

## Key Contacts at Nordson for Fluid Coating Systems

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## At ICE, Nordson Highlights the Diversity and Global Availability of its Coating Systems



A key message of Nordson Corporation at the ICE shows is that the company now offers the most diversified range of coating die systems available for web converting. Its slot die systems for applying cold fluids or hot melts include fluid delivery and die positioning equipment. Its extrusion coating dies for applying polymers feature internal decks that can be adjusted for edge profile control. The entire Nordson portfolio is backed by many decades of experience serving the converting industry and supported by a worldwide sales and support network.

The Nordson exhibit at **ICE USA** (Booth 715) will feature the company's entire coating product range, including the hot melt systems long offered by Nordson and the fluid coating and extrusion coating systems developed by Extrusion Dies Industries (EDI), which Nordson acquired in 2012.

At **ICE Europe** (Hall A5, Stand 1026), the Nordson exhibit will include the Premier Coating Division, which was part of the EDI acquisition. Widely used in the US, Premier™ dies are now offered globally.

Some of the systems now available from Nordson for web coating include:

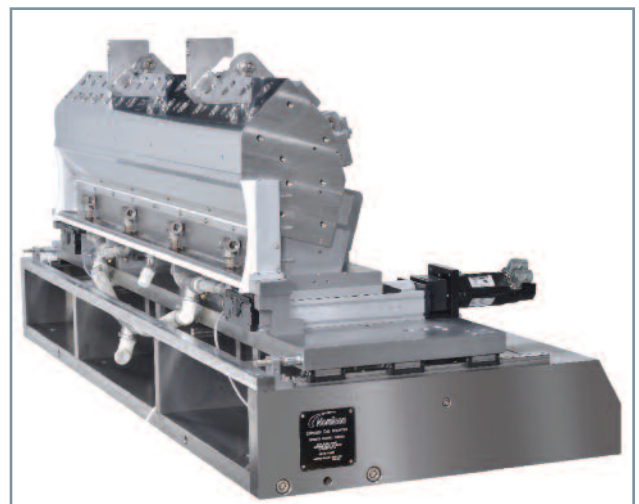
- **Premier™ fixed-lip fluid coating dies**, capable of applications as thin as one micron (wet) with coat weight accuracy of +/- 1 to 2%.
- **UltraCoat™ adjustable-lip coating dies for cold fluids or hot melts**, in which coating gap and width can be adjusted without disassembling the die.
- **TrueCoat™ fixed-lip hot melt coating dies**, with capability for quick job changeovers.
- **EPC™ extrusion coating dies**, whose internal deckle has independently adjustable components that can be used to set the overall coating width and to minimize edge bead.

This product-line versatility is just one of the capabilities that set Nordson apart as a supplier to the web converting industry. Nordson is the only truly global supplier of coating systems, offering sales and technical support through a network of directly operated facilities in more than 30 countries. The company manufactures both slot dies and extrusion dies in the US, Europe, and Asia.

It maintains trial laboratories for slot die coating at seven locations in China, Germany, India, Japan, Korea, and the US.

Nordson is a publicly traded multinational with annual sales of nearly US \$1.7-billion. It has a substantial commitment to investment in R&D and in local infrastructure, notes John J. Keane, senior vice president.

"Nordson's way of doing business is to operate in each region of the world as a local company that is backed by a strong central organization but engages customers in their own language, culture, and time zone," says Mr. Keane. "Our goal is to be able to make any product where we sell it, and we already have the leadership and infrastructure in place worldwide that enables us to do this." ♦



**HIGH-PRECISION FIXED-LIP DIES** make up the Premier™ slot die coating range. Dual-slot coating station shown here is capable of minimum wet coating thickness of 1 micron and coat weight tolerance of +/- 1 to 2%.

## Inside....

- Benefits of slot dies for converting to water-based coatings
- Flexible packaging producer eliminates edge bead in extrusion coating

**Advantages of Slot Die Systems** *continued from P. 4.*

**Large Economic Benefit of Converting to Slot Die System**

One way to put into perspective the economic benefits of converting to a slot die/water-base system is to consider the potential annual cost savings, compared with roll coating/solvent-base, for a typical 60-in. width application. Depending on a number of factors, savings can range from \$500,000 to \$1,000,000, often amounting to a reduction of operating costs in excess of 50%.

To understand how these savings are realized, it is useful first to review how the slot die coating process works. The slot die is a pre-metered system—that is, all of the fluid that is pumped into the die is transferred onto the substrate at a pulse-free, constant rate. The thickness of the coating is determined solely by line speed, pump speed, and the design of the die. The process permits precise control over coat weight and cross-web distribution, even at very low thicknesses or very high speeds. Further augmenting this control are three factors: 1) the precision flatness at the lip area of the die; 2) the manifold, or flow channel, inside the die, which is designed to uniformly distribute the coating fluid in accordance with the flow properties of the fluid; and 3) the slot die support system, which accurately positions the die relative to the back-up roll or substrate and ensures repeatability.

This precise control over coating application afforded by the slot die yields a **coat weight uniformity** equal to or better than that obtained with roll coating / solvent-base systems, along with these advantages:

- **Tighter coat weight tolerances.** By holding tolerances to +/- 1 or 2%, slot die coating allows for reduced coating material consumption without compromising the quality of the finished product. In fact, new formulations with customized slot die design often yield products with thinner coat weights and better performance.
- **20% or greater increase in line speed.** Maximum line speeds for slot dies are 3,000 feet (915 m) per minute; by contrast, roll coating typically runs no faster than 1,150 to 1,500 feet (350 to 460 m) per minute.

The accompanying table, based on one customer's use of a Premier slot die system to coat film for an electronics application, shows how these slot die coating advantages translate into cost savings.

Key to the success achieved in this example was the improved coat weight uniformity with the Premier die, which held cross-web thickness variation to +/- 2% and made possible coat weight thickness reduction to 5.7 gsm when wet and 2.5 microns when dry. Another contributor to the success of this system upgrade was the use of a vacuum system, which stabilized the coating process at very thin coat weights.

Also, the slot die coating process often provides significant increases in production yield. Defects, such as ribbing, streaks, bubbles and web breaks will often limit the line speed when applying fluids via roll coating. Slot die systems help to resist these defects, often allowing for significantly higher production speeds. Since roll coating allows only a partial transfer of the coating fluid from the applicator roll to the substrate, product defects can develop at high speeds as a result of film splitting.

The savings achieved in this electronics film application included annual savings of \$280,048 in coating fluid, \$99,533 in substrate material, \$298,718 from improved yield, and \$569,223 in labor, for a total annual saving of \$1,247,522.

**Additional Slot Die Benefits from Multilayer Coating**

Simultaneously coating two or more layers in one pass can dramatically improve production efficiency. In a Premier dual-slot die (see schematic), a wedge-shaped center body adds an additional slot, but the die can also be used as a single-slot die by using the lower and center bodies together. A triple-slot Premier die has two

wedge-shaped center bodies instead of one, and it too can be used as a single- or dual-slot die by using the lower and center bodies together.

In applying two coatings in the same pass, it is critically important that the fluids have different surface tensions to prevent the fluids from mixing. In general, to promote complete spreading, the top layer needs to have slightly lower surface tension than any of the other layers.

**Estimated Annual Savings after Switching from Roll Coating to Slot Die Coating**

Application Parameter	Electronics Film	
	Knife over Roll	Fixed Slot Die
Substrate	Poly-propylene	Poly-propylene
Base web coating	None	None
Coating width, mm	300	300
Solids content, %	35	35
Coat weight (wet), gsm	22.9	5.7
Tolerance, +/- %	4	2
Line speed, m/min.	10	15
1 <sup>st</sup> pass yield, %	10	90
Annualized savings with slot die	<b>\$1,247,522</b>	

Source: Nordson Extrusion Dies Industries

**Considerations for Switching to Slot Die Coating**

Below are some equipment recommendations for a successful slot coating process.

The die should be capable of performing both on- and off-roll coating to accommodate multiple application methods. A lip gap tolerance of +/- 1.25 microns is important for assuring precision control of coat weight uniformity. The die distribution manifold should be designed for low-shear distribution of multiple coating fluids, and the fluid delivery system should also be low-shear. A precision die positioner or coating station which includes a precision backing (coating) roll is also an important component for ensuring coating repeatability.

The Premier Coating Division of Nordson EDI supplies a full range of single-, dual-, and multi-layer fixed-lip slot dies. Nordson manufactures a wide range of related equipment essential for fluid coating accuracy and productivity. **Fluid delivery systems** provide a non-pulsing, consistent feed of fluid to the die, ensuring consistent coating volumes. **Die positioners or coating stations** provide repeatability and adjustability. And **vacuum boxes** help to control the length of the coating bead and the processing window for developing surface properties. Also available are complete **modular coating systems** for lease or purchase by customers, as well as for on-site customer trials. ♦

