, among other things, the possible taxation under U.S. law of certain income from foreign operations, the possible taxation under foreign laws of certain income Ashland reports in other jurisdictions, tariffs or quotas levied on Ashland products, raw materials or key components by certain countries, regulations related to the protection of private information of Ashland's employees and customers, regulations issued by the U.S. Food and Drug Administration (and analogous non-U.S. agencies) affecting Ashland and its customers, compliance with The U.S. Foreign Corrupt Practices Act (and analogous non-U.S. laws) and the European Union's Registration, Authorisation and Restriction of Chemicals (REACH) regulation (and analogous non-EU initiatives), and potential operational impacts of General Data Protection Regulation (GDPR). Uncertainty associated with the passage of new laws, as well as changes in and enforcement of existing laws, can limit Ashland's ability to make and execute business plans effectively. In addition, compliance with laws and regulations is complicated by Ashland's substantial and growing global footprint, which will require significant and additional resources to comprehend and ensure compliance with applicable laws in the more than one hundred countries where Ashland conducts business. Compliance with current and future regulations is further complicated by uncertainty around the reevaluation of international agreements by various countries, including the United States, and the resulting impact on regulatory regimes, customs regulations, tariffs, and other transnational protocols.

Business disruptions from natural, operational and other catastrophic risks could seriously harm Ashland's operations and financial performance. In addition, a catastrophic event at one of Ashland's facilities or involving its products or employees could lead to liabilities that could further impair its operations and financial performance.

Business disruptions, including those related to operating hazards inherent with the production of chemicals, natural disasters, severe weather conditions, supply or logistics disruptions, increasing costs for energy, temporary plant and/or power outages, information technology systems and network disruptions, cyber-security breach, terrorist attacks, armed conflict, war, pandemic diseases, fires, floods or other catastrophic events, could seriously harm Ashland's operations, as well as the operations of its customers and suppliers, and may adversely impact Ashland's financial performance. Although it is impossible to predict the occurrence or consequences of any such events, they could result in reduced demand for Ashland's products, make it difficult or impossible for Ashland to manufacture its products or deliver products and services to its customers or to receive raw materials from suppliers, or create delays and inefficiencies in the supply chain. In addition to leading to a serious disruption of Ashland's businesses, a catastrophic event at one of our facilities or involving our products or employees could lead to substantial legal liability to or claims by parties allegedly harmed by the event.

While Ashland maintains business continuity plans that are intended to allow it to continue operations or mitigate the effects of events that could disrupt its business, Ashland cannot provide assurances that its plans would fully protect it from all such events. In addition, insurance maintained by Ashland to protect against property damage, loss of business and other related consequences resulting from catastrophic events is subject to coverage limitations, depending on the nature of the risk insured. This insurance may not be sufficient to cover all of Ashland's damages or damages to others in the event of a catastrophe. In addition, insurance related to these types of risks may not be available now or, if available, may not be available in the future at commercially reasonable rates.

Ashland uses information technology (IT) systems to conduct business and these IT systems are at risk of potential disruption and cyber security threats.

Ashland's businesses rely on their IT systems to operate efficiently and in some cases, at all. Ashland employs third parties to manage and maintain a significant portion of its IT systems, including, but not limited to data centers, IT infrastructure, network, client support and end user services, as well as the functions of backing up and securing those systems. A partial or complete failure of Ashland's IT systems or those of our third parties managing, providing or servicing them for any amount of time more than several hours could result in significant business disruption causing harm to Ashland's reputation, results of operations or financial condition. In addition, the nature of our businesses, the markets we serve, and geographic profile of our operations make Ashland a target of cyber security threats. Despite steps Ashland takes to mitigate or eliminate them, cyber security threats in general are increasing and becoming more advanced and could occur as a result of the activity of hackers, employee error or employee misconduct. A breach of our IT systems could lead to the loss and destruction of trade secrets, confidential information, proprietary data, intellectual property, customer and supplier data, and employee personal information, and could disrupt business operations which could adversely affect Ashland's relationships with business partners and harm our brands, reputation, and financial results.

Adverse developments in the global economy and potential disruptions of financial markets could negatively impact Ashland's customers and suppliers, and therefore have a negative impact on Ashland's results of operations.

A global or regional economic downturn may reduce customer demand or inhibit Ashland's ability to produce and sell products. Ashland's business and operating results are sensitive to global and regional economic downturns, credit market tightness, declining consumer and business confidence, fluctuating commodity prices, volatile exchange rates, changes in interest rates, sovereign debt defaults and other challenges, including those related to international sanctions and acts of aggression or threatened aggression that can affect the global economy. In the event of adverse developments or stagnation in the economy or financial markets, Ashland's customers may experience deterioration of their businesses, reduced demand for their products, cash flow shortages and difficulty obtaining financing. As a result, existing or potential customers might delay or cancel plans to purchase products and may not be able to fulfill their obligations to Ashland in a timely fashion. Further, suppliers may experience similar conditions, which could impact their ability to fulfill their obligations to Ashland. A weakening or reversal of the current economic recovery in the global economy or a substantial part of it could negatively impact Ashland's business, results of operations, financial condition and ability to grow.

Ashland's substantial indebtedness may adversely affect its business, results of operations and financial condition.

Ashland maintains a substantial amount of debt. Ashland's substantial indebtedness could adversely affect its business, results of operations and financial condition by, among other things:

- requiring Ashland to dedicate a substantial portion of its cash flow from operations to pay principal and interest on its debt, which would reduce the availability of Ashland's cash flow to fund working capital, capital expenditures, acquisitions, execution of its growth strategy and other general corporate purposes;
- limiting Ashland's ability to borrow additional amounts to fund working capital, capital expenditures, acquisitions, debt service requirements, execution of its growth strategy and other purposes;
- making Ashland more vulnerable to adverse changes in general economic, industry and regulatory conditions and in its business by limiting Ashland's flexibility in planning for, and making it more difficult for Ashland to react quickly to, changing conditions;
- placing Ashland at a competitive disadvantage compared with those of its competitors that have less debt and lower debt service requirements;
- making Ashland more vulnerable to increases in interest rates since some of its indebtedness is subject to variable rates of interest; and
- making it more difficult for Ashland to satisfy its financial obligations.

In addition, Ashland may not be able to generate sufficient cash flow from its operations to repay its indebtedness when it becomes due and to meet its other cash needs. If Ashland is not able to pay its debts as they become due, it could be in default under its credit facility or other indebtedness. Ashland might also be required to pursue one or more alternative strategies to repay indebtedness, such as selling assets, refinancing or restructuring its indebtedness or selling additional debt or equity securities. Ashland may not be able to refinance its debt or sell additional debt or equity securities or its assets on favorable terms, if at all, and if Ashland must sell its assets, it may negatively affect its ability to generate revenues.

Ashland's future success depends on its ability to execute its strategy to optimize the value of its business portfolio through the divestiture of non-core businesses, while growing its core businesses organically and through targeted "bolt-on" acquisitions.

Ashland's strategic objective has been to create a more focused company built around a strong core of specialty chemicals businesses. Ashland intends to invest in and grow its specialty chemicals businesses and structure the rest of its businesses in a manner that optimizes its enterprise value. As Ashland evaluates opportunities to enhance its enterprise value, Ashland will continue to evaluate the alignment of its business portfolio with that strategic vision and may engage in future divestitures, acquisitions or joint ventures. Ashland's current planned divestiture of the Composites business and the Intermediates and Solvents plant at Marl, Germany is the next step in this process of optimizing the corporate business portfolio. If Ashland fails to complete this transaction, or do so in a realistic time-frame, it can result in the interruption of various strategic plans, require ongoing management attention, and require continued investment in businesses deemed not to be part of strategic core of the future of the company.

In addition, the execution of Ashland's strategy also may be affected by considerations related to its substantial debt level and contingent or legacy liabilities. If Ashland fails to optimize the value of its business portfolio while managing its debt level and contingent liabilities, Ashland's enterprise value could be negatively affected.

Ashland may not be able to effectively protect or enforce its intellectual property rights.

Ashland relies on the patent, trademark, trade secret and copyright laws of the United States and other countries to protect its intellectual property rights. The laws of some countries may not protect Ashland's intellectual property rights to the same extent as the laws of the United States. Failure of foreign countries to have laws to protect Ashland's intellectual property rights or an inability to effectively enforce such rights in foreign countries could result in the loss of valuable proprietary information, which could have an adverse effect on Ashland's business and results of operations.

Even in circumstances where Ashland has a patent on certain technologies, such patents may not provide meaningful protection against competitors or against competing technologies. In addition, any patent applications submitted by Ashland may not result in an issued patent. There can be no assurance that Ashland's intellectual property rights will not be challenged, invalidated, circumvented or rendered unenforceable. Ashland could also face claims from third parties alleging that Ashland's products or processes infringe on their proprietary rights. If Ashland is found liable for infringement, it could be responsible for significant damages, prohibited from using certain products or processes or required to modify certain products and processes. Any such infringement liability could adversely affect Ashland's product and service offerings, profitability and results of operations.

Ashland also has substantial intellectual property associated with its know-how and trade secrets that are not protected by patent or copyright laws. Ashland protects these rights by entering into confidentiality and non-disclosure agreements with most of its employees and with third parties. There can be no assurance that such agreements will not be breached or that Ashland will be able to effectively enforce them. In addition, Ashland's trade secrets and know-how may be improperly obtained by other means, such as a breach of Ashland's information technologies security systems or direct theft. Any unauthorized disclosure of any of Ashland's material know-how or trade secrets could adversely affect Ashland's business and results of operations.

Ashland has incurred, and will continue to incur, substantial costs as a result of environmental, health and safety, and hazardous substances liabilities and related compliance requirements. These costs could adversely impact Ashland's cash flow, and, to the extent they exceed Ashland's established reserves for these liabilities, its results of operations.

Ashland is subject to extensive federal, state, local and foreign laws, regulations, rules and ordinances relating to pollution, protection of the environment and human health and safety, and the generation, storage, handling, treatment, disposal and remediation of hazardous substances and waste materials. Ashland has incurred, and will continue to incur, significant costs and capital expenditures to comply with these laws and regulations.

Environmental, health and safety regulations change frequently, and such regulations and their enforcement have tended to become more stringent over time. Accordingly, changes in environmental, health and safety laws and regulations and the enforcement of such laws and regulations could interrupt Ashland's operations, require modifications to its facilities or cause Ashland to incur significant liabilities, costs or losses that could adversely affect its profitability. Actual or alleged violations of environmental, health or safety laws and regulations could result in restrictions or prohibitions on plant operations as well as substantial damages, penalties, fines, civil or criminal sanctions and remediation costs. In addition, under some environmental laws, Ashland may be strictly liable and/or jointly and severally liable for environmental damages and penalties.

Ashland is also subject to various federal, state, local and foreign environmental laws and regulations that require environmental assessment or remediation efforts (collectively, environmental remediation) at multiple locations. Ashland uses engineering studies, historical experience and other factors to identify and evaluate remediation alternatives and their related costs in determining the estimated reserves for environmental remediation. Environmental remediation reserves are subject to numerous inherent uncertainties that affect Ashland's ability to estimate its share of the applicable costs. Such uncertainties involve the nature and extent of contamination at each site, the extent of required cleanup efforts under existing environmental regulations, widely varying costs of alternate cleanup methods, changes in environmental regulations, the potential effect of continuing improvements in remediation technology and the number and financial strength of other potentially responsible parties at multiparty sites. As a result, Ashland's actual costs for environmental remediation could affect Ashland's cash flow and, to the extent costs exceed established reserves for those liabilities, its results of operations.

Ashland is responsible for, and has financial exposure to, liabilities from pending and threatened claims, including those alleging personal injury caused by exposure to asbestos, which could adversely impact Ashland's results of operations and cash flow.

There are various claims, lawsuits and administrative proceedings pending or threatened, including those alleging personal injury caused by exposure to asbestos, against Ashland and its current and former subsidiaries. Such actions are with respect to commercial matters, product liability, toxic tort liability and other matters that seek remedies or damages, some of which are for substantial amounts. While these actions are being contested, their outcome is not predictable. Ashland's results could be adversely affected by financial exposure to these liabilities. Insurance maintained by Ashland to protect against claims for damages alleged by third parties is subject to coverage limitations, depending on the nature of the risk insured. This insurance may not be sufficient to cover all of Ashland's liabilities to others. In addition, insurance related to these types of risks may not be available now or, if available, may not be available in the future at commercially reasonable rates. Ashland's ability to recover from its insurers for asbestos liabilities could also have an adverse impact on its results of operations. Projecting future asbestos costs is subject to numerous variables that are extremely difficult to predict. In addition to the significant uncertainties surrounding the number of claims that might be received, other variables include the type and severity of the disease alleged by each claimant, the long latency period associated with asbestos exposure, dismissal rates, costs of medical treatment, the impact of bankruptcies of other companies that are co-defendants in claims, uncertainties surrounding the litigation process from jurisdiction to jurisdiction and from case to case, and the impact of potential changes in legislative or judicial standards. Furthermore, any predictions with respect to these variables are subject to even greater uncertainty as the projection period lengthens. In light of these inherent uncertainties, Ashland believes that its asbestos reserves represent the best estimate within a range of possible outcomes. As a part of the process to develop these estimates of future asbestos costs, a range of long-term cost models was developed. These models are based on national studies that predict the number of people likely to develop asbestos-related diseases and are heavily influenced by assumptions regarding long-term inflation rates for indemnity payments and legal defense costs, as well as other variables mentioned previously. Because of the inherent uncertainties in projecting future asbestos liabilities and establishing appropriate reserves, Ashland's actual asbestos costs could adversely affect its results of operations and, to the extent they exceed its reserves, could adversely affect its results of operations.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Ashland's corporate headquarters is located in Covington, Kentucky and will remain there no later than December 2019, at which point it will move to Wilmington, Delaware. Principal offices of other major operations are located in Wilmington, Delaware (Specialty Ingredients); Bridgewater, New Jersey (Specialty Ingredients); Dublin, Ohio (Specialty Ingredients, Composites and Intermediates and Solvents); Lexington, Kentucky (Corporate); and Shanghai, China; Hyderabad, India; Warsaw, Poland; and Schaffhausen, Switzerland (each of which are shared service centers of Ashland's business units). All of these locations are leased, except for the Wilmington, Delaware site which is owned. Principal manufacturing, marketing and other materially important physical properties of Ashland and its subsidiaries are described within the applicable business units under "Item 1" in this annual report on Form 10-K. All of Ashland's physical properties are owned or leased. Ashland believes its physical properties are suitable and adequate for the Company's business. Additional information concerning leases may be found in Note K of Notes to Consolidated Financial Statements in this annual report on Form 10-K.

ITEM 3. LEGAL PROCEEDINGS

The following is a description of Ashland's material legal proceedings.

Asbestos-Related Litigation

Ashland is subject to liabilities from claims alleging personal injury caused by exposure to asbestos. Such claims result primarily from indemnification obligations undertaken in 1990 in connection with the sale of Riley Stoker Corporation (Riley), a former subsidiary. Although Riley was neither a producer nor a manufacturer of asbestos, its industrial boilers contained some asbestos-containing components provided by other companies.

Hercules LLC (formerly Hercules Incorporated), an indirect wholly-owned subsidiary of Ashland, is also subject to liabilities from asbestos-related personal injury lawsuits involving claims which typically arise from alleged exposure to asbestos fibers from resin encapsulated pipe and tank products which were sold by one of Hercules' former subsidiaries to a limited industrial market.

Ashland and Hercules are also defendants in lawsuits alleging exposure to asbestos at facilities formerly or presently owned or operated by Ashland or Hercules.

For additional detailed information regarding liabilities arising from asbestos-related litigation, see "Management's Discussion and Analysis - Critical Accounting Policies - Asbestos Litigation" and Note O of Notes to Consolidated Financial Statements in this annual report on Form 10-K.

Environmental Proceedings

(a) *CERCLA and Similar State Law Sites* - Under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and similar state laws, Ashland and its subsidiaries may be subject to joint and several liability for cleanup costs in connection with alleged releases of hazardous substances at sites where it has been identified as a "potentially responsible party" (PRP). As of September 30, 2018, Ashland and its subsidiaries have been identified as a PRP by U.S. federal and state authorities, or by private parties seeking contribution, for the cost of environmental investigation and/or cleanup at 81 waste treatment or disposal sites. These sites are currently subject to ongoing investigation and remedial activities, overseen by the United States Environmental Protection Agency (USEPA) or a state agency, in which Ashland or its subsidiaries are typically participating as a member of a PRP group. Generally, the types of relief sought include remediation of contaminated soil and/or groundwater, reimbursement for past costs of site cleanup and administrative oversight and/or long-term monitoring of environmental conditions at the sites. The ultimate costs are not predictable with assurance.

(b) *Philadelphia, Pennsylvania Matters* - On May 3, 2018, Ashland received a Consent Assessment of Civil Penalty from the Pennsylvania Department of Environmental Protection (PADEP), seeking a penalty of \$445,000 alleging violations under the Pennsylvania Storage Tank and Spill Prevention Act. The matter was settled in October 2018 for under \$100,000.

(c) *Hattiesburg, Mississippi Resource Conservation and Recovery Act (RCRA) Matter* - In November 2008, the Mississippi Department of Environmental Quality (MDEQ) issued a Notice of Violation to Hercules' now-closed Hattiesburg, Mississippi manufacturing facility alleging that a process water impoundment basin at the facility had been operated as a hazardous waste storage and treatment facility without a permit in violation of the Resource Conservation and Recovery Act. In May 2011, the USEPA issued an inspection report from a September 2010 inspection with allegations similar to those of the MDEQ and promulgated an information request. Ashland has been working with the MDEQ and USEPA to settle this matter in the context of the shutdown and ongoing remediation of the Hattiesburg facility. The USEPA proposed a settlement penalty in excess of \$100,000. While it is reasonable to believe that this matter will involve a penalty from the MDEQ and/or the USEPA exceeding \$100,000, the potential penalty with respect to this enforcement matter should not be material to Ashland.

(d) *Lower Passaic River, New Jersey Matters* - Ashland, through two formerly owned facilities, and ISP, through a now-closed facility, have been identified as PRPs, along with approximately 70 other companies (the Cooperating Parties Group or the CPG), in a May 2007 Administrative Order of Consent (AOC) with the USEPA. The parties are required to perform a remedial investigation and feasibility study (RI/FS) of the entire 17 miles of the Passaic River. In June 2007, the USEPA separately commenced a Focused Feasibility Study (FFS) as an interim measure. In accordance with the 2007 AOC, in June 2012 the CPG voluntarily entered into another AOC for an interim removal action focused solely at mile 10.9 of the Passaic River. The allocations for the 2007 AOC and the 2012 removal action are based on interim allocations, are immaterial and have been accrued. In April 2014, the USEPA released the FFS. The CPG submitted the Draft RI/FS Report on April 30, 2015. The USEPA has released the FFS Record of Decision for the lower 8 miles and reached an agreement with another chemical company to conduct and pay for the remedial design. This chemical company has sued Ashland, ISP and numerous other defendants to recover past and future costs pursuant to the CERCLA. Ashland, ISP and numerous other defendants have filed a Motion to Dismiss all of the claims. Ashland and ISP are participating in an USEPA allocation process. The release of the FFS Record of Decision, the current allocations proceedings and the lawsuit are not expected to be material to Ashland.

(e) *Freetown, MA Resource Conservation and Recovery Act (RCRA) Matter*—On September 27, 2018, the USEPA issued a Complaint, Compliance Order and Opportunity for Hearing to ISP Freetown Fine Chemicals, Inc.'s facility in Assonet, Massachusetts alleging various violations of the RCRA relating to certain distillation tanks at the facility and seeking a penalty of \$203,792. Ashland disputes USEPA's stated interpretation of the RCRA regulations and their applicability to these tanks. While this matter could result in a penalty from USEPA in excess of \$100,000, the potential penalty is not expected to be material to Ashland.

For additional information regarding environmental matters and reserves, see Note O of Notes to Consolidated Financial Statements in this annual report on Form 10-K.

Other Pending Legal Proceedings

In addition to the matters described above, there are other various claims, lawsuits and administrative proceedings pending or threatened against Ashland and its current and former subsidiaries. Such actions are with respect to commercial matters, product liability, toxic tort liability and other environmental matters which seek remedies or damages, some of which are for substantial amounts. While Ashland cannot predict with certainty the outcome of such actions, it believes that adequate reserves have been recorded and losses already recognized with respect to such actions were immaterial as of September 30, 2018. There is a reasonable possibility that a loss exceeding amounts already recognized may be incurred related to these actions; however, Ashland believes that such potential losses were immaterial as of September 30, 2018.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

ITEM X. EXECUTIVE OFFICERS OF ASHLAND

The following is a list of Ashland's current executive officers, their ages and their positions and offices during the last five years.

WILLIAM A. WULFSOHN (age 56) is Chairman and Chief Executive Officer of Ashland Global Holdings Inc. since September 2016 and held the same positions at Ashland Inc. since January 1, 2015. Prior to joining Ashland, Mr. Wulfsohn served as President and Chief Executive Officer of Carpenter Technology Corp., a manufacturer of stainless steel, titanium, and other specialty metals and engineered products, from July 2010 to November 2014. Mr. Wulfsohn also served as a Director for Carpenter Technology Corp. from April 2009 to November 2014 and of Valvoline Inc. from September 2016 to January 2018. Mr. Wulfsohn serves as a director of PolyOne Corporation.

J. KEVIN WILLIS (age 53) is Senior Vice President and Chief Financial Officer of Ashland Global Holdings Inc. since September 2016. Mr. Willis held the same positions at Ashland Inc. and served in such capacities since May 2013. Mr. Willis served as Vice President of Finance and Controller for the Specialty Ingredients business unit from August 2011 until May 2013.

PETER J. GANZ (age 56) is Senior Vice President, General Counsel and Secretary of Ashland Global Holdings Inc. and has served as Senior Vice President and General Counsel of Ashland Inc. since July 2011 and Secretary since November 2012. From July 2011 to August 2016, Mr. Ganz served as Chief Compliance Officer of Ashland Inc.

ANNE T. SCHUMANN (age 58) is Senior Vice President, Chief Human Resources and Information Technology Officer of Ashland Global Holdings Inc. since March 2017. Prior to this role, Ms. Schumann served as the Vice President and Chief Information and Administrative Services Officer of Ashland Global Holdings Inc. and served in the same capacities with Ashland Inc. since 2008 and 2009, respectively.

VITO J. CONSIGLIO (age 54) is Senior Vice President of Ashland Global Holdings Inc. since November 2018 and Group Vice President, Ashland Specialty Ingredients since July 2016. Prior to joining Ashland, Mr. Consiglio served as Vice President at Carpenter Technology, leading the transportation business unit for the specialty steel manufacturer from 2013 to 2016.

OSAMA M. MUSA (age 50) is Senior Vice President and Chief Technology Officer of Ashland Global Holdings Inc. since November 2018. Previously, Mr. Musa served as Vice President, ASI Technology from November 2014 to November 2018 and Vice President, Technology and Innovation of Ashland from August 2012 until November 2014.

KEITH C. SILVERMAN (age 51) is Senior Vice President, Global Operations, Quality and Environmental Health and Safety of Ashland Global Holdings Inc. since November 2018. Previously, Mr. Silverman served as Vice President, Global Operations, Quality and Environmental Health and Safety of Ashland Global Holdings Inc. and served in similar capacities at Ashland Inc. since June 2012.

J. WILLIAM HEITMAN (age 64) is Vice President and Controller of Ashland Global Holdings Inc. and has served in such capacities with Ashland Inc. since 2008.

Each executive officer is elected by the Board of Directors of Ashland to a term of one year, or until a successor is duly elected, at the annual meeting of the Board of Directors, except in those instances where the officer is elected other than at an annual meeting of the Board of Directors, in which case his or her tenure will expire at the next annual meeting of the Board of Directors unless the officer is re-elected.

PART II

ITEM 5. MARKET FOR REGISTRANT’S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

On September 20, 2016, Ashland Inc. became an indirect wholly owned subsidiary of Ashland Global Holdings Inc., and Ashland Inc.’s common stock ceased trading on the New York Stock Exchange (NYSE). Ashland Global Holdings Inc.’s common stock began trading on NYSE under the symbol “ASH” on September 20, 2016.

At October 31, 2018, there were approximately 11,100 holders of record of Ashland’s Common Stock. Ashland Common Stock is listed on the NYSE (ticker symbol ASH) and has trading privileges on Nasdaq.

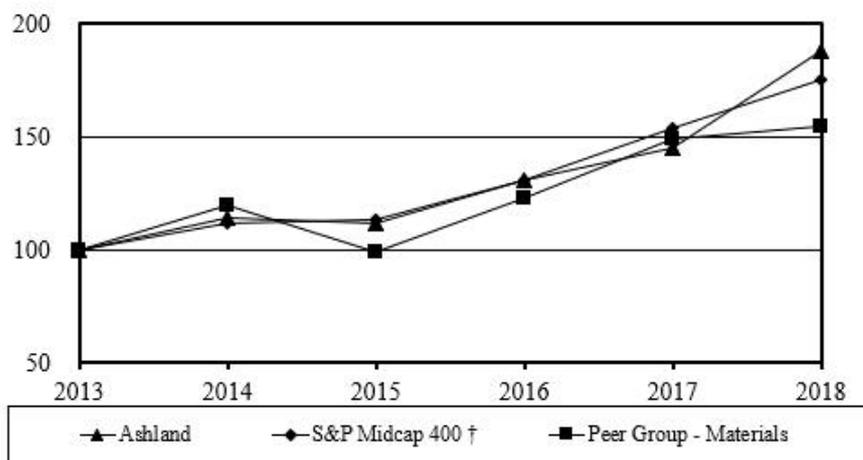
There were no sales of unregistered securities required to be reported under Item 5 of Form 10-K.

FIVE-YEAR TOTAL RETURN PERFORMANCE GRAPH

The following graph compares Ashland’s five-year cumulative total shareholder return with the cumulative total return of the S&P MidCap 400† index and one peer group of companies. Ashland is listed in the S&P MidCap 400† index. The cumulative total shareholder return assumes the reinvestment of dividends. On May 12, 2017, Ashland completed the final separation of Valvoline Inc. with the pro rata distribution of 2.745338 shares of Valvoline Inc. common stock for every share of Ashland Common Stock to Ashland stockholders. The effect of the final separation of Valvoline Inc. is reflected in the cumulative total return of Ashland Common Stock as a reinvested dividend.

COMPARISON OF FIVE-YEAR CUMULATIVE TOTAL RETURN
ASHLAND, S&P MIDCAP 400† INDEX AND PEER GROUP

(Dollars)



	2013	2014	2015	2016	2017	2018
Ashland	100	114	112	130	145	188
S&P MidCap 400†	100	112	113	131	153	175
Peer Group - Materials	100	119	98	123	149	155

The peer group consists of the following industry indices:

- Peer Group – Materials: S&P 500† Materials (large-cap) and S&P MidCap 400† Materials. As of September 28, 2018, this peer group consisted of 53 companies.

Purchase of Company Common Stock

Share repurchase activity during the three months ended September 30, 2018 was as follows:

Q4 Fiscal Periods	Total Number of Shares Purchased	Average Price Paid per Share, including commission	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Dollar Value of Shares That May Yet Be Purchased Under the Plans or Programs (in millions) (a)
July 1, 2018 to July 31, 2018	—	\$ —	—	\$ 1,000
August 1, 2018 to August 31, 2018:				
Employee tax withholdings	1,330 (b)	85.17	—	1,000
September 1, 2018 to September 30, 2018	—	—	—	1,000
Total	1,330		—	\$ 1,000

(a) During March 2018, Ashland's Board of Directors approved a new \$1 billion stock repurchase program, which replaced the previous stock repurchase program. The Company's stock repurchase program does not obligate it to acquire any specific number of shares. Under the program, shares may be repurchased in privately negotiated and/or open market transactions, including under plans complying with Rule 10b5-1 of the Exchange Act. As of September 30, 2018, \$1 billion remains available for repurchase under this authorization.

(b) Shares withheld from employees to cover their withholding requirements for personal income taxes related to the vesting of restricted stock.

ITEM 6. SELECTED FINANCIAL DATA

See Five-Year Selected Financial Information on page F-59.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

See Management's Discussion and Analysis of Financial Condition and Results of Operations on pages M-1 through M-41.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

See Quantitative and Qualitative Disclosures about Market Risk on page M-41.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

The consolidated financial statements of Ashland presented in this annual report on Form 10-K are listed in the index on page F-1.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Disclosure Controls and Procedures – As of September 30, 2018, Ashland, under the supervision and with the participation of Ashland's management, including Ashland's Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of Ashland's disclosure controls and procedures as defined in Exchange Act Rules 13a-15(e) and 15d-15(e). Based upon that evaluation, the Chief Executive Officer and Chief Financial Officer concluded that the disclosure controls and procedures were effective as of September 30, 2018.

Internal Control over Financial Reporting - See Management's Report on Internal Control Over Financial Reporting on page F-2 and the Reports of the Independent Registered Public Accounting Firm on pages F-3 and F-4.

Changes in Internal Control over Financial Reporting – There have been no changes in Ashland's internal control over financial reporting that occurred during the quarter ended September 30, 2018 that have materially affected, or are reasonably likely to materially affect, Ashland's internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

There is hereby incorporated by reference the information to appear under the caption "Proposal One - Election of Directors" in Ashland's Proxy Statement, which will be filed with the SEC within 120 days after September 30, 2018. See also the list of Ashland's executive officers and related information under "Executive Officers of Ashland" in Part I - Item X in this annual report on Form 10-K.

There is hereby incorporated by reference the information to appear under the caption "Corporate Governance - Governance Principles" in Ashland's Proxy Statement.

There is hereby incorporated by reference the information to appear under the caption "Corporate Governance - Stockholder Nominations of Directors" in Ashland's Proxy Statement.

There is hereby incorporated by reference the information to appear under the caption "Audit Committee Report" regarding Ashland's audit committee and audit committee financial experts, as defined under Item 407(d)(4) and (5) of Regulation S-K in Ashland's Proxy Statement.

There is hereby incorporated by reference the information to appear under the caption "Corporate Governance - Section 16(a) Beneficial Ownership Reporting Compliance" in Ashland's Proxy Statement.

ITEM 11. EXECUTIVE COMPENSATION

There is hereby incorporated by reference the information to appear under the captions "Compensation of Directors," "Corporate Governance - Compensation Committee Interlocks and Insider Participation," and "Executive Compensation," in Ashland's Proxy Statement.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

There is hereby incorporated by reference the information to appear under the captions "Ashland Common Stock Ownership of Certain Beneficial Owners," and "Ashland Common Stock Ownership of Directors and Executive Officers of Ashland" in Ashland's Proxy Statement.

The following table summarizes the equity compensation plans under which Ashland Common Stock may be issued as of September 30, 2018.

Equity Compensation Plan Information

Plan Category	Number of securities to be issued upon exercise of outstanding options, warrants and rights (a)	Weighted-average exercise price of outstanding options, warrants and rights (b)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)) (c)
Equity compensation plans approved by security holders	1,330,225 (1)	\$ 53.21 (2)	7,474,159 (3)
Equity compensation plans not approved by security holders	293,131 (4)	—	1,333,211 (5)
Total	1,623,356	\$ 53.21 (2)	8,807,370

(1) This figure includes 109,006 net shares that could be issued under stock-settled SARs under the 2006 Ashland Inc. Incentive Plan (“2006 Incentive Plan”), 379,583 net shares that could be issued under stock-settled SARs under the Amended and Restated 2011 Ashland Inc. Incentive Plan (“2011 Incentive Plan”) and 338,738 net shares that could be issued under stock-settled SARs and 286,086 shares that could be issued under stock-settled restricted stock units under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan (“2015 Incentive Plan”), based upon the closing price of Ashland Common Stock on the NYSE as of September 28, 2018 of \$83.86. Additionally, this figure includes 30,757 restricted shares granted under the Amended and Restated Ashland Inc. Incentive Plan (“Amended Plan”) and deferred, 64,243 restricted stock units for the fiscal 2016-2018 performance period payable in Ashland Common Stock under the 2015 Incentive Plan, and 94,750 performance units for the fiscal 2018-2020 performance period payable in Ashland Common Stock under the 2015 Incentive Plan, estimated assuming target performance is achieved. Also included in the figure are 27,062 shares to be issued under the pre-2005 Deferred Compensation Plan for Employees payable in Ashland Common Stock upon termination of employment or service with Ashland. The fiscal 2017-2019 LTIPP is cash-settled and therefore not included in the table above.

(2) The weighted-average exercise price excludes shares in Ashland Common Stock which may be distributed under the deferred compensation plans and the deferred restricted stock, and performance share units and restricted stock units which may be distributed under the 2011 Incentive Plan and 2015 Incentive Plan, as described in footnotes (1) and (4) in this table.

(3) This figure includes 3,756,201 shares available for issuance under the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan (“2018 Omnibus Plan”), 119,769 shares available for issuance under the pre-2005 Deferred Compensation Plan for Employees (closed) and 386,940 shares available for issuance under the pre-2005 Deferred Compensation Plan for Non-Employee Directors (closed). Under the 2018 Incentive Plan, full-value awards, which include all awards other than stock options and SARs, reduce the share reserve on a 2-to-1 basis. The remaining balance of shares available for grant under the 2015 Incentive Plan are now available for grant under the 2018 Omnibus Plan and are included in the numbers of shares available for issuance under the 2018 Omnibus Plan. This figure also includes 68,325 shares available for issuance under the 2006 Incentive Plan, 2,563,957 shares available for issuance under the 2011 Incentive Plan and 578,967 shares available for issuance under the 2015 Incentive Plan; however, these plans are closed for new issuances and the only shares remaining to be issued are shares paid in lieu of dividends and for the 2015 Incentive Plan, shares to be issued for unvested performance units and restricted stock units.

(4) This figure includes 48,430 shares to be issued under the Deferred Compensation Plan for Employees (2005), which is described in the “Non-Qualified Deferred Compensation-Ashland Employees’ Deferral Plan” section of Ashland’s proxy statement, and 244,701 shares to be issued under the Deferred Compensation Plan for Non-Employee Directors (2005), which is described in the “Compensation of Directors” section of Ashland’s proxy statement, payable in Ashland Common Stock upon termination of employment or service with Ashland. Because these plans are not equity compensation plans as defined by the rules of the NYSE, neither plan required approval by Ashland’s stockholders.

(5) This figure includes 684,051 shares available for issuance under the Deferred Compensation Plan for Employees (2005) and 649,160 shares available for issuance under the Deferred Compensation Plan for Non-Employee Directors (2005). Because these plans are not equity compensation plans as defined by the rules of the NYSE, neither plan required approval by Ashland’s stockholders.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

There is hereby incorporated by reference the information to appear under the captions “Corporate Governance - Director Independence and Certain Relationships,” “Corporate Governance - Related Person Transaction Policy,” and “Audit Committee Report” in Ashland’s Proxy Statement.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

There is hereby incorporated by reference the information with respect to principal accounting fees and services to appear under the captions “Audit Committee Report” and “Proposal Two - Ratification of Independent Registered Public Accountants” in Ashland’s Proxy Statement.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) Documents filed as part of this Report

- (1) Financial Statements; and
- (2) See Item 15(b) in this annual report on Form 10-K

The consolidated financial statements of Ashland presented in this annual report on Form 10-K are listed in the index on page F-1.

Schedules other than that listed above have been omitted because of the absence of the conditions under which they are required or because the information required is shown in the consolidated financial statements or the notes thereto. Separate financial statements of unconsolidated affiliates are omitted because each company does not constitute a significant subsidiary using the 20% tests when considered individually.

(b) Documents required by Item 601 of Regulation S-K

- 2.1 – [Stock and Asset Purchase Agreement, dated as of February 18, 2014, between Ashland Inc. and CD&R Seahawk Bidco, LLC \(filed as Exhibit 2.1 to Ashland’s Form 8-K filed on February 24, 2014 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 2.2 – [Sale and Purchase Agreement related to the ASK Chemicals Group, dated April 8, 2014, among Ashland Inc., Ashland International Holdings, Inc., Clariant Produkte \(Deutschland\) GmbH, Clariant Corp., mertus 158. GmbH, Ascot US Bidco Inc. and Ascot UK Bidco Limited \(filed as Exhibit 2.1 to Ashland’s Form 8-K filed on April 14, 2014 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 2.3 – [Agreement and Plan of Merger dated May 31, 2016, by and among Ashland Inc., Ashland Global Holdings Inc. and Ashland Merger Sub Corp. \(filed as Exhibit 2.1 to Ashland’s Form 8-K filed on May 31, 2016 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 3.1 – [Amended and Restated Articles of Incorporation of Ashland Global Holdings Inc. \(filed as Exhibit 3.1 to Ashland’s Form 8-K filed on September 20, 2016 \(SEC File No. 001-32532\), and incorporated by reference herein\).](#)
- 3.2 – [Amended and Restated By-laws of Ashland Global Holdings Inc. \(filed as Exhibit 3.1 to Ashland’s Form 8-K filed November 17, 2017 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 4.1 – Ashland agrees to provide the SEC, upon request, copies of instruments defining the rights of holders of long-term debt of Ashland and all of its subsidiaries for which consolidated or unconsolidated financial statements are required to be filed with the SEC.
- 4.2 – [Indenture, dated as of August 15, 1989, as amended and restated as of August 15, 1990, between Ashland Inc. and Citibank, N.A., as Trustee \(filed as Exhibit 4.2 to Ashland’s Form 10-K for the fiscal year ended September 30, 2008 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)

- 4.3 – [Agreement of Resignation, Appointment and Acceptance, dated as of November 30, 2006, by and among Ashland Inc., Wilmington Trust Company \(Wilmington\) and Citibank, N.A. \(Citibank\) whereby Wilmington replaced Citibank as Trustee under the Indenture dated as of August 15, 1989, as amended and restated as of August 15, 1990, between Ashland Inc. and Citibank \(filed as Exhibit 4 to Ashland’s Form 10-Q for the quarter ended December 31, 2006 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 4.4 – [Indenture, dated May 27, 2009, by and among Ashland Inc., the Guarantors and U.S. Bank National Association \(filed as Exhibit 4.1 to Ashland’s Form 10-Q for the quarter ended June 30, 2009 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 4.5 – [Warrant Agreement dated July 27, 1999 between Hercules and The Chase Manhattan Bank, as warrant agent \(filed as Exhibit 4.4 to Hercules’ Form 8-K filed on July 28, 1999 \(SEC File No. 001-00496\), and incorporated herein by reference\).](#)
- 4.6 – [Form of Series A Junior Subordinated Deferrable Interest Debentures \(filed as Exhibit 4.5 to Hercules’ Form 8-K filed on July 28, 1999 \(SEC File No. 001-00496\), and incorporated herein by reference\).](#)
- 4.7 – [Form of CRESTSM Unit \(filed as Exhibit 4.7 to Hercules’ Form 8-K filed on July 28, 1999 \(SEC File No. 001-00496\), and incorporated herein by reference\).](#)
- 4.8 – [Form of Warrant \(filed as Exhibit 4.8 to Hercules’ Form 8-K filed on July 28, 1999 \(SEC File No. 001-00496\), and incorporated herein by reference\).](#)
- 4.9 – [Form of \\$100,000,000 6.6% Debenture due August 27, 2027 \(filed as Exhibit 4.2 to Hercules’ Form 8-K filed on July 30, 1997 \(SEC File No. 001-00496\), and incorporated herein by reference\).](#)
- 4.10 – [Indenture, dated as of August 7, 2012, between Ashland Inc. and U.S. Bank N.A., as Trustee \(filed as Exhibit 4.1 to Ashland’s Form 8-K filed on September 21, 2012 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 4.11 – [First Supplemental Indenture, dated as of February 26, 2013, between Ashland Inc. and U.S. Bank National Association, as Trustee, in respect of the senior notes due 2022 \(filed as Exhibit 4.11 to Ashland’s Form 10-K for the fiscal year ended September 30, 2013 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 4.12 – [Indenture, dated as of February 26, 2013, between Ashland Inc. and U.S. Bank National Association, as Trustee \(filed as Exhibit 4.3 to Ashland’s Form 8-K filed on February 27, 2013 \(SEC File No. 001- 32532\), and incorporated herein by reference\).](#)
- 4.13 – [First Supplemental Indenture, dated as of February 26, 2013, between Ashland Inc. and U.S. Bank National Association, as Trustee, in respect of the senior notes due 2016, 2018 and 2043 \(filed as Exhibit 4.4 to Ashland’s Form 8-K filed on February 27, 2013 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 4.14 – [Second Supplemental Indenture, dated as of March 14, 2013, between Ashland Inc. and U.S. Bank National Association, as Trustee, in respect of the senior notes due 2043 \(filed as Exhibit 4.2 to Ashland’s Form 8-K filed on March 18, 2013 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 4.15 – [Second Supplemental Indenture dated October 19, 2016, among Ashland LLC, Ashland Global Holdings Inc. and US Bank National Association, to the Indenture dated as of August 7, 2012 between Ashland LLC and US Bank National Association \(filed as Exhibit 4.1 to Ashland’s Form 8-K filed on October 20, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 4.16 – [Third Supplemental Indenture dated October 19, 2016, among Ashland LLC, Ashland Global Holdings Inc. and US Bank National Association, to the Indenture dated as of February 27, 2013 between Ashland LLC and US Bank National Association \(filed as Exhibit 4.2 to Ashland’s Form 8-K filed on October 20, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)

The following Exhibits 10.1 through 10.45 are contracts or compensatory plans or arrangements or management contracts required to be filed as exhibits pursuant to Items 601(b)(10)(ii)(A) and 601(b)(10)(iii)(A) and (B) of Regulation S-K.

- 10.1 – [Ashland Inc. Deferred Compensation Plan for Non-Employee Directors and Amendment No. 1 \(filed as Exhibit 10.5 to Ashland's Form 10-Q for the quarter ended December 31, 2004 \(SEC File No. 001-02918\), and incorporated herein by reference\).](#)
- 10.2 – [Ashland Inc. Deferred Compensation Plan and Amendment No. 1 \(filed as Exhibit 10.3 to Ashland's Form 10-Q for the quarter ended December 31, 2004 \(SEC File No. 001-02918\), and incorporated herein by reference\).](#)
- 10.3 – [Amended and Restated Ashland Global Holdings Inc. Deferred Compensation Plan for Employees \(2005\) effective as of January 1, 2017 \(filed as Exhibit 10.3 to Ashland's Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.4 – [Amended and Restated Ashland Inc. Deferred Compensation Plan for Non-Employee Directors \(2005\) \(filed as Exhibit 10.4 to Ashland's Form 10-K for the fiscal year ended September 30, 2008 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.5 – [Amendment to the Amended and Restated Ashland Inc. Deferred Compensation Plan for Non-Employee Directors \(2005\) \(filed as Exhibit 10.4 to Ashland's Form 10-Q for the quarter ended March 31, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.6 – [Amended and Restated Ashland Global Holdings Inc. Deferred Compensation Plan for Non-Employee Directors \(2005\) effective as of January 1, 2017 \(filed as Exhibit 10.4 to Ashland's Form 10-Q for the quarter ended December 31, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.7 – [Ashland Supplemental Defined Contribution Plan for Certain Employees \(filed as Exhibit 10.3 to Ashland's Form 10-Q for the quarter ended March 31, 2011 \(SEC File No. 001-32532\), and incorporated herein by reference\) \(Frozen\).](#)
- 10.8 – [Ashland Inc. Supplemental Defined Contribution Plan for Certain Employees effective January 1, 2015 \(filed as Exhibit 10.1 to Ashland's Form 8-K filed on May 18, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\) \(Frozen\).](#)
- 10.9 – [Form of Chief Executive Officer Change in Control Agreement \(filed as Exhibit 10.1 to Ashland's Form 8-K filed on October 9, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.10 – [Form of Executive Officer Change in Control Agreement \(filed as Exhibit 10.2 to Ashland's Form 8-K filed on October 9, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.11 – [Amended and Restated Ashland Inc. Incentive Plan \(filed as Exhibit 10.17 to Ashland's Form 10-K for the fiscal year ended September 30, 2009 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.12 – [2006 Ashland Inc. Incentive Plan \(filed as Exhibit 10 to Ashland's Form 10-Q for the quarter ended December 31, 2005 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.13 – [Amended and Restated 2011 Ashland Inc. Incentive Plan \(filed as Exhibit 10.2 to Ashland's Form 8-K filed on February 1, 2013 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.14 – [Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(filed as Exhibit 10.21 to Ashland's Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.15 – [Form of Stock Appreciation Rights Award Agreement under the Amended and Restated 2011 Ashland Inc. Incentive Plan \(filed as Exhibit 10.16 to Ashland's Form 10-K for the fiscal year ended September 30, 2014 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.16 – [Form of Restricted Stock Award Agreement under the Amended and Restated 2011 Ashland Inc. Incentive Plan \(filed as Exhibit 10.18 to Ashland's Form 10-K for the fiscal year ended September 30, 2014 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)

- 10.17 – [Form of Restricted Stock Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(filed as Exhibit 10.5 to Ashland’s Form 10-Q for the quarter ended March 31, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.18 – [Form of Stock Appreciation Rights Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(filed as Exhibit 10.7 to Ashland’s Form 10-Q for the quarter ended March 31, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.19 – [Form of Restricted Stock Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(Double-Trigger Form\) \(filed as Exhibit 10.2 to Ashland’s Form 8-K filed on July 20, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.20 – [Separation Agreement and General Release between Ashland and Luis Fernandez-Moreno dated February 28, 2017 \(filed as Exhibit 10.4 to Ashland’s Form 10-Q for the quarter ended March 31, 2017 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.21 – [Confidentiality, Non-Competition and Non-Solicitation Agreement between Ashland and Luis Fernandez-Moreno dated February 28, 2017 \(filed as Exhibit 10.6 to Ashland’s Form 10-Q for the quarter ended March 31, 2017 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.22 – [Letter Agreement between Ashland and William A. Wulfsohn, dated November 12, 2014 \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on November 17, 2014 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.23 – [Separation Agreement and General Release between Ashland and Gregory Elliott dated February 28, 2017 \(filed as Exhibit 10.5 to Ashland’s Form 10-Q for the quarter ended March 31, 2017 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.24 – [Form of Performance-Based Restricted Stock Award Agreement \(filed as Exhibit 10.3 to Ashland’s Form 8-K filed on October 9, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.25 – [Form of Retention Award Agreement for certain Executive Officers \(filed as Exhibit 10.43 to Ashland’s Form 10-K for the fiscal year ended September 30, 2015 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.26 – [Form of Restricted Stock Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(Double-Trigger Form\) \(filed as Exhibit 10.37 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.27 – [Form of Restricted Stock Unit Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(Double-Trigger Form\) \(filed as Exhibit 10.38 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.28 – [Form of Stock Appreciation Rights Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(Double-Trigger Form\) \(filed as Exhibit 10.39 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.29 – [Form of Performance Unit \(LTIP\) Award Agreement under the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan \(Double-Trigger Form\) \(filed as Exhibit 10.40 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.30 – [Form of Indemnification Agreement between Ashland and members of its Board of Directors \(filed as Exhibit 10.2 to Ashland’s Form 8-K filed on September 20, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.31 – [Amendment to Ashland Inc. Supplemental Defined Contribution Plan for Certain Employees dated September 30, 2016 \(Plan Freeze\) \(filed as Exhibit 10.43 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.32 – [Ashland Severance Pay Plan effective as of August 1, 2016 \(filed as Exhibit 10.48 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)

- 10.33 – [Ashland Severance Pay Plan effective as of January 1, 2017 \(filed as Exhibit 10.49 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.34 – [Ashland Global Holdings Inc. Non-Qualified Defined Contribution Plan, as amended \(filed as Exhibit 10.1 to Ashland’s Form 10-Q for the quarter ended March 31, 2017 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.35 – [Form of Cash-Settled Performance Unit \(LTIP\) Award Agreement under the Amended and Restated Ashland Global Holdings Inc. Incentive Plan \(Double-Trigger Form\) \(filed as Exhibit 10.59 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.36 – [Amended and Restated Hercules Deferred Compensation Plan effective January 1, 2008 \(filed as Exhibit 10.8 to Ashland’s Form 10-K for the fiscal year ended on September 30, 2010 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)
- 10.37 – [Amendment to the Amended and Restated Hercules Deferred Compensation Plan dated September 30, 2016 \(annuity cash-out\) \(filed as Exhibit 10.61 to Ashland’s Form 10-K for the fiscal year ended September 30, 2016 \(SEC File No. 333-211719\), and incorporated by reference herein\).](#)
- 10.38 – [Amended and Restated Ashland Inc. Deferred Compensation Plan for Employees \(2005\) \(filed as Exhibit 10.3 to Ashland’s Form 10-K for the fiscal year ended September 30, 2008 \(SEC File No. 001-32532\) and incorporated herein by reference\).](#)
- 10.39 – [Amendment No. 1 to the Ashland Global Holdings Inc. Non-Qualified Defined Contribution Plan \(filed as Exhibit 10.1 to Ashland’s Form 10-Q for the quarter ended December 31, 2017 \(SEC File No. 333-211719\) and incorporated herein by reference\).](#)
- 10.40 – [Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on January 26, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.41 – [Form of Stock-Settled Restricted Stock Unit Award Agreement under the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan \(filed as Exhibit 10.2 to Ashland’s Form 8-K filed on January 26, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.42 – [Form of Restricted Stock Award Agreement under the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan \(filed as Exhibit 10.3 to Ashland’s Form 8-K filed on January 26, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.43 – [Form of Stock Appreciation Rights Award Agreement under the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan \(filed as Exhibit 10.4 to Ashland’s Form 8-K filed on January 26, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.44 – [Form of Performance Unit Award Agreement under the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan \(filed as Exhibit 10.5 to Ashland’s Form 8-K filed on January 26, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.45 – [Form of Cash-Settled Restricted Stock Unit Award Agreement under the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan \(filed as Exhibit 10.6 to Ashland’s Form 8-K filed on January 26, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.46 – [Stock Purchase Agreement dated as of May 30, 2011, entered into by and among The Samuel J. Heyman 1981 Continuing Trust for Lazarus S. Heyman, The Samuel J. Heyman 1981 Continuing Trust for Eleanor S. Heyman, The Samuel J. Heyman 1981 Continuing Trust for Jennifer L. Heyman, The Samuel J. Heyman 1981 Continuing Trust for Elizabeth D. Heyman, The Lazarus S. Heyman Age 50 Trust for Assets Appointed Under Will of Lazarus S. Heyman, The Eleanor S. Heyman Age 50 Trust for Assets Appointed Under Will of Lazarus S. Heyman, The Jennifer L. Heyman Age 50 Trust for Assets Appointed Under Will of Lazarus S. Heyman, The Elizabeth D. Heyman Age 50 Trust for Assets Appointed Under Will of Lazarus S. Heyman, The Horizon Holdings Residual Trust, RFH Investment Holdings LLC, Ashland and Ronnie F. Heyman, as representative of the Seller Parties \(filed as Exhibit 2.1 to Ashland’s Form 8-K filed on May 31, 2011 \(SEC File No. 001-32532\), and incorporated herein by reference\).](#)

- 10.47 – [Credit Agreement, dated as of May 17, 2017, among Ashland LLC, as Borrower, The Bank of Nova Scotia, as Administrative Agent, Swing Line Lender and an L/C Issuer, each Lender and L/C Issuer party thereto and the other agents party thereto \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on May 18, 2017 \(SEC File No. 333-211719\) and incorporated herein by reference\).](#)
- 10.48 – [Amendment No. 1 dated as of May 19, 2017, among Ashland LLC, as Borrower \(the “Borrower”\), certain subsidiaries of the Borrower, The Bank of Nova Scotia, as Administrative Agent \(the “Administrative Agent”\), and Citibank, N.A., as the Incremental Revolving Credit Lender, to the Credit Agreement dated as of May 17, 2017, among the Borrower, the Administrative Agent, each lender and letter of credit issuer party thereto and the other agents party thereto \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on May 22, 2017 \(SEC File No. 333-211719\) and incorporated herein by reference\).](#)
- 10.49 – [Amendment No. 2 dated as of June 14, 2017, among Ashland LLC, as Borrower \(the “Borrower”\), certain subsidiaries of the Borrower, The Bank of Nova Scotia, as Administrative Agent \(the “Administrative Agent”\), and Citibank, N.A., as the Term B Lender, to the Credit Agreement dated as of May 17, 2017, among the Borrower, the Administrative Agent, each lender and letter of credit issuer party thereto and the other agents party thereto \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on June 14, 2017 \(SEC File No. 333-211719\) and incorporated herein by reference\).](#)
- 10.50 – [Amendment No. 3 to the Credit Agreement dated as of May 17, 2017, dated as of May 22, 2018, among Ashland LLC, as Borrower, the Lenders from time to time party thereto, The Bank of Nova Scotia, as Administrative Agent, Swing Line Lender and an L/C Issuer, each other L/C Issuer from time to time party thereto and Citibank, N.A., as Syndication Agent, and the various other parties thereto \(as amended by Amendment No. 1 to the Credit Agreement, dated as of May 19, 2017, as further amended by Amendment No. 2 to the Credit Agreement, dated as of June 14, 2017, and as further amended, restated, modified and supplemented from time to time\) \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on May 23, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.51 – [Amendment No. 4 to the Credit Agreement dated as of May 17, 2017, dated as of June 29, 2018, among Ashland LLC, as Borrower, The Lenders from time to time party thereto, The Bank of Nova Scotia, as Administrative Agent \(the “Administrative Agent”\), Swing Line Lender and an L/C Issuer, each other L/C Issuer from time to time party thereto and Citibank, N.A., as Syndication Agent, and the various other parties thereto \(as amended by Amendment No. 1 to the Credit Agreement, dated as of May 19, 2017, as further amended by Amendment No. 2 to the Credit Agreement, dated as of June 14, 2017 and Amendment No. 3 to the Credit Agreement, dated as of May 22, 2018, and as further amended, restated, modified and supplemented from time to time\) \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on July 2, 2018 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.52 – [Assumption Agreement dated September 20, 2016, by and between Ashland Global Holdings Inc. and Ashland Inc. \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on September 20, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.53 – [Separation Agreement dated as of September 22, 2016, between and among Ashland Global Holdings Inc. and Valvoline Inc. \(filed as Exhibit 10.1 to Ashland’s Form 8-K filed on September 28, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.54 – [Transition Services Agreement dated as of September 22, 2016, between and among Ashland Global Holdings Inc. and Valvoline Inc. \(filed as Exhibit 10.2 to Ashland’s Form 8-K filed on September 28, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.55 – [Reverse Transition Services Agreement dated as of September 22, 2016, between and among Ashland Global Holdings Inc. and Valvoline Inc. \(filed as Exhibit 10.3 to Ashland’s Form 8-K filed on September 28, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.56 – [Tax Matters Agreement dated as of September 22, 2016, between and among Ashland Global Holdings Inc. and Valvoline Inc. \(filed as Exhibit 10.4 to Ashland’s Form 8-K filed on September 28, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)
- 10.57 – [Employee Matters Agreement dated as of September 22, 2016, between and among Ashland Global Holdings Inc. and Valvoline Inc. \(filed as Exhibit 10.5 to Ashland’s Form 8-K filed on September 28, 2016 \(SEC File No. 333-211719\), and incorporated herein by reference\).](#)

10.58	– Stock Purchase Agreement, dated April 14, 2017, by and among Ashland LLC, Pharmachem Laboratories, Inc., the holders of common stock of Pharmachem Laboratories, Inc., Dr. David Peele, and Photon SH Representative LLC, solely as the shareholders’ representative (filed as Exhibit 2.1 to Ashland’s Form 8-K filed on May 18, 2017 (SEC File No. 333-211719) and incorporated herein by reference).
10.59	– Amendment No. 1 to the Stock Purchase Agreement, dated May 16, 2017, by and among Ashland LLC, Pharmachem Laboratories, Inc., the holders of common stock of Pharmachem Laboratories, Inc., Dr. David Peele, and Photon SH Representative LLC, solely as the shareholders’ representative (filed as Exhibit 2.2 to Ashland’s Form 8-K filed on May 18, 2017 (SEC File No. 333-211719) and incorporated herein by reference).
10.60	– Amendment No. 2 to the Stock Purchase Agreement, dated August 23, 2017, by and among Ashland LLC, Pharmachem Laboratories, Inc., the holders of common stock of Pharmachem Laboratories, Inc., Dr. David Peele, and Photon SH Representative LLC, solely as the shareholders’ representative (filed as Exhibit 10.84 to Ashland’s Form 10-K for the fiscal year ended September 30, 2017 (SEC File No. 333-211719), and incorporated by reference herein).
11**	– Computation of Earnings Per Share (appearing in Note A of Notes to Consolidated Financial Statements in this annual report on Form 10-K).
21**	– List of Subsidiaries.
23.1**	– Consent of Ernst & Young LLP.
23.2**	– Consent of Hamilton, Rabinovitz & Associates, Inc.
23.3**	– Consent of Nathan Associates, Inc.
24**	– Power of Attorney.
31.1**	– Certification of William A. Wulfsohn, Chief Executive Officer of Ashland, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2**	– Certification of J. Kevin Willis, Chief Financial Officer of Ashland, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32**	– Certification of William A. Wulfsohn, Chief Executive Officer of Ashland, and J. Kevin Willis, Chief Financial Officer of Ashland, pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS*	XBRL Instance Document.
101.SCH*	XBRL Taxonomy Extension Schema Document.
101.CAL*	XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF*	XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB*	XBRL Taxonomy Extension Label Linkbase Document.
101.PRE*	XBRL Taxonomy Extension Presentation Linkbase Document.

* Attached as Exhibit 101 to this report are the following documents formatted in XBRL (Extensible Business Reporting Language): (i) Statements of Consolidated Comprehensive Income (Loss) for years ended September 30, 2018, 2017 and 2016; (ii) Consolidated Balance Sheets at September 30, 2018 and 2017; (iii) Statements of Consolidated Equity at September 30, 2018, 2017 and 2016; (iv) Statements of Consolidated Cash Flows for years ended September 30, 2018, 2017 and 2016; and (v) Notes to Consolidated Financial Statements.

** Filed herewith.

SM Service mark, Ashland or its subsidiaries, registered in various countries.

™ Trademark, Ashland or its subsidiaries, registered in various countries.

† Trademark owned by a third party.

Upon written or oral request, a copy of the above exhibits will be furnished at cost.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

ASHLAND GLOBAL HOLDINGS INC.

(Registrant)

By:

/s/ J. Kevin Willis

J. Kevin Willis

Senior Vice President and Chief Financial Officer

Date: November 19, 2018

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant, in the capacities indicated, on November 19, 2018.

<u>Signatures</u>	<u>Capacity</u>
/s/ William A. Wulfsohn	Chairman of the Board, Chief Executive Officer and Director
William A. Wulfsohn	(Principal Executive Officer)
/s/ J. Kevin Willis	Senior Vice President and Chief Financial Officer
J. Kevin Willis	(Principal Financial Officer)
/s/ J. William Heitman	Vice President and Controller
J. William Heitman	(Principal Accounting Officer)
*	Director
Brendan M. Cummins	Director
*	Director
William G. Dempsey	Director
*	Director
Jay V. Ihlenfeld	Director
*	Director
Susan L. Main	Director
*	Director
Jerome A. Peribere	Director
*	Director
Barry W. Perry	Director
*	Director
Mark C. Rohr	Director
*	Director
Janice J. Teal	Director
*	Director
Michael J. Ward	Director
*	Director
Kathleen Wilson-Thompson	

*By: /s/ Peter J. Ganz
Peter J. Ganz
Attorney-in-Fact

Date: November 19, 2018

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ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion should be read in conjunction with the Consolidated Financial Statements and the accompanying Notes to Consolidated Financial Statements for the years ended September 30, 2018, 2017 and 2016.

BUSINESS OVERVIEW

Ashland profile

Ashland is a premier global leader in providing specialty chemical solutions to customers in a wide range of consumer and industrial markets, including adhesives, architectural coatings, automotive, construction, energy, food and beverage, nutraceuticals, personal care and pharmaceutical. With approximately 6,000 employees worldwide, Ashland serves customers in more than 100 countries.

Ashland's sales generated outside of North America were 60% in 2018, 2017 and 2016. Sales by region expressed as a percentage of total consolidated sales were as follows:

Sales by Geography	2018	2017	2016
North America (a)	40%	40%	40%
Europe	35%	33%	33%
Asia Pacific	17%	18%	18%
Latin America & other	8%	9%	9%
	<u>100%</u>	<u>100%</u>	<u>100%</u>

(a) Ashland includes only U.S. and Canada in its North American designation.

Reportable segments

Ashland's reporting structure is composed of three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents. For further descriptions of each reportable segment, see "Results of Operations – Reportable Segment Review" beginning on page M-15.

Sales by each reportable segment expressed as a percentage of total consolidated sales were as follows:

Sales by Reportable Segment	2018	2017	2016
Specialty Ingredients	66%	68%	69%
Composites	25%	24%	22%
Intermediates and Solvents	9%	8%	9%
	<u>100%</u>	<u>100%</u>	<u>100%</u>

KEY DEVELOPMENTS

During 2018, the following operational decisions and economic developments had an impact on Ashland's current and future cash flows, results of operations and financial position.

Business results

Ashland's net income was \$114 million in 2018 compared to \$28 million in 2017. Ashland's Adjusted EBITDA increased by 20% during 2018 compared to 2017 to \$683 million (see U.S. GAAP reconciliation on page M-7). The increase in profitability was due to growth across all three of Ashland's reportable segments. Excluding the acquisition of Pharmachem, the increase in profitability for Specialty Ingredients was primarily driven by improved volume and mix as well as favorable foreign currency exchange. The increase in profitability for both Composites and Intermediates and Solvents was primarily driven by improved product pricing.

The following discussion outlines significant transactions announced or executed during 2018.

Composites segment and Intermediates and Solvents plant

On March 20, 2018, Ashland announced that it will explore strategic alternatives for its Composites segment and the Intermediates and Solvents manufacturing facility in Marl, Germany. On November 15, 2018, Ashland announced that it signed a definitive agreement to sell these assets in a transaction valued at \$1.1 billion. The sale is expected to close before the quarter ending June 30, 2019. This divestiture will allow Ashland to streamline its business portfolio, focusing it more on the higher margin, less volatile and more specialized portions of the business.

Restructuring Plans

In early May 2018, Ashland announced a company-wide restructuring program to accelerate EBITDA margin growth by creating a leaner, more cost competitive company with improved operating efficiency, faster decision making and a stronger customer focus. Under this program, Ashland intends to eliminate a total of \$120 million of existing allocated costs, direct expenses within Specialty Ingredients SG&A, and facility-related costs as follows:

- Approximately \$70 million of costs allocated to the Composites business and to the butanediol manufacturing facility in Marl, Germany, are expected to be offset or eliminated through transfers and reductions. This reduction is intended to eliminate stranded costs.
- Approximately \$50 million of additional costs are expected to be eliminated to drive improved profitability in Specialty Ingredients and accelerate achievement of its adjusted EBITDA margin target of 25-27 percent.

Ashland continues to expect to achieve the full \$120 million in run-rate savings by the end of calendar year 2019. Ashland met its expectation for capturing the targeted \$20 million in annualized run-rate savings under this program by the end of the September 2018 quarter. An additional \$30 million in run-rate savings is expected in the December 2018 quarter, bringing the total annualized run-rate savings to \$50 million by the end of calendar 2018.

Tax law changes

The Tax Cuts and Jobs Act (Tax Act) was enacted on December 22, 2017. The Tax Act reduces the U.S. federal corporate tax rate from 35% to 21%, requires companies to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously tax deferred and creates new taxes on certain foreign sourced earnings. At September 30, 2018, Ashland has not completed the internal accounting assessment for the tax effects of enactment of the Tax Act; however, Ashland determined a reasonable estimate of the effects on its existing deferred tax balances and the one-time transition tax. Ashland recognized a provisional amount during 2018, which is included as a component of income tax expense from continuing operations. Ashland recorded net unfavorable tax adjustments of \$2 million primarily related to deferred tax rate changes and a one-time transition tax assessed on foreign cash and unremitted earnings.

Stock repurchase program

During March 2018, Ashland's Board of Directors approved a new \$1 billion stock repurchase program, which replaced the 2015 stock repurchase program that had \$500 million of authorization remaining. Under the new program, Ashland's common shares may be repurchased in open market transactions, privately negotiated transactions or pursuant to one or more accelerated stock repurchase programs or Rule 10b5-1 plans.

Stockholder dividends

In May 2018, the Board of Directors of Ashland announced a quarterly cash dividend of 25 cents per share, which represented an increase from the previous quarterly cash dividend of 22.5 cents per share. This dividend was paid in the third and fourth quarters of fiscal 2018.

RESULTS OF OPERATIONS – CONSOLIDATED REVIEW

Use of non-GAAP measures

Ashland has included within this document the following non-GAAP measures, on both a consolidated and reportable segment basis, which are not defined within U.S. GAAP and do not purport to be alternatives to net income or cash flows from operating activities as a measure of operating performance or cash flows:

- EBITDA - net income (loss), plus income tax expense (benefit), net interest and other financing expenses, and depreciation and amortization.
- Adjusted EBITDA - EBITDA adjusted for noncontrolling interests, discontinued operations, net gain (loss) on acquisitions and divestitures, other income and (expense) and key items (including the remeasurement gains and losses related to pension and other postretirement plans).
- Adjusted EBITDA margin - Adjusted EBITDA, which can include pro forma adjustments, divided by sales.
- Adjusted diluted earnings per share (EPS) - income (loss) from continuing operations, adjusted for key items, net of tax, divided by the average outstanding diluted shares for the applicable period.
- Free cash flow - operating cash flows less capital expenditures and certain other adjustments as applicable.

Management believes the use of EBITDA and Adjusted EBITDA measures on a consolidated and reportable segment basis assists investors in understanding the ongoing operating performance by presenting comparable financial results between periods. Ashland believes that by removing the impact of depreciation and amortization and excluding certain non-cash charges, amounts spent on interest and taxes and certain other charges that are highly variable from year to year, EBITDA and Adjusted EBITDA provide Ashland's investors with performance measures that reflect the impact to operations from trends in changes in sales, margin and operating expenses, providing a perspective not immediately apparent from net income and operating income. The adjustments Ashland makes to derive the non-GAAP measures of EBITDA and Adjusted EBITDA exclude items which may cause short-term fluctuations in net income and operating income and which Ashland does not consider to be the fundamental attributes or primary drivers of its business. EBITDA and Adjusted EBITDA provide disclosure on the same basis as that used by Ashland's management to evaluate financial performance on a consolidated and reportable segment basis and provide consistency in our financial reporting, facilitate internal and external comparisons of Ashland's historical operating performance and its business units and provide continuity to investors for comparability purposes.

The Adjusted diluted EPS metric enables Ashland to demonstrate what effect key items have on an earnings per diluted share basis by taking income (loss) from continuing operations, adjusted for key items after tax that have been identified in the Adjusted EBITDA table, and dividing by the average outstanding diluted shares for the applicable period. Ashland's management believes this presentation is helpful to illustrate how the key items have impacted this metric during the applicable period.

The free cash flow metric enables Ashland to provide a better indication of the ongoing cash being generated that is ultimately available for both debt and equity holders as well as other investment opportunities. Unlike cash flow provided by operating activities, free cash flow includes the impact of capital expenditures from continuing operations, providing a more complete picture of cash generation. Free cash flow has certain limitations, including that it does not reflect adjustment for certain non-discretionary cash flows such as mandatory debt repayments. The amount of mandatory versus discretionary expenditures can vary significantly between periods.

Although Ashland provides forward-looking guidance for Adjusted EBITDA, Adjusted diluted EPS and free cash flow, Ashland is not reaffirming or providing forward-looking guidance for U.S. GAAP-reported financial measures or a reconciliation of forward-looking non-GAAP financial measures to the most directly comparable U.S. GAAP measure because it is unable to predict with reasonable certainty the ultimate outcome of certain significant items that affect these metrics such as domestic and international economic, political, legislative, regulatory and legal actions. In addition, certain economic conditions, such as recessionary trends, inflation, interest and monetary exchange rates, government fiscal policies and changes in the prices of certain key raw materials, can have a significant effect on operations and are difficult to predict with certainty.

These non-GAAP measures should be considered supplemental in nature and should not be construed as more significant than comparable measures defined by U.S. GAAP. Limitations associated with the use of these non-GAAP measures include that these measures do not present all of the amounts associated with our results as determined in accordance with U.S. GAAP. The non-GAAP measures provided are used by Ashland management and may not be determined in a manner consistent with the methodologies used by other companies. EBITDA and Adjusted EBITDA provide a supplemental presentation of Ashland's operating performance on a consolidated and reportable segment basis. Adjusted EBITDA generally includes adjustments for items that impact comparability between periods. In addition, certain financial covenants related to Ashland's 2017 Credit Agreement are based on similar non-GAAP measures and are defined further in the sections that reference this metric.

In accordance with U.S. GAAP, Ashland recognizes actuarial gains and losses for defined benefit pension and other postretirement benefit plans annually in the fourth quarter of each fiscal year and whenever a plan is determined to qualify for a remeasurement during a fiscal year. Actuarial gains and losses occur when actual experience differs from the estimates used to allocate the change in value of pension and other postretirement benefit plans to expense throughout the year or when assumptions change, as they may each year. Significant factors that can contribute to the recognition of actuarial gains and losses include changes in discount rates used to remeasure pension and other postretirement obligations on an annual basis or upon a qualifying remeasurement, differences between actual and expected returns on plan assets and other changes in actuarial assumptions, for example, the life expectancy of plan participants. Management believes Adjusted EBITDA, which includes the expected return on pension plan assets yet excludes both the actual return on pension plan assets and the impact of actuarial gains and losses, provides investors with a meaningful supplemental presentation of Ashland's operating performance (see the Adjusted EBITDA reconciliation table on page M-7 for additional details on exact amounts included within this non-GAAP measure related to pension and other postretirement plans). Management believes these actuarial gains and losses are primarily financing activities that are more reflective of changes in current conditions in global financial markets (and in particular interest rates) that are not directly related to the underlying business. For further information on the actuarial assumptions and plan assets referenced above, see Note N of the Notes to Consolidated Financial Statements.

Consolidated review

Net income (loss)

Ashland's net income (loss) is primarily affected by results within operating income, net interest and other financing expense, net loss on acquisitions and divestitures, income taxes, discontinued operations and other significant events or transactions that are unusual or nonrecurring. Operating income includes Ashland's adjustment for the immediate recognition of the change in the fair value of the plan assets and net actuarial gains and losses for defined benefit pension plans and other postretirement benefit plans for each fiscal year.

Key financial results for 2018, 2017 and 2016 included the following:

- Ashland's net income (loss) attributable to Ashland amounted to income of \$114 million in 2018, income of \$1 million in 2017, and a loss of \$29 million in 2016, or \$1.79, \$0.01 and \$(0.47) diluted earnings (loss) per share, respectively.
- Ashland's net income attributable to noncontrolling interest amounted to \$27 million and \$1 million during 2017 and 2016, respectively, and reflects the noncontrolling interest of Valvoline Inc. for the period after the IPO close on September 28, 2016 and before the final separation occurred on May 12, 2017.
- Discontinued operations, which are reported net of taxes, resulted in income of \$9 million, \$133 million and \$255 million during 2018, 2017 and 2016, respectively. The activity within discontinued operations includes the operating results of Valvoline Inc. for the period in fiscal year 2017 prior to the final separation on May 12, 2017 and for fiscal year 2016.
- Income (loss) from continuing operations, which excludes results from discontinued operations, amounted to income of \$105 million in 2018, a loss of \$105 million in 2017 and a loss of \$283 million in 2016.
- The effective income tax expense rate of 8% for 2018, income tax expense rate of 7% for 2017, and income tax benefit rate of 8% for 2016, were significantly impacted by certain tax specific key items and tax discrete items.

- Ashland incurred pretax net interest and other financing expense of \$122 million, \$234 million and \$173 million during 2018, 2017 and 2016, respectively, and was impacted by certain charges associated with debt financing activity during each year.
- Other net periodic benefit income (costs) totaled income of \$13 million during 2018 and costs of \$4 million and \$77 million during 2017 and 2016, respectively.
- Net loss on acquisitions and divestitures totaled \$4 million, \$6 million and \$8 million during 2018, 2017 and 2016, respectively.
- Operating income (loss) amounted to income of \$227 million in 2018, income of \$146 million in 2017, and a loss of \$50 million in 2016.

For further information on the items reported above, see the discussion in the comparative Statements of Consolidated Comprehensive Income (Loss) caption review analysis.

Operating income (loss)

Operating income (loss) amounted to income of \$227 million in 2018, income of \$146 million in 2017, and a loss of \$50 million in 2016. The current and prior years' operating income included certain key items that were excluded to arrive at Adjusted EBITDA and are quantified in the table on page M-7. These operating key items for the applicable periods are summarized as follows:

- Restructuring, separation and other costs - Ashland periodically implements company-wide restructuring programs related to acquisitions, divestitures and other cost reduction programs in order to enhance profitability through streamlined operations and an improved overall cost structure. Ashland often incurs severance, facility and integration costs associated with these programs. See Notes C and F in the Notes to Consolidated Financial Statements for further information. Also included within this key item category are separation costs incurred as a result of the separation from Valvoline, which primarily related to transaction, consulting and legal fees. See Note B of the Notes to Consolidated Financial Statements for more information on the separation of Valvoline.
- Accelerated depreciation – As a result of various restructuring activities at certain office facilities and manufacturing plants, Ashland recorded accelerated depreciation due to changes in the expected useful life of certain property, plant and equipment. See Note H of the Notes to Consolidated Financial Statements for more information.
- Environmental reserve adjustments – Ashland is subject to various federal, state and local environmental laws and regulations that require environmental assessment or remediation efforts (collectively environmental remediation) at multiple locations. As a result of these activities, Ashland recorded non-cash adjustments during each year to its environmental liabilities and receivables related to previously divested businesses or non-operational sites. See Note O of the Notes to Consolidated Financial Statements for more information.
- Asset impairments – Consistent with historical policies and U.S. GAAP provisions, Ashland recognizes assets at fair value less cost to sell which resulted in impairment charges to certain assets during 2018 and 2016. The charges during 2018 primarily related to the impairment of an office facility as a result of a company-wide restructuring program. See Note F of the Notes to Consolidated Financial Statements for more information. The charges during 2016 related to the impairment of the Intermediates and Solvents reportable segment in conjunction with the annual goodwill impairment assessment. See Note I of the Notes to Consolidated Financial Statements for more information.
- Tax indemnity expense – During 2018, Ashland recorded an adjustment to a tax indemnity receivable that was associated with the acquisition of Pharmachem.
- Legal settlement/reserve – Ashland recorded adjustments related to settlements and/or reserves for certain legal matters.
- Unplanned plant shutdowns – During 2017, Ashland incurred costs related to temporary shutdowns of an Intermediates and Solvents manufacturing plant due to a fire and a Specialty Ingredients manufacturing plant due to a hurricane.

- Inventory fair value adjustment – During 2017, Ashland recorded non-cash charges related to the fair value adjustment of inventory acquired from Pharmachem at the date of acquisition. See Note C for more information on the acquisition of Pharmachem.
- Benefit/stock incentive adjustment – During 2016, Ashland recorded income related to a legacy benefit for former directors.
- Customer claim adjustment – During 2016, Ashland recorded an income adjustment to a previous customer claim.

Operating income for 2018, 2017 and 2016 included depreciation and amortization of \$312 million, \$301 million and \$302 million, respectively (which includes accelerated depreciation of \$14 million, \$19 million, and \$6 million, respectively, for each year).

Non-operating key items affecting EBITDA

During the current and prior years, there were certain key items that were not included in operating income but were excluded to arrive at Adjusted EBITDA. These non-operating key items for the applicable periods are summarized as follows:

- Net loss on acquisitions and divestitures – Ashland recorded a loss on certain divestitures during each year and incurred certain transaction costs associated with the acquisition of Pharmachem during 2017. See Notes C and D of the Notes to Consolidated Financial Statements for more information on these acquisitions and divestitures. Additionally, Ashland recorded a net gain related to a Composites manufacturing facility during 2017.
- Loss (gain) on pension and other postretirement plan remeasurements - Ashland recognized actuarial gains and losses for defined benefit pension and other postretirement benefit plans annually in the fourth quarter of each fiscal year and whenever a plan is determined to qualify for a remeasurement during a fiscal year. See Note M of the Notes to Consolidated Financial Statements for more information.

EBITDA and Adjusted EBITDA

EBITDA totaled \$543 million, \$551 million and \$416 million for 2018, 2017 and 2016, respectively. EBITDA and Adjusted EBITDA results in the following table have been prepared to illustrate the ongoing effects of Ashland's operations, which exclude certain key items previously described. Management believes the use of such non-GAAP measures on a consolidated and reportable segment basis assists investors in understanding the ongoing operating performance by presenting the financial results between periods on a more comparable basis.

(In millions)	2018	2017	2016
Net income (loss)	\$ 114	\$ 28	\$ (28)
Income tax expense (benefit)	9	7	(25)
Net interest and other financing expense	122	234	173
Depreciation and amortization (a)	298	282	296
EBITDA	543	551	416
Income from discontinued operations (net of taxes)	(9)	(133)	(255)
Key items included in EBITDA:			
Restructuring, separation and other costs	85	87	82
Accelerated depreciation	14	19	6
Environmental reserve adjustments	44	9	15
Asset impairments	16	—	181
Tax indemnity expense	5	—	—
Net loss on acquisitions and divestitures (b)	2	6	12
Loss (gain) on pension and other postretirement plan remeasurements	(12)	6	142
Legal settlement/reserve	(5)	5	15
Unplanned plant shutdowns	—	13	—
Inventory fair value adjustment	—	7	—
Benefit/stock incentive adjustment	—	—	(11)
Customer claim adjustment	—	—	(5)
Total key items included in EBITDA	149	152	437
Adjusted EBITDA (c)	\$ 683	\$ 570	\$ 598
Total key items included in EBITDA	\$ 149	\$ 152	\$ 437
Debt refinancing costs (d)	1	112	6
Total key items, before tax	\$ 150	\$ 264	\$ 443

(a) Excludes \$14 million, \$19 million and \$6 million of accelerated depreciation during 2018, 2017 and 2016, respectively.

(b) Excludes expense of \$2 million during 2018 and income of \$4 million during 2016 related to ongoing adjustments of previous divestiture transactions.

(c) Includes \$9 million, \$8 million and \$(42) million during 2018, 2017 and 2016, respectively, of net periodic pension and other postretirement costs (income) recognized ratably through the fiscal year. These costs (income) are comprised of service cost, interest cost, expected return on plan assets, and amortization of prior service credit and are disclosed in further detail in Note N of the Notes to Consolidated Financial Statements.

(d) Debt refinancing costs during 2018 primarily included a \$1 million charge for new debt issuance costs incurred with the re-pricing of the term loan B facility. Debt refinancing costs during 2017 included \$92 million of accelerated accretion from the tender offer of the 2029 notes, a \$16 million charge for early redemption premium payments and bondholder consent fees for senior notes due 2018 and 2022, a \$9 million charge for debt issuance costs resulting from financing activity for the 2017 Credit Agreement and a net gain of \$5 million related to the repayment of notes due 2029. Debt refinancing costs during 2016 included \$6 million of accelerated debt issuance costs associated with financing activity for the amendment of the 2015 Senior Credit Agreement. All debt refinancing costs were recorded within the net interest and other financing expense caption on the Statements of Consolidated Comprehensive Income (Loss). See Note J of the Notes to Consolidated Financial Statements for more information.

Diluted EPS and Adjusted Diluted EPS

The following table reflects the U.S. GAAP calculation for the income (loss) from continuing operations adjusted for the cumulative diluted EPS effect for key items after tax that have been identified in the Adjusted EBITDA table in the previous section. Key items are defined as the financial effects from significant transactions that may have caused short-term fluctuations in net income and/or operating income which Ashland believes do not accurately reflect Ashland's underlying business performance and trends. The Adjusted diluted EPS for the income (loss) from continuing operations in the following table has been prepared to illustrate the ongoing effects of Ashland's operations. Management believes investors and analysts use this financial measure in assessing Ashland's business performance and that presenting this non-GAAP measure on a consolidated basis assists investors in better understanding Ashland's ongoing business performance and enhancing their ability to compare period-to-period financial results.

	2018	2017	2016
Diluted EPS from continuing operations (as reported)	\$ 1.66	\$ (1.69)	\$ (4.51)
Key items, before tax:			
Restructuring, separation and other costs	1.56	1.70	1.42
Environmental reserve adjustments	0.68	0.15	0.25
Asset impairments	0.25	—	2.85
Loss (gain) on pension and other postretirement plan remeasurements	(0.20)	0.09	2.25
Tax indemnity expense	0.08	—	—
Net loss on acquisitions and divestitures	0.04	0.09	0.19
Legal settlement/reserve	(0.07)	0.07	0.24
Unplanned plant shutdowns	—	0.21	—
Inventory fair value adjustment	—	0.11	—
Benefit/stock incentive adjustment	—	—	(0.17)
Customer claim adjustment	—	—	(0.08)
Debt refinancing costs	0.02	1.78	0.09
Key items, before tax	2.36	4.20	7.04
Tax effect of key items (a)	(0.52)	(1.40)	(1.51)
Key items, after tax	1.84	2.80	5.53
Tax specific key items:			
Deferred tax rate changes	(2.19)	—	—
One-time transition tax	2.00	—	—
Uncertain tax positions	(0.40)	—	—
Restructuring and separation activity	0.56	0.28	0.85
Other tax reform	0.17	—	—
Valuation allowances	(0.06)	(0.33)	0.48
Foreign dividends	—	1.38	—
Other	—	—	(0.10)
Tax specific key items (b)	0.08	1.33	1.23
Total key items	1.92	4.13	6.76
Adjusted diluted EPS from continuing operations (non-GAAP)	<u>\$ 3.58</u>	<u>\$ 2.44</u>	<u>\$ 2.25</u>

(a) Represents the diluted EPS impact from the tax effect of the key items that are previously identified above.

(b) Represents the diluted EPS impact from tax specific financial transactions, tax law changes or other matters that fall within the definition of tax specific key items. For additional explanation of these tax specific key items, see the income tax expense (benefit) discussion within the following caption review section.

Statements of Consolidated Comprehensive Income (Loss) – caption review

A comparative analysis of the Statements of Consolidated Comprehensive Income (Loss) by caption is provided as follows for the years ended September 30, 2018, 2017 and 2016.

(In millions)	2018	2017	2016	2018 change	2017 change
Sales	\$ 3,743	\$ 3,260	\$ 3,019	\$ 483	\$ 241

The following table provides a reconciliation of the change in sales between fiscal years 2018 and 2017 and between fiscal years 2017 and 2016.

(In millions)	2018 change	2017 change
Acquisitions and divestitures	\$ 158	\$ 113
Pricing	125	40
Volume	109	139
Currency exchange	73	(12)
Product mix	18	(39)
Change in sales	<u>\$ 483</u>	<u>\$ 241</u>

Sales for 2018 increased \$483 million, or 15%, compared to 2017. The acquisition of Pharmachem within the Specialty Ingredients reportable segment increased sales by \$140 million, or 4%, while the net impact of other acquisitions and divestitures increased sales by \$18 million. Improved pricing increased sales by \$125 million, or 4%, while higher volumes increased sales by \$109 million. Favorable foreign currency exchange increased sales by \$73 million and product mix increased sales by \$18 million.

Sales for 2017 increased \$241 million, or 8%, compared to 2016. The acquisition of Pharmachem within the Specialty Ingredients reportable segment increased sales by \$104 million, or 3%, while the net impact of other acquisitions and divestitures increased sales by \$9 million. Improved volume increased sales by \$139 million, or 5%, while higher pricing increased sales by \$40 million. Product mix decreased sales by \$39 million and unfavorable foreign currency exchange decreased sales by \$12 million.

(In millions)	2018	2017	2016	2018 change	2017 change
Cost of sales	\$ 2,668	\$ 2,363	\$ 2,132	\$ 305	\$ 231
Gross profit as a percent of sales	28.7%	27.5%	29.4%		

Fluctuations in cost of sales are driven primarily by raw material prices, volume and changes in product mix, currency exchange, acquisitions and divestitures and other certain charges incurred as a result of changes or events within the businesses or restructuring activities.

The following table provides a reconciliation of the changes in cost of sales between fiscal years 2018 and 2017 and between fiscal years 2017 and 2016.

(In millions)	2018 change	2017 change
Acquisitions and divestitures	\$ 119	\$ 81
Production costs	93	54
Volume and product mix	74	67
Currency exchange	50	(7)
Severance and other restructuring costs	2	2
Unplanned plant shutdowns	(13)	13
Accelerated depreciation	(13)	9
Inventory fair value adjustment	(7)	7
Customer claim	—	5
Change in cost of sales	<u>\$ 305</u>	<u>\$ 231</u>

Cost of sales for 2018 increased \$305 million, or 13%, compared to 2017. The Pharmachem acquisition increased cost of sales by \$101 million, or 4%, while the net impact of other acquisitions and divestitures increased cost of sales by \$18 million. Higher production costs and changes in volume and product mix increased cost of sales by \$93 million, or 4%, and \$74 million, or 3%, respectively. Unfavorable currency exchange increased cost of sales by \$50 million. Charges for unplanned plant shutdowns and accelerated depreciation in the prior year each decreased cost of sales by \$13 million, while other key items combined to decrease cost of sales by \$5 million compared to 2017.

Cost of sales for 2017 increased \$231 million, or 11%, compared to 2016. The Pharmachem acquisition increased cost of sales by \$72 million, or 3%, while the net impact of other acquisitions and divestitures increased cost of sales by \$9 million. Changes in volume and product mix and higher production costs increased cost of sales by \$67 million, or 3%, and \$54 million, or 3%, respectively. Favorable currency exchange decreased cost of sales by \$7 million. Charges for unplanned plant shutdowns increased cost of sales by \$13 million, while other key items combined to increase cost of sales by \$23 million compared to 2016.

(In millions)	2018		2017		2016		2018 change	2017 change		
Selling, general and administrative expense	\$	771	\$	675	\$	858	\$	96	\$	(183)
As a percent of sales		20.6%		20.7%		28.4%				

Selling, general and administrative expense for 2018 increased 14% compared to 2017, while expenses as a percent of sales decreased 0.1 percentage points. Key drivers of the fluctuation in selling, general and administrative expense compared to 2017 were:

- \$82 million and \$86 million of restructuring, separation and other costs during 2018 and 2017, respectively, comprised of the following:
 - \$63 million of severance, lease abandonment and other restructuring costs related to company-wide cost-savings initiatives during 2018;
 - \$10 million of costs related to the separation of Valvoline during 2018 compared to \$82 million during 2017; and
 - \$9 million of Pharmachem integration costs during 2018 compared to \$4 million during 2017;
- \$60 million and \$21 million in net environmental-related expenses during 2018 and 2017, respectively;
- \$23 million of incremental costs related to Pharmachem's operations;
- \$16 million of asset impairment charges during 2018;
- \$10 million increase during 2018 due to foreign currency exchange; and
- \$8 million of accelerated depreciation related to the closure of an office building during 2018 compared to \$3 million during 2017.

Selling, general and administrative expense for 2017 decreased 21% compared to 2016, while expenses as a percent of sales decreased 7.7 percentage points. Key drivers of the fluctuation in selling, general and administrative expense compared to 2016 were:

- a decrease of \$181 million due to the impairment of the Intermediates and Solvents reportable segment during 2016;
- \$21 million and \$38 million in net environmental-related expenses during 2017 and 2016, respectively;
- \$21 million of incremental and integration costs related to Pharmachem's operations during 2017;
- \$5 million and \$15 million charges for legal reserves during 2017 and 2016, respectively; and
- \$11 million of income related to the termination of a legacy benefit for former directors during 2016.

(In millions)	2018	2017	2016	2018 change	2017 change
Research and development expense	\$ 85	\$ 83	\$ 87	\$ 2	\$ (4)

Research and development expense remained relatively consistent during each year.

(In millions)	2018	2017	2016	2018 change	2017 change
Equity and other income					
Equity income	\$ 1	\$ —	\$ 1	\$ 1	\$ (1)
Other income	7	7	7	—	—
	<u>\$ 8</u>	<u>\$ 7</u>	<u>\$ 8</u>	<u>\$ 1</u>	<u>\$ (1)</u>

Total equity and other income remained relatively consistent during each year.

(In millions)	2018	2017	2016	2018 change	2017 change
Net interest and other financing expense (income)					
Interest expense	\$ 136	\$ 232	\$ 180	\$ (96)	\$ 52
Interest income	(4)	(4)	(5)	—	1
Available-for-sale securities income	(14)	(11)	(8)	(3)	(3)
Other financing costs	4	17	6	(13)	11
	<u>\$ 122</u>	<u>\$ 234</u>	<u>\$ 173</u>	<u>\$ (112)</u>	<u>\$ 61</u>

Net interest and other financing expense decreased \$112 million in 2018 compared to 2017. The current year decrease in interest expense was primarily due to the prior year including \$92 million of accelerated accretion related to the December 2016 tender offer of the 2029 notes. In addition, there was also interest expense of \$9 million in the prior year related to accelerated debt issuance costs associated with 2017 financing activity, which was comprised of \$7 million of accelerated amortization of previously capitalized debt issuance costs and \$2 million of new debt issuance costs immediately recognized. Interest expense in the current year included \$1 million of charges for new debt issuance costs incurred with the re-pricing of the 2017 term loan B facility. The available-for-sale securities income of \$14 million compared to \$11 million in the prior year represents investment income related to restricted investments discussed in Note G of the Notes to Consolidated Financial Statements. The current year decrease in other financing costs was primarily due to a net \$11 million charge during 2017 related to early redemption premium payments and bondholder consent fees for senior notes due 2018 and 2022, partially offset by a net gain related to the repayment of notes due 2029.

Net interest and other financing expense increased \$61 million in 2017 compared to 2016. Interest expense increased during 2017 primarily due to \$92 million of accelerated accretion related to the December 2016 tender offer of the 2029 notes, partially offset by a decrease in interest expense due to lower debt levels maintained in 2017 compared to 2016. During 2017, there was also interest expense of \$9 million related to accelerated debt issuance costs associated with 2017 financing activity, which was comprised of \$7 million of accelerated amortization of previously capitalized debt issuance costs and \$2 million of new debt issuance costs immediately recognized, while 2016 included interest expense of \$6 million related to accelerated debt issuance costs associated with 2016 financing activity. The increase in other financing costs was primarily due to a net \$11 million charge during 2017 related to early redemption premium payments and bondholder consent fees for senior notes due 2018 and 2022, partially offset by a net gain related to the repayment of notes due 2029. The available-for-sale securities income of \$11 million compared to \$8 million in the prior year represents investment income related to restricted investments discussed in Note G of the Notes to Consolidated Financial Statements.

(In millions)	2018	2017	2016	2018 change	2017 change
Other net periodic benefit income (costs)	\$ 13	\$ (4)	\$ (77)	\$ 17	\$ 73

Other net periodic benefit income (costs) during 2018 primarily included a gain on pension and other postretirement plan remeasurements of \$12 million.

Other net periodic benefit income (costs) during 2017 primarily included interest cost of \$10 million and a loss on pension and other postretirement plan remeasurements of \$6 million, partially offset by an expected return on plan assets of \$11 million.

Other net periodic benefit income (costs) during 2016 primarily included a loss on pension and other postretirement plan remeasurements of \$142 million and interest cost of \$97 million, partially offset by an expected return on plan assets of \$149 million and prior service credit amortization of \$12 million. The significant activity during 2016 included certain curtailments and actuarial adjustments related to plans that have since transferred to Valvoline Inc. as part of the separation.

(In millions)	2018		2017		2016		2018 change	2017 change
Net loss on acquisitions and divestitures	\$	(4)	\$	(6)	\$	(8)	\$	2

Net loss on acquisitions and divestitures during 2018 primarily included a loss of \$2 million related to the sale of a manufacturing facility, along with post-closing adjustments related to other previous divestitures.

Net loss on acquisitions and divestitures during 2017 included a net loss of \$5 million from the acquisition of Pharmachem, a loss of \$4 million recognized for the Specialty Ingredients joint venture divestiture in China and a loss of \$1 million due to post-closing adjustments related to other previous divestitures, partially offset by a net gain of \$4 million related to a Composites manufacturing facility.

Net loss on acquisitions and divestitures during 2016 included a \$12 million impairment related to a Specialty Ingredients joint venture, as well as a gain on the sale of a plant and other post-closing adjustments related to previous divestitures of \$2 million each.

(In millions)	2018		2017		2016		2018 change	2017 change
Income tax expense (benefit)	\$	9	\$	7	\$	(25)	\$	2
Effective tax rate		8%		(7)%		8%		32

The 2018 effective tax rate was impacted by jurisdictional income mix and restructuring activities, while the impact of U.S. tax reform and other items netted together to have an insignificant impact.

The 2017 effective tax rate was impacted by jurisdictional income mix, tax expense related to deemed dividend inclusions and a tax benefit for the reversal of a valuation allowance related to the utilization of foreign tax credits.

The 2016 effective tax rate was impacted by jurisdictional income mix and net unfavorable adjustments primarily related to a nondeductible goodwill impairment for the Intermediates and Solvents reporting unit, valuation allowances for domestic attributes, accruals for unrecognized tax benefits and items related to the separation of Valvoline.

Adjusted income tax expense (benefit)

Key items are defined as the financial effects from significant transactions that may have caused short-term fluctuations in net income and/or operating income which Ashland believes do not accurately reflect Ashland's underlying business performance and trends. Tax specific key items are defined as the financial effects from tax specific financial transactions, tax law changes or other matters that fall within the definition of key items as previously described. The effective tax rate, excluding key items, which is a non-GAAP measure, has been prepared to illustrate the ongoing tax effects of Ashland's operations. Management believes investors and analysts use this financial measure in assessing Ashland's business performance and that presenting this non-GAAP measure on a consolidated basis assists investors in better understanding Ashland's ongoing business performance and enhancing their ability to compare period-to-period financial results.

The effective tax rates during 2018, 2017 and 2016 were significantly impacted by the following tax specific key items:

- Deferred tax rate changes - Includes the impact from the remeasurement of Ashland's domestic deferred tax balances resulting from the enactment of the Tax Act as well as the impact from deferred rate changes for other jurisdictions during 2018;
- One-time transition tax - Includes the one-time transition tax resulting from the enactment of the Tax Act during 2018;
- Uncertain tax position - Includes the impact from the settlement of uncertain tax positions with various tax authorities during 2018;
- Restructuring and separation activity - Includes the impact from company-wide restructuring activities during 2018 and the separation of Valvoline during 2017 and 2016. These adjustments related to various tax impacts including state tax costs, foreign tax costs and other tax account adjustments;
- Other tax reform - Includes the impact from other tax law changes resulting from the enactment of the Tax Act during 2018. These adjustments include the impact from the deductibility of compensation items and miscellaneous state tax items;
- Valuation allowances - Includes the impact from net operating loss and foreign tax credit valuation allowances during 2018, 2017 and 2016; and
- Foreign dividends - Includes the impact from a significant deemed dividend inclusion in the U.S. during 2017. This deemed dividend transaction allowed Ashland to utilize foreign tax credit carryforwards which may have otherwise expired. This transaction was driven in part by projected changes to Ashland's business and tax profile as a result of the Valvoline separation.

The following table is a calculation of the effective tax rate, excluding the impact of these key items:

(In millions)	2018	2017	2016
Income (loss) from continuing operations			
before income taxes	\$ 114	\$ (98)	\$ (308)
Key items (pre-tax) (a)	150	264	443
Adjusted income from continuing operations			
before income taxes	<u>\$ 264</u>	<u>\$ 166</u>	<u>\$ 135</u>
Income tax expense (benefit)	9	7	(25)
Income tax rate adjustments:			
Tax effect of key items (b)	33	88	96
Tax specific key items: (c)			
Deferred tax rate changes	139	—	—
One-time transition tax	(128)	—	—
Uncertain tax positions	26	—	—
Restructuring and separation activity	(36)	(17)	(53)
Other tax reform	(11)	—	—
Valuation allowances	4	21	(31)
Foreign dividends	—	(87)	—
Other	—	—	6
Total income tax rate adjustments	27	5	18
Adjusted income tax expense (benefit)	<u>\$ 36</u>	<u>\$ 12</u>	<u>\$ (7)</u>
Effective tax rate, excluding key items (Non-GAAP)	14%	7%	(5)%

(a) See Adjusted EBITDA reconciliation table previously disclosed in this Management, Discussion and Analysis for a summary of the key items, before tax.

(b) The tax rate specific to the jurisdiction in which the key item originates is used to calculate the tax effect of key items.

(c) For additional information on the effect that these tax specific key items had on EPS, see the Adjusted Diluted EPS table previously disclosed in this Management Discussion and Analysis.

The following table provides a reconciliation of tax specific key items within the statutory federal income tax with the provision for income taxes summary disclosed in Note M of the Notes to Consolidated Financial Statements.

(In millions)	2018	2017	2016
Tax effect of key items computed at applicable statutory rate	\$ 33	\$ 88	\$ 96
Tax reform	44	—	—
Uncertain tax positions	23	(1)	(9)
Foreign dividend, deemed inclusions and other restructuring	(10)	(87)	—
Foreign tax credits	(44)	—	(15)
Valuation allowance changes (a)	4	7	(31)
Research & development tax credits	—	—	4
State taxes	—	7	(16)
Goodwill impairment	—	—	(15)
Other items	(23)	(9)	4
	<u>\$ 27</u>	<u>\$ 5</u>	<u>\$ 18</u>

(a) Includes \$14 million of charges during 2017 that were included in the "Restructuring and separation activity" line in previous table, which is an activity-based reconciliation.

(In millions)	2018	2017	2016	2018 change	2017 change
Income (loss) from discontinued operations (net of taxes)					
Asbestos-related litigation	\$ 13	\$ (25)	\$ (30)	\$ 38	\$ 5
Water Technologies	3	2	—	1	2
Distribution	(6)	(3)	(1)	(3)	(2)
Valvoline	(1)	159	286	(160)	(127)
	<u>\$ 9</u>	<u>\$ 133</u>	<u>\$ 255</u>	<u>\$ (124)</u>	<u>\$ (122)</u>

Asbestos-related activity during 2018, 2017 and 2016 included after-tax net adjustments to the asbestos reserves and receivables of \$13 million of income, \$25 million of expense and \$30 million of expense, respectively, including the adjustments for the annual update.

The activity for Water Technologies and Distribution during 2018, 2017 and 2016 was related to post-closing adjustments.

The Valvoline activity within 2018 primarily represents subsequent adjustments that were made in conjunction with the Tax Matters Agreement. Prior to the full separation of Valvoline Inc. on May 12, 2017, the operating results related to Valvoline Inc., including the operating results of the former Valvoline reportable segment, have been reflected as discontinued operations (net of tax) within the Statements of Consolidated Comprehensive Income (Loss) for 2017 and 2016. Valvoline's sales included in discontinued operations during 2017 and 2016 were \$1,237 million (reflective of sales until the full separation on May 12, 2017), and \$1,929 million, respectively. Valvoline's pre-tax income of discontinued operations during 2017 and 2016 totaled \$240 million and \$444 million, respectively.

(In millions)	2018	2017	2016	2018 change	2017 change
Net income attributable to noncontrolling interest	\$ —	\$ 27	\$ 1	\$ (27)	\$ 26

Since Ashland's ownership interest in Valvoline Inc. was approximately 83% after completing the IPO on September 28, 2016 and before the distribution of its remaining shares of Valvoline on May 12, 2017, the amount of net income attributable to the outside stockholders' approximately 17% noncontrolling interest in Valvoline Inc. was presented within this caption in the Statements of Consolidated Comprehensive Income (Loss) for 2017 and 2016.

Other comprehensive income (loss)

A comparative analysis of the components of other comprehensive income (loss) is provided below for the last three fiscal years ended September 30.

(In millions)	2018	2017	2016	2018 change	2017 change
Other comprehensive income (loss) (net of taxes)					
Unrealized translation gain (loss)	\$ (82)	\$ 81	\$ (14)	\$ (163)	\$ 95
Pension and postretirement obligation adjustment	—	(4)	14	4	(18)
Net change in available-for-sale securities	13	15	17	(2)	(2)
	<u>\$ (69)</u>	<u>\$ 92</u>	<u>\$ 17</u>	<u>\$ (161)</u>	<u>\$ 75</u>

Total other comprehensive income (loss), net of tax, decreased \$161 million in 2018 as compared to 2017 as a result of the following components.

- In 2018, the change in unrealized gain (loss) from foreign currency translation adjustments resulted in a loss of \$82 million, compared to a gain of \$81 million during 2017. The fluctuations in unrealized translation gains and losses were primarily due to translating foreign subsidiary financial statements from local currencies to U.S. Dollars.
- The pension and postretirement obligation adjustment was zero during 2018 compared to \$4 million during 2017. The adjustment during 2017 related to amortization of unrecognized prior services credits for pension and other postretirement benefit plans and were reclassified into net income.
- Gains of \$13 million and \$15 million on available-for-sale securities, net of tax, related to restricted investments, were recognized within other comprehensive income (loss) during 2018 and 2017, respectively.

Total other comprehensive income (loss), net of tax, increased \$75 million in 2017 as compared to 2016 as a result of the following components.

- In 2017, the change in unrealized gain (loss) from foreign currency translation adjustments resulted in a gain of \$81 million, compared to a loss of \$14 million during 2016. The fluctuations in unrealized translation gains and losses are primarily due to translating foreign subsidiary financial statements from local currencies to U.S. Dollars.
- The pension and postretirement obligation adjustment was a loss of \$4 million during 2017 compared to income of \$14 million during 2016. Of these amounts, \$4 million and \$41 million during 2017 and 2016, respectively, of unrecognized prior service credits, net of tax, relating to pension and other postretirement benefit plans were amortized and reclassified into net income. Additional unrecognized prior service credits, net of tax, of \$55 million during 2016 were included in other comprehensive income (loss) as a result of the pension and other postretirement plan remeasurements.
- Gains of \$15 million and \$17 million on available-for-sale securities, net of tax, related to restricted investments, were recognized within other comprehensive income (loss) during 2017 and 2016, respectively.

RESULTS OF OPERATIONS – REPORTABLE SEGMENT REVIEW

Ashland's operations are managed within the following three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents. Results of Ashland's reportable segments are presented based on its management and internal accounting structure. The structure is specific to Ashland; therefore, the financial results of Ashland's reportable segments are not necessarily comparable with similar information for other comparable companies. Ashland allocates all costs to its reportable segments except for certain significant company-wide restructuring activities and other costs or adjustments that relate to former businesses that Ashland no longer operates. The service cost component of pension and other postretirement benefits costs is allocated to each reportable segment on a ratable basis; while the remaining components of pension and other postretirement benefits costs are recorded within the other net periodic benefit income (costs) caption on the Statements of Consolidated Comprehensive Income (Loss). Ashland refines its expense allocation methodologies to the reportable segments from time to time as internal accounting practices are improved, more refined information becomes available and the industry or market changes. Significant revisions to Ashland's methodologies are adjusted for all segments on a retrospective basis.

The EBITDA and Adjusted EBITDA amounts presented within this business section are provided as a means to enhance the understanding of financial measurements that Ashland has internally determined to be relevant measures of comparison for each segment. Each of these non-GAAP measures is defined as follows: EBITDA (operating income plus depreciation and amortization), Adjusted EBITDA (EBITDA adjusted for key items, which may include pro forma effects for significant acquisitions or divestitures, as applicable), and Adjusted EBITDA margin (Adjusted EBITDA, which may include pro forma adjustments, divided by sales or sales adjusted for pro forma results). Ashland does not allocate items to each reportable segment below operating income, such as interest expense and income taxes. As a result, reportable segment EBITDA and Adjusted EBITDA are reconciled directly to operating income since it is the most directly comparable Statements of Consolidated Comprehensive Income (Loss) caption.

The following table shows sales, operating income, depreciation and amortization and statistical operating information by reportable segment for each of the last three years ended September 30.

(In millions)	2018	2017	2016
Sales			
Specialty Ingredients	\$ 2,470	\$ 2,216	\$ 2,089
Composites	942	779	669
Intermediates and Solvents	331	265	261
	<u>\$ 3,743</u>	<u>\$ 3,260</u>	<u>\$ 3,019</u>
Operating income (loss)			
Specialty Ingredients	\$ 314	\$ 233	\$ 237
Composites	73	67	63
Intermediates and Solvents	31	(12)	(181)
Unallocated and other	(191)	(142)	(169)
	<u>\$ 227</u>	<u>\$ 146</u>	<u>\$ (50)</u>
Depreciation and amortization			
Specialty Ingredients	\$ 252	\$ 243	\$ 243
Composites	22	22	22
Intermediates and Solvents	30	31	31
Unallocated and other	8	5	6
	<u>\$ 312</u>	<u>\$ 301</u>	<u>\$ 302</u>
Operating information			
Specialty Ingredients (a)			
Sales per shipping day	\$ 9.8	\$ 8.8	\$ 8.2
Metric tons sold (thousands)	324.7	317.2	307.4
Gross profit as a percent of sales	33.8%	32.7%	33.9%
Composites (a)			
Sales per shipping day	\$ 3.7	\$ 3.1	\$ 2.6
Metric tons sold (thousands)	382.2	346.4	309.1
Gross profit as a percent of sales	18.8%	19.8%	22.6%
Intermediates and Solvents (a)			
Sales per shipping day	\$ 1.3	\$ 1.1	\$ 1.0
Metric tons sold (thousands)	140.6	137.0	136.7
Gross profit as a percent of sales	18.6%	6.5%	11.0%

(a) Sales are defined as sales and operating revenues. Gross profit is defined as sales, less cost of sales.

Sales by region expressed as a percentage of reportable segment sales for each of the last three fiscal years ended September 30 were as follows. Ashland includes only U.S. and Canada in its North American designation.

2018			
Sales by Geography	Specialty Ingredients	Composites	Intermediates and Solvents
North America	40%	45%	21%
Europe	33%	34%	61%
Asia Pacific	18%	14%	15%
Latin America & other	9%	7%	3%
	<u>100%</u>	<u>100%</u>	<u>100%</u>

2017			
Sales by Geography	Specialty Ingredients	Composites	Intermediates and Solvents
North America	40%	47%	22%
Europe	31%	30%	57%
Asia Pacific	19%	15%	18%
Latin America & other	10%	8%	3%
	<u>100%</u>	<u>100%</u>	<u>100%</u>

2016			
Sales by Geography	Specialty Ingredients	Composites	Intermediates and Solvents
North America	39%	50%	22%
Europe	31%	30%	58%
Asia Pacific	20%	14%	16%
Latin America & other	10%	6%	4%
	<u>100%</u>	<u>100%</u>	<u>100%</u>

Specialty Ingredients

Specialty Ingredients offers industry-leading products, technologies and resources for solving formulation and product-performance challenges. Using natural, synthetic and semisynthetic polymers derived from cellulose ethers, vinyl pyrrolidones, acrylic polymers, polyester and polyurethane-based adhesives, and plant and seed extract, Specialty Ingredients offers comprehensive and innovative solutions for consumer and industrial applications. Key customers include pharmaceutical companies; makers of personal care products, food and beverages; makers of nutraceuticals and supplements; manufacturers of paint, coatings and construction materials; packaging and converting; and oilfield service companies.

On May 17, 2017, Ashland completed its acquisition of the stock of Pharmachem, a leading provider of quality ingredients to the global health and wellness industries and high-value differentiated products to fragrance and flavor houses. At the acquisition date, Pharmachem had approximately \$300 million in annual revenues and 14 manufacturing facilities located in the United States and Mexico. New Jersey-based Pharmachem develops, manufactures and supplies custom and branded nutritional and fragrance products. See Note C of the Notes to Consolidated Financial Statements for more information.

Ashland completed the transfer of its ownership interest in a consolidated joint venture during 2017. See Note D of the Notes to Consolidated Financial Statements for information on this divestiture

2018 compared to 2017

Specialty Ingredients' sales increased \$254 million, or 11%, to \$2,470 million in 2018. The acquisition of Pharmachem increased sales by \$140 million, or 6%. Volume and mix combined to increase sales by \$87 million while favorable foreign currency exchange increased sales by \$42 million. In addition, improved product pricing increased sales by \$18 million. These increases were partially offset by a decrease of \$33 million primarily related to the transfer of ownership interest in a consolidated joint venture.

Gross profit during 2018 increased \$110 million compared to 2017. The acquisition of Pharmachem and improved volume and mix increased gross profit by \$39 million each, while favorable foreign currency exchange increased gross profit by \$18 million. Additionally, the net impact of pricing and costs increased gross profit by \$18 million, which included a \$24 million net impact from the following key items during 2018 and 2017:

- \$3 million of costs related to restructuring activity at certain manufacturing plants during 2018;
- \$14 million of restructuring charges related to the closure of a manufacturing plant during 2017 (which included \$13 million of accelerated depreciation);
- \$7 million of non-cash charges related to the fair value assessment of inventory acquired from Pharmachem at the date of acquisition during 2017; and
- \$6 million of costs related to the temporary shutdown of a manufacturing plant due to a hurricane during 2017.

These increases to gross profit were partially offset by a decrease of \$4 million related to the joint venture divestiture. In total, gross profit margin during 2018 increased 1.1 percentage points to 33.8% as compared to 2017.

Selling, general and administrative expenses (which includes research and development expenses throughout the reportable segment discussion and analysis) increased \$27 million during 2018 as compared to 2017, largely due to incremental costs of \$23 million related to the acquisition of Pharmachem's operations. The remaining increase to selling, general and administrative expense was primarily attributable to unfavorable foreign currency exchange. Equity and other income (loss) decreased \$2 million compared to 2017.

Operating income totaled \$314 million for 2018 compared to \$233 million in 2017. EBITDA increased \$98 million to \$560 million in 2018, while Adjusted EBITDA increased \$81 million to \$574 million. Operating income margin increased 2.2 percentage points in 2018 to 12.7%. Adjusted EBITDA margin increased 1.0 percentage point in 2018 to 23.2%.

2017 compared to 2016

Specialty Ingredients' sales increased \$127 million, or 6%, to \$2,216 million in 2017. The acquisition of Pharmachem in 2017 increased sales by \$104 million, or 5%, while a tollor agreement exit and the divestiture of a joint venture combined to decrease sales by \$13 million. Volume increased sales by \$72 million as metric tons increased to 317.2 thousand in 2017, while mix declined sales by \$32 million during 2017. Unfavorable foreign currency exchange decreased sales by \$10 million, while improved product pricing increased sales by \$6 million.

Gross profit during 2017 increased \$18 million compared to 2016. The acquisition of Pharmachem in 2017 increased gross profit by \$32 million while improved volume and mix combined to increase gross profit by \$21 million. These increases were partially offset by decreases due to pricing and higher costs of \$29 million, primarily related to the impact from the following key items during 2017 and 2016:

- \$14 million of restructuring charges related the closure of a manufacturing plant and the termination of a contract at a manufacturing facility during 2017 (which included \$13 million of accelerated depreciation);
- \$7 million of non-cash charges related to the fair value assessment of inventory acquired from Pharmachem at the date of acquisition during 2017;
- \$6 million of costs related to the temporary shutdown of a manufacturing plant due to a hurricane during 2017;
- \$1 million of net restructuring income and \$4 million of accelerated depreciation related to a restructuring plan within an existing manufacturing facility during 2016; and
- \$5 million of income related to a customer claim adjustment during 2016.

Additionally, unfavorable foreign currency exchange and the divestiture of a joint venture decreased gross profit by \$4 million and \$2 million, respectively. In total, gross profit margin during 2017 decreased 1.2 percentage points to 32.7% as compared to 2016.

Selling, general and administrative expenses increased \$20 million during 2017 as compared to 2016, primarily due to incremental costs of \$17 million related to Pharmachem's operations. Equity and other income (loss) decreased \$2 million compared to 2016.

Operating income totaled \$233 million for 2017 compared to \$237 million in 2016. EBITDA decreased \$14 million to \$462 million in 2017, while Adjusted EBITDA increased \$17 million to \$493 million. Operating income margin decreased 0.8 percentage points in 2017 to 10.5%. Adjusted EBITDA margin decreased 0.6 percentage points in 2017 to 22.2%.

EBITDA and Adjusted EBITDA reconciliation

The following EBITDA and Adjusted EBITDA presentation for the three annual periods is provided as a means to enhance the understanding of financial measurements that Ashland has internally determined to be relevant measures of comparison for the results of Specialty Ingredients. Adjusted EBITDA results have been prepared to illustrate the ongoing effects of Ashland's operations, which exclude certain key items.

The key items during 2018 included \$6 million of accelerated depreciation related to the termination of a contract at a manufacturing facility, \$2 million of integration costs related to the acquisition of Pharmachem and \$3 million of costs related to restructuring activity at certain manufacturing plants. Additional key items during 2018 included \$2 million of asset impairment charges and \$1 million of environmental reserve adjustments.

The key items during 2017 included \$18 million of restructuring charges for the closure of a manufacturing plant and the termination of a contract at a manufacturing facility (which included \$14 million of accelerated depreciation and \$4 million of severance and other restructuring costs), \$7 million for the revaluation of Pharmachem inventory and \$6 million of charges related to an unplanned plant shutdown.

The \$4 million of restructuring charges in 2016 were partially offset by a \$5 million income adjustment to a severance accrual for a net impact of \$1 million of income. The \$4 million of accelerated depreciation in 2016 related to a manufacturing facility restructuring plan. In addition, there were environmental reserve adjustments of \$2 million and income of \$5 million for a customer claim receipt during 2016.

(In millions)	September 30		
	2018	2017	2016
Operating income	\$ 314	\$ 233	\$ 237
Depreciation and amortization (a)	246	229	239
EBITDA	560	462	476
Accelerated depreciation	6	14	4
Severance and other costs	5	4	(1)
Asset impairment	2	—	—
Environmental reserve adjustment	1	—	2
Inventory fair value adjustment	—	7	—
Unplanned plant shutdown	—	6	—
Customer claim	—	—	(5)
Adjusted EBITDA	\$ 574	\$ 493	\$ 476

(a) Excludes \$6 million, \$14 million and \$4 million of accelerated depreciation during 2018, 2017 and 2016, respectively.

Composites

Composites is a global leader in unsaturated polyester resins, vinyl ester resins and gelcoats. The Composites business manufactures and sells a broad range of general-purpose and high-performance grades of unsaturated polyester and vinyl ester resins, gelcoats and low-profile additives for the reinforced plastics industry. The products in the Composites business provide an array of functional properties including corrosion resistance, fire retardance, ultraviolet resistance, water and chemical resistance, high mechanical strength, impact and scratch resistance and high strength-to-weight ratios. Key end markets include transportation, construction, marine and infrastructure. In addition, the business manufactures and sells molten maleic anhydride for the manufacture of a variety of products such as unsaturated polyester resins, copolymers, lubricating oil additives, alkenyl succinic anhydrides, malic acid, fumaric acid and numerous derivative chemicals. Key markets include composites, personal care, dispersants and combustion engine oil.

2018 compared to 2017

Composites' sales increased by \$163 million to \$942 million in 2018. Improved product pricing increased sales by \$68 million, or 9%, while the acquisition of an unsaturated polyester resins manufacturing facility increased sales by \$51 million, or 7%. Volume and mix combined to increase sales by \$28 million as metric tons sold increased to 382.2 thousand in 2018. Additionally, favorable foreign currency exchange increased sales by \$16 million.

Gross profit increased \$23 million in 2018 compared to 2017. The net impact of pricing and costs increased gross profit by \$8 million while volume and mix combined to increase gross profit by \$7 million. Foreign currency exchange and the acquisition of an unsaturated polyester resins manufacturing facility increased gross profit by \$4 million each. In total, gross profit margin during 2018 decreased 1.0 percentage point to 18.8% as compared to 2017.

Selling, general and administrative expense increased \$18 million during 2018 compared to 2017, primarily due to higher general allocated resource costs. Equity and other income (loss) increased \$1 million compared to 2017.

Operating income totaled \$73 million in 2018 compared to \$67 million in 2017, while operating income margin decreased 0.9 percentage points in 2018 to 7.7%. EBITDA increased \$6 million to \$95 million in 2018, while the EBITDA margin decreased 1.3 percentage points to 10.1% in 2018.

2017 compared to 2016

Composites' sales increased \$110 million to \$779 million in 2017. Volume increased sales by \$59 million, or 9%, as metric tons increased to 346.4 thousand in 2017. Improved product pricing increased sales by \$35 million, or 5%, while the acquisition of an unsaturated polyester resins manufacturing facility in the current year increased sales by \$22 million, or 3%. Unfavorable product mix decreased sales by \$6 million.

Gross profit increased \$3 million in 2017 compared to 2016. Volume increased gross profit by \$15 million while the impact of the manufacturing facility acquisition increased gross profit by \$2 million. Pricing effects were offset by higher costs to decrease gross profit by \$10 million and unfavorable product mix decreased gross profit by \$4 million. In total, gross profit margin during 2017 decreased 2.8 percentage points to 19.8% as compared to 2016.

Selling, general and administrative expense decreased \$3 million during 2017 compared to 2016, primarily due to declines in employee related costs of \$2 million and a reduction in bad debt expense of \$2 million. Equity and other income (loss) decreased \$2 million compared to 2016.

Operating income totaled \$67 million in 2017 compared to \$63 million in 2016, while operating income margin decreased 0.8 percentage points in 2017 to 8.6%. EBITDA increased \$4 million to \$89 million in 2017, while the EBITDA margin decreased 1.3 percentage points to 11.4% in 2017.

EBITDA reconciliation

The following EBITDA presentation for the three annual periods is provided as a means to enhance the understanding of financial measurements that Ashland has internally determined to be relevant measures of comparison for the results of Composites. There were no unusual or key items that affected comparability for EBITDA during the current and prior years.

(In millions)	September 30		
	2018	2017	2016
Operating income	\$ 73	\$ 67	\$ 63
Depreciation and amortization	22	22	22
EBITDA	<u>\$ 95</u>	<u>\$ 89</u>	<u>\$ 85</u>

Intermediates and Solvents

Intermediates and Solvents is a leading producer of 1,4 butanediol and related derivatives, including tetrahydrofuran and n-methylpyrrolidone. These products are used as chemical intermediates in the production of engineering polymers and polyurethanes, and as specialty process solvents in a wide array of applications including electronics, pharmaceuticals, water filtration membranes and more. Butanediol is also supplied to Ashland's Specialty Ingredients business for use as a raw material.

2018 compared to 2017

Intermediates and Solvents' sales increased \$66 million to \$331 million in 2018. Improved product pricing increased sales by \$39 million while favorable foreign currency exchanged increased sales by \$15 million. Volume and mix combined to increase sales by \$12 million as metric tons sold increased to 140.6 thousand.

Gross profit increased \$45 million during 2018 compared to 2017. The net impact of pricing and costs increased gross profit by \$37 million, which included an increase of \$7 million related to the unplanned shutdown of a manufacturing plant due to a fire that occurred in 2017. Higher volumes increased gross profit by \$7 million and foreign currency exchange increased gross profit by \$1 million. In total, gross profit margin during 2018 increased 12.1 percentage points to 18.6%.

Selling, general and administrative expense increased \$2 million during 2018 as compared to 2017.

Operating income totaled \$31 million in 2018 as compared to a loss of \$12 million in 2017. EBITDA increased \$42 million to \$61 million in 2018, while Adjusted EBITDA increased \$35 million to \$61 million. Operating income margin increased to 9.4% in 2018 compared to a negative margin in 2017. Adjusted EBITDA margin increased 8.6 percentage points to 18.4% in 2018.

2017 compared to 2016

Intermediates and Solvents' sales increased \$4 million to \$265 million in 2017. The net impact of volume and product mix increased sales by \$7 million with metric tons sold increasing to 137.0 thousand. This increase was partially offset by unfavorable foreign currency exchange and lower product pricing, which decreased sales by \$2 million and \$1 million, respectively.

Gross profit decreased \$12 million during 2017 compared to 2016. Pricing effects were offset by higher costs to decrease gross profit by \$12 million, which included the impact of higher facility turn around costs of \$9 million and incremental costs of \$7 million related to the temporary shutdown of a manufacturing plant due to a fire. Higher volumes increased gross profit by \$2 million which was offset by unfavorable product mix of \$2 million. In total, gross profit margin during 2017 decreased 4.5 percentage points to 6.5%.

Selling, general and administrative expense decreased \$181 million during 2017 as compared to 2016, primarily due to the non-cash long lived asset impairment recorded during 2016. See further discussion of this impairment within the "Critical Accounting Policies" section of Management's Discussion and Analysis.

Operating loss totaled \$12 million in 2017 as compared to \$181 million in 2016. EBITDA increased \$169 million to \$19 million in 2017, while Adjusted EBITDA decreased \$5 million to \$26 million. Operating income margin was negative in both 2017 and 2016. Adjusted EBITDA margin decreased 2.1 percentage points to 9.8% in 2017.

EBITDA and Adjusted EBITDA reconciliation

The following EBITDA and Adjusted EBITDA presentation for the three annual periods is provided as a means to enhance the understanding of financial measurements that Ashland has internally determined to be relevant measures of comparison for the results of Intermediates and Solvents. Adjusted EBITDA results have been prepared to illustrate the ongoing effects of Ashland's operations, which exclude certain key items. There were no unusual or key items that affected comparability for Adjusted EBITDA during the current year, while key items in prior years included \$7 million of costs related to the temporary shutdown of a manufacturing plant due to a fire during 2017 and the \$181 million non-cash long lived asset impairment recorded in 2016.

(In millions)	September 30		
	2018	2017	2016
Operating income (loss)	\$ 31	\$ (12)	\$ (181)
Depreciation and amortization	30	31	31
EBITDA	61	19	(150)
Unplanned plant shutdown	—	7	—
Impairment	—	—	181
Adjusted EBITDA	\$ 61	\$ 26	\$ 31

Unallocated and other

The following table summarizes the key components of the Unallocated and other segment's operating income (loss) for each of the last three years ended September 30.

(In millions)	September 30		
	2018	2017	2016
Restructuring activities	\$ (101)	\$ (100)	\$ (125)
Environmental expenses	(58)	(20)	(36)
Asset impairment charges	(14)	—	—
Legal settlement/reserve	5	(5)	(15)
Tax indemnity expense	(5)	—	—
Other income (expense)	(18)	(17)	7
Total unallocated expense	<u>\$ (191)</u>	<u>\$ (142)</u>	<u>\$ (169)</u>

Unallocated and other recorded expense of \$191 million, \$142 million and \$169 million for 2018, 2017, and 2016, respectively. The charges for restructuring activities of \$101 million, \$100 million and \$125 million during 2018, 2017 and 2016, respectively, were primarily comprised of the following items:

- \$63 million of severance, lease abandonment and other restructuring costs related to company-wide cost-savings initiatives during 2018;
- \$13 million, \$13 million and \$37 million of stranded divestiture costs during 2018, 2017 and 2016, respectively. Of these stranded divestiture costs, \$22 million related to costs previously allocated to the Valvoline reportable segment during 2016;
- \$10 million, \$82 million and \$81 million of costs related to the separation of Valvoline during 2018, 2017 and 2016, respectively;
- \$8 million of accelerated depreciation related to the closure of an office building during 2018; and
- \$7 million and \$4 million of integration costs related to the acquisition of Pharamchem during 2018 and 2017, respectively.

FINANCIAL POSITION

Liquidity

Ashland had \$294 million in cash and cash equivalents as of September 30, 2018, of which \$258 million was held by foreign subsidiaries and had no significant limitations that would prohibit remitting the funds to satisfy corporate obligations. In certain circumstances, if such amounts were repatriated to the United States, additional taxes might need to be accrued and paid depending on the source of the earnings remitted. Ashland currently has no plans to repatriate any amounts for which additional taxes would need to be accrued. However, due to the Tax Act enacted in the current year, Ashland will be reassessing this position in future periods.

Ashland's cash flows from operating, investing and financing activities, as reflected in the Statements of Consolidated Cash Flows, are summarized as follows.

(In millions)	2018	2017	2016
Cash provided (used) by:			
Operating activities from continuing operations	\$ 344	\$ 273	\$ 385
Investing activities from continuing operations	(202)	(829)	(177)
Financing activities from continuing operations	(368)	136	(1,858)
Discontinued operations	(47)	(197)	1,589
Effect of currency exchange rate changes on cash and cash equivalents	1	(5)	(8)
Net decrease in cash and cash equivalents	<u>\$ (272)</u>	<u>\$ (622)</u>	<u>\$ (69)</u>

Ashland paid income taxes of \$77 million during 2018 compared to \$79 million in 2017 and \$108 million in 2016. Cash receipts for interest income were \$4 million in 2018, \$4 million in 2017 and \$5 million in 2016, while cash payments for interest expense amounted to \$126 million in 2018, \$132 million in 2017 and \$162 million in 2016.

Operating activities

The following discloses the cash flows associated with Ashland's operating activities for 2018, 2017 and 2016, respectively.

(In millions)	2018	2017	2016
Cash flows provided (used) by operating activities from continuing operations			
Net income (loss)	\$ 114	\$ 28	\$ (28)
Income from discontinued operations (net of tax)	(9)	(133)	(255)
Adjustments to reconcile income from continuing operations to cash flows from operating activities			
Depreciation and amortization	312	301	302
Original issue discount and debt issuance cost amortization	9	109	18
Deferred income taxes	(97)	(30)	(29)
Equity income from affiliates	(1)	—	(1)
Distributions from equity affiliates	1	1	2
Stock based compensation expense - Note Q	28	20	30
Excess tax benefits on stock based compensation	4	3	3
Loss on early retirement of debt	—	9	—
Realized gains and investment income on available-for-sale securities	(14)	(11)	(8)
Net loss on acquisitions and divestitures - Notes C and D	1	4	8
Impairments	16	—	181
Pension contributions	(9)	(7)	(33)
Loss (gain) on pension and other postretirement plan remeasurements	(12)	6	142
Change in operating assets and liabilities (a)	1	(27)	53
Total cash flows provided by operating activities from continuing operations	\$ 344	\$ 273	\$ 385

(a) Excludes changes resulting from operations acquired or sold.

Cash flows provided by operating activities from continuing operations, a major source of Ashland's liquidity, amounted to \$344 million in 2018, \$273 million in 2017 and \$385 million in 2016.

Operating Activities - Operating Assets and Liabilities

The cash results during each year were primarily driven by net income, excluding discontinued operation results, adjusted for certain non-cash items including depreciation and amortization (including debt issuance cost amortization), losses on acquisitions and divestitures as well as changes in working capital, which are fluctuations within accounts receivable, inventory, trade payables and accrued expenses. Ashland continues to emphasize working capital management as a high priority and focus.

The following details certain changes in key operating assets and liabilities for 2018, 2017 and 2016, respectively.

(In millions)	2018	2017	2016
Cash flows from assets and liabilities (a)			
Accounts receivable	\$ (70)	\$ (64)	\$ 77
Inventories	(29)	(23)	48
Trade and other payables	85	60	(99)
Other assets and liabilities	15	—	27
Change in operating assets and liabilities	\$ 1	\$ (27)	\$ 53

(a) Excludes changes resulting from operations acquired or sold.

Changes in net working capital accounted for an outflow of \$14 million in 2018, an outflow of \$27 million in 2017 and an inflow of \$26 million in 2016, and were driven by the following:

- Accounts receivable - Changes in accounts receivable resulted in a \$70 million outflow of cash in 2018 compared to a cash outflow of \$64 million in 2017 and a cash inflow of \$77 million in 2016, and primarily related to increased sales.
- Inventory – Changes in inventory resulted in a cash outflow of \$29 million in 2018 compared to cash outflow of \$23 million in 2017 and cash inflow of \$48 million in 2016, and were primarily driven by sales volumes and inventory management.
- Trade and other payables - Changes in trade and other payables resulted in a cash inflow of \$85 million in 2018 compared to cash inflow of \$60 million in 2017 and cash outflow of \$99 million in 2016, and primarily related to the timing of certain payments.

The remaining cash inflows of \$15 million and \$27 million during 2018 and 2016, respectively, were primarily due to income taxes paid or income tax refunds, interest paid, and adjustments to certain accruals and other long-term assets and liabilities.

Operating Activities - Summary

Operating cash flows for 2018 included income from continuing operations of \$105 million, non-cash adjustments of \$312 million for depreciation and amortization and \$97 million for deferred income taxes. The adjustment for deferred income taxes during 2018 was significantly higher compared to prior years due to the impact from the enactment of the Tax Act during the current year. Operating cash flows for 2018 also included non-cash adjustments of \$16 million related to asset impairment charges, \$12 million of net gains on pension and other postretirement plan remeasurements and \$9 million for debt issuance cost amortization.

Operating cash flows for 2017 included a loss from continuing operations of \$105 million, non-cash adjustments of \$301 million for depreciation and amortization and \$109 million for original issue discount and debt issuance cost amortization, including \$92 million of accelerated accretion related to the tender offer of the 2029 notes. Operating cash flows for 2017 also included non-cash adjustments of \$30 million for deferred income taxes and \$6 million of net losses on pension and other postretirement plan remeasurements.

Operating cash flows for 2016 included a loss from continuing operations of \$283 million, \$142 million of net losses on pension and other postretirement plan remeasurements and non-cash adjustments of \$302 million for depreciation and amortization and \$18 million for debt issuance cost amortization. Operating cash flows for 2016 also included non-cash adjustments of \$181 million related to the impairment of Intermediates and Solvents as well as an adjustment of \$29 million for deferred income taxes.

Investing activities

The following discloses the cash flows associated with Ashland's investing activities for 2018, 2017 and 2016.

(In millions)	2018	2017	2016
Cash flows provided (used) by investing activities from continuing operations			
Additions to property, plant and equipment	\$ (185)	\$ (199)	\$ (231)
Proceeds from disposal of property, plant and equipment	4	5	2
Purchase of operations - net of cash acquired	(11)	(680)	—
Proceeds from sale of operations or equity investments	6	18	19
Life insurance payments	(37)	—	—
Net purchases of funds restricted for specific transactions	(10)	(2)	(4)
Reimbursement from restricted investments	33	27	33
Proceeds from sale of available-for-sale securities	26	19	10
Purchase of available-for-sale securities	(26)	(19)	(10)
Proceeds from the settlement of derivative instruments	1	5	9
Payments for the settlement of derivative instruments	(3)	(3)	(5)
Total cash flows used by investing activities from continuing operations	<u>\$ (202)</u>	<u>\$ (829)</u>	<u>\$ (177)</u>

Cash used by investing activities was \$202 million in 2018 compared to \$829 million and \$177 million in 2017 and 2016, respectively. The significant cash investing activities for the current year primarily related to cash outflows of \$185 million for capital expenditures. The current year also included cash outflows of \$37 million related to payments for a corporate-owned life insurance policy loan and \$11 million for the purchase of Vornia Limited. Additionally, there were reimbursements of \$33 million from the restricted renewable annual asbestos trust.

The significant cash investing activities for 2017 primarily related to cash outflows of \$680 million for the acquisition of Pharmachem and \$199 million for capital expenditures. Additionally, there were reimbursements of \$27 million from the restricted renewable annual asbestos trust.

The significant cash investing activities for 2016 included capital expenditures of \$231 million and reimbursements of \$33 million from the restricted renewable annual asbestos trust.

Financing activities

The following discloses the cash flows associated with Ashland's financing activities for 2018, 2017 and 2016, respectively.

(In millions)	2018	2017	2016
Cash flows provided (used) by financing activities from continuing operations			
Proceeds from issuance of long-term debt	\$ —	\$ 1,100	\$ —
Repayment of long-term debt	(311)	(915)	(1,095)
Premium on long-term debt repayment	—	(17)	—
Proceeds from (repayment of) short-term debt	15	75	(156)
Repurchase of common stock	—	—	(500)
Debt issuance costs	(2)	(15)	—
Cash dividends paid	(60)	(77)	(97)
Stock based compensation employee withholding taxes paid in cash	(10)	(15)	(10)
Total cash flows provided (used) by financing activities from continuing operations	<u>\$ (368)</u>	<u>\$ 136</u>	<u>\$ (1,858)</u>

Cash provided (used) by financing activities was \$(368) million for 2018, \$136 million for 2017, and \$(1,858) million for 2016. Significant cash financing activities for the current year included a cash outflow \$311 million for repayments of long-term debt, including \$250 million for the full repayment of the three-year term loan A facility, \$55 million for early repayments of the five-year term loan A facility and \$6 million for repayments of the term loan B facility. The current period also included short-term debt net proceeds of \$15 million related to the revolving credit facility, the accounts receivable securitization facilities and a short-term loan facility. The revolving credit facility and the outstanding balance of the three-year term loan A facility were repaid primarily using cash from repatriations. The current year included cash dividends paid of \$0.95 per share, for a total of \$60 million.

Significant cash financing activities during 2017 included cash outflows of \$915 million primarily related to the full repayment of the 2018 notes and partial repayments of the 2029 notes and 2022 notes. There were also cash inflows of \$1,100 million from the issuance of the term loan A facilities and the term loan B facility. Additionally, 2017 included short-term debt net cash inflows of \$75 million primarily related to debt outstanding on the revolving credit facility and the accounts receivable securitization, partially offset by the repayment of the term loan due 2017. Ashland also paid cash dividends of \$1.23 per share, for a total of \$77 million.

Significant cash financing activities during 2016 included the repayment of long-term debt of \$1,095 million primarily related to the 2015 term loan facility. Additionally, 2016 included a cash outflow of \$500 million for the repurchase of common stock and short-term net debt repayments of \$156 million primarily related to the debt repayments under Ashland's 2015 revolving credit facility and the accounts receivable securitization facility, and the issuance of the \$150 million term loan facility due 2017. Ashland also paid cash dividends of \$1.56 per share, for a total of \$97 million.

Cash provided (used) by discontinued operations

The following discloses the cash flows associated with Ashland's discontinued operations for 2018, 2017 and 2016, respectively.

(In millions)	2018	2017	2016
Cash provided (used) by discontinued operations			
Operating cash flows	\$ (47)	\$ 110	\$ 293
Investing cash flows	—	(290)	(155)
Financing cash flows	—	(17)	1,451
Total cash provided (used) by discontinued operations	\$ (47)	\$ (197)	\$ 1,589

Cash flows for discontinued operations in the current year primarily related to previously divested businesses, including net payments of asbestos and environmental liabilities.

Cash flows for discontinued operations in 2017 and 2016 primarily related to net cash outflows of \$158 million and net cash inflows of \$1,629 million, respectively, related to the activity of Valvoline Inc. The remaining cash flows for discontinued operations for these years related to other previously divested businesses, including net payments of asbestos and environmental liabilities.

Free cash flow and other liquidity information

The following represents Ashland's calculation of free cash flow for the disclosed periods and reconciles free cash flow to cash flows provided by operating activities from continuing operations. Free cash flow does not reflect adjustments for certain non-discretionary cash flows such as mandatory debt repayments. See "Results of Operations - Consolidated Review - Use of non-GAAP measures" for additional information.

(In millions)	September 30		
	2018	2017	2016
Cash flows provided by operating activities from continuing operations	\$ 344	\$ 273	\$ 385
Less:			
Additions to property, plant and equipment	(185)	(199)	(231)
Free cash flows (a)	\$ 159	\$ 74	\$ 154

(a) Included \$39 million and \$64 million of restructuring-related and separation payments during 2018 and 2017, respectively.

At September 30, 2018, working capital (current assets minus current liabilities, excluding long-term debt due within one year) amounted to \$648 million, compared to \$941 million at the end of 2017. Liquid assets (cash, cash equivalents and accounts receivable) amounted to 91% of current liabilities at September 30, 2018 and 122% at September 30, 2017.

The following summary reflects Ashland's cash, investment securities and unused borrowing capacity as of September 30, 2018, 2017 and 2016.

(In millions)	September 30		
	2018	2017	2016
Cash and cash equivalents	\$ 294	\$ 566	\$ 1,017
Unused borrowing capacity			
2017 Revolving Credit Facility	\$ 725	\$ 579	\$ —
2015 Revolving Credit Facility	—	—	742
Accounts receivable securitizations	29	35	80

The borrowing capacity remaining under the 2017 Revolving Credit Facility was \$725 million due to an outstanding balance of \$25 million, as well as a reduction of \$50 million for letters of credit outstanding at September 30, 2018. In total, Ashland's available liquidity position, which includes cash, the revolving credit facilities and accounts receivable securitization facilities, was \$1,048 million at September 30, 2018 as compared to \$1,180 million at September 30, 2017 and \$1,839 million at September 30, 2016. For further information, see Note J within the Notes to Consolidated Financial Statements.

Capital resources

Debt

The following summary reflects Ashland's debt as of September 30, 2018 and 2017.

(In millions)	September 30	
	2018	2017
Short-term debt (includes current portion of long-term debt)	\$ 254	\$ 235
Long-term debt (less current portion and debt issuance cost discounts) (a)	2,275	2,584
Total debt	\$ 2,529	\$ 2,819

(a) Includes \$21 million and \$25 million of debt issuance cost discounts as of September 30, 2018 and 2017, respectively.

The current portion of long-term debt was \$11 million at September 30, 2018. Debt as a percent of capital employed was 43% at September 30, 2018 and 45% at September 30, 2017. At September 30, 2018, Ashland's total debt had an outstanding principal balance of \$2,600 million, discounts of \$50 million and debt issuance costs of \$21 million. The scheduled aggregate maturities of long-term debt for the next five fiscal years (including the current portion and excluding debt issuance costs) are as follows: \$11 million in 2019, \$19 million in 2020, \$56 million in 2021, \$1,224 million in 2022 and \$6 million in 2023.

Credit Agreements and Refinancing

2017 Credit Agreement

On May 17, 2017, in conjunction with the closing of the Pharmachem acquisition, Ashland entered into a secured credit agreement (the 2017 Credit Agreement) with a group of lenders. The 2017 Credit Agreement provided for (i) a \$250 million three-year term loan A facility (the Three-Year TLA Facility), (ii) a \$250 million five-year term loan A facility (the Five-Year TLA Facility and together with the Three-Year TLA Facility, the TLA Facilities) and (iii) a \$680 million five-year revolving credit facility (including a \$125 million letter of credit sublimit) (the 2017 Revolving Credit Facility). Proceeds of borrowings under the TLA Facilities were used solely to finance the acquisition of Pharmachem, while the proceeds of the 2017 Revolving Credit Facility were used to finance, in part, the acquisition of Pharmachem, to refinance the 2015 Senior Credit Agreement and for general corporate purposes. On May 19, 2017, Ashland entered into Amendment No. 1 to the 2017 Credit Agreement, which increased the aggregate commitments under the 2017 Revolving Credit Facility from \$680 million to \$800 million.

At Ashland's option, loans issued under the 2017 Credit Agreement bear interest at either LIBOR or an alternate base rate, in each case plus the applicable interest rate margin. Loans bear interest at LIBOR plus 1.75% per annum, in the case of LIBOR borrowings, or at the alternate base rate plus 0.75%, in the alternative, through and including the date of delivery of a quarterly compliance certificate and thereafter the interest rate will fluctuate between LIBOR plus 1.375% per annum and LIBOR plus 2.500% per annum (or between the alternate base rate plus 0.375% per annum and the alternate base rate plus 1.500% per annum).

annum), based upon Ashland's secured facilities ratings or the consolidated net leverage ratio (as defined in the 2017 Credit Agreement) (whichever yields a lower applicable interest rate margin) at such time. In addition, Ashland was required to pay fees of 0.25% per annum on the daily unused amount of the 2017 Revolving Credit Facility through and including the date of delivery of a compliance certificate, and thereafter the fee fluctuates between 0.175% and 0.40% per annum, based upon Ashland's secured facilities rating or the consolidated net leverage ratio (whichever yields a lower applicable rate). The TLA Facilities may be prepaid at any time without premium. The Three-Year TLA Facility will not amortize and had a due date of May 17, 2020. The Five-Year TLA Facility will not amortize in each of the first, second and third years and will amortize at a rate of 20% per annum in each of the fourth and fifth years (payable in equal quarterly installments), with the outstanding balance of the Five-Year TLA Facility to be paid on May 17, 2022.

On June 14, 2017, Ashland entered into Amendment No. 2 to the 2017 Credit Agreement, which provided for a new \$600 million seven-year senior secured term loan B facility (the 2017 TLB Facility). At Ashland's option, loans issued under the 2017 TLB Facility bear interest at either (x) LIBOR plus 2.00% per annum or (y) an alternate base rate plus 1.00% per annum. The 2017 TLB Facility may be prepaid at any time. The 2017 TLB Facility amortizes at a rate of 1.00% per annum (payable in equal quarterly installments) with the outstanding balance to be paid on May 17, 2024.

Ashland incurred \$15 million of new debt issuance costs in connection with the 2017 Credit Agreement, of which \$2 million was expensed immediately during 2017 within the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss). The remaining balance is amortized using the effective interest method. Additionally, as a result of the termination of the 2015 Senior Credit Agreement, Ashland recognized a \$5 million charge for the accelerated amortization of previously capitalized debt issuance costs during 2017, which is included in the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss).

The credit facilities under the 2017 Credit Agreement are guaranteed by Ashland Global Holdings Inc., Ashland Chemco Inc. and Ashland LLC's existing and future subsidiaries (other than certain immaterial subsidiaries, joint ventures, special purpose financing subsidiaries, regulated subsidiaries, foreign subsidiaries and certain other subsidiaries) and are secured by a first-priority security interest in substantially all of the personal property assets of Ashland and the guarantors, including all or a portion of the equity interests of certain of Ashland's domestic subsidiaries and first-tier foreign subsidiaries and, in certain cases, a portion of the equity interests of other foreign subsidiaries. The guarantees by Ashland's subsidiaries and pledge of security interests by such guarantors may, at Ashland's option, be released upon and during the occurrence of a Collateral Release Event (as defined in the 2017 Credit Agreement).

2018 financing activity related to the 2017 Credit Agreement

On May 22, 2018, Ashland entered into Amendment No. 3 to the 2017 Credit Agreement which provided for the re-pricing of the 2017 TLB facility. Due to this amendment, loans issued under the 2017 TLB facility bear interest at LIBOR plus 1.75% per annum (previously LIBOR plus 2.00% per annum). All other significant terms of the agreement remained unchanged. Ashland incurred \$1 million of new debt issuance costs in connection with the re-pricing, which was expensed during 2018 within the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss).

During 2018, Ashland utilized cash primarily from repatriations and borrowings from the accounts receivable securitization facilities to fully repay the \$250 million outstanding balance of the Three-Year TLA Facility and to repay \$55 million of the Five-Year TLA Facility. As a result of these repayments, Ashland recognized accelerated amortization of previously capitalized debt issuance costs of less than \$1 million during 2018, which was included in the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss).

Senior notes refinancing, 2015 Senior Credit Agreement and 2016 Amendment

During July 2016, Ashland amended its previous credit agreement (the 2015 Senior Credit Agreement) to permit the Reorganization and series of events relating to the separation of Valvoline Inc. As a result of the July 2016 amendment and the Valvoline debt borrowings in connection with the separation, Ashland reduced its revolving borrowing capacity to \$800 million. The outstanding balance of a previous term loan facility (the 2015 Term Loan Facility) was repaid in full in connection with the combined Ashland and Valvoline financing activities during September 2016. In connection with these transactions, Ashland recognized a \$6 million charge for the accelerated amortization of previously capitalized debt issuance costs, which is included in the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss) in 2016.

Debt repayments and repurchases

Cash repatriation

During 2018, Ashland repatriated approximately \$590 million in cash that was primarily used to repay existing debt, principally the 2017 Revolving Credit Facility and the outstanding balance of the Three-Year TLA facility (as previously discussed).

Redemption of 3.875% notes due 2018

During 2017, Ashland redeemed all of its outstanding 3.875% senior notes due 2018 (2018 Senior Notes), of which approximately \$659 million were outstanding. Proceeds of borrowings under the 2017 TLB Facility, together with cash on hand, were used to pay for the redemption. Ashland recognized a \$13 million charge related to premiums paid and accelerated amortization of previously capitalized debt issuance costs during 2017, which is included in the net interest and other financing expense caption of the Statement of Consolidated Comprehensive Income (Loss).

Open market repurchases of 4.750% notes due 2022 and 3.875% notes due 2018

During 2017, Ashland executed open market repurchases of its 4.750% notes due 2022 (2022 Senior Notes) and its 3.875% notes due 2018 (2018 Senior Notes). As a result of these repurchases, the carrying values of the 2022 and 2018 Senior Notes were reduced by \$39 million and \$41 million, respectively. Ashland recognized a \$3 million charge related to premiums paid in the open market repurchases and accelerated amortization of previously capitalized debt issuance costs during 2017, which is included in the net interest and other financing expense caption of the Statement of Consolidated Comprehensive Income (Loss). As previously discussed, the remaining outstanding amount of the 2018 Senior Notes was redeemed during 2017.

6.50% junior subordinated notes due 2029

In December 2016, Hercules, an indirect wholly-owned subsidiary of Ashland, repurchased, through a cash tender offer, \$182 million of the aggregate principal par value amount of its 6.50% junior subordinated notes due 2029 (2029 Notes) for an aggregate purchase price of \$177 million. As a result, the carrying value of the 2029 Notes was reduced by \$90 million and Ashland recognized a \$92 million charge related to accelerated accretion of the recorded debt discount (compared to the total par value) and \$5 million of a net gain related to the repayment of the debt during 2017. The charge and net gain are included in the net interest and other financing expense caption of the Statement of Consolidated Comprehensive Income (Loss).

Accounts receivable securitizations

2018 accounts receivable securitization

During July 2018, Ashland entered into a €115 million accounts receivable securitization facility (the Program) for the transfer by certain subsidiaries of Ashland (the Sellers) directly or indirectly to Ester Finance Titrisation (the Purchaser), a wholly-owned subsidiary of Crédit Agricole Corporate and Investment Bank (the Arranger), of certain receivables and/or collections originated by the Sellers towards certain corporate debtors located in multiple European jurisdictions and denominated in multiple currencies. The Program has a term of two years.

Under the Program, each Seller will assign, on an ongoing basis, certain of its accounts receivable and the right to the collections on those accounts receivable to the Purchaser. Under the terms of the Program, the Sellers could, from time to time, obtain up to €115 million from the Purchaser through the sale of an undivided interest in such accounts receivable and collections. Ashland accounts for the securitization facility as secured borrowings, and the receivables sold pursuant to the facility are included in the Consolidated Balance Sheets as accounts receivable. Fundings under the Program will be repaid as accounts receivable are collected, with new fundings being advanced (through daily advanced purchase price) as new accounts receivable are originated by the Sellers and assigned to the Purchaser, with settlement occurring monthly. Ashland classifies any borrowings under this facility as a short-term debt instrument within the Consolidated Balance Sheets. Once sold to the Purchaser, the accounts receivable and rights to collection described above are separate and distinct from each Sellers' own assets and are not available to its creditors should such Sellers become insolvent.

At September 30, 2018, the outstanding amount of accounts receivable transferred by Ashland to the Purchaser was \$153 million and there were \$109 million of borrowings (denominated in multiple currencies) under the facility. The weighted-average interest rate for this instrument was 1.8% for 2018.

2012 accounts receivable securitization

On August 31, 2012, Ashland entered into a \$350 million accounts receivable securitization facility pursuant to (i) a Sale Agreement, among Ashland and certain of its direct and indirect subsidiaries (each an Originator and collectively, the Originators) and CVG Capital III LLC, a wholly-owned “bankruptcy remote” special purpose subsidiary of the Originators (CVG) and (ii) a Transfer and Administration Agreement, among CVG, each Originator, Ashland, as Master Servicer, certain Conduit Investors, Uncommitted Investors, Letter of Credit Issuers, Managing Agents, Administrators and Committed Investors, and The Bank of Nova Scotia, as agent for various secured parties (the Agent). The Transfer and Administration Agreement had a term of three years, but was extendable at the discretion of Ashland and the Investors.

Under the Sale Agreement, each Originator will transfer, on an ongoing basis, certain of its accounts receivable, certain related assets and the right to the collections on those accounts receivable to CVG. Ashland accounts for the securitization facility as secured borrowings, and the receivables sold pursuant to the facility are included in the Consolidated Balance Sheets as accounts receivable. Fundings under the Transfer and Administration Agreement will be repaid as accounts receivable are collected, with new fundings being advanced (through daily reinvestments) as new accounts receivable are originated by the Originators and transferred to CVG, with settlement generally occurring monthly. Ashland continues to classify any borrowings under this facility as a short-term debt instrument within the Consolidated Balance Sheets. Once sold to CVG, the accounts receivable, related assets and rights to collection described above are separate and distinct from each Originator’s own assets and are not available to its creditors should such Originator become insolvent. Substantially all of CVG’s assets have been pledged to the Agent in support of its obligations under the Transfer and Administration Agreement.

During 2016, the termination date of the commitments under the Transfer and Administration Agreement was extended from December 31, 2015, the previous termination extension date, to March 22, 2017. During March 2017, this facility was extended for an additional year with similar terms as the previous facility agreement. During March 2018, the termination date of the accounts receivable securitization facility was extended from March 2018 to March 2020. The available funding for qualified receivables under the accounts receivable securitization facility increased from \$100 million to \$115 million. No other changes to the agreement are expected to have a significant impact to Ashland's results of operations and financial position.

At September 30, 2018 and 2017, the outstanding amount of accounts receivable transferred by Ashland to CVG was \$166 million and \$155 million, respectively. There were \$86 million of borrowings under the facility as of September 30, 2018, while Ashland had \$56 million of borrowings under the facility as of September 30, 2017. The weighted-average interest rate for this instrument was 2.7% for 2018 and 2.8% for 2017.

Other debt

At September 30, 2018 and 2017, Ashland held other debt totaling \$83 million and \$58 million, respectively, comprised primarily of a short-term loan facility, the 6.50% notes due 2029 and a medium-term note.

Ashland debt covenant restrictions

Ashland’s debt contains usual and customary representations, warranties and affirmative and negative covenants, including financial covenants for leverage and interest coverage ratios, limitations on liens, additional subsidiary indebtedness, restrictions on subsidiary distributions, investments, mergers, sale of assets and restricted payments and other customary limitations. As of September 30, 2018, Ashland was in compliance with all debt agreement covenant restrictions.

The maximum consolidated net leverage ratio permitted under Ashland’s most recent credit agreement (the 2017 Credit Agreement) is 4.5. The 2017 Credit Agreement defines the consolidated net leverage ratio as the ratio of consolidated indebtedness minus unrestricted cash and cash equivalents to consolidated EBITDA (Covenant Adjusted EBITDA) for any measurement period. In general, the 2017 Credit Agreement defines Covenant Adjusted EBITDA as net income plus consolidated interest charges, taxes, depreciation and amortization expense, fees and expenses related to capital market transactions and proposed or actual acquisitions and divestitures, restructuring and integration charges, non-cash stock and equity compensation expense, and any other nonrecurring expenses or losses that do not represent a cash item in such period or any future period; less any non-cash gains or other items increasing net income. The computation of Covenant Adjusted

EBITDA differs from the calculation of EBITDA and Adjusted EBITDA, which have been reconciled on page M-7. In general, consolidated indebtedness includes debt plus all purchase money indebtedness, banker's acceptances and bank guaranties, deferred purchase price of property or services, attributable indebtedness and guaranties. At September 30, 2018, Ashland's calculation of the consolidated net leverage ratio was 3.4.

The minimum required consolidated interest coverage ratio under the 2017 Credit Agreement during is 3.0. The 2017 Credit Agreement defines the consolidated interest coverage ratio as the ratio of Covenant Adjusted EBITDA to consolidated interest charges for any measurement period. At September 30, 2018, Ashland's calculation of the consolidated interest coverage ratio was 5.4.

Any change in Covenant Adjusted EBITDA of \$100 million would have an approximate 0.5x effect on the consolidated net leverage ratio and a 0.8x effect on the consolidated interest coverage ratio. Any change in consolidated indebtedness of \$100 million would affect the consolidated net leverage ratio by approximately 0.2x.

Ashland credit ratings

Ashland's corporate credit rating with Standard & Poor's is BB, while Moody's Investor Services is Ba2. Moody's Investor Services and Standard & Poor's outlooks both remained at stable. Subsequent changes to these ratings may have an effect on Ashland's borrowing rate or ability to access capital markets in the future.

Additional capital resources

Ashland cash projection

Ashland projects that cash flow from operations and other available financial resources such as cash on hand and revolving credit should be sufficient to meet investing and financing requirements to enable Ashland to comply with the covenants and other terms of its financing obligations. These projections are based on various assumptions that include, but are not limited to: operational results, capital expenditures, working capital needs and tax payment and receipts.

Total Equity

Total equity was \$3,406 million at September 30, 2018, which was unchanged from the total equity at September 30, 2017. During 2018, there were increases of \$114 million from net income, \$15 million for common shares issued under stock incentive and other plans and \$13 million from the net change in available-for-sale securities. These increases were offset by decreases of \$82 million for deferred translation losses and \$60 million for cash dividends paid during 2018.

Stock repurchase programs

In April 2015, Ashland's Board of Directors approved a \$1 billion share repurchase authorization (the 2015 stock repurchase program) that was set to expire on December 31, 2017. In September 2017, Ashland's Board of Directors extended the 2015 stock repurchase program indefinitely, at which point \$500 million of share repurchase authorization remained under the 2015 stock repurchase program.

During March 2018, Ashland's Board of Directors approved a new \$1 billion stock repurchase program, which replaced the 2015 stock repurchase program. Under the new program, Ashland's common shares may be repurchased in open market transactions, privately negotiated transactions or pursuant to one or more accelerated stock repurchase programs or Rule 10b5-1 plans. As of September 30, 2018, \$1 billion remained available for repurchase under this authorization.

Stock repurchase program agreements

In November 2015, under the 2015 stock repurchase program, Ashland announced that it entered into an accelerated share repurchase agreement (2016 ASR Agreement) with Goldman Sachs & Co. Under the 2016 ASR Agreement, Ashland paid an initial purchase price of \$500 million and received an initial delivery of approximately 3.9 million shares of common stock during November 2015. In February 2016, Goldman Sachs & Co. exercised their early termination option under the 2016 ASR Agreement and the pricing period was closed. The settlement price, which represents the weighted average price of Ashland's common stock over the pricing period less a discount, was \$99.01 per share. Based on this settlement price, the final number of shares repurchased by Ashland that were delivered by Goldman Sachs & Co. under the 2016 ASR Agreement was 5.1 million shares. Ashland received the additional 1.2 million shares during 2016 to settle the difference between the initial share delivery and the total number of shares repurchased.

Stockholder dividends

Ashland paid dividends per common share of \$0.95, \$1.23 and \$1.56 during 2018, 2017 and 2016, respectively.

In May 2018, the Board of Directors of Ashland announced a quarterly cash dividend of 25 cents per share to eligible stockholders at record, which represented an increase from the previous quarterly cash dividend of 22.5 cents per share. This dividend was paid in the third quarter and fourth quarters of fiscal 2018.

During May 2017, subsequent to the final distribution of Valvoline Inc.'s common stock, the Board of Directors announced a quarterly cash dividend of 22.5 cents per share to eligible shareholders at record, which was paid for quarterly dividends in the first and second quarter quarters of fiscal 2018 and the third and fourth quarters of fiscal 2017. This represented a reduction from the previous quarterly dividend of 39 cents per share paid during the first and second quarters of fiscal 2017 and each quarter of fiscal 2016.

Capital expenditures

Capital expenditures were \$185 million for 2018 and averaged \$205 million during the last three years. A summary of capital expenditures by reportable segment during 2018, 2017 and 2016 follow.

(In millions)	2018	2017	2016
Specialty Ingredients	\$ 138	\$ 148	\$ 179
Composites	24	26	23
Intermediates and Solvents	9	10	13
Unallocated and other	14	15	16
Total capital expenditures	<u>\$ 185</u>	<u>\$ 199</u>	<u>\$ 231</u>

A summary of the capital employed in Ashland's current operations, which is calculated by adding equity to capital investment, as of the end of the last three years is as follows.

(In millions)	2018	2017	2016
Capital employed (a)			
Specialty Ingredients	\$ 5,599	\$ 5,726	\$ 4,959
Composites	440	461	418
Intermediates and Solvents	242	250	267

(a) Excludes the assets and liabilities classified within unallocated and other which primarily includes debt and other long-term liabilities such as asbestos and pension. The net liability in unallocated and other was \$2,875 million, \$3,031 million and \$2,479 million as of September 30, 2018, 2017 and 2016, respectively.

Contractual obligations and other commitments

The following table aggregates Ashland's obligations and commitments to make future payments under existing contracts at September 30, 2018. Contractual obligations for which the ultimate settlement of quantities or prices are not fixed and determinable have been excluded.

(In millions)	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
Contractual obligations					
Raw material and service contract purchase obligations (a)	\$ 233	\$ 70	\$ 107	\$ 43	\$ 13
Employee benefit obligations (b)	85	13	16	16	40
Operating lease obligations (c)	187	31	43	25	88
Debt	2,600	254	75	1,230	1,041
Interest payments (d)	1,100	125	238	168	569
Unrecognized tax benefits (e)	164	—	—	—	164
One-time transition tax (f)	33	2	3	3	25
Total contractual obligations	<u>\$ 4,402</u>	<u>\$ 495</u>	<u>\$ 482</u>	<u>\$ 1,485</u>	<u>\$ 1,940</u>

Other commitments

Letters of credit (g)	\$ 50	\$ 50	\$ —	\$ —	\$ —
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(a) Includes raw material and service contracts where minimal committed quantities and prices are fixed.

(b) Includes estimated funding of Ashland's qualified U.S. and non-U.S. pension plans for 2019 as well as projected benefit payments through 2028 under Ashland's unfunded pension and other postretirement benefit plans. Excludes the benefit payments from the pension plan trust funds. See Note N of the Notes to Consolidated Financial Statements for additional information.

(c) Includes leases for office buildings, transportation equipment, warehouses and storage facilities and other equipment. For further information, see Note L of the Notes to Consolidated Financial Statements.

(d) Includes interest expense on both variable and fixed rate debt assuming no prepayments. Variable interest rates have been assumed to remain constant through the end of the term at rates that existed as of September 30, 2018.

(e) Due to uncertainties in the timing of the effective settlement of tax positions with respect to taxing authorities, Ashland is unable to determine the timing of payments related to noncurrent unrecognized tax benefits, including interest and penalties. Therefore, these amounts were included in the "More than 5 years" column.

(f) As a result of the Tax Act enacted during fiscal year 2018, Ashland has currently estimated and recorded \$128 million of expense for the one-time transition tax. This amount was reduced by attribute carryforwards and other items for a net liability of \$33 million payable over eight years, with the first payment estimated at \$2 million to be due during the first quarter of fiscal year 2019.

(g) Ashland issues various types of letters of credit as part of its normal course of business. For further information, see Note J of the Notes to Consolidated Financial Statements.

OFF-BALANCE SHEET ARRANGEMENTS

As part of its normal course of business, Ashland is a party to various financial guarantees and other commitments. These arrangements involve elements of performance and credit risk that are not included in the Consolidated Balance Sheets. The possibility that Ashland would have to make actual cash expenditures in connection with these obligations is largely dependent on the performance of the guaranteed party, or the occurrence of future events that Ashland is unable to predict. Ashland has reserved the approximate fair value of these guarantees in accordance with U.S. GAAP.

NEW ACCOUNTING PRONOUNCEMENTS

For a discussion and analysis of recently issued accounting pronouncements and its impact on Ashland, see Note A of Notes to Consolidated Financial Statements.

CRITICAL ACCOUNTING POLICIES

The preparation of Ashland's Consolidated Financial Statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, sales and expenses, and the disclosures of contingent assets and liabilities. Significant items that are subject to such estimates and assumptions include, but are not limited to, long-lived assets (including goodwill and other intangible assets), income taxes, liabilities and receivables associated with asbestos litigation and environmental remediation. Although management bases its estimates on historical experience and various other assumptions that are believed to be reasonable under the circumstances, actual results could differ significantly from the estimates under different assumptions or conditions. Management has reviewed the estimates affecting these items with the Audit Committee of Ashland's Board of Directors.

Long-lived assets

Tangible assets

The cost of property, plant and equipment is depreciated by the straight-line method over the estimated useful lives of the assets. Buildings are depreciated principally over 12 to 35 years and machinery and equipment principally over 2 to 25 years. Ashland reviews property, plant and equipment asset groups for impairment whenever events or changes in circumstances indicate the carrying amount of an asset may not be recoverable. Ashland monitors these changes and events on at least a quarterly basis. Examples of events or changes in circumstances could include, but are not limited to, a prolonged economic downturn, current period operating or cash flow losses combined with a history of losses or a forecast of continuing losses associated with the use of an asset group, or a current expectation that an asset group will be sold or disposed of before the end of its previously estimated useful life. Recoverability is based upon projections of anticipated future undiscounted cash flows associated with the use and eventual disposal of the property, plant and equipment asset groups, as well as specific appraisals in certain instances. Reviews occur at the lowest level for which identifiable cash flows are largely independent of cash flows associated with other property, plant and equipment asset groups. If the future undiscounted cash flows result in a value that is less than the carrying value, then the long-lived asset is considered impaired and a loss is recognized based on the amount by which the carrying amount exceeds the estimated fair value. Various factors that Ashland uses in determining the impact of these assessments include the expected useful lives of long-lived assets and the ability to realize any undiscounted cash flows in excess of the carrying amounts of such asset groups, and are affected primarily by changes in the expected use of the assets, changes in technology or development of alternative assets, changes in economic conditions, changes in operating performance and changes in expected future cash flows. Because judgment is involved in determining the fair value of property, plant and equipment asset groups, there is risk that the carrying value of these assets may require adjustment in future periods.

Total depreciation expense on property, plant and equipment for 2018, 2017 and 2016 was \$217 million, \$219 million and \$226 million, respectively. Depreciation expense for 2018, 2017 and 2016 included \$14 million, \$19 million and \$6 million, respectively, in accelerated depreciation. Capitalized interest for 2018, 2017 and 2016 was zero, \$1 million and \$1 million, respectively.

Finite-lived intangible assets

Finite-lived intangible assets principally consist of certain trademarks and trade names, intellectual property, and customer relationships. These intangible assets are amortized on a straight-line basis over their estimated useful lives. The cost of trademarks and trade names is amortized principally over 3 to 25 years, intellectual property over 5 to 25 years and customer and supplier relationships over 3 to 24 years. Ashland reviews finite-lived intangible assets for impairment whenever events or changes in circumstances indicate the carrying amount of an asset may not be recoverable. Ashland monitors these changes and events on at least a quarterly basis.

Amortization expense recognized on finite-lived intangible assets was \$95 million for 2018, \$82 million for 2017 and \$76 million for 2016, and is primarily included in the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss).

Goodwill

Ashland reviews goodwill and indefinite-lived intangible assets for impairment annually or when events and circumstances indicate an impairment may have occurred. The annual assessment is performed as of July 1 and consists of Ashland determining each reporting unit's current fair value compared to its current carrying value. Ashland determined that its reporting units for the allocation of goodwill are its three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents.

Goodwill associated with the reporting units as of September 30, 2018 was \$2,304 million for Specialty Ingredients, \$145 million for Composites, and zero for Intermediates and Solvents as a result of an impairment charge during 2016.

In prior years, Ashland performed a quantitative goodwill impairment test and determined the fair value of its reporting units using a combination of discounted cash flow models and valuations based on earnings multiples for guideline public companies in each reporting unit's industry peer group, when externally quoted market prices are not readily available. Discounted cash flow models are highly reliant on various assumptions. Significant assumptions Ashland utilized in these models in prior years included: projected business results and future industry direction, long-term growth factors and weighted-average cost of capital. The base models of future financial performance projections utilized in the goodwill impairment assessment reflect conservative assumptions on future operating performance as approved by Management and the Board of Directors. Ashland uses assumptions that it deems to be reasonable estimates of likely future events and compares the total fair values of each reporting unit to Ashland's market capitalization, and implied control premium, to determine if the fair values are reasonable compared to external market indicators. Subsequent changes in these key assumptions could affect the results of future goodwill impairment reviews. If this comparison indicates that a reporting unit's estimated fair value is less than its carrying value, it is adjusted to its calculated fair value and the adjustment represents the impairment charge.

In the current year for its July 1, 2018 goodwill impairment test, Ashland performed an extensive qualitative analysis in order to determine whether it was necessary to perform a quantitative goodwill impairment test. In performing this analysis, Ashland considered relevant events and circumstances such as macroeconomic conditions, industry and market considerations, overall financial performance and changes in management and business strategy, changes in carrying value, among others. Ashland considered how these relevant events and circumstances have changed since its most recent quantitative goodwill impairment test performed in the prior year as of July 1, 2017. After weighting the significance of these factors, Ashland determined that it was more likely than not that the fair value of its reporting units exceeds the carrying value and that a quantitative impairment test was not necessary to perform.

In conjunction with the July 1, 2017 annual assessment of goodwill, Ashland's valuation techniques did not indicate any impairment for Specialty Ingredients or Composites. Based on sensitivity analyses performed, a negative 1% change in the long-term growth factor and the weighted-average cost of capital assumption, which are key assumptions, would not have resulted in the carrying value of these reporting units to exceed their respective calculated fair value. Because the fair value results for these reporting units did not indicate a potential impairment existed, Ashland did not record any goodwill impairment for these reporting units during 2017 and 2016. Subsequent to this annual impairment test, no indicators of impairment were identified for any of these reporting units.

In conjunction with the July 1, 2016 annual assessment of impairment of goodwill, Ashland's valuation techniques determined that the carrying value of the Intermediates and Solvents reporting unit exceeded its fair value at July 1, 2016, which resulted in the reporting unit failing the first step of the goodwill impairment test. Ashland then performed the second step of the goodwill impairment test, which involved, among other things, obtaining third-party appraisals of substantially all of Intermediates and Solvents' tangible and intangible assets. Based on the results of its goodwill impairment testing as of July 1, 2016, Ashland recorded a pre-tax goodwill impairment charge of \$171 million in the fourth quarter of 2016, which is in addition to a \$10 million impairment related to Intermediates and Solvents' property, plant and equipment, and resulted in a total \$181 million impairment charge for Intermediates and Solvents during 2016.

Key factors that affected Ashland's conclusion that an impairment of the Intermediates and Solvents reporting unit had occurred during the fourth quarter of 2016 included the continued deterioration in the butanediol commodity market during 2016. Market conditions for butanediol, a commodity chemical used in the production of polymers, solvents and fine chemicals, can vary significantly from year to year or even quarter to quarter. Throughout 2016, increasing levels of

overcapacity for butanediol in the market, particularly in China, and the resulting weak pricing had a cumulating negative impact on the financial performance of the Intermediates and Solvents division. Butanediol commodity contract prices had fallen consistently during 2016. These factors contributed significantly to lower expected EBITDA results within the longer-term forecast period. Ashland prepares its annual forecast mid-August through October each year. As the 2016 forecast was developed, Ashland considered many factors when assessing the outlook for 2017 and beyond. Because of these factors, Ashland revised its forecasts down significantly, which ultimately led to the goodwill and other long-lived asset impairment charge for the Intermediates and Solvents reporting unit during the fourth quarter of 2016.

Other indefinite-lived intangible assets

Other indefinite-lived intangible assets include certain trademarks and trade names. These assets had a carrying value of \$301 million as of September 30, 2018. Ashland reviews these intangible assets for possible impairment annually or whenever events or changes in circumstances indicate that carrying amounts may not be recoverable. If the carrying value of an individual indefinite-lived intangible asset exceeds its fair value, such individual indefinite-lived intangible asset is written down by an amount equal to such excess. Similar to its annual assessment for goodwill, Ashland first performs a qualitative analysis in order to determine whether it is necessary to perform a quantitative goodwill impairment test for the trademarks and trade names. If a quantitative analysis is deemed necessary, trademarks and trade names are valued using a “relief-from-royalty” valuation method compared to the carrying value. Significant assumptions inherent in the valuation methodologies include, but are not limited to, such estimates as future projected business results, growth rates, the weighted-average cost of capital for a market participant, and royalty and discount rates. In conjunction with the July 1 annual assessment of indefinite-lived intangible assets, Ashland’s models did not indicate any impairment, as each indefinite-lived intangible asset’s fair value exceeded their carrying values.

Ashland’s assessment of an impairment charge on any of these assets classified currently as having indefinite lives, including goodwill, could change in future periods if any or all of the following events were to occur with respect to a particular reporting unit: a significant change in projected business results, a divestiture decision, increase in Ashland’s weighted-average cost of capital rates, decrease in growth rates or other assumptions, economic deterioration that is more severe or of a longer duration than anticipated, or another significant economic event. For further information, see Note I of Notes to Consolidated Financial Statements.

Income taxes

Ashland is subject to income taxes in the United States and numerous foreign jurisdictions. Significant judgment in the forecasting of taxable income using historical and projected future operating results is required in determining Ashland’s provision for income taxes and the related assets and liabilities. The provision for income taxes includes income taxes paid, currently payable or receivable, and deferred taxes. Under U.S. GAAP, deferred tax assets and liabilities are determined based on differences between financial reporting and tax basis of assets and liabilities, and are measured using enacted tax rates and laws that are expected to be in effect when the differences reverse. Deferred tax assets are also recognized for the estimated future effects of tax loss and credit carryforwards. The effect on deferred taxes of changes in tax rates is recognized in the period in which the enactment date occurs. Valuation allowances are established when necessary on a jurisdictional basis to reduce deferred tax assets to the amounts expected to be realized. Deferred taxes are not provided on the unremitted earnings of subsidiaries outside of the United States when it is expected that these earnings are indefinitely reinvested. In the event that the actual outcome of future tax consequences differs from Ashland’s estimates and assumptions due to changes or future events such as tax legislation, geographic mix of earnings, completion of tax audits or earnings repatriation plans, the resulting change to the provision for income taxes could have a material effect on the Statement of Consolidated Comprehensive Income (Loss) and Consolidated Balance Sheet.

The recoverability of deferred tax assets and the recognition and measurement of uncertain tax positions are subject to various assumptions and judgment by Ashland. If actual results differ from the estimates made by Ashland in establishing or maintaining valuation allowances against deferred tax assets, the resulting change in the valuation allowance would generally impact earnings or other comprehensive income depending on the nature of the respective deferred tax asset. Additionally, the positions taken with regard to tax contingencies may be subject to audit and review by tax authorities, which may result in future taxes, interest and penalties. Positive and negative evidence is considered in determining the need for a valuation allowance against deferred tax assets, which includes such evidence as historical earnings, projected future earnings, tax planning strategies and expected timing of reversal of existing temporary differences.

In determining the recoverability of deferred tax assets Ashland gives consideration to all available positive and negative evidence including reversals of deferred tax liabilities (other than those with an indefinite reversal period), projected future taxable income, tax planning strategies and recent financial operations. Ashland attaches the most weight to historical earnings due to their verifiable nature. In evaluating the objective evidence that historical results provide, Ashland considers three years of cumulative income or loss. In addition, Ashland has reflected increases and decreases in our valuation allowance based on the overall weight of positive versus negative evidence on a jurisdiction by jurisdiction basis.

Asbestos litigation

Ashland and Hercules have liabilities from claims alleging personal injury caused by exposure to asbestos. To assist in developing and annually updating independent reserve estimates for future asbestos claims and related costs given various assumptions, Ashland retained third party actuarial experts. Prior to 2018, Ashland retained Hamilton, Rabinovitz & Associates, Inc. (HR&A). During 2018, Ashland transitioned these responsibilities to Nathan Associates, Inc. (Nathan). The processes and methodologies used by Nathan are consistent with the ones historically employed by HR&A. The methodology used by Nathan to project future asbestos costs is based largely on recent experience, including claim-filing and settlement rates, disease mix, enacted legislation, open claims and litigation defense. The claim experience of Ashland and Hercules are separately compared to the results of previously conducted third party epidemiological studies estimating the number of people likely to develop asbestos-related diseases. Those studies were undertaken in connection with national analyses of the population expected to have been exposed to asbestos. Using that information, Nathan estimates a range of the number of future claims that may be filed, as well as the related costs that may be incurred in resolving those claims. Changes in asbestos-related liabilities and receivables are recorded on an after-tax basis within the discontinued operations caption in the Statements of Consolidated Comprehensive Income (Loss). See Note O of the Notes to Consolidated Financial Statements for additional information.

Ashland asbestos-related litigation

The claims alleging personal injury caused by exposure to asbestos asserted against Ashland result primarily from indemnification obligations undertaken in 1990 in connection with the sale of Riley, a former subsidiary. The amount and timing of settlements and number of open claims can fluctuate from period to period.

Ashland asbestos-related liability

From the range of estimates, Ashland records the amount it believes to be the best estimate of future payments for litigation defense and claim settlement costs, which generally approximates the mid-point of the estimated range of exposure from model results. Ashland reviews this estimate and related assumptions quarterly and annually updates the results of a non-inflated, non-discounted approximate 50-year model developed with the assistance of Nathan.

During the most recent update completed during 2018, it was determined that the estimated liability for Ashland asbestos-related claims should be decreased by \$8 million. Total reserves for asbestos claims were \$380 million at September 30, 2018 compared to \$419 million at September 30, 2017.

Ashland asbestos-related receivables

Ashland has insurance coverage for certain litigation defense and claim settlement costs incurred in connection with its asbestos claims, and coverage-in-place agreements exist with the insurance companies that provide substantially all of the coverage that will be accessed.

For the Ashland asbestos-related obligations, Ashland has estimated the value of probable insurance recoveries associated with its asbestos reserve based on management's interpretations and estimates surrounding the available or applicable insurance coverage, including an assumption that all solvent insurance carriers remain solvent. Substantially all of the estimated receivables from insurance companies are expected to be due from domestic insurers, all of which are solvent.

At September 30, 2018, Ashland's receivable for recoveries of litigation defense and claim settlement costs from insurers amounted to \$140 million (excluding the Hercules receivable for asbestos claims). Receivables from insurers amounted to \$155 million at September 30, 2017. During 2018, the annual update of the model used for purposes of valuing the asbestos reserve and its impact on valuation of future recoveries from insurers, was completed. This model update resulted in a \$5 million decrease in the receivable for probable insurance recoveries.

Hercules asbestos-related litigation

Hercules has liabilities from claims alleging personal injury caused by exposure to asbestos. Such claims typically arise from alleged exposure to asbestos fibers from resin encapsulated pipe and tank products which were sold by one of Hercules' former subsidiaries to a limited industrial market. The amount and timing of settlements and number of open claims can fluctuate from period to period.

Hercules asbestos-related liability

From the range of estimates, Ashland records the amount it believes to be the best estimate of future payments for litigation defense and claim settlement costs, which generally approximates the mid-point of the estimated range of exposure from model results. Ashland reviews this estimate and related assumptions quarterly and annually updates the results of a non-inflated, non-discounted approximate 50-year model developed with the assistance of Nathan. As a result of the most recent annual update of this estimate, completed during 2018, it was determined that the liability for Hercules asbestos-related claims should be decreased by \$19 million. Total reserves for asbestos claims were \$282 million at September 30, 2018 compared to \$323 million at September 30, 2017.

Hercules asbestos-related receivables

For the Hercules asbestos-related obligations, certain reimbursement obligations pursuant to coverage-in-place agreements with insurance carriers exist. As a result, any increases in the asbestos reserve have been partially offset by probable insurance recoveries. Ashland has estimated the value of probable insurance recoveries associated with its asbestos reserve based on management's interpretations and estimates surrounding the available or applicable insurance coverage, including an assumption that all solvent insurance carriers remain solvent. The estimated receivable consists exclusively of solvent domestic insurers.

As of September 30, 2018 and 2017, the receivables from insurers amounted to \$54 million and \$68 million, respectively. During 2018, the annual update of the model used for purposes of valuing the asbestos reserve and its impact on valuation of future recoveries from insurers was completed. This model update resulted in a \$14 million decrease in the receivable for probable insurance recoveries.

Asbestos litigation cost projection

Projecting future asbestos costs is subject to numerous variables that are extremely difficult to predict. In addition to the significant uncertainties surrounding the number of claims that might be received, other variables include the type and severity of the disease alleged by each claimant, the long latency period associated with asbestos exposure, mortality rates, dismissal rates, costs of medical treatment, the impact of bankruptcies of other companies that are co-defendants in claims, uncertainties surrounding the litigation process from jurisdiction to jurisdiction and from case to case, and the impact of potential changes in legislative or judicial standards. Furthermore, any predictions with respect to these variables are subject to even greater uncertainty as the projection period lengthens. In light of these inherent uncertainties, Ashland believes that the asbestos reserves for Ashland and Hercules represent the best estimate within a range of possible outcomes. As a part of the process to develop these estimates of future asbestos costs, a range of long-term cost models was developed. These models are based on national studies that predict the number of people likely to develop asbestos-related diseases and are heavily influenced by assumptions regarding long-term inflation rates for indemnity payments and legal defense costs, as well as other variables mentioned previously. Ashland has currently estimated in various models ranging from approximately 40 to 50 year periods that it is reasonably possible that total future litigation defense and claim settlement costs on an inflated and undiscounted basis could range as high as approximately \$600 million for the Ashland asbestos-related litigation (current reserve of \$380 million) and approximately \$450 million for the Hercules asbestos-related litigation (current reserve of \$282 million), depending on the combination of assumptions selected in the various models. If actual experience is worse than projected, relative to the number of claims filed, the severity of alleged disease associated with those claims or costs incurred to resolve those claims, or actuarial refinement or improvements to the assumptions used within these models are initiated, Ashland may need to further increase the estimates of the costs associated with asbestos claims and these increases could be material over time.

Environmental remediation and asset retirement obligations

Ashland is subject to various federal, state and local environmental laws and regulations that require environmental assessment or remediation efforts (collectively environmental remediation) at multiple locations. At September 30, 2018, such locations included 81 waste treatment or disposal sites where Ashland has been identified as a potentially responsible party under Superfund or similar state laws, 116 current and former operating facilities and about 1,225 service station properties, of which 35 are being actively remediated.

Ashland's reserves for environmental remediation and related environmental litigation amounted to \$187 million at September 30, 2018 compared to \$163 million at September 30, 2017, of which \$147 million at September 30, 2018 and \$121 million at September 30, 2017 were classified in other noncurrent liabilities on the Consolidated Balance Sheets. The remaining reserves were classified in accrued expenses and other liabilities on the Consolidated Balance Sheets.

The total reserves for environmental remediation reflect Ashland's estimates of the most likely costs that will be incurred over an extended period to remediate identified conditions for which the costs are reasonably estimable, without regard to any third-party recoveries. Engineering studies, probability techniques, historical experience and other factors are used to identify and evaluate remediation alternatives and their related costs in determining the estimated reserves for environmental remediation. Ashland continues to discount certain environmental sites and regularly adjusts its reserves as environmental remediation continues. Ashland has estimated the value of its probable insurance recoveries associated with its environmental reserve based on management's interpretations and estimates surrounding the available or applicable insurance coverage. At September 30, 2018 and 2017, Ashland's recorded receivable for these probable insurance recoveries was \$12 million and \$15 million, respectively, of which \$11 million and \$14 million, respectively, were classified in other noncurrent assets in the Consolidated Balance Sheets.

During 2018, Ashland recognized a \$60 million charge for certain environmental liabilities. Of that amount, \$18 million related to one site where, after significant research and analysis as part of Ashland's normal process and protocol for these matters, the estimated cost for the ongoing remediation was finalized. As such, Ashland recorded the expense for this remediation project during 2018 since a reasonable estimate that is in accordance with U.S. GAAP provisions could be determined. The remaining charges in 2018 related to normal ongoing remediation cost estimate updates for sites, which is consistent with Ashland's historical environmental accounting policy.

Environmental remediation reserves are subject to numerous inherent uncertainties that affect Ashland's ability to estimate its share of the costs. Such uncertainties involve the nature and extent of contamination at each site, the extent of required cleanup efforts under existing environmental regulations, widely varying costs of alternate cleanup methods, changes in environmental regulations, the potential effect of continuing improvements in remediation technology, and the number and financial strength of other potentially responsible parties at multiparty sites. Although it is not possible to predict with certainty the ultimate costs of environmental remediation, Ashland currently estimates that the upper end of the reasonably possible range of future costs for identified sites could be as high as approximately \$430 million. The largest reserve for any site is 14% of the remediation reserve.

EFFECTS OF INFLATION AND CHANGING PRICES

Ashland's financial statements are prepared on the historical cost method of accounting in accordance with U.S. GAAP and, as a result, do not reflect changes in the purchasing power of the U.S. dollar. Monetary assets (such as cash, cash equivalents and accounts receivable) lose purchasing power as a result of inflation, while monetary liabilities (such as accounts payable and indebtedness) result in a gain, because they can be settled with dollars of diminished purchasing power. As of September 30, 2018, Ashland's monetary assets exceed its monetary liabilities, leaving it currently more exposed to the effects of future inflation. However, given the recent consistent stability of inflation in the United States in the past decade as well as forward economic outlooks, current inflationary pressures seem moderate.

Certain of the industries in which Ashland operates are capital-intensive, and replacement costs for its plant and equipment generally would substantially exceed their historical costs. Accordingly, depreciation and amortization expense would be greater if it were based on current replacement costs. However, because replacement facilities would reflect technological improvements and changes in business strategies, such facilities would be expected to be more productive than existing facilities, mitigating at least part of the increased expense.

Ashland uses the LIFO method to value a relatively small portion of its inventories to provide a better matching of revenues with current costs. However, LIFO values such inventories below their replacement costs during inflationary periods.

FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements including, without limitation, statements made under the caption "Management's Discussion and Analysis of Financial Condition and Results of Operation" (MD&A), within the meaning of Section 27A of the Securities Act of 1933, as amended and Section 21E of the Securities Exchange Act of 1934, as amended. Ashland has identified some of these forward-looking statements with words such as "anticipates," "believes," "expects," "estimates," "is likely," "predicts," "projects," "forecasts," "objectives," "may," "will," "should," "plans" and "intends" and the negative of these words or other comparable terminology. Ashland may from time to time make forward-looking statements in its Annual Report to Shareholders, quarterly reports and other filings with the Securities and Exchange Commission (SEC), news releases and other written and oral communications. These forward-looking statements are based on Ashland's expectations and assumptions, as of the date such statements are made, regarding Ashland's future operating performance and financial condition, as well as the economy and other future events or circumstances. Ashland's expectations and assumptions include, without limitation, those mentioned within the MD&A, internal forecasts and analyses of current and future market conditions and trends, management plans and strategies, operating efficiencies and economic conditions (such as prices, supply and demand, cost of raw materials, and the ability to recover raw-material cost increases through price increases), and risks and uncertainties associated with the following: the program to eliminate certain existing corporate and Specialty Ingredients expenses (including the possibility that such cost eliminations may not occur or may take longer to implement than anticipated), the expected divestiture of its Composites segment and the Marl facility and related merchant I&S products (including, in each case, the possibility that a transaction may not occur or that, if a transaction does occur, Ashland may not realize the anticipated benefits from such transaction), the impact of acquisitions and/or divestitures that Ashland has made or may make (including the possibility that Ashland may not realize the anticipated benefits from such transactions); Ashland's substantial indebtedness (including the possibility that such indebtedness and related restrictive covenants may adversely affect Ashland's future cash flows, results of operations, financial condition and its ability to repay debt); Ashland's ability to generate sufficient cash to finance its stock repurchase plans; severe weather, natural disasters, cyber events and legal proceedings and claims (including product recalls, environmental and asbestos matters); and without limitation, risks and uncertainties affecting Ashland that are contained in "Use of estimates, risks and uncertainties" in Note A of the Notes to Consolidated Financial Statements and in Item 1A of this Annual Report on Form 10-K. Various risks and uncertainties may cause actual results to differ materially from those stated, projected or implied by any forward-looking statements. Ashland believes its expectations and assumptions are reasonable, but there can be no assurance that the expectations reflected herein will be achieved. Unless legally required, Ashland undertakes no obligation to update any forward-looking statements made in this Form 10-K whether as a result of new information, future events or otherwise. Information on Ashland's website is not incorporated into or a part of this Form 10-K.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Ashland conducts business in a variety of foreign currencies. Accordingly, Ashland regularly uses foreign currency derivative instruments to manage exposure on certain transactions denominated in foreign currencies to curtail potential earnings volatility effects of certain assets and liabilities, including short-term inter-company loans, denominated in currencies other than Ashland's functional currency of an entity. These derivative contracts generally require exchange of one foreign currency for another at a fixed rate at a future date and generally have maturities of less than twelve months. All contracts are valued at fair value with net changes in fair value recorded within the selling, general and administrative expense caption. The impacts of these contracts were largely offset by gains and losses resulting from the impact of changes in exchange rates on transactions denominated in non-functional currencies.

As of September 30, 2018 and 2017, Ashland had not identified any significant credit risk on open derivative contracts. The potential loss from a hypothetical 10% adverse change in foreign currency rates on Ashland's open foreign currency derivative instruments would be largely offset by gains resulting from the impact of changes in exchange rates on transactions denominated in non-functional currencies. Ashland did not transact or have open any significant hedging contracts with respect to commodities or any related raw material requirements as of and for the year ended September 30, 2018.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

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MANAGEMENT'S REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

Management is responsible for the preparation and integrity of the Consolidated Financial Statements and other financial information included in this annual report on Form 10-K. Such financial statements are prepared in accordance with accounting principles generally accepted in the United States. Accounting principles are selected and information is reported which, using management's best judgment and estimates, present fairly Ashland's consolidated financial position, results of operations and cash flows. The other financial information in this annual report on Form 10-K is consistent with the Consolidated Financial Statements.

Ashland's management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Ashland's internal control over financial reporting is designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of Ashland's Consolidated Financial Statements. Ashland's internal control over financial reporting is supported by a code of business conduct which summarizes our guiding values such as obeying the law, adhering to high ethical standards and acting as responsible members of the communities where we operate. Compliance with that Code forms the foundation of our internal control systems, which are designed to provide reasonable assurance that Ashland's assets are safeguarded and its records reflect, in all material respects, transactions in accordance with management's authorization. The concept of reasonable assurance is based on the recognition that the cost of a system of internal control should not exceed the related benefits. Management believes that adequate internal controls are maintained by the selection and training of qualified personnel, by an appropriate division of responsibility in all organizational arrangements, by the establishment and communication of accounting and business policies, and by internal audits.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements and even when determined to be effective, can only provide reasonable assurance with respect to financial statement preparation and presentation. Also, projections of any evaluation of effectiveness to future periods are subject to the risks that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

The Board, subject to stockholder ratification, selects and engages the independent auditors based on the recommendation of the Audit Committee. The Audit Committee, composed of directors who are not members of management, reviews the adequacy of Ashland's policies, procedures, controls and risk management strategies, the scope of auditing and other services performed by the independent auditors, and the scope of the internal audit function. The Committee holds meetings with Ashland's internal auditor and independent auditors, with and without management present, to discuss the findings of their audits, the overall quality of Ashland's financial reporting and their evaluation of Ashland's internal controls. The report of Ashland's Audit Committee can be found in Ashland's Proxy for its 2019 Annual Meeting.

Management assessed the effectiveness of Ashland's internal control over financial reporting as of September 30, 2018. Management conducted its assessment utilizing the framework described in *Internal Control - Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on this assessment, management believes that Ashland maintained effective internal control over financial reporting as of September 30, 2018.

Ernst & Young LLP, an independent registered public accounting firm, has audited and reported on the Consolidated Financial Statements of Ashland Global Holdings Inc. and Consolidated Subsidiaries as of and for the year ended September 30, 2018 and the effectiveness of Ashland's internal control over financial reporting as of September 30, 2018. The reports of the independent registered public accounting firm are contained in this Annual Report on Form 10-K.

/s/ William A. Wulfsohn
William A. Wulfsohn
Chairman of the Board and Chief Executive Officer

/s/ J. Kevin Willis
J. Kevin Willis
Senior Vice President and Chief Financial Officer

November 19, 2018

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Stockholders of
Ashland Global Holdings Inc. and Consolidated Subsidiaries

Opinion on Internal Control over Financial Reporting

We have audited Ashland Global Holdings Inc. and Consolidated Subsidiaries' internal control over financial reporting as of September 30, 2018, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework), (the COSO criteria). In our opinion, Ashland Global Holdings Inc. and Consolidated Subsidiaries (the Company) maintained, in all material respects, effective internal control over financial reporting as of September 30, 2018, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of September 30, 2018 and 2017, the related consolidated statements of comprehensive income (loss), equity and cash flows for each of the three years in the period ended September 30, 2018, and the related notes and our report dated November 19, 2018 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP

Cincinnati, Ohio
November 19, 2018

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Stockholders of
Ashland Global Holdings Inc. and Consolidated Subsidiaries

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Ashland Global Holdings Inc. and Consolidated Subsidiaries (the Company) as of September 30, 2018 and 2017, the related consolidated statements of comprehensive income (loss), equity and cash flows for each of the three years in the period ended September 30, 2018, and the related notes (collectively referred to as the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at September 30, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended September 30, 2018, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company’s internal control over financial reporting as of September 30, 2018, based on criteria established in the Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework), and our report dated November 19, 2018 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on the Company’s financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company’s auditor since 2014.

Cincinnati, Ohio

November 19, 2018

Ashland Global Holdings Inc. and Consolidated Subsidiaries
Statements of Consolidated Comprehensive Income (Loss)
Years Ended September 30

(In millions except per share data)	2018	2017	2016
Sales	\$ 3,743	\$ 3,260	\$ 3,019
Cost of sales	2,668	2,363	2,132
Gross profit	1,075	897	887
Selling, general and administrative expense (a)	771	675	858
Research and development expense	85	83	87
Equity and other income	8	7	8
Operating income (loss)	227	146	(50)
Net interest and other financing expense - Note J	122	234	173
Other net periodic benefit income (costs) - Note N	13	(4)	(77)
Net loss on acquisitions and divestitures - Notes C and D	(4)	(6)	(8)
Income (loss) from continuing operations before income taxes	114	(98)	(308)
Income tax expense (benefit) - Note M	9	7	(25)
Income (loss) from continuing operations	105	(105)	(283)
Income from discontinued operations (net of tax) - Note E	9	133	255
Net income (loss)	114	28	(28)
Net income attributable to noncontrolling interest (b)	—	27	1
Net income (loss) attributable to Ashland	<u>\$ 114</u>	<u>\$ 1</u>	<u>\$ (29)</u>

PER SHARE DATA - NOTE A

Basic earnings per share			
Income (loss) from continuing operations	\$ 1.68	\$ (1.69)	\$ (4.51)
Income from discontinued operations attributable to Ashland	0.14	1.70	4.04
Net income (loss) attributable to Ashland	<u>\$ 1.82</u>	<u>\$ 0.01</u>	<u>\$ (0.47)</u>
Diluted earnings per share			
Income (loss) from continuing operations	\$ 1.66	\$ (1.69)	\$ (4.51)
Income from discontinued operations attributable to Ashland	0.13	1.70	4.04
Net income (loss) attributable to Ashland	<u>\$ 1.79</u>	<u>\$ 0.01</u>	<u>\$ (0.47)</u>

COMPREHENSIVE INCOME (LOSS)

Net income (loss)	\$ 114	\$ 28	\$ (28)
Other comprehensive income (loss), net of tax			
Unrealized translation gain (loss)	(82)	81	(14)
Pension and postretirement obligation adjustment	—	(4)	14
Net change in available-for-sale securities	13	15	17
Other comprehensive income (loss)	(69)	92	17
Comprehensive income (loss)	45	120	(11)
Comprehensive income attributable to noncontrolling interest	—	27	1
Comprehensive income (loss) attributable to Ashland	<u>\$ 45</u>	<u>\$ 93</u>	<u>\$ (12)</u>

(a) During 2016, selling, general and administrative expense included an impairment charge of \$181 million related to the Intermediates and Solvents reportable segment. See Note I for more information.

(b) Represents the income attributable to the previous noncontrolling interest in Valvoline Inc., whose results are now included within discontinued operations. See Note B for more information.

See Notes to Consolidated Financial Statements.

Ashland Global Holdings Inc. and Consolidated Subsidiaries
Consolidated Balance Sheets
At September 30

(In millions)	2018	2017
Assets		
Current assets		
Cash and cash equivalents	\$ 294	\$ 566
Accounts receivable (a)	681	612
Inventories - Note A	663	634
Other assets	74	91
Total current assets	1,712	1,903
Noncurrent assets		
Property, plant and equipment - Note H		
Cost	3,847	3,762
Accumulated depreciation	1,948	1,792
Net property, plant and equipment	1,899	1,970
Goodwill - Note I	2,449	2,465
Intangibles - Note I	1,225	1,319
Restricted investments - Note G	312	302
Asbestos insurance receivable - Note O	179	209
Deferred income taxes - Note M	28	28
Other assets - Note K	448	422
Total noncurrent assets	6,540	6,715
Total assets	\$ 8,252	\$ 8,618
Liabilities and Equity		
Current liabilities		
Short-term debt - Note J	\$ 254	\$ 235
Trade and other payables	483	409
Accrued expenses and other liabilities	338	324
Total current liabilities	1,075	968
Noncurrent liabilities		
Long-term debt - Note J	2,275	2,584
Asbestos litigation reserve - Note O	612	694
Deferred income taxes - Note M	279	375
Employee benefit obligations - Note N	179	191
Other liabilities - Note K	426	400
Total noncurrent liabilities	3,771	4,244
Commitments and contingencies - Notes L and O		
Equity - Notes P and Q		
Common stock, par value \$.01 per share, 200 million shares authorized		
Issued 62 million shares in 2018 and 2017	1	1
Paid-in capital	946	931
Retained earnings	2,750	2,696
Accumulated other comprehensive loss	(291)	(222)
Total equity	3,406	3,406
Total liabilities and equity	\$ 8,252	\$ 8,618

(a) Accounts receivable includes an allowance for doubtful accounts of \$6 million and \$9 million at September 30, 2018 and 2017, respectively.

See Notes to Consolidated Financial Statements.

Ashland Global Holdings Inc. and Consolidated Subsidiaries
Statements of Consolidated Equity

(In millions)	Common stock	Paid-in capital	Retained earnings	Accumulated other comprehensive income (loss) (a)	Noncontrolling interest (b)	Total
Balance at September 30, 2015	\$ 1	\$ 46	\$ 3,281	\$ (291)	\$ —	\$ 3,037
Total comprehensive income (loss)						
Net income (loss)			(29)		1	(28)
Other comprehensive income				17		17
Dividends, \$1.56 per common share			(97)			(97)
Common shares issued under stock incentive and other plans (c) (d)		24				24
Repurchase of common shares (e)		(49)	(451)			(500)
Valvoline Inc. initial public offering (b)		902		(7)	(183)	712
Balance at September 30, 2016	<u>1</u>	<u>923</u>	<u>2,704</u>	<u>(281)</u>	<u>(182)</u>	<u>3,165</u>
Total comprehensive income (loss)						
Net income			1		27	28
Other comprehensive income				92		92
Dividends, \$1.23 per common share			(77)			(77)
Common shares issued under stock incentive and other plans (c) (d)		15				15
Distribution of Valvoline Inc. (b)			68	(33)	152	187
Other		(7)			7	—
Distributions to noncontrolling interest					(4)	(4)
Balance at September 30, 2017	<u>1</u>	<u>931</u>	<u>2,696</u>	<u>(222)</u>	<u>—</u>	<u>3,406</u>
Total comprehensive income						
Net income			114			114
Other comprehensive loss				(69)		(69)
Dividends, \$0.95 per common share			(60)			(60)
Common shares issued under stock incentive and other plans (c) (d)		15				15
Balance at September 30, 2018	<u>\$ 1</u>	<u>\$ 946</u>	<u>\$ 2,750</u>	<u>\$ (291)</u>	<u>\$ —</u>	<u>\$ 3,406</u>

(a) At September 30, 2018 and 2017, the accumulated other comprehensive loss of \$291 million and \$222 million, respectively, was comprised of net unrealized translation losses of \$328 million and \$246 million, respectively, net unrealized gains on available for sale securities of \$34 million and \$21 million, respectively, and unrecognized prior service credits as a result of certain employee benefit plan amendments of \$3 million for each period.

(b) See Note B for discussion of the noncontrolling interest and the initial public offering and distribution of Valvoline Inc.

(c) Includes income tax expense resulting from the exercise of stock options of \$1 million in 2018 and income tax benefits of \$4 million in both 2017 and 2016.

(d) Common shares issued were 360,468, 42,861 and 417,584 for 2018, 2017 and 2016, respectively.

(e) Common shares repurchased were 5,049,911 for 2016.

See Notes to Consolidated Financial Statements.

Ashland Global Holdings Inc. and Consolidated Subsidiaries
Statements of Consolidated Cash Flows
Years Ended September 30

(In millions)	2018	2017	2016
Cash flows provided (used) by operating activities from continuing operations			
Net income (loss)	\$ 114	\$ 28	\$ (28)
Income from discontinued operations (net of tax)	(9)	(133)	(255)
Adjustments to reconcile income from continuing operations to cash flows from operating activities			
Depreciation and amortization	312	301	302
Original issue discount and debt issuance cost amortization	9	109	18
Deferred income taxes	(97)	(30)	(29)
Equity income from affiliates	(1)	—	(1)
Distributions from equity affiliates	1	1	2
Stock based compensation expense - Note Q	28	20	30
Excess tax benefits on stock based compensation	4	3	3
Loss on early retirement of debt	—	9	—
Realized gains and investment income on available-for-sale securities	(14)	(11)	(8)
Net loss on acquisitions and divestitures - Notes C and D	1	4	8
Impairments	16	—	181
Pension contributions	(9)	(7)	(33)
Loss (gain) on pension and other postretirement plan remeasurements	(12)	6	142
Change in operating assets and liabilities (a)	1	(27)	53
Total cash flows provided by operating activities from continuing operations	344	273	385
Cash flows provided (used) by investing activities from continuing operations			
Additions to property, plant and equipment	(185)	(199)	(231)
Proceeds from disposal of property, plant and equipment	4	5	2
Purchase of operations - net of cash acquired	(11)	(680)	—
Proceeds from sale of operations or equity investments	6	18	19
Life insurance payments	(37)	—	—
Net purchases of funds restricted for specific transactions	(10)	(2)	(4)
Reimbursement from restricted investments	33	27	33
Proceeds from sale of available-for-sale securities	26	19	10
Purchase of available-for-sale securities	(26)	(19)	(10)
Proceeds from the settlement of derivative instruments	1	5	9
Payments for the settlement of derivative instruments	(3)	(3)	(5)
Total cash flows used by investing activities from continuing operations	(202)	(829)	(177)
Cash flows provided (used) by financing activities from continuing operations			
Proceeds from issuance of long-term debt	—	1,100	—
Repayment of long-term debt	(311)	(915)	(1,095)
Premium on long-term debt repayment	—	(17)	—
Proceeds from (repayment of) short-term debt	15	75	(156)
Repurchase of common stock	—	—	(500)
Debt issuance costs	(2)	(15)	—
Cash dividends paid	(60)	(77)	(97)
Stock based compensation employee withholding taxes paid in cash	(10)	(15)	(10)
Total cash flows provided (used) by financing activities from continuing operations	(368)	136	(1,858)
Cash used by continuing operations	(226)	(420)	(1,650)
Cash provided (used) by discontinued operations			
Operating cash flows	(47)	110	293
Investing cash flows	—	(290)	(155)
Financing cash flows	—	(17)	1,451
Total cash provided (used) by discontinued operations	(47)	(197)	1,589
Effect of currency exchange rate changes on cash and cash equivalents	1	(5)	(8)
Decrease in cash and cash equivalents	(272)	(622)	(69)
Cash and cash equivalents - beginning of year	566	1,017	1,257
Change in cash and cash equivalents held by Valvoline	—	171	(171)
Cash and cash equivalents - end of year	\$ 294	\$ 566	\$ 1,017
Changes in assets and liabilities (a)			
Accounts receivable	\$ (70)	\$ (64)	\$ 77
Inventories	(29)	(23)	48
Trade and other payables	85	60	(99)
Other assets and liabilities	15	—	27
Change in operating assets and liabilities	\$ 1	\$ (27)	\$ 53
Supplemental disclosures			
Interest paid	\$ 126	\$ 132	\$ 162
Income taxes paid	77	79	108

(a) Excludes changes resulting from operations acquired or sold.

See Notes to Consolidated Financial Statements.

NOTE A – SIGNIFICANT ACCOUNTING POLICIES

Principles of consolidation and basis of presentation

On September 20, 2016, Ashland was reincorporated under the laws of the State of Delaware through a tax-free reorganization under a new holding company structure (the Reorganization). As a result of the Reorganization, Ashland Global Holdings Inc. replaced Ashland Inc. as the publicly held corporation and, through its subsidiaries, now conducts all of the operations that historically were conducted by Ashland Inc. Pursuant to the terms of the Reorganization, each outstanding share of Ashland common stock was automatically converted into one share of Ashland Global Holdings Inc. common stock. Following consummation of the Reorganization, (i) Ashland Inc. was converted into Ashland LLC, an indirect, wholly owned subsidiary of Ashland Global Holdings Inc., and (ii) Ashland Global Holdings Inc., as the new holding company, through its subsidiaries, conducts all of the operations conducted by Ashland Inc. immediately prior to the Reorganization. The Consolidated Financial Statements include the accounts of Ashland Global Holdings Inc. and its majority owned subsidiaries and, when applicable, entities for which Ashland has a controlling financial interest or is the primary beneficiary (Ashland). For entities for which Ashland has a controlling financial interest but owns less than 100%, the outside stockholders' interests are shown as noncontrolling interests. Investments in joint ventures and 20% to 50% owned affiliates where Ashland has the ability to exert significant influence are accounted for under the equity method.

The accompanying Consolidated Financial Statements have been prepared in accordance with accounting principles generally accepted in the United States of America (U.S. GAAP) and U.S. Securities and Exchange Commission (SEC) regulations. All intercompany transactions and balances have been eliminated. Additionally, certain prior period data, primarily related to discontinued operations, have been reclassified in the Consolidated Financial Statements and accompanying notes to conform to the current period presentation, as further described in this section.

On May 12, 2017, Ashland completed the distribution of its remaining 170 million shares of common stock of Valvoline Inc. which represented approximately 83% of the total outstanding shares of Valvoline Inc.'s common stock. This distribution of Valvoline represented a strategic shift in Ashland's business and, in accordance with U.S. GAAP, qualified as a discontinued operation. Accordingly, Valvoline's assets, liabilities, operating results and cash flows for all periods presented have been classified as discontinued operations within the Consolidated Financial Statements. See Note B for additional information on the separation of Valvoline Inc. The term Valvoline as used herein, depending on context, refers to either Valvoline Inc. or Valvoline as a previous reportable segment of Ashland.

Subsequent to completing the separation from Valvoline Inc., Ashland's operations are managed within the following three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents.

During the periods presented in the Consolidated Financial Statements, Ashland sold certain assets in its portfolio of businesses which, in accordance with U.S. GAAP, were not reflected as discontinued operations. See Notes D and R for additional information on these transactions as well as Ashland's current reportable segment results.

Use of estimates, risks and uncertainties

The preparation of Ashland's Consolidated Financial Statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses, and the disclosures of contingent assets and liabilities. Significant items that are subject to such estimates and assumptions include, but are not limited to, long-lived assets (including goodwill and other intangible assets), income taxes and liabilities and receivables associated with asbestos litigation and environmental remediation. Although management bases its estimates on historical experience and various other assumptions that are believed to be reasonable under the circumstances, actual results could differ significantly from the estimates under different assumptions or conditions.

Ashland's results are affected by domestic and international economic, political, legislative, regulatory and legal actions. Economic conditions, such as recessionary trends, inflation, interest and monetary exchange rates, government fiscal policies and changes in the prices of certain key raw materials, can have a significant effect on operations. While Ashland maintains reserves for anticipated liabilities and carries various levels of insurance, Ashland could be affected by civil, criminal, regulatory or administrative actions, claims or proceedings relating to asbestos, environmental remediation or other matters.

Cash and cash equivalents

Cash and cash equivalents include cash on hand and highly liquid investments maturing within three months after purchase.

Allowance for doubtful accounts

Ashland records an allowance for doubtful accounts as a best estimate of the amount of probable credit losses for accounts receivable. Ashland reviews this allowance and considers factors such as customer credit, past transaction history with the customer and changes in customer payment terms when determining whether the collection of a receivable is reasonably assured. Past due balances over 90 days and over a specified amount are reviewed individually for collectibility. The allowance for doubtful accounts is adjusted when it becomes probable a receivable will not be recovered.

A progression of activity in the allowance for doubtful accounts is presented in the following table.

(In millions)	2018		2017		2016	
Allowance for doubtful accounts - beginning of year	\$	9	\$	10	\$	7
Adjustments to net income		2		4		4
Reserves utilized		(5)		(4)		(2)
Other changes		—		(1)		1
Allowance for doubtful accounts - end of year	\$	<u>6</u>	\$	<u>9</u>	\$	<u>10</u>

Inventories

Inventories are carried at the lower of cost or net realizable value. Inventories are primarily stated at cost using the weighted-average cost method. In addition, certain chemicals with a replacement cost of \$124 million at September 30, 2018 and \$108 million at September 30, 2017 are valued at cost using the last-in, first-out (LIFO) method.

The following summarizes Ashland's inventories as of the Consolidated Balance Sheet dates.

(In millions)	2018		2017	
Finished products	\$	402	\$	390
Raw materials, supplies and work in process		268		245
LIFO reserves		(7)		(1)
	\$	<u>663</u>	\$	<u>634</u>

A progression of activity in the inventory reserves, which reduce the amounts of finished products and raw materials, supplies and work in process reported, is presented in the following table.

(In millions)	2018		2017		2016	
Inventory reserves - beginning of year	\$	29	\$	31	\$	31
Adjustments to net income		5		6		6
Reserves utilized		(10)		(8)		(6)
Inventory reserves - end of year	\$	<u>24</u>	\$	<u>29</u>	\$	<u>31</u>

Property, plant and equipment

The cost of property, plant and equipment is depreciated by the straight-line method over the estimated useful lives of the assets. Buildings are depreciated principally over 12 to 35 years and machinery and equipment principally over 2 to 25 years. Such costs are periodically reviewed for recoverability when impairment indicators are present. Such indicators include, among other factors, operating losses, unused capacity, market value declines and technological obsolescence. Recorded values of asset groups of property, plant and equipment that are not expected to be recovered through undiscounted future net cash flows are written down to current fair value, which generally is determined from estimated discounted future net cash flows (assets held for use) or net realizable value (assets held for sale).

Goodwill and other intangibles

Ashland tests goodwill and other indefinite-lived intangible assets for impairment annually as of July 1 and when events and circumstances indicate an impairment may have occurred. Ashland reviews goodwill for impairment based on its identified reporting units, which are defined as operating segments or groupings of businesses one level below the operating segment level. Ashland tests goodwill for impairment by comparing the carrying value to the estimated fair value of its reporting units.

In prior years, Ashland performed a quantitative goodwill impairment test and determined the fair value of its reporting units using a combination of discounted cash flow models and valuations based on earnings multiples for guideline public companies in each reporting unit's industry peer group, when externally quoted market prices are not readily available. If this comparison indicates that a reporting unit's estimated fair value is less than its carrying value, it is adjusted to its calculated fair value and the adjustment represents the impairment charge.

In the current year for its July 1, 2018 goodwill impairment test, Ashland performed an extensive qualitative analysis in order to determine whether it was necessary to perform a quantitative goodwill impairment test. In performing this analysis, Ashland considered relevant events and circumstances such as macroeconomic conditions, industry and market considerations, overall financial performance and changes in management and business strategy, changes in carrying value, among others. Ashland considered how these relevant events and circumstances have changed since its most recent quantitative goodwill impairment test performed in the prior year as of July 1, 2017. After weighting the significance of these factors, Ashland determined that it was more likely than not that the fair value of its reporting units exceeds the carrying value and that a quantitative impairment test was not necessary to perform.

Ashland tests its indefinite-lived intangible assets, principally trademarks and trade names. If the carrying value of an individual indefinite-lived intangible asset exceeds its fair value, such individual indefinite-lived intangible asset is written down by an amount equal to such excess. Similar to goodwill, Ashland first performs a qualitative analysis in order to determine whether it is necessary to perform a quantitative goodwill impairment test for the trademarks and trade names. If a quantitative analysis is deemed necessary, trademarks and trade names are valued using a "relief-from-royalty" valuation method compared to the carrying value. Significant assumptions inherent in the valuation methodologies include, but are not limited to, such estimates as future projected business results, growth rates, the weighted-average cost of capital for a market participant, and royalty and discount rates.

Finite-lived intangible assets principally consist of certain trademarks and trade names, intellectual property, and customer lists. These intangible assets are amortized on a straight-line basis over their estimated useful lives. The cost of trademarks and trade names is amortized principally over 3 to 25 years, intellectual property over 5 to 25 years and customer and supplier relationships over 3 to 24 years. Ashland reviews finite-lived intangible assets for impairment whenever events or changes in circumstances indicate the carrying amount of an asset may not be recoverable. Ashland monitors these changes and events on at least a quarterly basis. For further information on goodwill and other intangible assets, see Note I.

Derivative instruments

Ashland regularly uses derivative instruments to manage its exposure to fluctuations in foreign currencies and certain commodities. All derivative instruments are recognized as either assets or liabilities on the balance sheet and are measured at fair value. Changes in the fair value of all derivatives are recognized immediately in the Statements of Consolidated Comprehensive Income (Loss) unless the derivative qualifies as a hedge of future cash flows or a hedge of a net investment in a foreign operation. Gains and losses related to an instrument that qualifies for hedge accounting are either recognized in the Statements of Consolidated Comprehensive Income (Loss) immediately to offset the gain or loss on the hedged item, or deferred and recorded in the stockholders' equity section of the Consolidated Balance Sheets as a component of accumulated other comprehensive income and subsequently recognized in the Statements of Consolidated Comprehensive Income (Loss) when the hedged item affects net income. The ineffective portion of the change in fair value of a hedge is recognized in income immediately. For additional information on derivative instruments, see Note G.

Restricted investments

On January 13, 2015, Ashland and Hercules LLC (formerly Hercules Incorporated), an indirect wholly-owned subsidiary of Ashland that was acquired in 2009, entered into a comprehensive settlement agreement related to certain insurance coverage for asbestos bodily injury claims with Underwriters at Lloyd's, certain London companies and Chartis (AIG) member companies, along with National Indemnity Company and Resolute Management, Inc., under which Ashland and Hercules received a total of \$398 million (the January 2015 asbestos insurance settlement). During 2015, Ashland placed \$335 million of the settlement funds into a renewable annual trust that Ashland determined is restricted for the purpose of paying ongoing and future litigation defense and claim settlement costs incurred in conjunction with asbestos claims. These funds are presented primarily as noncurrent assets, with \$30 million classified within other current assets in the Consolidated Balance Sheets as of September 30, 2018 and 2017.

As of September 30, 2018 and 2017, the funds within the trust had a balance of \$342 million and \$332 million, respectively, and were primarily invested in equity and corporate bond investments with a portion maintained in demand deposits. The funds within the trust are classified as available-for-sale securities. Available-for-sale securities are reported at fair value with unrealized gains and losses, net of related deferred income taxes, included in the stockholders' equity section of the Consolidated Balance Sheets as a component of accumulated other comprehensive income. Interest income and realized gains and losses on the available-for-sale securities are reported in the net interest and other financing expense caption in the Statements of Consolidated Comprehensive Income (Loss). See Note G for additional information regarding fair value of these investments within the trust.

Revenue recognition

Sales generally are recognized when persuasive evidence of an arrangement exists, products are received or services are provided to customers, the sales price is fixed or determinable and collectibility is reasonably assured. For consignment inventory, title and risk of loss are transferred when the products have been consumed or used in the customer's production process. The percentage of Ashland's sales recognized from consignment inventory sales was 5% during 2018, and 6% during 2017 and 2016. Ashland reports all sales net of tax assessed by qualifying governmental authorities. Certain shipping and handling costs paid by the customer are recorded in sales, while those costs paid by Ashland are recorded in cost of sales.

In May 2014, the FASB issued accounting guidance effective on October 1, 2018 that will change Ashland's policy and disclosure requirements for revenue recognition treatment. See the new accounting pronouncements section within this Note A for further information.

Expense recognition

Cost of sales include material and production costs, as well as the costs of inbound and outbound freight, purchasing and receiving, inspection, warehousing, internal transfers and all other distribution network costs. Selling, general and administrative expense includes sales and marketing costs, advertising, customer support, environmental remediation, corporate and divisional administrative and other costs. Advertising costs (\$5 million in 2018 and \$6 million in both 2017 and 2016) and research and development costs (\$85 million in 2018, \$83 million in 2017 and \$87 million in 2016) are expensed as incurred.

Income taxes

Ashland is subject to income taxes in the United States and numerous foreign jurisdictions. Significant judgment in the forecasting of taxable income using historical and projected future operating results is required in determining Ashland's provision for income taxes and the related assets and liabilities. The provision for income taxes includes income taxes paid, currently payable or receivable, and deferred taxes. Ashland recognizes the income tax benefit from an uncertain tax position only if it is more likely than not that the tax position will be sustained on examination by taxing authorities, based on the technical merits of the position. Ashland evaluates and adjusts these accruals based on changing facts and circumstances. Deferred tax assets and liabilities are determined based on differences between financial reporting and tax basis of assets and liabilities, and are measured using enacted tax rates and laws that are expected to be in effect when the differences reverse. Deferred tax assets are also recognized for the estimated future effects of tax loss and credit carryforwards. The effect on deferred taxes of changes in tax rates is recognized in the period in which the enactment date occurs. Valuation allowances are established when necessary on a jurisdictional basis to reduce deferred tax assets to the amounts expected to be realized. In the

event that the actual outcome of future tax consequences differs from Ashland's estimates and assumptions due to changes or future events such as tax legislation, geographic mix of earnings, completion of tax audits or earnings repatriation plans, the resulting change to the provision for income taxes could have a material effect on the Statements of Consolidated Comprehensive Income (Loss) and Consolidated Balance Sheets. For additional information on income taxes, see Note M.

A progression of activity in the tax valuation allowances is presented in the following table.

(In millions)	2018	2017	2016
Tax valuation allowances - beginning of year	\$ 122	\$ 136	\$ 103
Adjustments to income tax expense (benefit)	(5)	27	43
Reserves utilized	(38)	(41)	(10)
Tax valuation allowances - end of year	\$ 79	\$ 122	\$ 136

Asbestos-related litigation

Ashland is subject to liabilities from claims alleging personal injury caused by exposure to asbestos. Such claims result from indemnification obligations undertaken in 1990 in connection with the sale of Riley Stoker Corporation (Riley) and the acquisition of Hercules in November 2008. Although Riley, a former subsidiary, was neither a producer nor a manufacturer of asbestos, its industrial boilers contained some asbestos-containing components provided by other companies. Hercules, an indirect wholly-owned subsidiary of Ashland, has liabilities from claims alleging personal injury caused by exposure to asbestos. Such claims typically arise from alleged exposure to asbestos fibers from resin encapsulated pipe and tank products sold by one of Hercules' former subsidiaries to a limited industrial market.

Prior to 2018, Ashland retained Hamilton, Rabinovitz & Associates, Inc. (HR&A) to assist in developing and annually updating independent reserve estimates for future asbestos claims and related costs given various assumptions. During 2018, Ashland transitioned these responsibilities to Nathan Associates, Inc. (Nathan). The processes and methodologies used by Nathan are consistent with the ones historically employed by HR&A. The methodology used by Nathan to project future asbestos costs is based largely on Ashland's recent experience, including claim-filing and settlement rates, disease mix, enacted legislation, open claims, and litigation defense. Ashland's claim experience is compared to the results of previously conducted epidemiological studies estimating the number of people likely to develop asbestos-related diseases. Those studies were undertaken in connection with national analyses of the population expected to have been exposed to asbestos. Using that information, Nathan estimates a range of the number of future claims that may be filed, as well as the related costs that may be incurred in resolving those claims. From the range of estimates, Ashland records the amount it believes to be the best estimate of future payments for litigation defense and claim settlement costs. For additional information on asbestos-related litigation, see Note O.

Environmental remediation

Accruals for environmental remediation are recognized when it is probable a liability has been incurred and the amount of that liability can be reasonably estimated. Such costs are charged to expense if they relate to the remediation of conditions caused by past operations or are not expected to mitigate or prevent contamination from future operations. Liabilities are recorded at estimated cost values based on experience, assessments and current technology, without regard to any third-party recoveries and are regularly adjusted as environmental assessments and remediation efforts continue. For additional information on environmental remediation, see Note O.

Pension and other postretirement benefits

The funded status of Ashland's pension and other postretirement benefit plans is recognized in the Consolidated Balance Sheets. The funded status is measured as the difference between the fair value of plan assets and the benefit obligation at September 30, the measurement date. For defined benefit pension plans, the benefit obligation is the projected benefit obligation (PBO) and for the other postretirement benefit plans, the benefit obligation is the accumulated postretirement benefit obligation (APBO). The PBO represents the actuarial present value of benefits expected to be paid upon retirement based on estimated future compensation levels. The APBO represents the actuarial present value of postretirement benefits attributed to employee services already rendered. The measurement of the benefit obligation is based on Ashland's estimates and actuarial valuations. These valuations reflect the terms of the plans and use participant-specific information such as compensation, age

and years of service, as well as certain key assumptions that require significant judgment, including, but not limited to, estimates of discount rates, expected return on plan assets, rate of compensation increases, interest rates and mortality rates. The fair value of plan assets represents the current market value of assets held by an irrevocable trust fund for the sole benefit of participants. For additional information regarding plan assumptions and the current financial position of the pension and other postretirement plans, see Note N.

Ashland recognizes the change in the fair value of plan assets and net actuarial gains and losses annually in the fourth quarter of each fiscal year and whenever a plan is determined to qualify for a remeasurement. The remaining components of pension and other postretirement benefits expense are recorded ratably on a quarterly basis. Pension and other postretirement benefits adjustments charged directly to cost of sales that are applicable to inactive participants are excluded from inventoriable costs. The service cost component of pension and other postretirement benefits costs is allocated to each reportable segment on a ratable basis; while the remaining components of pension and other postretirement benefits costs are recorded within the other net periodic benefit income (costs) caption on the Statements of Consolidated Comprehensive Income (Loss).

Foreign currency translation

Operations outside the United States are measured primarily using the local currency as the functional currency. Upon consolidation, the results of operations of the subsidiaries and affiliates whose functional currency is other than the U.S. dollar are translated into U.S. dollars at the average exchange rates for the year while assets and liabilities are translated at year-end exchange rates. Consistent with U.S. GAAP standards, adjustments to translate assets and liabilities into U.S. dollars are recorded in the stockholders' equity section of the Consolidated Balance Sheets as a component of accumulated other comprehensive income and are included in net earnings only upon sale or substantial liquidation of the underlying foreign subsidiary or affiliated company.

Stock incentive plans

Ashland recognizes compensation expense for stock incentive plans awarded to key employees and directors, primarily in the form of stock appreciation rights (SARs), restricted stock and restricted stock units, performance shares and other non-vested stock awards, that are generally based upon the grant-date fair value over the appropriate vesting period. Ashland utilizes several industry accepted valuation models to determine the fair value. For further information concerning stock incentive plans, see Note Q.

Earnings per share

The following is the computation of basic and diluted earnings per share (EPS) from continuing operations attributable to Ashland. Earnings per share are reported under the treasury stock method. Stock options and SARs for each reported year whose grant price was greater than the market price of Ashland Common Stock at the end of each fiscal year were not included in the computation of loss from continuing operations per diluted share because the effect of these instruments would be antidilutive. The total number of these shares outstanding was 0.7 million for 2018, 1.1 million for 2017 and 1.2 million for 2016.

(In millions except per share data)	2018	2017	2016
Numerator			
Numerator for basic and diluted EPS -			
Income (loss) from continuing operations, net of tax	\$ 105	\$ (105)	\$ (283)
Denominator			
Denominator for basic EPS - Weighted-average			
common shares outstanding	63	62	63
Share based awards convertible to common shares (a)	1	—	—
Denominator for diluted EPS - Adjusted weighted -			
average shares and assumed conversions	64	62	63
EPS from continuing operations			
Basic	\$ 1.68	\$ (1.69)	\$ (4.51)
Diluted	1.66	(1.69)	(4.51)

(a) As a result of the loss from continuing operations for 2017 and 2016, the effect of the share-based awards convertible to common shares would be antidilutive. In accordance with U.S. GAAP, they have been excluded from the diluted EPS calculation.

New accounting pronouncements

Revenue recognition

In May 2014, the FASB issued accounting guidance outlining a single comprehensive five step model for entities to use in accounting for revenue arising from contracts with customers (ASC 606 Revenue from Contracts with Customers). The new guidance and subsequent amendments to it supersedes most current revenue recognition guidance, in an effort to converge the revenue recognition principles within U.S. GAAP. This new guidance also requires entities to disclose certain quantitative and qualitative information regarding the nature, amount, timing and uncertainty of qualifying revenue and cash flows arising from contracts with customers. Entities have the option of using a full retrospective or a modified retrospective approach to adopt the new guidance. This guidance became effective for Ashland on October 1, 2018.

Ashland formed an implementation team that evaluated the impact of the new standard on the Consolidated Financial Statements and the adoption method options available as well as the overall impact the new guidance will have on the organization. The assessment process consisted of categorizing Ashland's revenue streams and reviewing the current internal accounting policies and practices to determine potential differences that would result from applying the requirements of the new standard to revenue contracts. Additional discussions and meetings with each revenue stream team occurred to solicit input, identify potential impacts and appropriate changes to Ashland's business processes, systems and controls to support the revenue recognition and disclosure requirements under the new standard. Based on various assessments conducted, Ashland identified agreements with customers that contained elements of material rights and/or variable consideration. Ashland determined that these elements do not result in a material change to how revenue would be recognized for these agreements.

Ashland has elected to adopt this standard using the modified retrospective approach. Ashland has finalized its assessment of the standard and determined that the overall impact will not be material to the Consolidated Financial Statements but does expect there to be significant additional disclosures within the Notes to Consolidated Financial Statements moving forward. Further, Ashland does not expect a significant change to its internal controls or the manner and timing of recognizing revenue.

Leases

In February 2016, the FASB issued new accounting guidance related to lease transactions. The main objective of this guidance is to increase transparency and comparability among organizations by requiring lessees to recognize assets and liabilities on the balance sheet for the rights and obligations created by leases and to disclose key information about leasing arrangements. The presentation of the Statements of Consolidated Comprehensive Income (Loss) and the Statements of Consolidated Cash Flows is largely unchanged under this guidance. This guidance retains a distinction between finance leases and operating leases, and the classification criteria for distinguishing between finance leases and operating leases are substantially similar to the classification criteria for distinguishing between capital leases and operating leases in the current accounting literature. The guidance will become effective for Ashland on October 1, 2019 and it will have a significant effect on Ashland's Consolidated Balance Sheet and disclosures.

Ashland has formed an implementation team and is currently evaluating implementation options and quantifying the impact that this guidance will have within its Consolidated Financial Statements. In July 2018, the FASB amended this guidance to give entities the option to apply the standard at the adoption date and recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. Ashland currently intends to utilize this transition method upon adopting the guidance.

Other pronouncements

In August 2018, the FASB issued guidance to align the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. Under the new guidance, the deferred implementation costs are amortized to expense over the term of the hosting arrangement. The term of the hosting arrangement includes the non-cancellable period of the cloud computing arrangement plus any optional renewal periods that are reasonably certain to be exercised by the customer. Additionally, an entity should present the capitalized implementation costs in the same line item that a prepayment for fees of the associated hosting arrangement are presented, and an entity should classify the cash flows from capitalized implementation costs in the same manner as the cash flows for the fees paid for the associated hosting arrangement. Ashland elected to early adopt this guidance immediately and apply it prospectively as permitted by the guidance. This guidance did not have a material impact on Ashland's Consolidated Financial Statements during 2018.

In February 2018, the FASB issued guidance which permits entities to reclassify tax effects stranded in accumulated other comprehensive income (AOCI) as a result of U.S. tax reform legislation to retained earnings. Additionally, this guidance requires entities to disclose whether they made an election to reclassify the tax effects and to disclose their accounting policy for releasing income tax effects from AOCI. This guidance becomes effective for Ashland on October 1, 2019. Ashland is currently evaluating the impact this guidance may have on Ashland's Consolidated Financial Statements.

In August 2017, the FASB issued accounting guidance amending the existing hedge accounting model to simplify various hedge documentation requirements while also expanding hedging abilities for certain nonfinancial and financial risk components. This guidance will become effective for Ashland on October 1, 2019. Ashland is currently evaluating the impact this guidance may have on Ashland's Consolidated Financial Statements.

In March 2017, the FASB issued accounting guidance that changes how employers who sponsor defined benefit pension and/or postretirement benefit plans present the net periodic benefit cost in the Statement of Consolidated Comprehensive Income. This guidance requires employers to present the service cost component of net periodic benefit cost in the same caption within the Statement of Consolidated Comprehensive Income (Loss) as other employee compensation costs from services rendered during the period. All other components of the net periodic benefit cost will be presented separately outside of the operating income caption. This guidance must be applied retrospectively. Ashland elected to early adopt this guidance on October 1, 2017, which resulted in a reclassification of \$4 million and \$77 million from the selling, general and administrative expense and cost of sales captions to the other net periodic benefit income (costs) caption in the Statement of Consolidated Comprehensive Income (Loss) for 2017 and 2016, respectively. The components of net periodic benefit income (costs) reclassified primarily relate to interest cost, expected return on assets, curtailments, settlements and actuarial gains and losses. Ashland did not have to adjust the classification of service cost since it previously was recorded within the caption required by the new guidance. See Note K for additional information on net periodic benefit income (costs).

In January 2017, the FASB issued accounting guidance which simplifies the subsequent measurement of goodwill by eliminating the second step of the two-step impairment test under which the implied fair value of goodwill is determined as if the reporting unit were being acquired in a business combination. The guidance instead requires entities to compare the fair value of a reporting unit with its carrying amount and recognize an impairment charge for any amount by which the carrying amount exceeds the reporting unit's fair value. Ashland elected to early adopt this guidance in conjunction with its annual assessment of goodwill performed as of July 1, 2017.

In March 2016, the FASB issued new accounting guidance for certain aspects of share-based payments to employees. This guidance requires all excess tax benefits and tax deficiencies related to share-based payments to be recognized as income tax expense in the Statements of Consolidated Comprehensive Income (Loss) instead of additional paid in capital, and changes the classification of excess tax benefits from a financing activity to an operating activity within the statement of cash flows. This guidance also allows entities to make an accounting policy election to either estimate the number of awards that are expected to vest or account for forfeitures when they occur. In addition, this guidance increases the amount an employer can withhold to cover income taxes on awards and still qualify for equity classification and requires that cash paid by an employer when directly withholding shares for tax-withholding purposes be classified as a financing activity within Statements of Consolidated Cash Flows. The guidance became effective for Ashland and was adopted on October 1, 2017. The guidance specifically related to the Statements of Consolidated Comprehensive Income (Loss) was adopted prospectively while the guidance related to the Statements of Consolidated Cash Flows was adopted retrospectively, as required by the guidance. Additionally, Ashland made a policy election to account for forfeitures when they occur across all share-based awards. Upon adoption, the overall impact on Ashland's Consolidated Financial Statements was not significant.

In January 2016, the FASB issued accounting guidance related to the recognition and measurement as well as the presentation and disclosures for certain financial instruments. Most notably, the guidance requires entities to measure equity investments at fair value and to recognize any changes in fair value in net income rather than accumulated other comprehensive income. The guidance does not change the recognition and measurement of investments in debt securities or loans. As a result of the implementation of this guidance, unrealized gains and losses from Ashland's available-for-sale equity securities will be recorded within the Statements of Consolidated Comprehensive Income (Loss) instead of the accumulated other comprehensive income section of equity within the Consolidated Balance Sheets. The impact of implementing this new guidance could have a significant impact on Ashland's Statements of Consolidated Comprehensive Income (Loss) in prospective periods depending on the fluctuations of unrealized gains and losses within the available-for-sale equity securities portfolio. The guidance will become effective for Ashland on October 1, 2018. For further information on Ashland's available-for-sale investment securities see Note G.

NOTE B – VALVOLINE

Ashland Separation of Valvoline

On September 22, 2015, Ashland announced that the Board of Directors approved proceeding with a plan to separate Ashland into two independent, publicly traded companies comprising of the new Ashland (now known as Ashland Global Holdings Inc.) and Valvoline Inc. The initial step of the separation, the initial public offering (IPO) of Valvoline Inc., closed on September 28, 2016. As discussed further within the Final Separation section of this Note B, Ashland completed the distribution of its remaining shares in Valvoline Inc. on May 12, 2017. The new Ashland is a premier global leader in providing specialty chemical solutions to customers in a wide range of consumer and industrial markets. Key markets and applications include adhesives, architectural coatings, automotive, construction, energy, food and beverage, nutraceuticals, personal care and pharmaceutical.

After completing the IPO on September 28, 2016 and before the distribution of its remaining shares on May 12, 2017, Ashland owned 170 million shares of Valvoline Inc.'s common stock which represented approximately 83% of the total outstanding shares of Valvoline Inc.'s common stock. As a result, Ashland continued to consolidate Valvoline within the Consolidated Financial Statements up until the distribution of the remaining shares. The resulting outside stockholders' interests in Valvoline Inc., which were approximately 17%, was presented separately as a noncontrolling interest within Ashland's equity in the Consolidated Balance Sheets up until the distribution of the remaining shares. The amount of consolidated net income attributed to these previous minority holders is presented as a separate caption on the Statements of Consolidated Comprehensive Income (Loss) for 2017 and 2016.

Final Separation

Ashland completed the distribution of its remaining 170 million shares of common stock of Valvoline Inc. as a pro rata dividend on shares of Ashland common stock outstanding at the close of business on the record date of May 5, 2017. Based on the shares of Ashland common stock outstanding as of May 5, 2017, the record date for the distribution, each share of Ashland common stock received 2.745338 shares of Valvoline common stock in the distribution. The distribution was recorded at the carrying amount of Valvoline Inc.'s net assets which was a deficit of \$187 million as of May 12, 2017, as follows:

(In millions)	May 12 2017
ASSETS	
Current assets	
Cash	179
Accounts receivable, net	385
Inventories	153
Other current assets	24
Total current assets	741
Noncurrent assets	
Net property, plant and equipment	357
Goodwill	329
Equity and other unconsolidated investments	31
Deferred income taxes	391
Other noncurrent assets	93
Total noncurrent assets	1,201
Total assets	\$ 1,942
LIABILITIES AND EQUITY	
Current liabilities	
Short-term debt	75
Current portion of long-term debt	16
Trade and other payables	353
Other current liabilities	34
Total current liabilities	478
Noncurrent liabilities	
Long-term debt	662
Employee benefit obligations	826
Other long-term liabilities	163
Total noncurrent liabilities	1,651
Total liabilities	\$ 2,129
Net deficit	\$ (187)

A Tax Matters Agreement between Ashland and Valvoline Inc. governs the rights and obligations after the separation regarding certain income taxes and other taxes, including certain tax liabilities and benefits, attributes, returns and contests.

Discontinued Operations Assessment

Valvoline met the criteria to qualify as a discontinued operation and accordingly, its operating results and cash flows have been classified as discontinued operations within the Consolidated Financial Statements. See Note E for more information.

In 2016, certain indirect corporate costs included within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss) that were previously allocated to the Valvoline reportable segment do not qualify for classification within discontinued operations and continue to be reported as selling, general and administrative expense within continuing operations on a consolidated basis and within the Unallocated and other segment. These costs were \$22 million during 2016.

Costs of transaction

Ashland recognized separation costs of \$10 million, \$95 million and \$88 million during 2018, 2017 and 2016, respectively, which were primarily related to transaction, consulting and legal fees. During 2017 and 2016, \$13 million and \$7 million, respectively, of the separation costs directly related to Valvoline were included within the discontinued operations caption of the Statements of Consolidated Comprehensive Income (Loss). Otherwise, separation costs are primarily recorded within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss).

NOTE C – ACQUISITIONS

Pharmachem

On May 17, 2017, Ashland completed its acquisition of the stock of Pharmachem Laboratories, Inc. (Pharmachem), a leading provider of quality ingredients to the global health and wellness industries and high-value differentiated products to fragrance and flavor houses. At the acquisition date, Pharmachem had approximately \$300 million in annual revenues and 14 manufacturing facilities located in the United States and Mexico. New Jersey-based Pharmachem develops, manufactures and supplies custom and branded nutritional and fragrance products. Ashland has included Pharmachem within the Specialty Ingredients reporting segment.

Purchase price allocation

The acquisition was recorded by Ashland using the purchase method of accounting in accordance with U.S. GAAP whereby the total purchase price was allocated to tangible and intangible assets and liabilities acquired based on respective fair values. Goodwill was calculated as the excess of the consideration transferred over the net assets recognized and represents the estimated future economic benefits arising from other assets acquired that could not be individually identified and separately recognized. The factors contributing to the recognition of goodwill were based on strategic benefits that are expected to be realized from the acquisition. None of the goodwill is expected to be deductible for income tax purposes.

The all-cash purchase price of Pharmachem was \$680 million which included working capital adjustments of approximately \$20 million. Ashland incurred \$5 million of transaction costs during 2017 related to the acquisition, which was recorded within the net loss on acquisitions and divestitures caption in the Statement of Consolidated Comprehensive Income (Loss). The purchase price allocation was finalized during 2018 and the following table summarizes the values of the assets acquired and liabilities assumed at the date of acquisition.

	At May 17, 2017 As Adjusted
Purchase price allocation (in millions)	
Assets:	
Accounts receivable	52
Inventory	74
Other current assets	4
Intangible assets	330
Goodwill	288
Property, plant and equipment	94
Other noncurrent assets	17
Liabilities:	
Accounts payable	(33)
Deferred tax - net	(132)
Other noncurrent liabilities	(14)
Total purchase price	<u>\$ 680</u>

Subsequent adjustments to initial purchase price allocation

During the September 2017 quarter, Ashland updated certain valuations and reserve estimates as part of the purchase accounting process and procedures. As a result of these updates, Ashland increased the intangible assets associated with the purchase by \$18 million. The remaining updates to the Consolidated Balance Sheet during the September 2017 quarter related to certain liabilities that in total, along with the intangible assets impact, increased goodwill by \$11 million. These adjustments did not have a significant effect on the Statement of Consolidated Comprehensive Income (Loss) during 2017.

During 2018, there were subsequent adjustments of \$6 million to deferred tax liabilities, \$3 million to property, plant and equipment, \$3 million to other noncurrent assets and \$1 million to accounts payable. The combined impact of these adjustments resulted in an increase to goodwill of \$1 million. These adjustments did not have a significant effect on the Statement of Consolidated Comprehensive Income (Loss) during 2018.

Intangible assets identified

The purchase price allocation included \$330 million of certain definite-lived intangible assets which are being amortized over the estimated useful life in proportion to the economic benefits consumed. The determination of the useful lives is based upon various industry studies, historical acquisition experience, economic factors, and future cash flows of the combined company. In addition, Ashland reviewed certain technological trends and also considered the current Pharmachem customer base.

The following details the total intangible assets identified as of May 17, 2017.

Intangible asset type (in millions)	Value	Weighted-average amortization period (years)
Trademarks and trade names	\$ 26	15
Intellectual property	68	22
Customer and supplier relationships	236	20
Total	<u>\$ 330</u>	

Impact on operating results

The results of Pharmachem's operations have been included in Ashland's Consolidated Financial Statements since the May 17, 2017 closing date. The following table provides sales and operating income from the acquired Pharmachem operations included in Ashland's 2017 results.

Pharmachem results of operations (In millions)	2017 (a)
Sales	\$ 104
Operating income	7

(a) Amounts represent the sales and results of operations for the period May 17, 2017 through September 30, 2017, the period for which Pharmachem was owned during 2017.

The following unaudited pro forma information for 2017 and 2016 assumes the acquisition of Pharmachem occurred at the beginning of the respective periods presented.

Unaudited pro forma information (In millions)	2017	2016
Sales	\$ 3,434	\$ 3,321
Net income (loss)	31	(27)

These amounts have been calculated after applying Ashland's accounting policies and adjusting the results of Pharmachem to reflect the additional depreciation, amortization and interest expense that would have been charged assuming the fair value adjustments to tangible and intangible assets, and the related debt incurred had been applied on October 1, 2015, together with an estimate of the various tax effects.

The unaudited pro forma information presented above is for illustrative purposes only and does not purport to be indicative of the results of future operations of Ashland or the results that would have been attained had the operations been combined during the periods presented.

Vornia Limited

In January 2018, Ashland completed the acquisition of Vornia Limited for \$12 million, of which \$1 million will be paid in future periods. Vornia Limited's principal activity is the design, development and fabrication of customized biomaterial solutions. The purchase price allocation primarily included \$8 million of intellectual property and \$4 million of goodwill and has been included within the Specialty Ingredients reportable segment.

NOTE D – DIVESTITURES

Specialty Ingredients Facility

During 2017, Ashland committed to a plan to reorganize certain operations within the Specialty Ingredients reportable segment resulting in the closure of a manufacturing facility that was previously operational. As a result of this closure, Ashland recorded accelerated depreciation of \$13 million for the remaining value of the machinery and equipment related to this facility, as well as an additional \$1 million reserve for employee costs associated with the facility closure during 2017.

During 2018, Ashland entered into a definitive sale agreement to sell the facility and recognized a loss of \$2 million before tax. The loss was reported within the net loss on acquisitions and divestitures caption within the Statement of Consolidated Comprehensive Income (Loss) for 2018.

Ashland determined this transaction did not qualify for discontinued operations treatment since it did not represent a strategic shift that had or will have a major effect on Ashland's operations and financial results.

Specialty Ingredients Joint Venture

During September 2016, Ashland entered into a definitive sale agreement to sell its ownership interest in a Specialty Ingredients consolidated joint venture. Ashland recognized a loss of \$12 million before tax in 2016 to recognize the assets at fair value less cost to sell, using Level 2 nonrecurring fair value measurements.

During 2017, Ashland completed the transfer of its ownership interest in the joint venture and recognized an additional loss of \$4 million primarily related to a license fee and tax adjustments.

The losses in 2017 and 2016 were reported within the net loss on acquisitions and divestitures caption within the Statements of Consolidated Comprehensive Income (Loss).

Ashland determined this transaction did not qualify for discontinued operations treatment since it did not represent a strategic shift that had or will have a major effect on Ashland's operations and financial results.

NOTE E – DISCONTINUED OPERATIONS

In previous periods, Ashland has divested certain businesses that have qualified as discontinued operations. The operating results from these divested businesses and subsequent adjustments related to ongoing assessments and activities of certain retained liabilities and tax items have been recorded within the discontinued operations caption in the Statements of Consolidated Comprehensive Income (Loss) for all periods presented and are discussed further within this note.

As previously discussed in Notes A and B, Ashland completed the distribution of its remaining 170 million shares of common stock of Valvoline Inc. on May 12, 2017. Ashland determined that the Valvoline separation qualified as a discontinued operation, in accordance with U.S. GAAP, since it represents a strategic shift for Ashland and has a major effect on Ashland's operations and financial results. Accordingly, Valvoline's operating results and cash flows for all periods presented have been classified as discontinued operations within the Consolidated Financial Statements. The activity during 2018 generally represents subsequent adjustments that were made in conjunction with the Tax Matters Agreement.

Ashland is subject to liabilities from claims alleging personal injury caused by exposure to asbestos. Such claims result primarily from indemnification obligations undertaken in 1990 in connection with the sale of Riley Stoker Corporation (Riley), a former subsidiary, which qualified as a discontinued operation and from the acquisition during 2009 of Hercules LLC (formerly Hercules Incorporated), an indirect wholly-owned subsidiary of Ashland. Adjustments to the recorded litigation reserves and related insurance receivables are recorded within the discontinued operations caption. See Note O for more information related to the adjustments on asbestos liabilities and receivables.

During 2014, Ashland completed the sale of the Ashland Water Technologies (Water Technologies) business. Ashland determined that this sale qualified as a discontinued operation, in accordance with U.S. GAAP, since Ashland does not have significant continuing involvement in the Water Technologies business. Ashland has made subsequent adjustments to the discontinued operations caption related to the sale.

During 2011, Ashland completed the sale of substantially all of the assets and certain liabilities of its global distribution business, which previously comprised the Ashland Distribution (Distribution) reportable segment. Ashland determined that this sale qualified as a discontinued operation, in accordance with U.S. GAAP, since Ashland does not have significant continuing involvement in the Distribution business. Ashland has made subsequent adjustments to the discontinued operations caption related to the sale.

Due to the ongoing assessment of certain matters associated with previous divestitures, subsequent adjustments to these divestitures may continue in future periods in the discontinued operations caption in the Statements of Consolidated Comprehensive Income (Loss). Components of amounts reflected in the Statements of Consolidated Comprehensive Income (Loss) related to discontinued operations are presented in the following table for each of the years ended September 30.

(In millions)	2018	2017	2016
Income (loss) from discontinued operations			
Valvoline	\$ (1)	\$ 240	\$ 444
Asbestos-related litigation	14	(31)	(37)
Water Technologies	—	1	7
Distribution	(11)	(5)	(2)
Income before taxes	<u>2</u>	<u>205</u>	<u>412</u>
Income tax benefit (expense)			
Benefit (expense) related to income (loss) from discontinued operations			
Valvoline	—	(81)	(158)
Asbestos-related litigation	(1)	6	7
Water Technologies	3	1	(7)
Distribution	5	2	1
Income from discontinued operations (net of taxes)	<u>\$ 9</u>	<u>\$ 133</u>	<u>\$ 255</u>

Valvoline Separation

The following table presents a reconciliation of the captions within Ashland's Statements of Consolidated Income for the income from discontinued operations attributable to Valvoline for each of the years ended September 30.

(In millions)	2017 (a)	2016
Income from discontinued operations attributable to Valvoline		
Sales	\$ 1,237	\$ 1,929
Cost of sales	(750)	(1,168)
Selling, general and administrative expense	(234)	(314)
Research and development expense	(8)	(13)
Equity and other income	17	20
Operating income of discontinued operations	<u>262</u>	<u>454</u>
Net loss on acquisitions and divestitures	—	(1)
Net interest and other financing expense	(22)	(9)
Pretax income of discontinued operations	240	444
Income tax expense	(81)	(158)
Income from discontinued operations	<u>\$ 159</u>	<u>\$ 286</u>

(a) Results in 2017 reflect activity through May 12, 2017 when Valvoline was fully separated, as previously discussed.

NOTE F – RESTRUCTURING ACTIVITIES

Ashland periodically implements company-wide restructuring programs related to acquisitions, divestitures and other cost reduction programs in order to enhance profitability through streamlined operations and an improved overall cost structure.

Severance costs

During 2018, Ashland announced and initiated a company-wide restructuring program as a result of ongoing strategic asset plans and activities. As part of this restructuring program, Ashland announced a voluntary severance offer (VSO) to certain qualifying employees that were formally approved during 2018. Additionally, during 2018, an involuntary program for employees was also initiated as part of the restructuring program. The VSO and involuntary programs resulted in expense of \$36 million being recognized during 2018, which was primarily recorded within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss). As of September 30, 2018, the severance reserve for the company-wide restructuring program was \$36 million.

Facility costs

Ashland incurred \$9 million of lease abandonment charges during 2018 due to the exit from certain office facilities in conjunction with the company-wide restructuring program. The costs related to this reserve were recorded within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss) and will be paid over the remaining lease terms. As of September 30, 2018, the remaining restructuring reserve for all qualifying facility costs totaled \$7 million.

The following table details at September 30, 2018, the amount of restructuring reserves related to the programs discussed above, and the related activity in these reserves during 2018. The severance reserves and facility cost reserves were primarily included in accrued expenses and other liabilities in the Consolidated Balance Sheet as of September 30, 2018.

(In millions)	Severance costs		Facility costs		Total	
Balance as of September 30, 2017	\$	—	\$	—	\$	—
Reserve adjustments		36		9		45
Utilization (cash paid)		—		(2)		(2)
Balance as of September 30, 2018	\$	<u>36</u>	\$	<u>7</u>	\$	<u>43</u>

Impairments

During 2018, Ashland incurred \$16 million of asset impairment charges primarily related to restructuring activities which were recorded within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss). Of these impairment charges, \$12 million was related to the sale of an office facility. Consistent with historical policies and U.S. GAAP provisions, Ashland recognized the building at fair value using Level 2 nonrecurring fair value measurements.

NOTE G – FAIR VALUE MEASUREMENTS

As required by U.S. GAAP, Ashland uses applicable guidance for defining fair value, the initial recording and periodic remeasurement of certain assets and liabilities measured at fair value and related disclosures for instruments measured at fair value. Fair value accounting guidance establishes a fair value hierarchy, which prioritizes the inputs to valuation techniques used to measure fair value into three broad levels. The fair value hierarchy gives the highest priority to quoted prices in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). An instrument's categorization within the fair value hierarchy is based upon the lowest level of input that is significant to the instrument's fair value measurement. The three levels within the fair value hierarchy are described as follows.

Level 1 – Observable inputs such as unadjusted quoted prices in active markets for identical assets or liabilities.

Level 2 – Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly. These include quoted prices for similar assets or liabilities in active markets and quoted prices for identical or similar assets or liabilities in markets that are not active.

Level 3 – Unobservable inputs for the asset or liability for which there is little, if any, market activity at the measurement date. Unobservable inputs reflect Ashland’s own assumptions about what market participants would use to price the asset or liability. The inputs are developed based on the best information available in the circumstances, which might include Ashland’s own financial data such as internally developed pricing models, discounted cash flow methodologies, as well as instruments for which the fair value determination requires significant management judgment.

For assets that are measured using quoted prices in active markets (Level 1), the total fair value is the published market price per unit multiplied by the number of units held without consideration of transaction costs. Assets and liabilities that are measured using significant other observable inputs (Level 2) are primarily valued by reference to quoted prices of similar assets or liabilities in active markets, adjusted for any terms specific to that asset or liability. For all other assets and liabilities for which unobservable inputs are used (Level 3), fair value is derived through the use of fair value models, such as a discounted cash flow model or other standard pricing models that Ashland deems reasonable.

The following table summarizes financial instruments subject to recurring fair value measurements as of September 30, 2018. For additional information on fair value hierarchy measurements of pension plan asset holdings, see Note N.

(In millions)	Carrying value	Total fair value	Quoted prices in active markets for identical assets Level 1	Significant other observable inputs Level 2	Significant unobservable inputs Level 3
Assets					
Cash and cash equivalents	\$ 294	\$ 294	\$ 294	\$ —	\$ —
Restricted investments (a)	342	342	342	—	—
Deferred compensation investments (b)	165	165	—	165	—
Investments of captive insurance company (b)	3	3	3	—	—
Foreign currency derivatives	11	11	—	11	—
Total assets at fair value	\$ 815	\$ 815	\$ 639	\$ 176	\$ —
Liabilities					
Foreign currency derivatives	\$ 3	\$ 3	\$ —	\$ 3	\$ —

(a) Included in restricted investments and \$30 million within other current assets in the Consolidated Balance Sheets.

(b) Included in other noncurrent assets in the Consolidated Balance Sheets.

The following table summarizes financial instruments subject to recurring fair value measurements as of September 30, 2017.

(In millions)	Carrying value	Total fair value	Quoted prices in active markets for identical assets Level 1	Significant other observable inputs Level 2	Significant unobservable inputs Level 3
Assets					
Cash and cash equivalents	\$ 566	\$ 566	\$ 566	\$ —	\$ —
Restricted investments (a)	332	332	332	—	—
Deferred compensation investments (b)	158	158	—	158	—
Investments of captive insurance company (b)	3	3	3	—	—
Foreign currency derivatives	2	2	—	2	—
Total assets at fair value	\$ 1,061	\$ 1,061	\$ 901	\$ 160	\$ —

Liabilities

Foreign currency derivatives	\$ 36	\$ 36	\$ —	\$ 36	\$ —
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(a) Included in restricted investments and \$30 million within other current assets in the Consolidated Balance Sheets.

(b) Included in other noncurrent assets in the Consolidated Balance Sheets.

Restricted investments

As discussed in Note A, Ashland maintains certain investments in a company restricted renewable annual trust for the purpose of paying future asbestos indemnity and defense costs. The investments are designated as available-for-sale securities, classified as Level 1 measurements within the fair value hierarchy. These securities were classified primarily as noncurrent restricted investment assets, with \$30 million classified within other current assets, in the Consolidated Balance Sheets. The following table provides a summary of the activity within the available-for-sale securities portfolio as of September 30, 2018 and 2017:

(In millions)	2018	2017
Original cost	\$ 335	\$ 335
Accumulated adjustments, net	(38)	(24)
Adjusted cost, beginning of year (a)	297	311
Investment income (b)	8	9
Net unrealized gain	54	35
Realized gain	6	2
Settlement funds	10	2
Disbursements	(33)	(27)
Fair value	\$ 342	\$ 332

(a) The adjusted cost of the demand deposit includes accumulated investment income, realized gains, disbursements and settlements recorded in previous periods.

(b) Investment income relates to the demand deposit and includes interest income as well as dividend income transferred from the equity and corporate bond mutual funds.

The following table presents gross unrealized gains and losses for the available-for-sale securities as of September 30, 2018 and 2017:

(In millions)	Adjusted Cost	Gross		Gross		Fair Value
		Unrealized Gain	Unrealized Loss			
As of September 30, 2018						
Demand Deposit	\$ 20	\$ —	\$ —	\$ —	\$ —	20
Equity Mutual Fund	148	59	—	—	—	207
Corporate bond Mutual Fund	120	—	(5)	—	—	115
Fair value	<u>\$ 288</u>	<u>\$ 59</u>	<u>\$ (5)</u>	<u>\$ —</u>	<u>\$ —</u>	<u>342</u>
As of September 30, 2017						
Demand Deposit	\$ 9	\$ —	\$ —	\$ —	\$ —	9
Equity Mutual Fund	168	34	—	—	—	202
Corporate bond Mutual Fund	120	1	—	—	—	121
Fair value	<u>\$ 297</u>	<u>\$ 35</u>	<u>\$ —</u>	<u>\$ —</u>	<u>\$ —</u>	<u>332</u>

The unrealized gains and losses as of September 30, 2018 and 2017 were recognized within accumulated other comprehensive income (AOCI). No other-than-temporary impairment was recognized in AOCI during 2018 and 2017.

The following table presents the investment income, realized gains and disbursements related to the investments within the portfolio during 2018, 2017 and 2016.

(In millions)	2018	2017	2016
Investment income	\$ 8	\$ 9	\$ 8
Realized gains	6	2	—
Disbursements	(33)	(27)	(33)

Deferred compensation investments

Deferred compensation investments consist of Level 2 measurements within the fair value hierarchy which are comprised primarily of a guaranteed interest fund, a common stock index fund and an intermediate investment grade bond fund. Gains and losses related to deferred compensation investments are immediately recognized within the selling, general and administrative expense caption on the Statements of Consolidated Comprehensive Income (Loss). The gains on these investments were \$10 million, \$11 million and \$10 million during 2018, 2017 and 2016, respectively.

Foreign currency derivatives

Ashland conducts business in a variety of foreign currencies. Accordingly, Ashland regularly uses foreign currency derivative instruments to manage exposure on certain transactions denominated in foreign currencies to curtail potential earnings volatility effects of certain assets and liabilities, including short-term inter-company loans denominated in currencies other than Ashland's functional currency of an entity. These derivative contracts generally require exchange of one foreign currency for another at a fixed rate at a future date and generally have maturities of less than twelve months. All contracts are valued at fair value with net changes in fair value recorded within the selling, general and administrative expense caption. The impacts of these contracts were largely offset by gains and losses resulting from the impact of changes in exchange rates on transactions denominated in non-functional currencies. The following table summarizes the gains and losses recognized during 2018, 2017 and 2016 within the Statements of Consolidated Comprehensive Income (Loss).

(In millions)	2018	2017	2016
Foreign currency derivative gain (loss)	\$ (32)	\$ 3	\$ 6

The following table summarizes the fair values of the outstanding foreign currency derivatives as of September 30, 2018 and 2017 included in accounts receivable and accrued expenses and other liabilities of the Consolidated Balance Sheets.

(In millions)	2018		2017	
Foreign currency derivative assets	\$	11	\$	2
Notional contract values		1,209		79
Foreign currency derivative liabilities	\$	3	\$	36
Notional contract values		755		1,601

Other financial instruments

At September 30, 2018 and 2017, Ashland's long-term debt (including current portion and excluding debt issuance cost discounts) had a carrying value of \$2,307 million and \$2,615 million, respectively, compared to a fair value of \$2,372 million and \$2,768 million, respectively. The fair values of long-term debt are based on quoted market prices or, if market prices are not available, the present values of the underlying cash flows discounted at Ashland's incremental borrowing rates, which are deemed to be Level 2 measurements within the fair value hierarchy.

NOTE H – PROPERTY, PLANT AND EQUIPMENT

The following table describes the various components of property, plant and equipment within the Consolidated Balance Sheets.

(In millions)	2018		2017	
Land	\$	159	\$	150
Buildings		603		547
Machinery and equipment		2,880		2,840
Construction in progress		205		225
Total property, plant and equipment (gross)		3,847		3,762
Accumulated depreciation		(1,948)		(1,792)
Total property, plant and equipment (net)	\$	1,899	\$	1,970

The following table summarizes various property, plant and equipment charges included within the Statements of Consolidated Comprehensive Income.

(In millions)	2018		2017		2016
Depreciation	\$	217	\$	219	\$ 226
Capitalized interest		—		1	1

Accelerated Depreciation

During 2018 and 2017, the termination of a contract at a manufacturing facility resulted in \$6 million and \$1 million, respectively, of accelerated depreciation for the remaining value of the related machinery and equipment. These charges related to the Specialty Ingredients reportable segment and were recorded within the equity and other income (loss) caption of the Statements of Consolidated Comprehensive Income (Loss).

During 2017, Ashland committed to a plan to reorganize certain operations which resulted in the closure of a manufacturing facility that was previously operational. Due to this closure, depreciation included \$13 million of accelerated depreciation for the remaining value of this facility primarily related to machinery and equipment. See Note D for additional information related to this facility. This charge related to the Specialty Ingredients reportable segment and was recorded within the cost of sales caption of the Statement of Consolidated Comprehensive Income (Loss) for 2017.

During 2016, depreciation included \$4 million of accelerated depreciation related to the restructuring plan of an existing manufacturing facility. This charge related to the Specialty Ingredients reportable segment and was recorded within the cost of sales caption of the Statement of Consolidated Comprehensive Income (Loss) for 2016.

During 2018, 2017 and 2016, depreciation also included \$8 million, \$5 million and \$2 million, respectively, of accelerated depreciation within Unallocated and other and was recorded within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income.

NOTE I – GOODWILL AND OTHER INTANGIBLES

Goodwill

Ashland reviews goodwill for impairment annually or when events and circumstances indicate an impairment may have occurred. This annual assessment is performed as of July 1 and consists of Ashland determining each reporting unit's current fair value compared to its current carrying value. Ashland determined that its reporting units for the allocation of goodwill are its three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents.

As part of the goodwill impairment assessment, Ashland compares the carrying value of each reporting unit to its respective estimated fair value. For its July 1, 2018 annual goodwill impairment assessment, Ashland performed an extensive qualitative analysis in order to determine whether it was necessary to perform a quantitative goodwill impairment test. In performing this analysis, Ashland considered relevant events and circumstances such as macroeconomic conditions, industry and market considerations, overall financial performance and changes in management and business strategy, changes in carrying value, among others. Ashland considered how these relevant events and circumstances have changed since its most recent quantitative goodwill impairment test performed in the prior year as of July 1, 2017. After weighting the significance of these factors, Ashland determined that it was more likely than not that the fair value of its reporting units exceeds the current carrying value and that a quantitative impairment test was not necessary to perform. Thus, Ashland concluded no impairment existed for any of its reporting units for its July 1, 2018 annual assessment.

During 2016, due to the deterioration in the butanediol commodity in which Intermediates and Solvents operates, Ashland determined that the carrying value of the Intermediates and Solvents reporting unit exceeded its fair value at July 1, 2016 which resulted in the reporting unit failing the first step of the goodwill impairment test. Ashland then performed the second step of the goodwill impairment test, which involved, among other things, obtaining third-party appraisals of substantially all of Intermediates and Solvents tangible and intangible assets. Based on the results of its goodwill impairment testing as of July 1, 2016, Ashland recorded a pre-tax goodwill impairment charge of \$171 million in the fourth quarter of 2016, which in addition to a \$10 million impairment related to Intermediates and Solvents property, plant and equipment, resulted in a total \$181 million impairment charge for Intermediates and Solvents during 2016. A portion of the goodwill impairment was nondeductible for tax purposes.

Ashland's assessment of an impairment charge on any of these remaining assets currently classified as having indefinite lives, including goodwill, could result in additional impairment charges in future periods if any or all of the following events were to occur with respect to a particular reporting unit: a significant change in projected business results, a divestiture decision, increase in Ashland's weighted-average cost of capital rates, decrease in growth rates or other assumptions, economic deterioration that is more severe or of a longer duration than anticipated, or another significant economic event.

The following is a progression of goodwill by reportable segment for the years ended September 30, 2018 and 2017.

(In millions)	Specialty Ingredients	Composites	Intermediates and Solvents (a)	Total
Balance at September 30, 2016	\$ 1,991	\$ 147	\$ —	\$ 2,138
Acquisition (b)	287	—	—	287
Currency translation	37	3	—	40
Balance at September 30, 2017	2,315	150	—	2,465
Acquisition (c)	5	—	—	5
Currency translation	(16)	(5)	—	(21)
Balance at September 30, 2018	<u>\$ 2,304</u>	<u>\$ 145</u>	<u>\$ —</u>	<u>\$ 2,449</u>

(a) As of September 30, 2018 and 2017, there was accumulated impairment of \$171 million related to the Intermediates and Solvents reportable segment.

(b) Relates to the acquisition of Pharmachem during 2017. See Note C for more information.

(c) Relates to the acquisition of Vornia Limited and subsequent adjustments to the initial purchase price allocation of Pharmachem during 2018. See Note C for more information.

Other intangible assets

Intangible assets principally consist of trademarks and trade names, intellectual property, and customer relationships. Intangible assets classified as finite are amortized on a straight-line basis over their estimated useful lives. The cost of trademarks and trade names is amortized principally over 3 to 25 years, intellectual property over 5 to 25 years and customer and supplier relationships over 3 to 24 years.

As of September 30, 2018 and 2017, certain intangible assets within trademarks and tradenames were classified as indefinite-lived and had a balance of \$301 million. Ashland annually reviews indefinite-lived intangible assets for possible impairment or whenever events or changes in circumstances indicate that carrying amounts may not be recoverable. In conjunction with the July 1, 2018 annual assessment of indefinite-lived intangible assets, Ashland's qualitative and/or quantitative analysis did not indicate any impairment for indefinite-lived intangible assets. Intangible assets were comprised of the following as of September 30, 2018 and 2017.

(In millions)	2018			2017		
	Gross carrying amount	Accumulated amortization	Net carrying amount	Gross carrying amount	Accumulated amortization	Net carrying amount
Definite-lived intangible assets						
Trademarks and trade names	\$ 67	\$ (25)	\$ 42	\$ 67	\$ (22)	\$ 45
Intellectual property	759	(373)	386	757	(326)	431
Customer and supplier relationships	770	(274)	496	777	(235)	542
Total definite-lived intangible assets	<u>1,596</u>	<u>(672)</u>	<u>924</u>	<u>1,601</u>	<u>(583)</u>	<u>1,018</u>
Indefinite-lived intangible assets						
Trademarks and trade names	301	—	301	301	—	301
Total intangible assets	<u>\$ 1,897</u>	<u>\$ (672)</u>	<u>\$ 1,225</u>	<u>\$ 1,902</u>	<u>\$ (583)</u>	<u>\$ 1,319</u>

Amortization expense recognized on intangible assets was \$95 million for 2018, \$82 million for 2017 and \$76 million for 2016, and is primarily included in the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income. As of September 30, 2018, all of Ashland's intangible assets that had a carrying value were being amortized except for certain trademarks and trade names that have been determined to have indefinite lives. Estimated amortization expense for future periods is \$91 million in 2019, \$89 million in 2020, \$89 million in 2021, \$88 million in 2022 and \$88 million in 2023. The amortization expense for future periods is an estimate. Actual amounts may change from such estimated amounts due to fluctuations in foreign currency exchange rates, additional intangible asset acquisitions and divestitures, potential impairment, accelerated amortization, or other events.

NOTE J – DEBT

The following table summarizes Ashland's current and long-term debt at September 30, 2018 and 2017.

(In millions)	2018	2017
4.750% notes, due 2022	\$ 1,083	\$ 1,082
Term loan B, due 2024	593	599
6.875% notes, due 2043	376	376
Term loan A, due 2022	195	250
Accounts receivable securitizations	195	56
6.50% junior subordinated notes, due 2029	52	51
Revolving credit facility	25	173
Medium-term notes, due 2019, interest of 9.4% at September 30, 2018	5	5
Term loan A, due 2020	—	250
Other (a)	5	(23)
Total debt	2,529	2,819
Short-term debt (includes current portion of long-term debt)	(254)	(235)
Long-term debt (less current portion and debt issuance costs)	\$ 2,275	\$ 2,584

(a) Other includes \$21 million and \$25 million of debt issuance costs as of September 30, 2018 and 2017, respectively. Additionally, as of September 30, 2018, other included a European short-term loan facility with an outstanding balance of \$23 million.

At September 30, 2018, Ashland's total debt had an outstanding principal balance of \$2,600 million, discounts of \$50 million and debt issuance costs of \$21 million. The scheduled aggregate maturities of long-term debt for the next five fiscal years (including the current portion and excluding debt issuance costs) are as follows: \$11 million in 2019, \$19 million in 2020, \$56 million in 2021, \$1,224 million in 2022 and \$6 million in 2023.

Credit Agreements and Refinancing

2017 Credit Agreement

On May 17, 2017, in conjunction with the closing of the Pharmachem acquisition, Ashland entered into a secured credit agreement (the 2017 Credit Agreement) with a group of lenders. The 2017 Credit Agreement provided for (i) a \$250 million three-year term loan A facility (the Three-Year TLA Facility), (ii) a \$250 million five-year term loan A facility (the Five-Year TLA Facility and together with the Three-Year TLA Facility, the TLA Facilities) and (iii) a \$680 million five-year revolving credit facility (including a \$125 million letter of credit sublimit) (the 2017 Revolving Credit Facility). Proceeds of borrowings under the TLA Facilities were used solely to finance the acquisition of Pharmachem, while the proceeds of the 2017 Revolving Credit Facility were used to finance, in part, the acquisition of Pharmachem, to refinance the 2015 Senior Credit Agreement and for general corporate purposes. On May 19, 2017, Ashland entered into Amendment No. 1 to the 2017 Credit Agreement, which increased the aggregate commitments under the 2017 Revolving Credit Facility from \$680 million to \$800 million.

At Ashland's option, loans issued under the 2017 Credit Agreement bear interest at either LIBOR or an alternate base rate, in each case plus the applicable interest rate margin. Loans bear interest at LIBOR plus 1.75% per annum, in the case of LIBOR borrowings, or at the alternate base rate plus 0.75%, in the alternative, through and including the date of delivery of a quarterly compliance certificate and thereafter the interest rate will fluctuate between LIBOR plus 1.375% per annum and LIBOR plus 2.500% per annum (or between the alternate base rate plus 0.375% per annum and the alternate base rate plus 1.500% per annum), based upon Ashland's secured facilities ratings or the consolidated net leverage ratio (as defined in the 2017 Credit Agreement) (whichever yields a lower applicable interest rate margin) at such time. In addition, Ashland was required to pay fees of 0.25% per annum on the daily unused amount of the 2017 Revolving Credit Facility through and including the date of delivery of a compliance certificate, and thereafter the fee fluctuates between 0.175% and 0.40% per annum, based upon Ashland's secured facilities rating or the consolidated net leverage ratio (whichever yields a lower applicable rate). The TLA Facilities may be prepaid at any time without premium. The Three-Year TLA Facility will not amortize and had a due date of May 17, 2020. The Five-Year TLA Facility will not amortize in each of the first, second and third years and will amortize at a rate of 20% per annum in each of the fourth and fifth years (payable in equal quarterly installments), with the outstanding balance of the Five-Year TLA Facility to be paid on May 17, 2022.

On June 14, 2017, Ashland entered into Amendment No. 2 to the 2017 Credit Agreement, which provided for a new \$600 million seven-year senior secured term loan B facility (the 2017 TLB Facility). At Ashland's option, loans issued under the 2017 TLB Facility bear interest at either (x) LIBOR plus 2.00% per annum or (y) an alternate base rate plus 1.00% per annum. The 2017 TLB Facility may be prepaid at any time. The 2017 TLB Facility amortizes at a rate of 1.00% per annum (payable in equal quarterly installments) with the outstanding balance to be paid on May 17, 2024.

Ashland incurred \$15 million of new debt issuance costs in connection with the 2017 Credit Agreement, of which \$2 million was expensed immediately during 2017 within the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss). The remaining balance is amortized using the effective interest method. Additionally, as a result of the termination of the 2015 Senior Credit Agreement, Ashland recognized a \$5 million charge for the accelerated amortization of previously capitalized debt issuance costs during 2017, which is included in the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss).

The credit facilities under the 2017 Credit Agreement are guaranteed by Ashland Global Holdings Inc., Ashland Chemco Inc. and Ashland LLC's existing and future subsidiaries (other than certain immaterial subsidiaries, joint ventures, special purpose financing subsidiaries, regulated subsidiaries, foreign subsidiaries and certain other subsidiaries) and are secured by a first-priority security interest in substantially all of the personal property assets of Ashland and the guarantors, including all or a portion of the equity interests of certain of Ashland's domestic subsidiaries and first-tier foreign subsidiaries and, in certain cases, a portion of the equity interests of other foreign subsidiaries. The guarantees by Ashland's subsidiaries and pledge of security interests by such guarantors may, at Ashland's option, be released upon and during the occurrence of a Collateral Release Event (as defined in the 2017 Credit Agreement).

2018 financing activity related to the 2017 Credit Agreement

On May 22, 2018, Ashland entered into Amendment No. 3 to the 2017 Credit Agreement which provided for the re-pricing of the 2017 TLB Facility. Due to this amendment, loans issued under the 2017 TLB Facility bear interest at LIBOR plus 1.75% per annum (previously LIBOR plus 2.00% per annum). All other significant terms of the agreement remained unchanged. Ashland incurred \$1 million of new debt issuance costs in connection with the re-pricing, which was expensed during 2018 within the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss).

During 2018, Ashland utilized cash primarily from repatriations and borrowings from the accounts receivable securitization facilities to fully repay the \$250 million outstanding balance of the Three-Year TLA Facility and to repay \$55 million of the Five-Year TLA Facility. As a result of these repayments, Ashland recognized accelerated amortization of previously capitalized debt issuance costs of less than \$1 million during 2018, which was included in the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss).

Senior notes refinancing, 2015 Senior Credit Agreement and 2016 Amendment

During July 2016, Ashland amended its previous credit agreement (the 2015 Senior Credit Agreement) to permit the Reorganization and series of events relating to the separation of Valvoline Inc. As a result of the July 2016 amendment and the Valvoline debt borrowings in connection with the separation, Ashland reduced its revolving borrowing capacity to \$800 million. The outstanding balance of a previous term loan facility (the 2015 Term Loan Facility) was repaid in full in connection with the combined Ashland and Valvoline financing activities during September 2016. In connection with these transactions, Ashland recognized a \$6 million charge for the accelerated amortization of previously capitalized debt issuance costs, which is included in the net interest and other financing expense caption of the Statements of Consolidated Comprehensive Income (Loss) in 2016.

Debt repayments and repurchases

Cash repatriation

During 2018, Ashland repatriated approximately \$590 million in cash that was primarily used to repay existing debt, principally the 2017 Revolving Credit Facility and the outstanding balance of the Three-Year TLA Facility (as previously discussed).

Redemption of 3.875% notes due 2018

During 2017, Ashland redeemed all of its outstanding 3.875% senior notes due 2018 (2018 Senior Notes), of which approximately \$659 million were outstanding. Proceeds of borrowings under the 2017 TLB Facility, together with cash on hand, were used to pay for the redemption. Ashland recognized a \$13 million charge related to premiums paid and accelerated amortization of previously capitalized debt issuance costs during 2017, which is included in the net interest and other financing expense caption of the Statement of Consolidated Comprehensive Income (Loss).

Open market repurchases of 4.750% notes due 2022 and 3.875% notes due 2018

During 2017, Ashland executed open market repurchases of its 4.750% notes due 2022 (2022 Senior Notes) and its 3.875% notes due 2018 (2018 Senior Notes). As a result of these repurchases, the carrying values of the 2022 and 2018 Senior Notes were reduced by \$39 million and \$41 million, respectively. Ashland recognized a \$3 million charge related to premiums paid in the open market repurchases and accelerated amortization of previously capitalized debt issuance costs during 2017, which is included in the net interest and other financing expense caption of the Statement of Consolidated Comprehensive Income (Loss). As previously discussed, the remaining outstanding amount of the 2018 Senior Notes was redeemed during 2017.

6.50% junior subordinated notes due 2029

In December 2016, Hercules, an indirect wholly-owned subsidiary of Ashland, repurchased, through a cash tender offer, \$182 million of the aggregate principal par value amount of its 6.50% junior subordinated notes due 2029 (2029 Notes) for an aggregate purchase price of \$177 million. As a result, the carrying value of the 2029 Notes was reduced by \$90 million and Ashland recognized a \$92 million charge related to accelerated accretion of the recorded debt discount (compared to the total par value) and \$5 million of a net gain related to the repayment of the debt during 2017. The charge and net gain are included in the net interest and other financing expense caption of the Statement of Consolidated Comprehensive Income (Loss).

Accounts receivable securitizations

2018 accounts receivable securitization

During July 2018, Ashland entered into a €115 million accounts receivable securitization facility (the Program) for the transfer by certain subsidiaries of Ashland (the Sellers) directly or indirectly to Ester Finance Titrisation (the Purchaser), a wholly-owned subsidiary of Crédit Agricole Corporate and Investment Bank (the Arranger), of certain receivables and/or collections originated by the Sellers towards certain corporate debtors located in multiple European jurisdictions and denominated in multiple currencies. The Program has a term of two years.

Under the Program, each Seller will assign, on an ongoing basis, certain of its accounts receivable and the right to the collections on those accounts receivable to the Purchaser. Under the terms of the Program, the Sellers could, from time to time, obtain up to €115 million from the Purchaser through the sale of an undivided interest in such accounts receivable and collections. Ashland accounts for the securitization facility as secured borrowings, and the receivables sold pursuant to the facility are included in the Consolidated Balance Sheets as accounts receivable. Fundings under the Program will be repaid as accounts receivable are collected, with new fundings being advanced (through daily advanced purchase price) as new accounts receivable are originated by the Sellers and assigned to the Purchaser, with settlement occurring monthly. Ashland classifies any borrowings under this facility as a short-term debt instrument within the Consolidated Balance Sheets. Once sold to the Purchaser, the accounts receivable and rights to collection described above are separate and distinct from each Sellers' own assets and are not available to its creditors should such Sellers become insolvent.

At September 30, 2018, the outstanding amount of accounts receivable transferred by Ashland to the Purchaser was \$153 million and there were \$109 million of borrowings (denominated in multiple currencies) under the facility. The weighted-average interest rate for this instrument was 1.8% for 2018.

2012 accounts receivable securitization

On August 31, 2012, Ashland entered into a \$350 million accounts receivable securitization facility pursuant to (i) a Sale Agreement, among Ashland and certain of its direct and indirect subsidiaries (each an Originator and collectively, the Originators) and CVG Capital III LLC, a wholly-owned "bankruptcy remote" special purpose subsidiary of the Originators (CVG) and (ii) a Transfer and Administration Agreement, among CVG, each Originator, Ashland, as Master Servicer, certain

Conduit Investors, Uncommitted Investors, Letter of Credit Issuers, Managing Agents, Administrators and Committed Investors, and The Bank of Nova Scotia, as agent for various secured parties (the Agent). The Transfer and Administration Agreement had a term of three years, but was extendable at the discretion of Ashland and the Investors.

Under the Sale Agreement, each Originator will transfer, on an ongoing basis, certain of its accounts receivable, certain related assets and the right to the collections on those accounts receivable to CVG. Ashland accounts for the securitization facility as secured borrowings, and the receivables sold pursuant to the facility are included in the Consolidated Balance Sheets as accounts receivable. Fundings under the Transfer and Administration Agreement will be repaid as accounts receivable are collected, with new fundings being advanced (through daily reinvestments) as new accounts receivable are originated by the Originators and transferred to CVG, with settlement generally occurring monthly. Ashland continues to classify any borrowings under this facility as a short-term debt instrument within the Consolidated Balance Sheets. Once sold to CVG, the accounts receivable, related assets and rights to collection described above are separate and distinct from each Originator's own assets and are not available to its creditors should such Originator become insolvent. Substantially all of CVG's assets have been pledged to the Agent in support of its obligations under the Transfer and Administration Agreement.

During 2016, the termination date of the commitments under the Transfer and Administration Agreement was extended from December 31, 2015, the previous termination extension date, to March 22, 2017. During March 2017, this facility was extended for an additional year with similar terms as the previous facility agreement. During March 2018, the termination date of the accounts receivable securitization facility was extended from March 2018 to March 2020. The available funding for qualified receivables under the accounts receivable securitization facility increased from \$100 million to \$115 million. No other changes to the agreement are expected to have a significant impact to Ashland's results of operations and financial position.

At September 30, 2018 and 2017, the outstanding amount of accounts receivable transferred by Ashland to CVG was \$166 million and \$155 million, respectively. There were \$86 million of borrowings under the facility as of September 30, 2018, while Ashland had \$56 million of borrowings under the facility as of September 30, 2017. The weighted-average interest rate for this instrument was 2.7% for 2018 and 2.8% for 2017.

Other debt

At September 30, 2018 and 2017, Ashland held other debt totaling \$83 million and \$58 million, respectively, comprised primarily of a European short-term loan facility, the 6.50% notes due 2029 and a medium-term note.

Available borrowing capacity

The borrowing capacity remaining under the 2017 Revolving Credit Facility was \$725 million due to an outstanding balance of \$25 million, as well as a reduction of \$50 million for letters of credit outstanding at September 30, 2018. Ashland's total borrowing capacity at September 30, 2018 was \$754 million, which included \$29 million of available capacity under the two accounts receivable securitization facilities.

Covenants related to current Ashland debt agreements

Ashland's debt contains usual and customary representations, warranties and affirmative and negative covenants, including financial covenants for leverage and interest coverage ratios, limitations on liens, additional subsidiary indebtedness, restrictions on subsidiary distributions, investments, mergers, sale of assets and restricted payments and other customary limitations. As of September 30, 2018, Ashland was in compliance with all debt agreement covenant restrictions.

The maximum consolidated net leverage ratio permitted under Ashland's most recent credit agreement (the 2017 Credit Agreement) is 4.5. The 2017 Credit Agreement defines the consolidated net leverage ratio as the ratio of consolidated indebtedness minus unrestricted cash and cash equivalents to consolidated EBITDA (Covenant Adjusted EBITDA) for any measurement period. In general, the 2017 Credit Agreement defines Covenant Adjusted EBITDA as net income plus consolidated interest charges, taxes, depreciation and amortization expense, fees and expenses related to capital market transactions and proposed or actual acquisitions and divestitures, restructuring and integration charges, non-cash stock and equity compensation expense, and any other nonrecurring expenses or losses that do not represent a cash item in such period or any future period; less any non-cash gains or other items increasing net income. The computation of Covenant Adjusted EBITDA differs from the calculation of EBITDA and Adjusted EBITDA, which have been reconciled on page M-7. In general, consolidated indebtedness includes debt plus all purchase money indebtedness, banker's acceptances and bank guaranties,

deferred purchase price of property or services, attributable indebtedness and guarantees. At September 30, 2018, Ashland's calculation of the consolidated net leverage ratio was 3.4.

The minimum required consolidated interest coverage ratio under the 2017 Credit Agreement during is 3.0. The 2017 Credit Agreement defines the consolidated interest coverage ratio as the ratio of Covenant Adjusted EBITDA to consolidated interest charges for any measurement period. At September 30, 2018, Ashland's calculation of the consolidated interest coverage ratio was 5.4.

Guarantee of senior notes

Ashland Global Holdings Inc. fully and unconditionally guaranteed the 3.875% notes due 2018 (which were fully repaid during 2017), 4.750% notes due 2022 and 6.875% notes due 2043 and has no significant independent assets or operations.

Net interest and other financing expense (income)

(In millions)	2018	2017	2016
Interest expense (a)	\$ 136	\$ 232	\$ 180
Interest income	(4)	(4)	(5)
Available-for-sale securities income (b)	(14)	(11)	(8)
Other financing costs (c)	4	17	6
	<u>\$ 122</u>	<u>\$ 234</u>	<u>\$ 173</u>

(a) Includes \$1 million, \$101 million and \$6 million of accelerated accretion and/or amortization for original issue discounts and debt issuance costs during 2018, 2017 and 2016, respectively.

(b) Represents investment income related to the restricted investments discussed in Note G.

(c) Includes costs of \$16 million related to early redemption premium payments and bondholder consent fees for the 2022 and 2018 Senior Notes and a net gain of \$5 million related to the repayment of the 2029 Notes during 2017.

The following table details the debt issuance cost and original issue discount amortization included in interest expense during 2018, 2017 and 2016.

(In millions)	2018	2017	2016
Normal amortization	\$ 8	\$ 8	\$ 12
Accelerated amortization (a)	1	101	6
Total	<u>\$ 9</u>	<u>\$ 109</u>	<u>\$ 18</u>

(a) Fiscal year 2017 includes \$92 million of accelerated accretion of the recorded debt discount for the 2029 Notes, while the remaining amounts in each year related to the accelerated amortization of debt issuance costs.

NOTE K – OTHER NONCURRENT ASSETS AND LIABILITIES

The following table provides the components of other noncurrent assets in the Consolidated Balance Sheets as of September 30.

(In millions)	2018	2017
Deferred compensation investments	\$ 165	\$ 158
Tax and tax indemnity receivables	74	86
Life insurance policies (a)	52	15
Manufacturing catalyst supplies	40	37
Defined benefit plan assets	35	27
Equity and other unconsolidated investments	29	32
Land use rights	15	16
Environmental insurance receivables	11	14
Debt issuance costs	6	6
Notes receivable	2	5
Other	19	26
	<u>\$ 448</u>	<u>\$ 422</u>

(a) The increase in life insurance policies during 2018 was primarily due to a \$37 million repayment of a corporate-owned life insurance policy loan.

The following table provides the components of other noncurrent liabilities in the Consolidated Balance Sheets as of September 30.

(In millions)	2018		2017	
Tax liabilities	\$	176	\$	179
Environmental remediation reserves		147		121
Deferred compensation		47		50
Other		56		50
	\$	<u>426</u>	\$	<u>400</u>

NOTE L – LEASE COMMITMENTS

Ashland and its subsidiaries are lessees of office buildings, transportation equipment, warehouses and storage facilities, other equipment, facilities and properties under leasing agreements that expire at various dates. Capitalized lease obligations are not significant and are included in long-term debt while capital lease assets are included in property, plant and equipment. Future minimum rental payments at September 30, 2018 were \$31 million in 2019, \$24 million in 2020, \$19 million in 2021, \$14 million in 2022, \$11 million in 2023 and \$88 million in 2024 and later years. Rental expense under operating leases for continuing operations was as follows:

(In millions)	2018		2017		2016
Minimum rentals (including rentals under short-term leases)	\$	54	\$	48	\$ 50
Contingent rentals		—		—	1
Sublease rental income		(1)		(1)	(1)
	\$	<u>53</u>	\$	<u>47</u>	<u>\$ 50</u>

NOTE M – INCOME TAXES

Tax Law Changes

The Tax Cuts and Jobs Act (Tax Act) was enacted on December 22, 2017. The Tax Act reduces the U.S. federal corporate tax rate from 35% to 21%, requires companies to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously tax deferred and creates new taxes on certain foreign sourced earnings. At September 30, 2018, Ashland has not completed the internal accounting assessment for the tax effects of enactment of the Tax Act; however, Ashland determined a reasonable estimate of the effects on our existing deferred tax balances and the one-time transition tax. Ashland recognized a provisional amount during 2018, which is included as a component of income tax expense from continuing operations. Ashland recorded net unfavorable tax adjustments of \$2 million during 2018 primarily related to deferred tax rate changes and a one-time transition tax assessed on foreign cash and unremitted earnings.

Provisional amounts - Deferred tax assets and liabilities

Ashland remeasured certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21%. However, Ashland is still analyzing certain aspects of the Tax Act and refining certain calculations, which could potentially affect the measurement of these balances or potentially give rise to new deferred tax amounts. The provisional amount recorded related to the remeasurement of the deferred tax balance was a favorable tax adjustment of \$139 million during 2018.

Provisional amounts - Foreign tax effects

The one-time transition tax is based on Ashland's total post-1986 earnings and profits (E&P) of foreign subsidiaries that were previously deferred from U.S. income taxes. Ashland recorded a provisional amount for this one-time transition tax of \$128 million during 2018. Ashland has not yet completed its calculation of the total post-1986 E&P for these foreign subsidiaries. In addition, the transition tax is based in part on the amount of those earnings held in cash and other specified assets. This amount may change when Ashland finalizes the calculation of post-1986 foreign E&P previously deferred from U.S. federal taxation and finalizes the amounts held in cash or other specified assets. No additional income taxes have been provided for any remaining undistributed foreign earnings not subject to the transition tax, or any additional outside basis difference inherent in these entities, as management intends to indefinitely reinvest all foreign earnings. Ashland determined

that estimating the amount of unrecognized deferred tax liability related to any remaining undistributed foreign earnings not subject to the transition tax and additional outside basis difference in these entities (i.e., basis difference in excess of that subject to the one-time transition tax) is not practicable at this time.

Global Intangible Low-Taxed Income

Regarding new Global Intangible Low-Taxed Income (GILTI) tax rules, Ashland is allowed to make an accounting policy election to either treat taxes due on future GILTI exclusions in U.S. taxable income as a current period expense when incurred or reflect such portion of the future GILTI exclusions in U.S. taxable income that relate to existing basis differences in our measurement of deferred taxes. Ashland's analysis of the new GILTI rules is incomplete. Accordingly, Ashland has not made a policy election regarding the treatment of the GILTI tax.

Income Tax Provision

A summary of the provision for income taxes related to continuing operations follows.

(In millions)	2018	2017	2016
Current			
Federal	\$ 29	\$ (10)	\$ (56)
State	(1)	—	(8)
Foreign	78	46	68
	<u>106</u>	<u>36</u>	<u>4</u>
Deferred	(97)	(29)	(29)
Income tax expense (benefit)	<u>\$ 9</u>	<u>\$ 7</u>	<u>\$ (25)</u>

Foreign net operating loss carryforwards primarily relate to certain European and Asian Pacific operations and generally may be carried forward. U.S. state net operating loss carryforwards relate to losses within certain states and generally may be carried forward. Temporary differences that give rise to significant deferred tax assets and liabilities as of September 30 are presented in the following table.

(In millions)	2018	2017
Deferred tax assets		
Foreign net operating loss carryforwards (a)	\$ 43	\$ 69
Employee benefit obligations	31	47
Environmental, self-insurance and litigation reserves (net of receivables)	120	192
State net operating loss carryforwards (net of unrecognized tax benefits) (b)	48	62
Compensation accruals	31	72
Credit carryforwards (net of unrecognized tax benefits) (c)	10	26
Other items	33	47
Valuation allowances (d)	(79)	(122)
Total deferred tax assets	<u>237</u>	<u>393</u>
Deferred tax liabilities		
Goodwill and other intangibles (e)	273	432
Property, plant and equipment	215	302
Unremitted earnings	—	6
Total deferred tax liabilities	<u>488</u>	<u>740</u>
Net deferred tax liability	<u>\$ (251)</u>	<u>\$ (347)</u>

(a) Gross net operating loss carryforwards of \$141 million will expire in future years beyond 2020 or have no expiration.

(b) Apportioned net operating loss carryforwards generated of \$1.1 billion will expire in future years as follows: \$69 million in 2019, \$82 million in 2020 and the remaining balance in other future years.

(c) Credit carryforwards consist primarily of foreign tax credits of \$4 million expiring in future years beyond 2020, and miscellaneous tax credits that will expire in 2024 or other future years.

(d) Valuation allowances primarily relate to certain state and foreign net operating loss carryforwards.

(e) The total gross amount of goodwill as of September 30, 2018 expected to be deductible for tax purposes is \$29 million.

The U.S. and foreign components of income from continuing operations before income taxes and a reconciliation of the statutory federal income tax with the provision for income taxes follow. The foreign components of income from continuing operations disclosed in the following table exclude any allocations of certain corporate expenses incurred in the U.S.

(In millions)	2018	2017	2016
Income (loss) from continuing operations before income taxes			
United States	\$ (163)	\$ (376)	\$ (557)
Foreign	277	278	249
Loss from continuing operations before income taxes	<u>\$ 114</u>	<u>\$ (98)</u>	<u>\$ (308)</u>
Income taxes computed at U.S. statutory rate (a)	\$ 28	\$ (34)	\$ (108)
Increase (decrease) in amount computed resulting from			
Tax reform (b)	44	—	—
Uncertain tax positions	(12)	12	24
Foreign dividends, deemed inclusions and other restructuring (c)	48	124	111
Foreign tax credits	(54)	(29)	(93)
Valuation allowance changes (d)	(5)	(3)	33
Research and development credits	(5)	(6)	(9)
State taxes (e)	(2)	(15)	(3)
Goodwill impairment	—	—	55
International rate differential	(55)	(63)	(57)
Other items (f)	22	21	22
Income tax expense (benefit)	<u>\$ 9</u>	<u>\$ 7</u>	<u>\$ (25)</u>

(a) The domestic tax rates are 35% for 2016 and 2017, and 24.5% for 2018. For 2019 and forward, the domestic tax rate is expected to be 21%.

(b) 2018 includes expense of \$187 million related to the one-time transition tax and a benefit of \$143 million related to the deferred rate change. The related foreign tax credits are included within the foreign tax credits caption, the state tax impact of the federal rate change is included within the state taxes caption and the remeasurement of the federal tax effect of uncertain tax positions is included within the uncertain tax positions caption.

(c) 2018 includes a gain recognition of \$6 million, deemed inclusions of \$13 million and tax restructuring costs of \$23 million.

(d) 2018 includes a \$5 million benefit for the release of a foreign tax credit valuation allowance; 2017 includes \$25 million of benefit for the release of a foreign tax credit valuation allowance and \$22 million of expense for state, foreign and domestic federal deferred tax asset valuation allowances net of a NOL write-off offset; 2016 relates to foreign tax credit carryforward and state deferred tax asset valuation allowance establishments.

(e) 2018 includes a \$27 million tax benefit for a valuation reserve release against state net operating losses and \$26 million of tax expense for state tax rate changes; 2017 includes \$6 million of benefit for state tax rate changes primarily related to the final distribution of Valvoline.

(f) 2018 includes \$22 million related to foreign withholding taxes; 2017 includes \$7 million of expense related to foreign withholding taxes, \$5 million of expense for the write-off of a prepaid asset related to an intercompany transaction with a Valvoline legal entity, \$4 million of expense for non-deductible transaction costs primarily related to the Valvoline spin-off and \$6 million of benefit for certain other domestic permanent items; 2016 includes \$25 million of expense for costs associated with the separation of Valvoline.

The 2018 effective tax rate was impacted by jurisdictional income mix and restructuring activities, while U.S. tax reform and other items netted together to have an insignificant tax impact.

The 2017 effective tax rate was impacted by jurisdictional income mix, tax expense related to deemed dividend inclusions and a tax benefit for the reversal of a valuation allowance related to the utilization of foreign tax credits.

The 2016 effective tax rate was impacted by jurisdictional income mix and net unfavorable adjustments primarily related to a nondeductible goodwill impairment for the Intermediates and Solvents division, valuation allowances for domestic attributes, accruals for unrecognized tax benefits and items related to the separation of Valvoline.

Unrecognized tax benefits

U.S. GAAP prescribes a recognition threshold and measurement attribute for the accounting and financial statement disclosure of tax positions taken or expected to be taken in a tax return. The evaluation of a tax position is a two-step process. The first step requires Ashland to determine whether it is more likely than not that a tax position will be sustained upon examination based on the technical merits of the position. The second step requires Ashland to recognize in the financial statements each tax position that meets the more likely than not criteria, measured at the amount of benefit that has a greater than 50% likelihood of being realized. Ashland had \$164 million and \$194 million of unrecognized tax benefits at September 30, 2018 and 2017, respectively. As of September 30, 2018, the total amount of unrecognized tax benefits that, if

recognized, would affect the tax rate for continuing and discontinued operations was \$152 million. The remaining unrecognized tax benefits relate to tax positions for which ultimate deductibility is highly certain but for which there is uncertainty as to the timing of such deductibility. Recognition of these tax benefits would not have an impact on the effective tax rate.

Ashland recognizes interest and penalties related to uncertain tax positions as a component of income tax expense (benefit) in the Statements of Consolidated Comprehensive Income. Such interest and penalties totaled a \$1 million benefit in 2018, \$3 million expense in 2017 and \$5 million expense in 2016. Ashland had \$25 million and \$26 million in interest and penalties related to unrecognized tax benefits accrued as of September 30, 2018 and 2017, respectively.

Changes in unrecognized tax benefits were as follows:

(In millions)		
Balance at September 30, 2016	\$	168
Increases related to positions taken on items from prior years		8
Decreases related to positions taken on items from prior years		(3)
Increases related to positions taken in the current year		14
Lapse of statute of limitations		(3)
Acquisition of Pharmachem		11
Settlement of uncertain tax positions with tax authorities		(1)
Balance at September 30, 2017 (a)		194
Increases related to positions taken on items from prior years		5
Decreases related to positions taken on items from prior years		(40)
Increases related to positions taken in the current year		14
Lapse of statute of limitations		(5)
Settlement of uncertain tax positions with tax authorities		(4)
Balance at September 30, 2018 (a)	\$	164

(a) Ashland has indemnity receivables from Valvoline and Pharmachem for \$39 million and \$48 million of the gross unrecognized tax benefits at September 30, 2018 and 2017, respectively.

From a combination of statute expirations and audit settlements in the next twelve months, Ashland expects a decrease in the amount of accrual for uncertain tax positions of between \$1 million and \$2 million for continuing operations. For the remaining balance as of September 30, 2018, it is reasonably possible that there could be material changes to the amount of uncertain tax positions due to activities of the taxing authorities, settlement of audit issues, reassessment of existing uncertain tax positions or the expiration of applicable statute of limitations; however, Ashland is not able to estimate the impact of these items at this time.

Ashland or one of its subsidiaries files income tax returns in the U.S. federal jurisdiction and various state and foreign jurisdictions. Foreign taxing jurisdictions significant to Ashland include Brazil, Canada, China, Germany, Mexico, Netherlands, Spain, Switzerland and United Kingdom. Ashland is subject to U.S. federal income tax examinations by tax authorities for periods after September 30, 2013 and U.S. state income tax examinations by tax authorities for periods after September 30, 2005. With respect to countries outside of the United States, with certain exceptions, Ashland's foreign subsidiaries are subject to income tax audits for years after 2007.

NOTE N – EMPLOYEE BENEFIT PLANS

Pension plans

Ashland and its subsidiaries have several contributory and noncontributory qualified defined benefit pension plans that generally cover international employees and a small portion of certain U.S. manufacturing union employees. Pension obligations for applicable employees of non-U.S. consolidated subsidiaries are provided for in accordance with local practices and regulations of the respective countries. The majority of these foreign pension plans are closed to new participants while those that remain open relate to areas where jurisdictions require plans to operate within the applicable country.

Benefits for those eligible for Ashland's U.S. pension plans generally are based on employees' years of service and compensation during the years immediately preceding their retirement. The remaining U.S. plans are still open for enrollment for qualifying union employees within certain manufacturing sites.

Other postretirement benefit plans

Ashland and its subsidiaries maintain limited health care for certain eligible employees in the U.S. who are retired or disabled. Ashland shares the costs of providing health care coverage with certain eligible retired employees through premiums, deductibles and coinsurance provisions. Ashland funds its share of the costs of the postretirement benefit plans as the benefits are paid. This benefit obligation was significantly reduced due to the transfer of a substantial portion to Valvoline.

Postretirement health care plans include a limit on Ashland's share of costs for recent and future retirees. The assumed pre-65 health care cost trend rate as of September 30, 2018 was 7.5% and continues to be reduced to 4.5% in 2037 and thereafter. The assumptions used to project the liability anticipate future cost-sharing changes to the written plans that are consistent with the increase in health care cost.

Change in applying discount rate to measure benefit costs

During 2016, Ashland changed the method used to estimate the service and interest cost components of net periodic benefit cost for pension and other postretirement benefits. This change compared to the previous method resulted in a decrease in the service and interest cost components for pension and other postretirement benefit costs during the quarter. Historically, Ashland estimated these service and interest cost components utilizing a single weighted-average discount rate derived from the yield curve used to measure the benefit obligation at the beginning of the period. Ashland elected during 2016 to utilize a full yield curve approach in the estimation of these components by applying the specific spot rates along the yield curve used in the determination of the benefit obligation to the relevant projected cash flows. Ashland made this change to provide a more precise measurement of service and interest costs by improving the correlation between projected benefit cash flows to the corresponding spot yield curve rates. This change did not impact the measurement of Ashland's total benefit obligations or annual net periodic benefit costs as the change in the service and interest costs will be offset in the actuarial gain or loss reported, which typically occurs during the fourth fiscal quarter. Ashland accounted for this change as a change in accounting estimate that is inseparable from a change in accounting principle and accordingly has accounted for it prospectively.

The impact of this discount rate change compared to the previous method decreased the estimated pension and other postretirement benefits service and interest cost by \$27 million for 2016. Ashland's total projected benefit obligation was not impacted by these reductions in service and interest costs as the decrease was substantially offset within the actuarial gain or loss caption when the plans were remeasured during the fiscal year.

Plan Amendments and Remeasurements

During 2017, Ashland discontinued certain post-employment health and life insurance benefits which resulted in a remeasurement gain of \$2 million within the Statements of Consolidated Comprehensive Income.

During 2016, Ashland was required to remeasure certain U.S. pension plans and postretirement benefit plans due to various plan amendments. As a result of these remeasurements, Ashland recognized a loss of \$18 million within the Statements of Consolidated Comprehensive Income.

Plan Transfers

During September 2016, Ashland transferred a substantial portion of its largest U.S. qualified pension and non-qualified U.S. pension plans as well as certain other postretirement obligations to Valvoline Inc. As of September 30, 2016, the net pension and other postretirement plan liabilities that transferred to Valvoline Inc. totaled \$886 million.

The disclosures within this footnote exclude these amounts that were transferred and only relate to plans Ashland currently records within continuing operations, except for the net periodic benefit cost and weighted-average plan assumptions table which, in accordance with U.S. GAAP, required certain amounts of the transferred plans to be included in continuing operations.

Net periodic benefit costs (income) allocation

Consistent with Ashland's historical accounting policies, service cost for continuing operations is proportionately allocated to each reportable segment, excluding the Unallocated and other segment, while all other costs for continuing operations are recorded within the Unallocated and other segment.

The following table summarizes the components of pension and other postretirement benefit costs for continuing operations and the assumptions used to determine net periodic benefit costs (income) for the plans. During 2016, certain curtailments and actuarial adjustments related to plans that transferred to Valvoline Inc. were required, in accordance with US GAAP, to be recorded within Ashland's continuing operations within the Statements of Consolidated Comprehensive Income (Loss) and totaled \$78 million. As a result, comparisons between fiscal years within the components of pension and other postretirement benefit cost table, including weighted-average plan assumptions, are significantly impacted by the inclusion of these costs and plans within continuing operations during 2016.

(In millions)	Pension benefits			Other postretirement benefits		
	2018	2017	2016	2018	2017	2016
Net periodic benefit costs (income)						
Service cost (a)	\$ 9	\$ 8	\$ 21	\$ 1	\$ 1	\$ 1
Interest cost (b)	10	8	94	1	2	3
Curtailment, settlement and other (b)	—	—	(64)	—	—	(34)
Expected return on plan assets (b)	(12)	(11)	(149)	—	—	—
Amortization of prior service credit (b)	—	—	(1)	—	—	(11)
Actuarial (gain) loss (b)	(12)	—	208	—	6	32
	<u>\$ (5)</u>	<u>\$ 5</u>	<u>\$ 109</u>	<u>\$ 2</u>	<u>\$ 9</u>	<u>\$ (9)</u>
Weighted-average plan assumptions (c)						
Discount rate for service cost	2.51%	1.92%	3.95%	3.93%	3.93%	4.07%
Discount rate for interest cost	2.52%	2.22%	3.30%	3.13%	2.86%	2.57%
Rate of compensation increase	2.55%	2.80%	3.04%			
Expected long-term rate of return on plan assets	3.33%	3.41%	6.71%			

(a) Service cost was not impacted by new accounting guidance adopted in 2018 and is therefore still classified within the selling, general and administrative expense and cost of sales captions on the Statements of Consolidated Comprehensive Income (Loss). See Note A for additional information.

(b) These components are now classified within the other net periodic benefit income (costs) caption on the Statements of Consolidated Comprehensive Income (Loss) due to the adoption of new accounting guidance in 2018. See Note A for additional information.

(c) The plan assumptions discussed are a blended weighted-average rate for Ashland's U.S. and non-U.S. plans.

There were no changes in prior service credit recognized in accumulated other comprehensive income during both 2018 and 2017. At September 30, 2018, Ashland expects to recognize \$1 million of the prior service credit in accumulated other comprehensive income as net periodic benefit cost (income) during the next fiscal year.

At September 30, 2018 and 2017, the amounts included in accumulated other comprehensive income are shown in the following table.

(In millions)	Pension		Postretirement	
	2018	2017	2018	2017
Prior service credit	\$ (4)	\$ (3)	\$ —	\$ —

Obligations and funded status

Actuarial valuations are performed for the pension and other postretirement benefit plans to determine Ashland's obligation for each plan. In accordance with U.S. GAAP, Ashland recognizes the unfunded status of the plans as a liability in the Consolidated Balance Sheets. Summaries of the change in benefit obligations, plan assets, funded status of the plans, amounts recognized in the balance sheet, and assumptions used to determine the benefit obligations for 2018 and 2017 are as follows.

(In millions)	Pension plans		Other postretirement benefit plans	
	2018	2017	2018	2017
Change in benefit obligations				
Benefit obligations at October 1	\$ 455	\$ 448	\$ 62	\$ 59
Service cost	9	8	1	1
Interest cost	10	8	1	2
Participant contributions	1	1	—	—
Benefits paid	(14)	(12)	(6)	(6)
Actuarial (gain) loss	(14)	(20)	—	6
Foreign currency exchange rate changes	(6)	13	—	—
Other	(2)	17	—	—
Curtailment and settlement	(8)	(8)	—	—
Benefit obligations at September 30	<u>\$ 431</u>	<u>\$ 455</u>	<u>\$ 58</u>	<u>\$ 62</u>
Change in plan assets				
Value of plan assets at October 1	\$ 355	\$ 353	\$ —	\$ —
Actual return on plan assets	10	(9)	—	—
Employer contributions	9	7	—	—
Participant contributions	1	1	—	—
Benefits paid	(14)	(12)	—	—
Foreign currency exchange rate changes	(6)	8	—	—
Other	(9)	7	—	—
Value of plan assets at September 30	<u>\$ 346</u>	<u>\$ 355</u>	<u>\$ —</u>	<u>\$ —</u>
Unfunded status of the plans	<u>\$ (85)</u>	<u>\$ (100)</u>	<u>\$ (58)</u>	<u>\$ (62)</u>
Amounts recognized in the balance sheet				
Noncurrent benefit assets	\$ 35	\$ 27	\$ —	\$ —
Current benefit liabilities	(3)	(3)	(4)	(4)
Noncurrent benefit liabilities	(117)	(124)	(54)	(58)
Net amount recognized	<u>\$ (85)</u>	<u>\$ (100)</u>	<u>\$ (58)</u>	<u>\$ (62)</u>
Weighted-average plan assumptions				
Discount rate	2.92%	2.66%	4.24%	3.66%
Rate of compensation increase	2.55%	2.80%		

The accumulated benefit obligation for all pension plans was \$420 million at September 30, 2018 and \$441 million at September 30, 2017. All Ashland pension plans are either qualified U.S. or non-US plans. Information for pension plans with an accumulated benefit obligation in excess of plan assets follows:

(In millions)	2018	2017
Projected benefit obligation	\$ 254	\$ 254
Accumulated benefit obligation	244	239
Fair value of plan assets	134	126

Plan assets

The expected long-term rate of return on pension plan assets was 3.33% and 3.41% for 2018 and 2017, respectively. The basis for determining the expected long-term rate of return is a combination of future return assumptions for various asset classes in Ashland's investment portfolio, historical analysis of previous returns, market indices and a projection of inflation.

The following table summarizes the various investment categories that the pension plan assets are invested in and the applicable fair value hierarchy that the financial instruments are classified within these investment categories as of September 30, 2018. For additional information and a detailed description of each level within the fair value hierarchy, see Note G.

(In millions)	Total fair value	Quoted prices in active markets for identical assets Level 1	Significant other observable inputs Level 2	Significant unobservable inputs Level 3
Cash and cash equivalents	\$ 6	\$ 6	\$ —	\$ —
U.S. Government securities	19	—	19	—
Non-U.S. Government securities	56	—	56	—
Corporate debt instruments	147	—	147	—
Listed real assets	10	—	10	—
Asset-backed securities	22	—	22	—
Corporate stocks	31	—	31	—
Insurance contracts	55	—	55	—
Total assets at fair value	\$ 346	\$ 6	\$ 340	\$ —

The following table summarizes the various investment categories that the pension plan assets are invested in and the applicable fair value hierarchy that the financial instruments are classified within these investment categories as of September 30, 2017.

(In millions)	Total fair value	Quoted prices in active markets for identical assets Level 1	Significant other observable inputs Level 2	Significant unobservable inputs Level 3
Cash and cash equivalents	\$ 18	\$ 18	\$ —	\$ —
Non-U.S. Government securities	103	—	103	—
Corporate debt instruments	123	—	123	—
Corporate stocks	67	—	67	—
Insurance contracts	44	—	44	—
Total assets at fair value	\$ 355	\$ 18	\$ 337	\$ —

Ashland's pension plan holds a variety of investments designed to diversify risk. Investments classified as a Level 1 fair value measure principally represent marketable securities priced in active markets. Cash and cash equivalents and public equity and debt securities are well diversified and invested in U.S. and international small-to-large companies across various asset managers and styles. Investments classified as a Level 2 fair value measure principally represents fixed-income securities and other investment grade corporate bonds and debt obligations.

Investments and Strategy

In developing an investment strategy for its defined benefit plans, Ashland has considered the following factors: the nature of the plans' liabilities, the allocation of liabilities between active, deferred and retired members, the funded status of the plans, the applicable investment horizon, the respective size of the plans and historical and expected capital market returns. Ashland's U.S. pension plan assets are managed by outside investment managers, which are monitored against investment return benchmarks and Ashland's established investment strategy. Investment managers are selected based on an analysis of, among other things, their investment process, historical investment results, frequency of management turnover, cost structure and assets under management. Assets are periodically reallocated between investment managers to maintain an appropriate asset mix and diversification of investments and to optimize returns.

The current target asset allocation for the U.S. plans is 49% fixed securities, 38% equity securities and 13% other securities. Fixed income securities primarily includes cash and cash equivalents, long duration corporate debt obligations and U.S. government debt obligations. In addition, Ashland's non-U.S. plan fixed income securities include insurance contracts. Equity securities are comprised solely of traditional public equity investments. Investment managers may employ a limited use of derivatives to gain efficient exposure to markets.

Ashland's investment strategy and management practices relative to plan assets of non-U.S. plans generally are consistent with those for U.S. plans, except in those countries where investment of plan assets is dictated by applicable regulations. Although the investment allocation may vary based on funding percentages and whether plans are still accruing additional liabilities, the weighted-average asset allocations for Ashland's U.S. and non-U.S. plans at September 30, 2018 and 2017 by asset category follow.

(In millions)	Target	Actual at September 30	
		2018	2017
Plan assets allocation			
Equity securities	5 - 45%	9%	19%
Fixed income securities	55 - 95%	88%	81%
Other	0 - 5%	3%	0%
		100%	100%

Cash flows

During 2018 and 2017, Ashland contributed \$1 million to its U.S. pension plans each year and \$8 million and \$6 million, respectively, to its non-U.S. pension plans. Ashland expects to contribute approximately \$1 million to its U.S. pension plans and \$8 million to its non-U.S. pension plans during 2019.

The following benefit payments, which reflect future service expectations, are projected to be paid from plan assets in each of the next five years and in aggregate for five years thereafter.

(In millions)	Pension benefits		Other postretirement benefits
2019	\$	20	\$ 4
2020		17	4
2021		17	4
2022		18	4
2023		19	4
2024 - 2028		104	20

Other plans

Ashland sponsors savings plans to assist eligible employees in providing for retirement or other future needs. Under such plans, company contributions amounted to \$25 million in 2018, \$26 million in 2017 and \$35 million in 2016. Ashland also sponsors various other employee benefit plans, some of which are required by different countries. The total noncurrent liabilities associated with these plans were \$8 million and \$9 million as of September 30, 2018 and 2017, respectively.

NOTE O – LITIGATION, CLAIMS AND CONTINGENCIES

Asbestos litigation

Ashland and Hercules have liabilities from claims alleging personal injury caused by exposure to asbestos. To assist in developing and annually updating independent reserve estimates for future asbestos claims and related costs given various assumptions, Ashland retained third party actuarial experts. Prior to 2018, Ashland retained Hamilton, Rabinovitz & Associates, Inc. (HR&A). During 2018, Ashland transitioned these responsibilities to Nathan Associates, Inc. (Nathan). The processes and methodologies used by Nathan are consistent with the ones historically employed by HR&A. The methodology used by Nathan to project future asbestos costs is based largely on recent experience, including claim-filing and settlement rates, disease mix, enacted legislation, open claims and litigation defense. The claim experience of Ashland and Hercules are separately compared to the results of previously conducted third party epidemiological studies estimating the number of people likely to develop asbestos-related diseases. Those studies were undertaken in connection with national analyses of the population expected to have been exposed to asbestos. Using that information, Nathan estimates a range of the number of future claims that may be filed, as well as the related costs that may be incurred in resolving those claims. Changes in asbestos-related liabilities and receivables are recorded on an after-tax basis within the discontinued operations caption in the Statements of Consolidated Comprehensive Income (Loss).

Ashland asbestos-related litigation

The claims alleging personal injury caused by exposure to asbestos asserted against Ashland result primarily from indemnification obligations undertaken in 1990 in connection with the sale of Riley, a former subsidiary. The amount and timing of settlements and number of open claims can fluctuate from period to period. A summary of Ashland asbestos claims activity, excluding Hercules claims, follows.

(In thousands)	2018	2017	2016
Open claims - beginning of year	54	57	60
New claims filed	2	2	2
Claims settled	(1)	(1)	—
Claims dismissed	(2)	(4)	(5)
Open claims - end of year	53	54	57

Ashland asbestos-related liability

From the range of estimates, Ashland records the amount it believes to be the best estimate of future payments for litigation defense and claim settlement costs, which generally approximates the mid-point of the estimated range of exposure from model results. Ashland reviews this estimate and related assumptions quarterly and annually updates the results of a non-inflated, non-discounted approximate 50-year model developed with the assistance of Nathan.

During the most recent update completed during 2018, it was determined that the liability for Ashland asbestos-related claims should be decreased by \$8 million. Total reserves for asbestos claims were \$380 million at September 30, 2018 compared to \$419 million at September 30, 2017.

A progression of activity in the asbestos reserve is presented in the following table.

(In millions)	2018	2017	2016
Asbestos reserve - beginning of year	\$ 419	\$ 415	\$ 409
Reserve adjustment	(8)	36	37
Amounts paid	(31)	(32)	(31)
Asbestos reserve - end of year (a)	\$ 380	\$ 419	\$ 415

(a) Included \$30 million and \$34 million classified in accrued expenses and other liabilities on the Consolidated Balance Sheets as of September 30, 2018 and 2017, respectively.

Ashland asbestos-related receivables

Ashland has insurance coverage for certain litigation defense and claim settlement costs incurred in connection with its asbestos claims, and coverage-in-place agreements exist with the insurance companies that provide substantially all of the coverage that will be accessed.

For the Ashland asbestos-related obligations, Ashland has estimated the value of probable insurance recoveries associated with its asbestos reserve based on management's interpretations and estimates surrounding the available or applicable insurance coverage, including an assumption that all solvent insurance carriers remain solvent. Substantially all of the estimated receivables from insurance companies are expected to be due from domestic insurers, all of which are solvent.

At September 30, 2018, Ashland's receivable for recoveries of litigation defense and claim settlement costs from insurers amounted to \$140 million (excluding the Hercules receivable for asbestos claims). Receivables from insurers amounted to \$155 million at September 30, 2017. During 2018, the annual update of the model used for purposes of valuing the asbestos reserve and its impact on valuation of future recoveries from insurers, was completed. This model update resulted in a \$5 million decrease in the receivable for probable insurance recoveries.

A progression of activity in the Ashland insurance receivable is presented in the following table.

(In millions)	2018	2017	2016
Insurance receivable - beginning of year	\$ 155	\$ 151	\$ 150
Receivable adjustment	(5)	15	16
Insurance settlement	—	(5)	(4)
Amounts collected	(10)	(6)	(11)
Insurance receivable - end of year (a)	<u>\$ 140</u>	<u>\$ 155</u>	<u>\$ 151</u>

(a) Included \$15 million and \$14 million classified in accounts receivable on the Consolidated Balance Sheets as of September 30, 2018 and 2017, respectively.

Hercules asbestos-related litigation

Hercules has liabilities from claims alleging personal injury caused by exposure to asbestos. Such claims typically arise from alleged exposure to asbestos fibers from resin encapsulated pipe and tank products which were sold by one of Hercules' former subsidiaries to a limited industrial market. The amount and timing of settlements and number of open claims can fluctuate from period to period. A summary of Hercules' asbestos claims activity follows.

(In thousands)	2018	2017	2016
Open claims - beginning of year	12	15	20
New claims filed	2	1	1
Claims dismissed	(1)	(4)	(6)
Open claims - end of year	<u>13</u>	<u>12</u>	<u>15</u>

Hercules asbestos-related liability

From the range of estimates, Ashland records the amount it believes to be the best estimate of future payments for litigation defense and claim settlement costs, which generally approximates the mid-point of the estimated range of exposure from model results. Ashland reviews this estimate and related assumptions quarterly and annually updates the results of a non-inflated, non-discounted approximate 50-year model developed with the assistance of Nathan. As a result of the most recent annual update of this estimate, completed during 2018, it was determined that the liability for Hercules asbestos-related claims should be decreased by \$19 million. Total reserves for asbestos claims were \$282 million at September 30, 2018 compared to \$323 million at September 30, 2017.

A progression of activity in the asbestos reserve is presented in the following table.

(In millions)	2018		2017		2016
Asbestos reserve - beginning of year	\$	323	\$	321	\$ 311
Reserve adjustments		(19)		16	25
Amounts paid		(22)		(14)	(15)
Asbestos reserve - end of year (a)	\$	<u>282</u>	\$	<u>323</u>	\$ <u>321</u>

(a) Included \$20 million and \$14 million classified in accrued expenses and other liabilities on the Consolidated Balance Sheets as of September 30, 2018 and 2017, respectively.

Hercules asbestos-related receivables

For the Hercules asbestos-related obligations, certain reimbursement obligations pursuant to coverage-in-place agreements with insurance carriers exist. As a result, any increases in the asbestos reserve have been partially offset by probable insurance recoveries. Ashland has estimated the value of probable insurance recoveries associated with its asbestos reserve based on management's interpretations and estimates surrounding the available or applicable insurance coverage, including an assumption that all solvent insurance carriers remain solvent. The estimated receivable consists exclusively of solvent domestic insurers.

As of September 30, 2018 and 2017, the receivables from insurers amounted to \$54 million and \$68 million, respectively. During 2018, the annual update of the model used for purposes of valuing the asbestos reserve and its impact on valuation of future recoveries from insurers was completed. This model update resulted in a \$14 million decrease in the receivable for probable insurance recoveries.

A progression of activity in the Hercules insurance receivable is presented in the following table.

(In millions)	2018		2017		2016
Insurance receivable - beginning of year	\$	68	\$	63	\$ 56
Receivable adjustment		(14)		5	7
Insurance receivable - end of year	\$	<u>54</u>	\$	<u>68</u>	\$ <u>63</u>

Asbestos litigation cost projection

Projecting future asbestos costs is subject to numerous variables that are extremely difficult to predict. In addition to the significant uncertainties surrounding the number of claims that might be received, other variables include the type and severity of the disease alleged by each claimant, the long latency period associated with asbestos exposure, mortality rates, dismissal rates, costs of medical treatment, the impact of bankruptcies of other companies that are co-defendants in claims, uncertainties surrounding the litigation process from jurisdiction to jurisdiction and from case to case, and the impact of potential changes in legislative or judicial standards. Furthermore, any predictions with respect to these variables are subject to even greater uncertainty as the projection period lengthens. In light of these inherent uncertainties, Ashland believes that the asbestos reserves for Ashland and Hercules represent the best estimate within a range of possible outcomes. As a part of the process to develop these estimates of future asbestos costs, a range of long-term cost models was developed. These models are based on national studies that predict the number of people likely to develop asbestos-related diseases and are heavily influenced by assumptions regarding long-term inflation rates for indemnity payments and legal defense costs, as well as other variables mentioned previously. Ashland has currently estimated in various models ranging from approximately 40 to 50 year periods that it is reasonably possible that total future litigation defense and claim settlement costs on an inflated and undiscounted basis could range as high as approximately \$600 million for the Ashland asbestos-related litigation (current reserve of \$380 million) and approximately \$450 million for the Hercules asbestos-related litigation (current reserve of \$282 million), depending on the combination of assumptions selected in the various models. If actual experience is worse than projected, relative to the number of claims filed, the severity of alleged disease associated with those claims or costs incurred to resolve those claims, or actuarial refinement or improvements to the assumptions used within these models are initiated, Ashland may need to further increase the estimates of the costs associated with asbestos claims and these increases could be material over time.

Environmental remediation and asset retirement obligations

Ashland is subject to various federal, state and local environmental laws and regulations that require environmental assessment or remediation efforts (collectively environmental remediation) at multiple locations. At September 30, 2018, such locations included 81 waste treatment or disposal sites where Ashland has been identified as a potentially responsible party under Superfund or similar state laws, 116 current and former operating facilities and about 1,225 service station properties, of which 35 are being actively remediated.

Ashland's reserves for environmental remediation and related environmental litigation amounted to \$187 million at September 30, 2018 compared to \$163 million at September 30, 2017, of which \$147 million at September 30, 2018 and \$121 million at September 30, 2017 were classified in other noncurrent liabilities on the Consolidated Balance Sheets. The remaining reserves were classified in accrued expenses and other liabilities on the Consolidated Balance Sheets.

The following table provides a reconciliation of the changes in the environmental remediation reserves during 2018 and 2017.

(In millions)		2018		2017
Environmental remediation reserve - beginning of year	\$	163	\$	177
Disbursements		(37)		(32)
Revised obligation estimates and accretion		61		18
Environmental remediation reserve - end of year	\$	<u>187</u>	\$	<u>163</u>

The total reserves for environmental remediation reflect Ashland's estimates of the most likely costs that will be incurred over an extended period to remediate identified conditions for which the costs are reasonably estimable, without regard to any third-party recoveries. Engineering studies, probability techniques, historical experience and other factors are used to identify and evaluate remediation alternatives and their related costs in determining the estimated reserves for environmental remediation. Ashland continues to discount certain environmental sites and regularly adjusts its reserves as environmental remediation continues. Ashland has estimated the value of its probable insurance recoveries associated with its environmental reserve based on management's interpretations and estimates surrounding the available or applicable insurance coverage. At September 30, 2018 and 2017, Ashland's recorded receivable for these probable insurance recoveries was \$12 million and \$15 million, respectively, of which \$11 million and \$14 million, respectively, were classified in other noncurrent assets in the Consolidated Balance Sheets.

During 2018, Ashland recognized \$60 million of expense for certain environmental liabilities. Of that amount, \$18 million related to one site where, after significant research and analysis as part of Ashland's normal process and protocol for these matters, the estimated cost for the ongoing remediation was finalized. As such, Ashland recorded the expense for this remediation project during 2018 since a reasonable estimate that is in accordance with U.S. GAAP provisions could be determined. The remaining charges in 2018 related to normal ongoing remediation cost estimate updates for sites, which is consistent with Ashland's historical environmental accounting policy.

Components of environmental remediation expense included within the selling, general and administrative expense caption of the Statements of Consolidated Comprehensive Income (Loss) are presented in the following table for the years ended September 30, 2018, 2017 and 2016.

(In millions)		2018		2017		2016
Environmental expense	\$	60	\$	17	\$	33
Accretion		1		1		2
Legal expense		6		8		8
Total expense		<u>67</u>		<u>26</u>		<u>43</u>
Insurance receivable		(2)		(2)		(3)
Total expense, net of receivable activity (a)	\$	<u>65</u>	\$	<u>24</u>	\$	<u>40</u>

(a) Net expense of \$5 million, \$3 million and \$2 million for the fiscal years ended September 30, 2018, 2017 and 2016, respectively, related to divested businesses which qualified for treatment as discontinued operations and for which certain environmental liabilities were retained by Ashland. These amounts are classified within the income from discontinued operations caption of the Statements of Consolidated Comprehensive Income (Loss).

Environmental remediation reserves are subject to numerous inherent uncertainties that affect Ashland's ability to estimate its share of the costs. Such uncertainties involve the nature and extent of contamination at each site, the extent of required cleanup efforts under existing environmental regulations, widely varying costs of alternate cleanup methods, changes in environmental regulations, the potential effect of continuing improvements in remediation technology, and the number and financial strength of other potentially responsible parties at multiparty sites. Although it is not possible to predict with certainty the ultimate costs of environmental remediation, Ashland currently estimates that the upper end of the reasonably possible range of future costs for identified sites could be as high as approximately \$430 million. The largest reserve for any site is 14% of the remediation reserve.

Other legal proceedings and claims

In addition to the matters described above, there are other various claims, lawsuits and administrative proceedings pending or threatened against Ashland and its current and former subsidiaries. Such actions are with respect to commercial matters, product liability, toxic tort liability, and other environmental matters, which seek remedies or damages, some of which are for substantial amounts. While Ashland cannot predict with certainty the outcome of such actions, it believes that adequate reserves have been recorded and losses already recognized with respect to such actions were immaterial as of September 30, 2018 and 2017. There is a reasonable possibility that a loss exceeding amounts already recognized may be incurred related to these actions; however, Ashland believes that such potential losses were immaterial as of September 30, 2018 and 2017.

NOTE P – EQUITY ITEMS

Stock repurchase programs

In April 2015, Ashland's Board of Directors approved a \$1 billion share repurchase authorization (the 2015 stock repurchase program) that was set to expire on December 31, 2017. In September 2017, Ashland's Board of Directors extended the 2015 stock repurchase program indefinitely, at which point \$500 million of share repurchase authorization remained under the 2015 stock repurchase program.

During March 2018, Ashland's Board of Directors approved a new \$1 billion stock repurchase program, which replaced the 2015 stock repurchase program. Under the new program, Ashland's common shares may be repurchased in open market transactions, privately negotiated transactions or pursuant to one or more accelerated stock repurchase programs or Rule 10b5-1 plans. As of September 30, 2018, \$1 billion remained available for repurchase under this authorization.

Stock repurchase program agreements

In November 2015, under the 2015 stock repurchase program, Ashland announced that it entered into an accelerated share repurchase agreement (2016 ASR Agreement) with Goldman Sachs & Co. Under the 2016 ASR Agreement, Ashland paid an initial purchase price of \$500 million and received an initial delivery of approximately 3.9 million shares of common stock during November 2015. In February 2016, Goldman Sachs & Co. exercised their early termination option under the 2016 ASR Agreement and the pricing period was closed. The settlement price, which represents the weighted average price of Ashland's common stock over the pricing period less a discount, was \$99.01 per share. Based on this settlement price, the final number of shares repurchased by Ashland that were delivered by Goldman Sachs & Co. under the 2016 ASR Agreement was 5.1 million shares. Ashland received the additional 1.2 million shares during 2016 to settle the difference between the initial share delivery and the total number of shares repurchased.

Stockholder dividends

Ashland paid dividends per common share of \$0.95, \$1.23 and \$1.56 during 2018, 2017 and 2016, respectively.

In May 2018, the Board of Directors of Ashland announced a quarterly cash dividend of 25 cents per share to eligible stockholders at record, which represented an increase from the previous quarterly cash dividend of 22.5 cents per share. This dividend was paid in the third quarter and fourth quarters of fiscal 2018.

During May 2017, subsequent to the final distribution of Valvoline Inc.'s common stock, the Board of Directors announced a quarterly cash dividend of 22.5 cents per share to eligible shareholders at record, which was paid for quarterly dividends in the first and second quarter quarters of fiscal 2018 and the third and fourth quarters of fiscal 2017. This represented a reduction from the previous quarterly dividend of 39 cents per share paid during the first and second quarters of fiscal 2017 and each quarter of fiscal 2016.

Shares reserved for issuance

At September 30, 2018, 15.7 million common shares were reserved for issuance under stock incentive and deferred compensation plans.

Other comprehensive income (loss)

Components of other comprehensive income (loss) recorded in the Statements of Consolidated Comprehensive Income (Loss) are presented in the following table, before tax and net of tax effects.

(In millions)	Before tax	Tax (expense) benefit	Net of tax
Year ended September 30, 2018			
Other comprehensive income (loss)			
Unrealized translation loss	\$ (82)	\$ —	\$ (82)
Net change in available-for-sale securities:			
Unrealized gain on available-for-sale securities	24	(7)	17
Reclassification adjustment for gains included in net income	(6)	2	(4)
Total other comprehensive loss	<u>\$ (64)</u>	<u>\$ (5)</u>	<u>\$ (69)</u>
Year ended September 30, 2017			
Other comprehensive income (loss)			
Unrealized translation gain	\$ 80	\$ 1	\$ 81
Amortization of unrecognized prior service credits included in net income (a)			
	(7)	3	(4)
Net change in available-for-sale securities:			
Unrealized gain on available-for-sale securities	24	(8)	16
Reclassification adjustment for gains included in net income	(2)	1	(1)
Total other comprehensive income	<u>\$ 95</u>	<u>\$ (3)</u>	<u>\$ 92</u>
Year ended September 30, 2016			
Other comprehensive income (loss)			
Unrealized translation loss	\$ (15)	\$ 1	\$ (14)
Pension and postretirement obligation adjustment:			
Adjustment of unrecognized prior service cost	86	(31)	55
Amortization of unrecognized prior service credits included in net income (a)			
	(60)	19	(41)
Unrealized gain on available-for-sale securities	28	(11)	17
Total other comprehensive income	<u>\$ 39</u>	<u>\$ (22)</u>	<u>\$ 17</u>

(a) Amortization of unrecognized prior service credits are included in the calculation of net periodic benefit costs (income) for pension and other postretirement plans. For specific financial statement captions impacted by the amortization see the table below.

In accordance with U.S. GAAP, as disclosed in the table above, certain pension and other postretirement costs (income) are amortized from accumulated other comprehensive income and recognized in net income. The captions on the Statements of Consolidated Comprehensive Income (Loss) impacted by the amortization of unrecognized prior service credits for pension and other postretirement plans are disclosed below. During 2016, the amortization of unrecognized prior service credits included the curtailment impact of certain pension and other postretirement plan remeasurements related to plan amendments of \$40 million.

(In millions)	2018		2017		2016
Cost of sales	\$	—	\$	—	\$ (22)
Selling, general and administrative expense		—		—	(31)
Discontinued operations		—		(7)	(7)
Total amortization of unrecognized prior service credits	\$	—	\$	(7)	\$ (60)

NOTE Q – STOCK INCENTIVE PLANS

Ashland has stock incentive plans under which key employees or directors are granted stock appreciation rights (SARs), performance share awards or nonvested stock awards. Each program is typically a long-term incentive plan designed to link employee compensation with increased shareholder value or reward superior performance and encourage continued employment with Ashland. Ashland recognizes compensation expense for the grant date fair value of stock-based awards over the applicable vesting period and accounts for forfeitures when they occur across all stock-based awards.

The components of Ashland's pretax stock-based awards (net of forfeitures) and associated income tax benefits are as follows:

(In millions)	2018 ^(a)		2017 ^(b)		2016 ^(c)
SARs	\$	7	\$	5	\$ 9
Nonvested stock awards		25		15	17
Performance share awards		13		8	8
	\$	45	\$	28	\$ 34
Income tax benefit	\$	14	\$	11	\$ 13

(a) The year ended September 30, 2018 included \$9 million and \$8 million of expense related to cash-settled nonvested restricted stock awards and cash-settled performance units, respectively.

(b) The year ended September 30, 2017 included \$5 million and \$3 million of expense related to cash-settled nonvested restricted stock awards and cash-settled performance units, respectively.

(c) The year ended September 30, 2016 included \$4 million of expense related primarily to cash-settled nonvested restricted stock awards.

Conversion of Equity Awards Outstanding from Valvoline Distribution

On May 12, 2017, the date of the final distribution of Valvoline common stock, certain of Ashland's outstanding equity awards held by Valvoline Inc. employees were converted to equivalent equity awards, as applicable, with respect to Valvoline Inc.'s common stock. These modified awards otherwise retained substantially the same terms and conditions, including term and vesting provisions, as the existing Ashland equity awards had at the time of conversion. Ashland transferred all Valvoline awards and will not incur any future compensation cost related to the conversion of Ashland equity awards held by Valvoline Inc. employees and directors in connection with the final Valvoline Inc. distribution.

Additionally, in connection with this transaction, Ashland proportionately adjusted the number and exercise prices of SARs, nonvested stock awards and performance awards granted to Ashland employees and directors that were outstanding at the time of this transaction to maintain the approximate aggregate intrinsic value of such awards. To calculate the exchange ratio for all outstanding stock based compensation awards, Ashland utilized a 10-day volume weighted average stock price (VWAP), using the 10 consecutive trading days following the distribution. The ratio used to adjust these awards differs slightly from the exchange ratio that would have resulted had the ratio been calculated based on Ashland's stock price immediately following the transaction.

On the date of the final distribution, and in accordance with U.S. GAAP, Ashland reassessed all outstanding equity awards to determine if additional compensation expense had been incurred due to the transaction causing a modification to the outstanding equity awards. The additional stock compensation expense as a result of this modification and assessment performed during 2017 for all outstanding equity awards was not significant.

Stock Appreciation Rights

SARs are granted to employees or directors at a price equal to the fair market value of the stock on the date of grant and typically become exercisable over periods of one to three years. Unexercised SARs lapse ten years and one month after the date of grant. Ashland estimates the fair value of SARs granted using the Black-Scholes option-pricing model. This model requires several assumptions, which Ashland has developed and updates based on historical trends and current market observations. The accuracy of these assumptions is critical to the estimate of fair value for these equity instruments. The following table illustrates the weighted-average of key assumptions used within the Black-Scholes option-pricing model. The risk-free interest rate assumption was based on the U.S. Treasury yield curve in effect at the time of the grant for the expected term of the instrument. The dividend yield reflects the assumption that the current dividend payout will continue with no anticipated increases. The volatility assumption was calculated by utilizing an unbiased standard deviation of Ashland's Common Stock closing price for the past five years. The expected life is based on historical data and is not necessarily indicative of exercise patterns that may occur.

(In millions except per share data)		2018		2017		2016
Weighted-average fair value per share of SARs granted (a)	\$	19.62	\$	21.25	\$	26.24
Assumptions (weighted-average)						
Risk-free interest rate		2.1%		1.8%		1.8%
Expected dividend yield		1.3%		1.4%		1.4%
Expected volatility		31.8%		22.8%		27.7%
Expected life (in years)		6		5		5

(a) The weighted-average fair values per share are as of the grant date and have not been adjusted for the Valvoline separation if the SARs were granted prior to the final distribution on May 12, 2017.

A progression of activity and various other information relative to SARs and previously issued and vested stock options is presented in the following table.

(In thousands except per share data)	2018		2017		2016	
	Number of common shares	Weighted-average exercise price per share	Number of common shares	Weighted-average exercise price per share	Number of common shares	Weighted-average exercise price per share
Outstanding - beginning of year	2,261	\$ 47.98	1,511	\$ 83.64	1,383	\$ 73.18
Granted	470	67.16	422	109.15	362	111.89
Exercised	(421)	40.10	(330)	70.55	(196)	59.69
Forfeitures and expirations	(47)	58.73	(70)	105.98	(38)	95.65
Transfer to Valvoline Inc. (a)	—	—	(352)	94.28	—	—
Conversion adjustment (b)	—	—	1,080	—	—	—
Outstanding - end of year (c)	<u>2,263</u>	<u>53.21</u>	<u>2,261</u>	<u>47.98</u>	<u>1,511</u>	<u>83.64</u>
Exercisable - end of year	1,472	47.76	1,456	42.10	991	69.68

(a) Represents the transfer of SARs held by Valvoline Inc. employees at the time of the final Valvoline Inc. distribution in 2017.

(b) The number and exercise prices of SARs outstanding at the time of the final Valvoline Inc. distribution in 2017 were proportionately adjusted to maintain the aggregate intrinsic value before and after the transaction.

(c) Exercise prices per share for SARs outstanding at September 30, 2018 ranged from \$5.04 to \$5.70 for 27 thousand shares, from \$20.02 to \$29.50 for 260 thousand shares, from \$34.47 to \$47.63 for 419 thousand shares, and from \$57.96 to \$67.16 for 1,557 thousand shares. The weighted-average remaining contractual life of outstanding SARs and stock options was 6.7 years and exercisable SARs and stock options was 5.6 years.

The total intrinsic value of SARs exercised was \$15 million in 2018, \$14 million in 2017 and \$11 million in 2016. The actual tax benefit realized from the exercised SARs was \$5 million in 2018, \$2 million in 2017 and \$2 million in 2016. The total grant date fair value of SARs that vested during 2018, 2017 and 2016 was \$4 million, \$8 million and \$9 million,

respectively. As of September 30, 2018, there was \$7 million of total unrecognized compensation costs related to SARs. That cost is expected to be recognized over a weighted-average period of 1.8 years. As of September 30, 2018, the aggregate intrinsic value of outstanding SARs was \$69 million and exercisable SARs was \$53 million.

Nonvested stock awards

Nonvested stock awards are granted to employees or directors at a price equal to the fair market value of the stock on the date of grant and generally vest over a one-to-five-year period. However, such shares or units are subject to forfeiture upon termination of service before the vesting period ends. Beginning in 2016, these awards were primarily granted as stock units that will convert to shares upon vesting, while the grants in prior years were generally made in nonvested shares. Only nonvested stock awards granted in the form of shares entitle employees or directors to vote the shares. Dividends on nonvested stock awards granted are in the form of additional units or shares of nonvested stock awards, which are subject to vesting and forfeiture provisions.

A progression of activity and various other information relative to nonvested stock awards is presented in the following table.

	2018		2017		2016	
	Number of common shares	Weighted-average grant date fair value	Number of common shares	Weighted-average grant date fair value	Number of common shares	Weighted-average grant date fair value
(In thousands except per share data)						
Nonvested - beginning of year	219	\$ 59.16	293	\$ 109.12	298	\$ 106.41
Granted	192	71.36	92	105.10	107	111.76
Vested	(107)	59.46	(189)	99.69	(93)	104.44
Forfeitures	(13)	62.22	(24)	104.19	(19)	104.66
Transfer to Valvoline Inc. (a)	—	—	(71)	111.97	—	—
Conversion adjustment (b)	—	—	118	—	—	—
Nonvested - end of year	291	66.98	219	59.16	293	109.12

(a) Represents the transfer of nonvested stock awards held by Valvoline Inc. employees at the time of the final Valvoline Inc. distribution in 2017.

(b) The number and exercise prices of nonvested stock awards outstanding at the time of the final Valvoline Inc. distribution in 2017 were proportionately adjusted to maintain the aggregate intrinsic value before and after the transaction.

The total fair value of nonvested stock awards that vested during 2018, 2017 and 2016 was \$6 million, \$19 million and \$10 million, respectively. As of September 30, 2018, there was \$9 million of total unrecognized compensation costs related to nonvested stock awards. That cost is expected to be recognized over a weighted-average period of 1.9 years.

Executive performance incentive and retention program

During 2016, certain executives were granted 260 thousand performance-based restricted shares of Ashland in order to provide an incentive to remain employed in the period after the full separation of Ashland and Valvoline. At September 30, 2018, total nonvested shares outstanding were 61 thousand shares, which include forfeitures and the cumulative value of forfeitable dividends. The expense recognition for these awards commenced upon completing the full separation of Valvoline which occurred on May 12, 2017, as discussed further in Note B, and resulted in expense of \$6 million and \$3 million during 2018 and 2017, respectively. As of September 30, 2018, there was \$3 million of total unrecognized compensation costs related to these awards.

Cash-settled nonvested stock awards

Certain nonvested stock awards are granted to employees and are settled in cash upon vesting. As of September 30, 2018, 215 thousand cash-settled nonvested stock awards were outstanding. The value of these cash-settled nonvested stock awards changes in connection with changes in the fair market value of the Ashland Common Stock. These awards generally vest over a period of three years. The expense recognized related to cash-settled nonvested stock awards was \$9 million, \$5 million, and \$4 million during 2018, 2017 and 2016, respectively.

Performance awards

Ashland sponsors a long-term incentive plan that awards performance shares/units to certain key employees that are tied to Ashland's overall financial performance relative to the financial performance of selected industry peer groups and/or internal targets. Awards are granted annually, with each award covering a three-year vesting period. Nonvested performance shares/units do not entitle employees to vote the shares or to receive any dividends thereon.

For awards granted in 2016, each performance share is convertible to one share of Ashland Common Stock. These plans are recorded as a component of stockholders' equity in the Consolidated Balance Sheets. Performance measures used to determine the actual number of performance shares issuable upon vesting include an equal weighting of Ashland's total shareholder return (TSR) performance and Ashland's return on investment (ROI) performance as compared to the internal targets. TSR relative to peers is considered a market condition while ROI is considered a performance condition in accordance with U.S. GAAP.

For awards granted in 2018 and 2017, upon vesting, each performance unit will be settled in stock or cash based on the fair market value of Ashland common stock. The awards granted in 2018 are settled in stock and recorded as a component of stockholders' equity while the awards granted in 2017 are settled in cash and recorded within the other liabilities caption in the Consolidated Balance Sheets. For these awards, the performance measure used to determine the actual number of performance units issuable upon vesting is the financial performance of Ashland compared to award targets. The financial performance award metric is considered a performance condition under applicable U.S. GAAP. Additionally, the actual number of performance units issuable upon vesting can be potentially increased or decreased based on a TSR performance modifier relative to peers for Ashland.

The following table shows the performance shares/units granted for all plans that award Ashland Common Stock or cash.

(In thousands)	Vesting period	Target shares/units granted ^(a)	Weighted-average fair value per share/unit ^(a)
Fiscal Year 2018	October 1, 2017 - September 30, 2020	101	\$ 68.93
Fiscal Year 2017	October 1, 2016 - September 30, 2019	56	\$ 103.72
Fiscal Year 2016	October 1, 2015 - September 30, 2018	73	\$ 110.03

(a) At the end of the performance period, the actual number of shares/units awarded can range from zero to 200% of the target shares/units granted, which is assumed to be 100%. Both the shares granted and weighted-average fair value per share/unit are as of the grant date and have not been adjusted for the Valvoline separation that occurred during 2017.

For awards granted in 2016, the fair value of the ROI portion of the performance share awards is equal to the fair market value of Ashland's Common Stock on the date of the grant discounted for the dividends forgone during the vesting period of the three-year performance cycle. For awards granted in 2018 and 2017, the fair value of the performance unit awards is equal to the fair market value of Ashland's Common Stock as of the end of each reporting period. Compensation cost is recognized over the requisite service period if it is probable that the performance condition will be satisfied.

The fair values of the TSR portion of the performance share awards and TSR modifier of the performance unit awards are calculated using a Monte Carlo simulation valuation model using key assumptions included in the following table. Compensation cost is recognized over the requisite service period regardless of whether the market condition is satisfied.

	2018	2017	2016
Risk-free interest rate	1.6% - 1.8%	1.3% - 1.4%	0.5% - 1.2%
Expected dividend yield	1.4%	1.4%	1.2%
Expected life (in years)	3	3	3
Expected volatility	25.0%	25.1%	21.1%

The following table shows changes in nonvested performance shares/units for all plans that award Ashland Common Stock or cash.

	2018		2017		2016	
	Shares/ Units	Weighted- average grant date fair value	Shares/ Units	Weighted- average grant date fair value	Shares/ Units	Weighted- average grant date fair value
(In thousands except per share data)						
Nonvested - beginning of year	268	\$ 63.00	199	\$ 106.91	204	\$ 93.79
Granted (a)	101	68.93	71	99.86	73	110.03
Vested (a)	(104)	65.53	(69)	85.86	(72)	76.26
Forfeitures (b)	(5)	66.24	(54)	75.52	(6)	114.83
Transfer to Valvoline Inc. (c)	—	—	(21)	115.68	—	—
Conversion adjustment (d)	—	—	142	—	—	—
Nonvested - end of year	260	64.55	268	63.00	199	106.91

(a) 2017 includes 15 thousand additional shares from the fiscal year 2014 since a portion of the payouts for this plan was in excess of the initial 100% target.

(b) During 2017, Ashland determined that zero percent of the TSR portion of the fiscal year 2016 plan will be paid out upon vesting which resulted in the forfeiture of 35 thousand shares.

(c) Represents the transfer of performance shares from the fiscal year 2016 plans held by Valvoline Inc. employees at the time of the final Valvoline Inc. distribution in 2017.

(d) The number and exercise prices of performance shares/units outstanding at the time of the final Valvoline Inc. distribution in 2017 were proportionately adjusted to maintain the aggregate intrinsic value before and after the transaction.

As of September 30, 2018, there was \$12 million of total unrecognized compensation costs related to nonvested performance share/unit awards. That cost is expected to be recognized over a weighted-average period of approximately 1.5 years.

NOTE R – REPORTABLE SEGMENT INFORMATION

Ashland determines its reportable segments based on how operations are managed internally for the products and services sold to customers, including how the results are reviewed by the chief operating decision maker, which includes determining resource allocation methodologies used for reportable segments. Operating income is the primary measure on the Statements of Consolidated Comprehensive Income (Loss) that is reviewed by the chief operating decision maker in assessing each reportable segment's financial performance.

Ashland's operations are managed by the chief operating decision maker within the following three reportable segments: Specialty Ingredients, Composites and Intermediates and Solvents. Ashland does not aggregate operating segments to arrive at these reportable segments.

Reportable segment business descriptions

Specialty Ingredients offers industry-leading products, technologies and resources for solving formulation and product-performance challenges. Using natural, synthetic and semisynthetic polymers derived from cellulose ethers, vinyl pyrrolidones, acrylic polymers, polyester and polyurethane-based adhesives, and plant and seed extract, Specialty Ingredients offers comprehensive and innovative solutions for consumer and industrial applications. Key customers include pharmaceutical companies; makers of personal care products, food and beverages; makers of nutraceuticals and supplements; manufacturers of paint, coatings and construction materials; packaging and converting; and oilfield service companies. Certain customer relationships are significant, and the loss of any one of those customers could have a material adverse effect on the Specialty Ingredients reportable segment. On May 17, 2017, Ashland completed its acquisition of the stock of Pharmachem, a leading provider of quality ingredients to the global health and wellness industries and high-value differentiated products to fragrance and flavor houses. At the acquisition date, Pharmachem had 14 manufacturing facilities located in the United States and Mexico. New Jersey-based Pharmachem develops, manufactures and supplies custom and branded nutritional and fragrance products. See Note C for more information.

Composites is a global leader in unsaturated polyester resins, vinyl ester resins and gelcoats. The Composites business manufactures and sells a broad range of general-purpose and high-performance grades of unsaturated polyester and vinyl ester resins, gelcoats and low-profile additives for the reinforced plastics industry. The products in the Composites business provide an array of functional properties including corrosion resistance, fire retardance, ultraviolet resistance, water and chemical

resistance, high mechanical strength, impact and scratch resistance and high strength-to-weight ratios. Key end markets include transportation, construction, marine and infrastructure. In addition, the business manufactures and sells molten maleic anhydride for the manufacture of a variety of products such as unsaturated polyester resins, copolymers, lubricating oil additives, alkenyl succinic anhydrides, malic acid, fumaric acid and numerous derivative chemicals. Key markets include composites, personal care, dispersants and combustion engine oil.

Intermediates and Solvents is a leading producer of 1,4 butanediol and related derivatives, including tetrahydrofuran and n-methylpyrrolidone. These products are used as chemical intermediates in the production of engineering polymers and polyurethanes, and as specialty process solvents in a wide array of applications including electronics, pharmaceuticals, water filtration membranes and more. Butanediol is also supplied to Ashland's Specialty Ingredients business for use as a raw material.

Unallocated and Other generally includes items such as certain significant company-wide restructuring activities, including internal separation costs, and legacy costs or adjustments that relate to divested businesses that are no longer operated by Ashland.

International data

Information about Ashland's domestic and international operations follows. Ashland has no operations in any individual international country or single customer that represented more than 10% of sales in 2018, 2017 or 2016.

(In millions)	Sales to external customers			Net assets (liabilities)		Property, plant and equipment - net	
	2018	2017	2016	2018	2017	2018	2017
United States	\$ 1,420	\$ 1,248	\$ 1,165	\$ 1,142	\$ 674	\$ 1,371	\$ 1,417
International	2,323	2,012	1,854	2,264	2,732	528	553
	<u>\$ 3,743</u>	<u>\$ 3,260</u>	<u>\$ 3,019</u>	<u>\$ 3,406</u>	<u>\$ 3,406</u>	<u>\$ 1,899</u>	<u>\$ 1,970</u>

Reportable segment results

The following tables present various financial information for each reportable segment for the years ended September 30, 2018, 2017 and 2016 and as of September 30, 2018, 2017 and 2016. Results of Ashland's reportable segments are presented based on its management and internal accounting structure. The structure is specific to Ashland; therefore, the financial results of Ashland's reportable segments are not necessarily comparable with similar information for other comparable companies. Ashland allocates all costs to its reportable segments except for certain significant company-wide restructuring activities and other costs or adjustments that relate to former businesses that Ashland no longer operates. The service cost component of pension and other postretirement benefits costs is allocated to each reportable segment on a ratable basis; while the remaining components of pension and other postretirement benefits costs are recorded to Unallocated and other. Ashland refines its expense allocation methodologies to the reportable segments from time to time as internal accounting practices are improved, more refined information becomes available and the industry or market changes. Significant revisions to Ashland's methodologies are adjusted for all segments on a retrospective basis.

Ashland determined that disclosing sales by specific product was impracticable due to the highly customized and extensive portfolio of products offered to customers and since no one product or a small group of products could be aggregated together to represent a majority of revenue within a reportable segment. As such, the following table provides a summary of 2018 sales by product category for each reportable segment:

Sales by product category for 2018

Specialty Ingredients		Composites		Intermediates and Solvents	
Cellulosics	34%	UPR/VER (a)	85%	Derivatives	55%
Poly vinyl pyrrolidones	17%	Gelcoats and other	15%	Butanediol	45%
Adhesives	14%		100%		100%
Pharmachem	10%				
Actives	6%				
Vinyl ethers	6%				
Other	13%				
	100%				

(a) UPR stands for unsaturated polyester resins and VER stands for vinyl ester resins.

The following table presents various financial information for each reportable segment. The operating results of divested divisions and assets during 2018, 2017 and 2016 that did not qualify for discontinued operations accounting treatment are included in the financial information until the date of sale.

Ashland Global Holdings Inc. and Consolidated Subsidiaries

Reportable Segment Information

Years Ended September 30

(In millions)	2018	2017	2016
Sales			
Specialty Ingredients	\$ 2,470	\$ 2,216	\$ 2,089
Composites	942	779	669
Intermediates and Solvents	331	265	261
	<u>\$ 3,743</u>	<u>\$ 3,260</u>	<u>\$ 3,019</u>
Equity income			
Specialty Ingredients	\$ —	\$ —	\$ —
Composites	1	—	1
Intermediates and Solvents	—	—	—
Unallocated and other	—	—	—
	<u>1</u>	<u>—</u>	<u>1</u>
Other income (expense)			
Specialty Ingredients	(5)	(2)	(1)
Composites	4	4	5
Intermediates and Solvents	—	—	—
Unallocated and other	8	5	3
	<u>7</u>	<u>7</u>	<u>7</u>
	<u>\$ 8</u>	<u>\$ 7</u>	<u>\$ 8</u>
Operating income (loss)			
Specialty Ingredients	\$ 314	\$ 233	\$ 237
Composites	73	67	63
Intermediates and Solvents	31	(12)	(181)
Unallocated and other	(191)	(142)	(169)
	<u>\$ 227</u>	<u>\$ 146</u>	<u>\$ (50)</u>
Assets			
Specialty Ingredients	\$ 5,955	\$ 6,050	\$ 5,235
Composites	589	586	520
Intermediates and Solvents	301	292	311
Unallocated and other	1,407	1,690	3,934
	<u>\$ 8,252</u>	<u>\$ 8,618</u>	<u>\$ 10,000</u>

Reportable Segment Information (continued)

Years Ended September 30

(In millions)	2018	2017	2016
Depreciation and amortization			
Specialty Ingredients	\$ 252	\$ 243	\$ 243
Composites	22	22	22
Intermediates and Solvents	30	31	31
Unallocated and other	8	5	6
	<u>\$ 312</u>	<u>\$ 301</u>	<u>\$ 302</u>
Property, plant and equipment - net			
Specialty Ingredients	\$ 1,434	\$ 1,470	\$ 1,388
Composites	192	189	175
Intermediates and Solvents	130	146	160
Unallocated and other	143	165	177
	<u>\$ 1,899</u>	<u>\$ 1,970</u>	<u>\$ 1,900</u>
Additions to property, plant and equipment			
Specialty Ingredients	\$ 138	\$ 148	\$ 179
Composites	24	26	23
Intermediates and Solvents	9	10	13
Unallocated and other	14	15	16
	<u>\$ 185</u>	<u>\$ 199</u>	<u>\$ 231</u>

NOTE S – SUBSEQUENT EVENT

On November 15, 2018, Ashland announced that it had signed a definitive agreement to sell its Composites segment and Intermediates and Solvents facility in Marl, Germany to INEOS Enterprises in a transaction valued at \$1.1 billion. Ashland will retain the remaining Intermediates and Solvents facility in Lima, Ohio for its own internal business use.

Ashland currently expects net proceeds from the sale to total approximately \$1 billion and anticipates that the proceeds will be primarily used to reduce outstanding debt.

The transaction is expected to close prior to the end of the June 2019 quarter, contingent on certain customary regulatory approvals, standard closing conditions and completion of required employee information and consultation processes. Upon the closing of this transaction, Ashland currently expects to recognize a gain within the Statements of Consolidated Comprehensive Income (Loss).

QUARTERLY FINANCIAL INFORMATION (UNAUDITED)

The following table presents quarterly financial information and per share data relative to Ashland's Common Stock.

Quarters ended (In millions except per share data)	December 31		March 31		June 30		September 30	
	2017	2016	2018	2017	2018	2017	2018 (a)	2017 (b)
Sales	\$ 842	\$ 704	\$ 974	\$ 806	\$ 971	\$ 870	\$ 956	\$ 880
Cost of sales	613	515	699	578	681	635	675	635
Gross profit as a percentage of sales	27.2%	26.8%	28.2%	28.3%	29.9%	27.0%	29.4%	27.8%
Operating income	39	15	95	53	66	37	27	42
Income (loss) from continuing operations	(7)	(65)	66	29	36	(16)	11	(53)
Net income (loss)	(4)	10	73	105	36	(30)	9	(58)
Basic earnings per share								
Continuing operations	\$ (0.12)	\$ (1.05)	\$ 1.06	\$ 0.46	\$ 0.57	\$ (0.26)	\$ 0.17	\$ (0.84)
Net income (loss) attributable to Ashland	(0.07)	(0.01)	1.17	1.48	0.57	(0.54)	0.15	(0.92)
Diluted earnings per share								
Continuing operations	\$ (0.12)	\$ (1.05)	\$ 1.04	\$ 0.46	\$ 0.56	\$ (0.26)	\$ 0.17	\$ (0.84)
Net income (loss) attributable to Ashland	(0.07)	(0.01)	1.15	1.47	0.56	(0.54)	0.15	(0.92)
Regular cash dividends per share	\$ 0.225	\$ 0.390	\$ 0.225	\$ 0.390	\$ 0.250	\$ 0.225	\$ 0.250	\$ 0.225

(a) Fourth quarter results for 2018 included pre-tax key items of \$56 million related to restructuring, separation and other costs, \$16 million of asset impairment charges, \$12 million related to the gain on pension and postretirement benefit plan rereasurements and \$5 million of tax indemnity expense. Income tax benefit for the fourth quarter included \$3 million of net favorable tax specific key items.

(b) Fourth quarter results for 2017 included pre-tax key items of \$23 million related to restructuring, separation and other costs, \$13 million for charges related to unplanned plant shutdowns, \$8 million related to the loss on pension and postretirement benefit plan rereasurements and a \$6 million charge for the fair value adjustment of inventory acquired from Pharmachem. Income tax expense for the fourth quarter included \$71 million of net unfavorable tax specific key items.

Five-Year Selected Financial Information (unaudited)

Years Ended September 30

(In millions except per share data) (a)	2018	2017	2016	2015	2014
Summary of operations					
Sales	\$ 3,743	\$ 3,260	\$ 3,019	\$ 3,420	\$ 4,080
Cost of sales	2,668	2,363	2,132	2,470	3,091
Gross profit	1,075	897	887	950	989
Selling, general and administrative expense	771	675	858	590	775
Research and development expense	85	83	87	99	103
Equity and other income (loss)	8	7	8	15	(28)
Operating income (loss)	227	146	(50)	276	83
Net interest and other financing expense	122	234	173	174	166
Other net periodic benefit income (costs)	13	(4)	(77)	(164)	(332)
Net gain (loss) on acquisitions and divestitures	(4)	(6)	(8)	(89)	4
Income (loss) from continuing operations					
before income taxes	114	(98)	(308)	(151)	(411)
Income tax expense (benefit)	9	7	(25)	(139)	(290)
Income (loss) from continuing operations	105	(105)	(283)	(12)	(121)
Income from discontinued operations	9	133	255	321	354
Net income (loss)	114	28	(28)	309	233
Net income attributable to noncontrolling interest	—	27	1	—	—
Net income (loss) attributable to Ashland	\$ 114	\$ 1	\$ (29)	\$ 309	\$ 233
Balance sheet information (as of September 30)					
Current assets	\$ 1,712	\$ 1,903	\$ 2,888	\$ 3,093	\$ 3,443
Current liabilities	1,075	968	1,238	1,442	1,679
Working capital	\$ 637	\$ 935	\$ 1,650	\$ 1,651	\$ 1,764
Total assets	\$ 8,252	\$ 8,618	\$ 10,000	\$ 10,066	\$ 10,916
Short-term debt	\$ 254	\$ 235	\$ 170	\$ 381	\$ 338
Long-term debt	2,275	2,584	2,325	3,348	2,911
Equity	3,406	3,406	3,165	3,037	3,583
Cash flow information					
Cash flows provided (used) by operating activities from					
continuing operations	\$ 344	\$ 273	\$ 385	\$ (226)	\$ 430
Additions to property, plant and equipment	185	199	231	220	212
Cash dividends	60	77	97	98	103
Common stock information					
Basic earnings per share					
Income (loss) from continuing operations	\$ 1.68	\$ (1.69)	\$ (4.51)	\$ (0.18)	\$ (1.57)
Net income (loss) attributable to Ashland	1.82	0.01	(0.47)	4.54	3.04
Diluted earnings per share					
Income (loss) from continuing operations	1.66	(1.69)	(4.51)	(0.18)	(1.57)
Net income (loss) attributable to Ashland	1.79	0.01	(0.47)	4.54	3.04
Dividends	0.95	1.23	1.56	1.46	1.36

(a) As a result of the final Valvoline Inc. distribution on May 12, 2017, Valvoline's assets, liabilities, operating results and cash flows for all periods presented have been classified as discontinued operations within the Consolidated Financial Statements. See Note B within the Notes to Consolidated Financial Statements for more information.

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LIST OF SUBSIDIARIES

Subsidiaries of Ashland Global Holdings Inc. (“Ashland”) at September 30, 2018, included the companies listed below.

Company	Jurisdiction of Incorporation
565 Corporation	Delaware, United States
Adams Drive Totowa, L.L.C.	New Jersey, United States
Alera Property Holdings, LLC	Delaware, United States
Alera Technologies, Inc.	Delaware, United States
Alix Technologies LLC	Delaware, United States
Aloe Vemera, S.P.R de R.L. de C.V.	Mexico
Ash (Gibraltar) One Limited	Gibraltar
Ash B CIS 1 Limited	Bermuda
Ash B CIS 2 Limited	Bermuda
Ash B1 Limited	Bermuda
Ash B2 Limited	Bermuda
Ash B3 Limited	Bermuda
Ash B4 Limited	Bermuda
Ash B5 Limited	Bermuda
Ash CIS Canada Corp.	Nova Scotia, Canada
Ash CIS Canada Holdings B.V.	Netherlands
Ash CIS GmbH	Switzerland
Ash Global Holding Three GmbH	Switzerland
Ash Global Holdings Two B.V.	Netherlands
ASH GP INC.	Delaware, United States
Ash Junior Global Holding One LLC	Delaware, United States
Ash Junior Global Holding Two LLC	Delaware, United States
Ash Swiss Holding Two GmbH	Switzerland
Ashland (Australasia) Pty. Limited	Australia
Ashland (Changzhou) Advanced Chemical Co., Ltd.	China
Ashland (Changzhou) Specialty Chemical Co.,Ltd	China
Ashland (China) Holdings Co., Ltd.	China
Ashland (Gibraltar) One Holding, Inc.	Delaware, United States
Ashland (Thailand) Co., Ltd	Thailand
Ashland Argentina S.R.L.	Argentina
Ashland Canada Corp./Corporation Ashland Canada	Nova Scotia, Canada
Ashland Canada Holdings B. V.	Netherlands
Ashland Chemco Inc.	Delaware, United States
Ashland Chemical De Mexico S.A. De C.V.	Mexico
Ashland Chemical Hispania, S. L.	Spain
Ashland Chemical Trading (Shanghai) Company Limited	China
Ashland Chemicals (Nanjing) Company Limited	China
Ashland Colombia S.A.S.	Colombia
Ashland Comercio de Especialidades Quimicas do Brasil Ltda.	Brazil
Ashland CZ s.r.o.	Czech Republic
Ashland Danmark ApS	Denmark
Ashland Eastern Markets LLC	Russia
Ashland Ethanol, Inc.	Delaware, United States
Ashland Finance Limited	Bermuda
Ashland Finland Oy	Finland
Ashland France SAS	France
Ashland Global Holdings One C.V.	Netherlands
Ashland India Private Limited	India
Ashland Industria de Ingredientes do Brasil Ltda.	Brazil
Ashland Industries Deutschland GmbH	Germany
Ashland Industries Europe GmbH	Switzerland
Ashland Industries France SAS	France
Ashland Industries Italia S.r.l.	Italy
Ashland Industries Nederland B.V.	Netherlands

Ashland Industries UK Limited	United Kingdom
Ashland International Holdings LLC	Delaware, United States
Ashland Italia S.r.l.	Italy
Ashland Japan Ltd.	Japan
Ashland Korea Limited	Korea
Ashland Licensing and Intellectual Property LLC	Delaware, United States
Ashland LLC	Kentucky, United States
Ashland ME Holdings, Inc.	Delaware, United States
Ashland Mexico Holdings One, LLC	Delaware, United States
Ashland Mexico Holdings Two, LLC	Delaware, United States
Ashland Nigeria Exploration Unlimited	Nigeria
Ashland Oil (Nigeria) Company Unlimited	Nigeria
Ashland Oil, Inc.	Kentucky, United States
Ashland Pacific Pty. Ltd.	Australia
Ashland Participacoes Ltda.	Brazil
Ashland Pharmachem International Holdings LLC	Delaware, United States
Ashland Polimeros do Brasil S.A.	Brazil
Ashland Services B. V.	Netherlands
Ashland Services Mexico, S.A. de C.V.	Mexico
Ashland Singapore Pte. Ltd.	Singapore
Ashland Specialties Austria GmbH	Austria
Ashland Specialties Belgium BVBA	Belgium
Ashland Specialties France S.a.r.l.	France
Ashland Specialties Hispania S.L.	Spain
Ashland Specialties Holding C.V.	Netherlands
Ashland Specialties Ireland Limited	Ireland
Ashland Specialties Poland Sp. z o.o.	Poland
Ashland Specialties Sverige AB	Sweden
Ashland Specialties UK Limited	United Kingdom
ASHLAND SPECIALTY CHEMICAL (SINGAPORE) PTE. LTD.	Singapore
Ashland Specialty Chemical Korea Co., Ltd.	Korea
ASHLAND SPECIALTY CHEMICALS (MALAYSIA) SDN.BHD	Malaysia
Ashland Specialty Ingredients G.P.	Delaware, United States
Ashland Technologies GmbH	Germany
Ashland-Alaskan, Limited	Alaska, United States
Ashland-Plasticos De Portugal, Lda.	Portugal
AshLux Three, S.à r.l.	Luxembourg
Ashmont Insurance Company, Inc.	Vermont, United States
AshOne C. V.	Netherlands
Ashprop Two LLC	Delaware, United States
Avoca LLC	North Carolina, United States
Avoele, S.A. de C.V.	Mexico
Belleville Realty Corp.	Delaware, United States
Bluegrass Insurance Company Limited	Bermuda
Carol Clifton, Inc.	New Jersey, United States
Clevedon Sp. z o.o.	Poland
CLTA LLC	Delaware, United States
Curtis Bay Insurance Co. Ltd	Bermuda
CVG Capital III LLC	Delaware, United States
East Bay Realty Services, Inc.	Delaware, United States
Ever Success Overseas Limited	British Virgin Islands
FRJ, Inc.	Georgia, United States
Hercofina	Delaware, United States
Hercules Holding BV BVBA	Belgium
Hercules Holding II Limited	United Kingdom
Hercules Hydrocarbon Holdings, Inc.	Delaware, United States
Hercules International Limited, LLC	Delaware, United States
Hercules Investment ApS	Denmark
Hercules Investments Netherlands B.V.	Netherlands
Hercules Islands Corporation	American Virgin Islands
Hercules LLC	Delaware, United States

Hercules Paper Holdings, Inc.	Delaware, United States
Hercules Trading (Shanghai) Company Limited	China
International Specialty Holdings LLC	Delaware, United States
International Specialty Products (India) Private Limited	India
International Specialty Products Funding Corporation	Delaware, United States
International Specialty Products Inc.	Delaware, United States
ISP (Belgium) International N. V.	Belgium
ISP Alginates Inc.	Delaware, United States
ISP Asia Pacific Pte. Ltd	Singapore
ISP Biochema Schwaben GmbH	Germany
ISP Canada Corp.	Nova Scotia, Canada
ISP Capital LLC	Delaware, United States
ISP Chemco LLC	Delaware, United States
ISP Chemical Products LLC	Delaware, United States
ISP Chemicals LLC	Delaware, United States
ISP Environmental Services Inc.	Delaware, United States
ISP France Holding SARL	France
ISP France Marketing SARL	France
ISP Freetown Fine Chemicals Inc.	Delaware, United States
ISP Freight Services N. V.	Belgium
ISP Global Operations (Barbados) Inc.	Barbados
ISP Global Technologies Deutschland Unterstutzungskasse GmbH	Germany
ISP Global Technologies Inc.	Delaware, United States
ISP Global Technologies LLC	Delaware, United States
ISP HC Limited	Cyprus
ISP Holdings (U.K.) Ltd.	United Kingdom
ISP Hungary Holdings Limited Liability Company	Hungary
ISP International Corp.	Delaware, United States
ISP Investments LLC	Delaware, United States
ISP Lima LLC	Delaware, United States
ISP Luxembourg Canada S.a.r.l.	Luxembourg
ISP Management Company, Inc.	Delaware, United States
ISP Marl GmbH	Germany
ISP Marl Holdings GmbH	Germany
ISP Microcaps (U.K.) Limited	United Kingdom
ISP Pharma Systems LLC	Delaware, United States
ISP Real Estate Company, Inc.	Delaware, United States
ISP Singapore Holding LLC	Delaware, United States
ISP Technologies Inc.	Delaware, United States
ISP Technologies LLC	Delaware, United States
Jiangmen Ashland Chemicals Company Limited	China
Pakistan Gum Industries (Private) Limited	Pakistan
Pharmachem Laboratories LLC	Delaware, United States
Pharmachem Laboratories Utah, LLC	Utah, United States
Prince Street Paterson, LLC	New Jersey, United States
Progiven S.A.S.	France
Proprietary Nutritionals LLC	Delaware, United States
PT Ashland Asia	Indonesia
PT ISP Chemicals Indonesia	Indonesia
Ralop, S. de R.L. de C.V.	Mexico
Saudi Industrial Resins Co. Ltd. (Polyester)	Saudi Arabia
Shanghai Ashland Industrial Trading Co., Ltd.	China
St Croix Petrochemical Corp	American Virgin Islands
Taiwan Ashland Co., Ltd.	Taiwan
Techwax Limited	United Kingdom
Vemera, S. de R.L. de C.V.	Mexico
WSP LLC	Delaware, United States

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the following Registration Statements:

1. Registration Statement on Form S-8 (No. 333-131792-01) pertaining to the 2006 Ashland Inc. Incentive Plan,
2. Registration Statements on Form S-8 (Nos. 333-172019-01 and 333-186408-01) pertaining to the Amended and Restated 2011 Ashland Inc. Incentive Plan,
3. Registration Statement on Form S-8 (No. 333-201895-01) pertaining to the Amended and Restated 2015 Ashland Global Holdings Inc. Incentive Plan,
4. Registration Statement on Form S-8 (No. 333-222841) pertaining to the Ashland Global Holdings Inc. 2018 Omnibus Incentive Compensation Plan,
5. Registration Statement on Form S-8 (No. 33-62091-01) pertaining to the Ashland Inc. Deferred Compensation Plan,
6. Registration Statement on Form S-8 (No. 33-52125-01) pertaining to the Ashland Inc. Deferred Compensation Plan for Non-Employee Directors (Formerly known as Ashland Oil, Inc. Deferred Compensation and Stock Incentive Plan for Non-Employee Directors),
7. Registration Statement on Form S-8 (No. 333-122269-01) pertaining to the Ashland Global Holdings Inc. Deferred Compensation Plan for Employees (2005),
8. Registration Statement on Form S-8 (No. 333-122270-01) pertaining to the Ashland Global Holdings Inc. Deferred Compensation Plan for Non-Employee Directors (2005),
9. Registration Statements on Form S-8 (Nos. 33-32612-100, 333-157040-01 and 333-203840-01) pertaining to the Ashland Employee Savings Plan,
10. Registration Statements on Form S-8 (Nos. 333-155396-01 and 333-203840-01) pertaining to the Ashland Union Employee Savings Plan (Formerly known as the Hercules Incorporated Savings and Investment Plan),
11. Registration Statements on Form S-8 (Nos. 333-184109-01 and 333-203840-01) pertaining to the International Specialty Products Inc. 401(k) Plan,
12. Registration Statement on Form S-3ASR (No. 333-214069) of Ashland Global Holdings Inc.,
13. Registration Statement on Form S-8 (No. 333-215077) pertaining to the Amended and Restated Ashland Inc. Deferred Compensation Plan for Employees (2005) and the Amended and Restated Ashland Inc. Deferred Compensation Plan for Non-Employee Directors (2005).

of our reports dated November 19, 2018, with respect to the consolidated financial statements of Ashland Global Holdings Inc. and Consolidated Subsidiaries and the effectiveness of internal control over financial reporting of Ashland Global Holdings Inc. and Consolidated Subsidiaries included in this Annual Report (Form 10-K) of Ashland Global Holdings Inc. for the year ended September 30, 2018.

/s/ Ernst & Young LLP

Cincinnati, Ohio
November 19, 2018

CONSENT OF HAMILTON, RABINOVITZ & ASSOCIATES, INC.

We hereby consent to being named in Ashland Global Holdings Inc.'s Annual Report on Form 10-K for the year ended September 30, 2018 in the form and context in which we are named. We do not authorize or cause the filing of such Annual Report and do not make or purport to make any statement other than as reflected in the Annual Report.

/s/ Francine F. Rabinovitz

Hamilton, Rabinovitz & Associates, Inc.

November 19, 2018

CONSENT OF NATHAN ASSOCIATES, INC.

We hereby consent to being named in Ashland Global Holdings Inc.'s Annual Report on Form 10-K for the year ended September 30, 2018 in the form and context in which we are named. We do not authorize or cause the filing of such Annual Report and do not make or purport to make any statement other than as reflected in the Annual Report.

/s/ Jessica Horewitz

Nathan Associates, Inc.

November 19, 2018

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, that each of the undersigned Directors and Officers of ASHLAND GLOBAL HOLDINGS INC., a Delaware corporation (the "Corporation"), which anticipates filing an Annual Report on Form 10-K with the Securities and Exchange Commission, under the provisions of the Securities Act of 1933, as amended, hereby constitutes and appoints WILLIAM A. WULFSOHN, PETER J. GANZ, MICHAEL S. ROE and JENNIFER I. HENKEL, and each of them, his or her true and lawful attorneys-in-fact and agents, with full power to act without the others to sign and file such Annual Report and the exhibits thereto and any and all other documents in connection therewith, and any such amendments thereto, with the Securities and Exchange Commission, and to do and perform any and all acts and things requisite and necessary to be done in connection with the foregoing as fully as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, may lawfully do or cause to be done by virtue hereof.

Dated: November 19, 2018

/s/ William A. Wulfsohn

William A. Wulfsohn, Chairman of the Board
and Chief Executive Officer
(Principal Executive Officer)

/s/ Jerome A. Peribere

Jerome A. Peribere, Director

/s/ J. Kevin Willis

J. Kevin Willis, Senior Vice President and Chief
Financial Officer
(Principal Financial Officer)

/s/ Barry W. Perry

Barry W. Perry, Director

/s/ J. William Heitman

J. William Heitman, Vice President and Controller
(Principal Accounting Officer)

/s/ Mark C. Rohr

Mark C. Rohr, Director

/s/ Brendan M. Cummins

Brendan M. Cummins, Director

/s/ Janice J. Teal

Janice J. Teal, Director

/s/ William G. Dempsey

William G. Dempsey, Director

/s/ Michael J. Ward

Michael J. Ward, Director

/s/ Jay V. Ihlenfeld

Jay V. Ihlenfeld, Director

/s/ Kathleen Wilson-Thompson

Kathleen Wilson-Thompson, Director

/s/ Susan L. Main

Susan L. Main, Director

CERTIFICATIONS

I, William A. Wulfsohn, certify that:

1. I have reviewed this annual report on Form 10-K of Ashland Global Holdings Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the Audit Committee of the registrant's Board of Directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 19, 2018

/s/ William A. Wulfsohn

William A. Wulfsohn
Chairman and Chief Executive Officer
(Principal Executive Officer)

CERTIFICATIONS

I, J. Kevin Willis, certify that:

1. I have reviewed this annual report on Form 10-K of Ashland Global Holdings Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the Audit Committee of the registrant's Board of Directors (or persons performing the equivalent functions):
 - a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
 - b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 19, 2018

/s/ J. Kevin Willis

J. Kevin Willis

Chief Financial Officer

(Principal Financial Officer)

ASHLAND GLOBAL HOLDINGS INC.

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Ashland Global Holdings Inc. (the "Company") on Form 10-K for the period ended September 30, 2018 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), each of the undersigned, William A. Wulfsohn, Chief Executive Officer of the Company, and J. Kevin Willis, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

- (1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ William A. Wulfsohn

William A. Wulfsohn
Chief Executive Officer
November 19, 2018

/s/ J. Kevin Willis

J. Kevin Willis
Chief Financial Officer
November 19, 2018