Nordson Corporation is carrying out an intensive program to serve the plastics industry as the first truly global resource for melt processing components and pelletizers. The company has made investments around the world to build new facilities, install advanced production systems, add expert personnel, and develop innovative products. In the midst of this burst of activity, Nordson’s Polymer Processing Systems (PPS) business has become a single source for multiple components required by resin companies, equipment OEMs, recyclers, and extrusion and molding processors.

“Nordson PPS products and services are now accessible worldwide on a highly localized basis to customers large and small,” says Nordson Corp. executive vice president John J. Keane. “In many cases we can supply a combination of components that work together to optimize the customer’s process. A recycler, for example, can rely on Nordson for pelletizers, melt pumps, and filtration systems, while a manufacturer of film or sheet can look to us for components ranging from screws and barrels to extrusion dies.”

Nordson’s investment program has created regional “centers of excellence” that enable customers to order projects from any region and obtain the same components in terms of material and quality, notes Mr. Keane. “Regional centers also lower shipping costs and lead times, and the resulting decrease in air or ocean transportation means a lower environmental impact.”

Some recent innovations by Nordson are described in this issue of Nordson Advances. They represent three PPS brands: BKG® melt delivery systems; EDI® extrusion and fluid coating dies; and Xaloy® screws and barrels for extrusion and injection molding. Each brand includes a diversity of product offerings to suit a wide range of customer requirements.

“Virtually all of the innovations that we have introduced help customers to meet goals of sustainability,” says John Keane. “In any project to develop a new product, one of our key considerations is minimizing the impact of the product on critical environmental resources.”

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Nordson Expands  

Building New Capacity on Three Continents

Nordson Corp., parent company of the PPS group, reported sales of USD $2.1-billion in 2017. The company has operations and support offices in more than 30 countries. Currently, it is building new and expanded capabilities for the PPS group on three continents:

- **Münster, Germany.** Nordson is building a global hub for BKG pellets and melt delivery components, due for completion in the summer of this year. The project will also include a dedicated aftermarket center for both BKG systems and EDI extrusion dies. The new facility is being built at the site of the longstanding home of BKG pelletizers in Münster and will more than triple the amount of office, R&D, and manufacturing space at that location. Besides expanding capabilities for engineering, manufacturing, and sales of pelletizers, screen changers, melt pumps and polymer valves, the project will include an enhanced technical center for R&D and customer trials. The aftermarket center will provide European customers with rework and repair services and be designed to minimize order lead times and reduce downtime for customers.

- **Pirmasens, Germany.** Nordson is producing Xaloy screws and barrels in Europe for the first time, following extensive investment to modernize the infrastructure and install new equipment in a plant acquired from twin screw and barrel manufacturer WAFO in 2015. Screws and barrels made in the facility meet the exact same standards as those produced by Nordson in the USA and Thailand. Prior to the Pirmasens startup, the Xaloy brand was already well established in Europe through Nordson’s sales and support operation at Neckarsulm, Germany.

- **Austintown, Ohio, USA.** Nordson has just opened a regional hub in the Americas for Xaloy screws and barrels in a new 18,580 sq.m facility that includes substantial investment in new machining centers, furnaces, and other equipment, as well as production capabilities relocated from three other sites in the USA. The relocation process will be complete in coming months. This large state of the art operation has advanced capabilities for precision manufacturing and rapid customer support, along with an information platform integrated with Nordson PPS systems worldwide.

- **Chippewa Falls, Wisconsin, USA.** As a result of a major investment, Nordson is starting up advanced systems for the manufacture of EDI dies. The new capabilities enhance quality assurance and decrease lead times. Nordson has also expanded capacity for remanufacturing as part of a reorganization of operations at its three sites in Chippewa Falls.

- **Shanghai, China.** Following a move of its EDI extrusion and coating dies operation to a new, larger facility, Nordson has begun assembly of BKG screen changers and gear pumps. It has also begun planning for the finishing of Xaloy barrels from semi-finished products produced at the Nordson facility in Chonburi, Thailand. Also new is an underwater pelletizing lab line for demonstrations, customer trials, and product development for the BKG pelletizer brand. In addition, the facility has upgraded quality and inspection capabilities to meet all critical parameters for processing performance.

- **Saitama, Japan.** Nordson has added capacity for building EDI dies and for remanufacturing dies. A new superfinishing unit is particularly valuable for local specialty markets such as that for optical-grade film. Nordson has also added production, sales, and technical support personnel at Saitama and the sales office in Tokyo.

Along with these investments in construction and new manufacturing equipment, Nordson is building a worldwide IT infrastructure that will enhance coordination among the various PPS operations, adding speed and efficiency to order processing, increasing responsiveness to customer needs, and expanding Nordson’s capability to provide multi-component equipment packages custom-designed for specific applications.

“We have crafted a unique presence across all aspects of the polymer industry and a global capability unmatched by any other component supplier,” says John Keane. “Our aim is to enable customers to take full advantage of our technical depth, breadth of product offerings, and localized service.”

Gear Pumps  

Continued from p. 1

pumps that can accommodate the differing mechanical specifications of extrusion systems around the world while achieving an even higher level of productivity and reliability,” says Sven Conrad, business unit director for melt delivery products. “BKG BlueFlow gear pumps provide better melt delivery performance for all processes and are particularly valuable in operations involving technical polymers, optically clear products, or other high-specification applications where it is important to minimize shear stress.”

Chief among the improvements are:

- **More efficient melt delivery,** which makes it possible to achieve up to 15% greater throughput without increasing pump rpm, thereby avoiding added wear on the extruder and an increase in shear stress on the polymer. Alternatively, more efficient melt delivery makes it possible to reduce rpm, lessening shear stress on the polymer without sacrificing throughput.

- **Better sealing performance and more sealing options.** The full range of sealing types are now available worldwide. In addition to air- and water-cooled systems, alternative designs with cooling fins are also available.
• Improved control over melt parameters. The new gear pumps include pressure and temperature sensors at both the inlet and the outlet sides, contributing to more consistent melt properties and improved quality.

Gear Pumps Designed For Specific Uses

The new BKG BlueFlow design harmonizes options previously available separately in different parts of the world. The product range now includes three series: “EP” for standard extrusion; “MP” for processes involving frequent color changes or heat-sensitive polymers; and “RP” for discharge out of vessels and reactors where no vacuum is applied or for low-viscosity extrusion applications. Pumps are available for the full spectrum of contingencies, including pumping capacities, pressure rates, and different heating methods. While pumps are designated as “US” and “EA” (for Europe and Asia) because of regional differences in connecting and sealing, they all have the same core components, such as bearings, shafts, and sealing options. The availability of “US” and “EA” versions makes it possible to install BKG BlueFlow gear pumps as drop-in replacements for existing pumps.

Taken together, the BKG BlueFlow range includes gear pumps for film, sheet, pipe, profile, fiber, compounding, recycling, polymerization, and hot melt applications. A wide range of pumping capacities or specific volumes are available, ranging from 33 to 3,201 cc/revolution, for throughput ranges up to 12,000 kg/hr. Each pump size comes with either electrical or fluid heating and with either US or EA connections. The gear pumps are for use with polymer viscosities from 2 to 20,000 Pas and at temperatures up to 350 °C. All specifications are in metric units.

“The BKG BlueFlow portfolio is truly comprehensive, providing a great degree of flexibility for applications ranging from general-purpose to highly specialized,” says Christian Schroeder, global product manager for melt delivery products. “Our product range includes a number of pump types that were available in one or the other of the earlier ranges but not both. For example, there is now a consistent global design for our MP series.”

Worldwide Expansion of Extrusion Die Options for Cast Film

The extrusion die technologies that Nordson offers for cast film are now so diverse that processors can select a package of EDI® die system components that exactly meets their performance requirements. Recent innovations in gauge profiling and feedblock adjustment have added new dimensions of automation and quality assurance to film production. At the same time, Nordson has begun to make globally available a proven cast film die for applications that do not call for the unique capabilities of the EDI Contour® die.

The Contour die is the most technologically advanced cast film die on the market, with a distinctive “sculpted” shape that is the key to enhanced product quality, raw material conservation, and maximum uptime. The new alternative to the Contour die is one that was first developed by the Belgian firm Verbruggen (which Nordson acquired in 2011) and has been used globally for 15 years. Nordson has adapted this die system and now offers it worldwide under the name Uniflow™.

“While the Uniflow die represents a lower-cost alternative to the Contour die as well as top-of-the-line dies from competitors, it provides real advantages in important application areas,” says Scott Smith, business unit director for polymer dies. “It is a versatile die whose effectiveness has been proven in both monolayer and multilayer production.”

The cast film die alternatives now offered by Nordson are:

• Contour® die. The special configuration of this die offsets the differences in die body deflection across the width of the die; an elongated teardrop, diminishing volume manifold cross-section improves layer uniformity in coextrusion; and a non-linear interface between the preland and manifold greatly reduces or eliminates “M” or “W” flow patterns. Compared with standard cast film dies, the Contour die reduces gauge variation across the width of the die, resulting in a substantial improvement in transverse product uniformity. In addition, it reduces the time to achieve on-spec product and to purge between product runs. And it avoids gels and degradation. Nordson recommends the Contour die for applications where thermally sensitive materials (such as barrier resins) are used or where there are frequent rate changes.

Most Advanced Cast Film Die. Uniquely shaped Contour® die reduces gauge variation across the width of the die, resulting in a substantial improvement in transverse product uniformity. In addition, it reduces the time to achieve on-spec product and to purge between product runs, and it avoids gels and degradation.

Continued on p. 5
**Pellet Dryer for Abrasive Compounds**

At NPE2018 Nordson will introduce a new-design pellet dryer for use with its BKG® pelletizing systems that meets the challenge posed by the steady growth in use of glass-filled and other abrasive materials. The dryer substantially reduces the time and cost associated with replacing “wear” parts. By simplifying maintenance, the new design reduces production downtime and makes it possible for one person to carry out maintenance tasks.

Nordson achieved these benefits by reducing the number, complexity, and cost of the dryer components that are subject to abrasion, and by making them more accessible for maintenance or replacement. While the new dryer has much the same overall appearance and footprint as a standard BKG dryer and provides the same throughput, there are substantial differences in the configuration of components subject to wear.

Domo Engineering Plastics GmbH is an initial user of the BKG dryer, having installed the unit on an existing underwater pelletizing line that processes polyamide 6 compounds with up to 50% glass fiber content. “We have seen a reduction in maintenance times by up to 70%,” says Matthias Köhler, operations manager at the Domo facility in Premnitz, Germany. “It is now possible to determine concrete maintenance intervals, so downtime becomes more plannable and less unexpected.”

Frank Asmuss, Nordson global product manager for BKG pelletizers, cites a number of design enhancements for reducing wear or simplifying maintenance:

- **Pellet inlet.** As a result of a new design made in accordance with flow simulations, the inlet now enters the dryer housing tangentially, reducing the impact on all parts in the lower part of the dryer, and allowing quick access to all remaining wear parts, says Asmuss.

- **Rotor.** Due to the optimized pellet inlet, the rotor has been simplified, especially in the lower area, and wear is minimized by the reduced impact of abrasive pellets. Other measures taken to reduce or eliminate wear from pellet flow include a new cover plate design and countersinking of screw heads. “In standard dryers,” says Asmuss, “rotor disassembly and reassembly took ten hours; the new design reduces this time to about three hours.”

- **Pellet outlet.** The new design includes fewer wear parts, and these are more accessible. Disassembly / reassembly time has been reduced from 6 hours to a range of 1 to 4 hours.

“The design changes we made to reduce wear led to significant overall savings per ton of glass fiber filled product,” Frank Asmuss says. “In combination with the reduced maintenance time, the overall operating costs for the dryer were decreased significantly, which is a big benefit for our customers.”

Domo Engineering Plastics GmbH is part of Domo Chemicals GmbH, an international producer of polyamide polymers, compounds, and films, with plants in Germany, Italy, China, and the USA. Domo Engineering Plastics GmbH is headquartered in Premnitz, Germany. [www.domochemicals.com](http://www.domochemicals.com)

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**Plasticizing Units**

and such kitchenware as baking pans and spatulas.

- **Highly glass-filled compounds.** A plasticizing system for compounds with 10 to 50% loadings of glass fiber reinforcement provides wear-resistance, high throughput, and gentle mixing, enabling injection molders to meet the requirements of metal-replacement, automotive, and other high-strength applications while enhancing productivity and part quality.

Components in the Xaloy package system include: 1) Pulsar I mixing screw, whose wave-style root geometry enhances distributive and dispersive mixing, providing continually varying, localized high- and low-pressure areas that yield complete melt homogenization with low shear. The resulting gentle mixing minimizes fiber breakage and thus maximizes part strength. 2) X-800™ screw encapsulation, a nickel-based alloy with high tungsten carbide content that provides twice the abrasive and corrosion wear life than standard high-velocity oxy-fuel (HVOF)-applied coatings. Nordson uses HVOF technology to apply the coating to the entire screw geometry, then fuses the alloy to the parent metal of the screw, forming a metallurgical bond. In addition, the X-8000 encapsulation is double the thickness of standard HVOF-applied coatings. 3) X-800 barrel inlay, providing a high degree of abrasion and corrosion resistance and functioning compatibly with the X-8000 screw encapsulation. And 4) an application-specific valve, designed to accommodate the viscosity and flow properties of highly filled compounds.
The versatility of the Contour die in comparison with a standard die is apparent in reduced start-up time to sellable product (10 to 15 minutes, versus 30 to 60 for the standard die); shorter product changeover (10 to 15 minutes versus 90 or more); and shorter purge time (20 to 25 minutes versus 40 or more).

- **Uniflow™ die.** This die provides an affordable option for high-speed production of thermally stable resins with very few rate changes, such as for stretch film. Its versatile flow channel accommodates a broader range of resins and processing parameters. It has an elongated teardrop manifold cross-section that promotes uniform layers in coextrusion. The outstanding mechanical stability of the Uniflow die reduces the changeover time between product runs.

- **Multi-Manifold Dies.** As an alternative to use of coextrusion feedblocks with single-cavity dies, Nordson also offers multi-manifold dies designed to accommodate materials with dissimilar viscosities and partial coverage requirements. These dies are capable of generating skin layers with less than 10% of the thickness of the total structure and producing coextrusion structures with temperature differentials up to 50 °F (28 °C). Recently Nordson built a nine-manifold die—the first of its kind. Nordson has built more multi-manifold dies than any other manufacturer.

All of these dies are available as part of a total system, including Autoflex™ automatic gauge profiling systems, Ultraflow™ coextrusion feedblocks, dual-chamber vacuum boxes, and UltraSplit™ online die separation devices. Nordson has recently introduced next-generation technologies for these system components. In Autoflex VI-RE gauge profile control system, the stroke of the lip adjusting system has been increased by 43% without adding to response time, enabling it to correct a wider range of process variations, often without need for manual intervention. The new Ultraflow V-T feedblock makes it possible to fine-tune individual layers as well as accommodate changes in layer ratio, and to adjust the tuning system without removing the feedblock from the production line.

**New Screen Changer Design**

**Cuts Lead Time, Boosts Versatility**

Nordson has redesigned the widely used BKG® NorCon™ slide plate screen changer with a modular concept that drastically reduces order lead time, streamlines operation, and includes optional features often requested by customers.

Standardization of these options now enables Nordson to meet customer-specific requirements while reducing lead times considerably from the 6 to 8 week range that has been typical in the industry. Different connection features for extrusion line installation are available to meet U.S. requirements (NorCon EH-U) and those of Europe and Asia (NorCon EH-E). Nordson offers models for a wide range of throughputs and to meet the special needs of polymer processing such as sophisticated multi-layer thin film extrusion and sheet applications.

A standard feature in the BKG NorCon EH system is a detachable control that can be affixed to the screen changer or connected to it by means of a cable that permits remote operator control.

Different breaker plate configurations are available to help achieve the best possible system for a given application. The BKG NorCon EH comes with a standard breaker plate which is detachable from the slide plate and includes a screen and is fixed by a retention ring. The second standard version is the hydraulic screen changer (HSC) design, in which the screen and the retention ring are detachable from the breaker plate. An optional breaker plate for coextrusion applications adds an additional “coex” plate and retention ring, particularly important for offsetting backpressure generated during shutdown of one of the extruders. A second option is a twist-lock breaker plate, designed for rapid replacement by another preheated twist-lock package during screen exchange.

![AFFORDABLE CAST FILM OPTION. The Uniflow™ die is well suited for high-speed production of thermally stable resins with very few rate changes, such as for stretch film.](image)

**SHORTER LEAD TIMES, SMOOTHER OPERATION. The new design for the BKG® NorCon™ slide plate screen changer enables Nordson to meet specific customer requirements while still reducing order lead times substantially. New features streamline operation and maintenance.**

Other options available with the BKG NorCon slide plate screen changer include:

- A high-temperature seal usable in the 500-650 °F (260-343 °C) temperature range.
- A new fluid heating alternative to electrical cartridges for heating the system.

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Screen Changer  Continued from p. 5

- Insulation concept for reducing energy consumption.

Nordson has also made changes to the basic system that enhance performance and maintenance. These include easier removal and replacement of heater cartridges, easily lifted stainless steel sheet metal covers, wiring confined to a single junction box, and position control for the hydraulic cylinder.

“While the BKG NorCon slide plate screen changer has been a reliable industry workhorse, our extensive redesign has made it more versatile, easier to operate and maintain, and much more readily available once the customer has placed an order,” said Christian Schroeder, global product manager for melt delivery products. “In addition, we can also supply BKG gear pumps for installation downstream of the screen changer to increase productivity and provide uniform flow.”

The BKG NorCon slide plate screen changer is available in six platforms covering a wide range of bore sizes, screen diameters, heater requirements, and unit weights.

The BKG NorCon slide plate screen changer is a direct drop in replacement for existing extrusion lines. The inlet and outlet connections from the legacy model were kept. Inner parts like breaker plates and established industry leading sealing technology will remain unchanged as well.◆

Lithium-Ion Batteries  Continued from p. 8

in which a polyolefin such as HDPE that has been impregnated with oil or wax is extruded and subjected to machine- and transverse-direction orientation before the oil is removed with a solvent to produce a uniform fibrous network. The finished film must be as thin as possible—typically 30 µm or less—yet strong enough to maintain the mechanical and electrical separation between the electrodes. Extrusion dies are typically 600 to 780 mm wide at outputs from 200 to 550 kg/hr. Clearly such films require exceedingly precise thickness uniformity. To achieve this, Nordson uses rheological analysis to design a die manifold that provides uniform distribution. In addition, the Autoflex automated gauge profile control fine-tunes the flow distribution.

Another essential requirement for separator film is freedom from defects. One key to this is use of a diminishing-volume coat-hanger manifold for reduced residence time, faster purging, and avoidance of gels. Another key is to avoid die lines by designing the die with sharp lip edges. A third way to prevent defects is to resist die buildup through use of high-quality tool steel with mirror finishes.

Nordson also offers more sophisticated solutions for defect-free extrusion. One of these is extra-hard EverSharp™ tungsten carbide coating for wear-resistant lip lands and faces. Another is use of ambient cooling instead of the standard air-cooling system for the Autoflex gauge control. In wet-process production, the oil from the polymer melt may condense on the air cooling component and subsequently drip onto the film, causing product defects.

• BKG® melt filtration systems and gear pumps. Installed just downstream of the extruder, screen changers or melt filtration systems are the chief line of defense against contaminants that can result in defective separator film. Situated just after the screen changer, the gear pump provides a constant mass flow to the extrusion die, helping to ensure product consistency. Since 2010, Nordson has supplied its BKG screen changers and BKG BlueFlow™ gear pumps to producers of battery separator film in Japan, South Korea, China, and Germany. Applications have ranged from laboratory lines to production lines operating at 1,000 kg/hr. Nordson has supplied both discontinuous single-piston screen changers with a single screen cavity and continuous double-piston screen changers with two screen cavities. A continuous screen changer enables the process to continue without shutdown while a screen is changed.

• Xaloy® extrusion screws. As a supplier of screws and barrels to producers of separator films, Nordson recommends two different screw designs. For polyolefins, the Fusion™ barrier screw has a low-shear metering section, provides high outputs at low resin melt temperatures, and exhibits low motor power consumption. For applications that require additional mixing for color or additive dispersion, the Efficient™ barrier screw can be used with the Stratablend® II mixer, which provides intensive chaotic and distributive mixing with little or no temperature rise; or the Nano® mixer, which improves product quality through break-up of color and additives into fine particles and provides superior dispersion throughout the polymer melt. Both screw designs provide excellent melt pressure stability and melt quality to downstream filtration components.

“Nordson is prepared to work with customers to specify the best equipment package for their application, drawing on our years of experience working with separator film producers, slurry coaters, and battery assemblers, and on our global network of engineering and support capabilities,” says Kelly Harings. “The precision and efficiency of Nordson’s coating and extrusion systems can help to minimize consumption of raw materials, which account for a great share of battery production costs.”◆
Plasticizing Units For Molding and Extrusion Address Special Processing Challenges

Nordson has continued its program to develop Xaloy® plasticizing systems that help customers succeed in processing materials that pose special challenges. In recent years it has introduced plasticizing units for high-speed injection molding of thin-wall packaging and for molding and extrusion of highly abrasive materials. Now Nordson has addressed the special problems posed by the processing of polycarbonate (PC), polyactic acid (PLA), liquid silicone rubber (LSR), and highly glass-filled compounds.

“General-purpose screws, barrels, and valves often do not develop the full benefit and avoid the problems associated with these materials,” says Mark Colella, Xaloy global product manager. “Nordson can draw on its 100 years of combined engineering, metallurgical, and machining experience to fashion specialty plasticizing packages customized for the needs of individual customers.”

- **Polycarbonate and acrylic.** An Xaloy package for processing optical grades of these and other polymers produces high-clarity, enhanced-quality parts by delivering a homogeneous melt with a minimum level of the shear that can cause yellowness or discoloration, and by avoiding polymer sticking points or “dead” spots where blemishes such as black specks can form. Nordson recommends the system for processing lens-grade or colored PC for automotive lighting, eyeglasses, optical disks, and electrical and telecommunications components.

The components of the PC molding system include: 1) the Pulsar® II mixing screw, which minimizes color degradation caused by shear during mixing and prevents the sticking of material at sites on the screw where specks can form; 2) a barrel with X-800® inlay, which is composed of a nickel-based alloy with tungsten carbide that provides an especially hard surface with release properties that prevent polymer from sticking to the barrel; 3) a valve for free-flowing melt delivery, designed for PC viscosity; and 4) a nickel-plated end cap designed to smoothly transition the PC melt from the screw to the injection nozzle.

- **PLA bioplastic.** The Xaloy PLA package—one of several packages that Nordson has developed that allow processors to use a bio-based polymer—provides greater productivity and better product quality than standard screw and barrel systems while resisting the corrosive and abrasive effects of PLA compounds. Special design elements are: 1) screw geometries designed specifically for PLA that increase throughput while minimizing shear and controlling melt temperature; 2) mixing segments that deliver a homogenized melt; and 3) screw and barrel materials that resist the mildly corrosive effects of PLA and the abrasion caused by compound ingredients.

For all PLA applications, barrels in the new package system are lined with wear-resistant X-800 inlay; screws consist of 17-4 PH stainless steel with X-183™ hardfacing. For extrusion, the recommended screw is the Efficient™ barrier screw with patented Stratablend® II mixer, providing chaotic and distributive mixing and homogenized melt temperatures for enhanced quality and productivity. For injection molding, the EasyMelt® screw can be tailored to a specific PLA resin grade to provide optimum temperature control and rapid recovery. When mixing is required, the Z-Mixer™ can be added; it is particularly valuable for applications requiring high clarity.

- **Liquid silicone rubber.** The Xaloy complete injection-unit package for LSR molding can be readily retrofitted on standard molding machines.

“The low-viscosity liquid ingredients for LSR pose a very different set of mixing and metering requirements from those of thermoplastics, and their temperatures must be maintained below the curing point until homogenized material reaches the mold cavity,” said Mr. Colella. “Our LSR package addresses these unique challenges yet can be retrofitted in what amounts to a bolt-on conversion.”

The components of the LSR package are: 1) a single-flight, wear-resistant, 12:1 to 14:1 L/D screw designed to provide optimum homogenization of catalyst and crosslinking agents without increasing the temperature of the compound; 2) a barrel with feed port moved downstream, two welded cooling jackets, and a low L/D ratio, providing the intensive cooling required to hold the LSR compound below crosslinking temperature; 3) a rear seal installed on the barrel or as a seal ring on the screw shank; 4) a spring-loaded valve to ensure immediate shutoff with low-viscosity LSR compounds; and 5) a shutoff nozzle.

Nordson recommends the Xaloy LSR package for manufacturers of seals, gaskets, cushioning pads, medical devices, infant feeding items, ruggedized electronic devices, etc. Continued on p. 4
A Single Source of Coating and Film Technologies for Makers of Lithium-Ion Batteries

Anticipating rapid growth in the market for lithium-ion (LI) batteries, Nordson has assembled the most comprehensive portfolio of extrusion and coating technologies available for battery manufacturers. The technologies focus on two critical components of these batteries: the anode and cathode slurries that serve as electrodes; and the separator films that keep the electrodes apart to prevent short circuits. Starting with the first of four U.S. Department of Defense contracts awarded in 2002, Nordson played a role in helping to perfect these components, and today the company supplies separator film and battery manufacturers around the world.

While LI batteries are familiar to everyone because of their widespread use in consumer electronics, much new growth is anticipated in automotive and energy storage applications. These uses pose great challenges because of stringent requirements for efficient and reliable battery performance. At the same time, global competition forces battery manufacturers to achieve even higher levels of operational economy and productivity.

Technologies supplied by Nordson to help meet these requirements include EDI® polymer dies for extruding separator film, Premier™ fluid coating dies for applying electrode slurries onto metal foils, Xaloy® screws and barrels, and BKG® melt filtration systems and melt pumps.

“Nordson has become a single source for key components used in separator film extrusion and electrode application and can draw on sixteen years of experience in LI battery applications to custom-design a package to meet customer requirements,” says Kelly Harings, global manager of marketing for Nordson’s Polymer Processing Systems brands. “We are prepared to help customers with budget-sensitive applications as well as those that require the most sophisticated and advanced equipment.”

- **Premier™ fluid coating dies.** Nordson’s experience with electrode application began in 2002 with building and operating a pilot coating line. Today these fixed-lip dies are widely used in LI battery applications by virtue of unmatched flatness and slot gap uniformity, which yield a coat weight uniformity of +/- 1 to 2%. An accompanying Premier die positioner provides a repeatability of +/- 1.25 µm. Such precision is important for preventing product shorts in operations with coat thicknesses in the 200 to 500 µm range and lines speeds from 5 to 40 m/min. Premier dies are used to coat copper or aluminum foil substrates on both sides in a single pass or separate passes.

- **EDI® polymer extrusion dies.** Separator films are permeable membranes with 40 to 50% void volume to facilitate ion transport. A common method of producing them is the so-called “wet” process, which involves precisely applying electrolyte to both sides of a thin polymer film. Nordson has supplied these dies to lithium-ion battery producers since 2002.

- **EDF® polymer extrusion dies.** Separator films are permeable membranes with 40 to 50% void volume to facilitate ion transport. A common method of producing them is the so-called “wet” process, which involves precisely applying electrolyte to both sides of a thin polymer film. Nordson has supplied these dies to lithium-ion battery producers since 2002.

**NORDSON ON THE WEB**

For information on all Nordson Polymer Processing Systems brands, readers are invited to visit www.nordsonpolymerprocessing.com. Nordson Corporation (Nasdaq: NDSN) engineers, manufactures and markets differentiated products and systems used for the precision dispensing and processing of adhesives, coatings, polymers and plastics, sealants, biomaterials and other materials and for fluid management, test and inspection, UV curing and plasma surface treatment, all supported by application expertise and direct global sales and service. Nordson serves a wide variety of consumer non-durable, durable and technology end markets including packaging, nonwovens, electronics, medical, appliances, energy, transportation, construction, and general product assembly and finishing. Founded in 1954 and headquartered in Westlake, Ohio, the company has operations and support offices in more than 35 countries. Visit Nordson on the web at www.nordson.com, www.twitter.com/Nordson_Corp or www.facebook.com/nordson.