Advantages of Slot Coating Technology

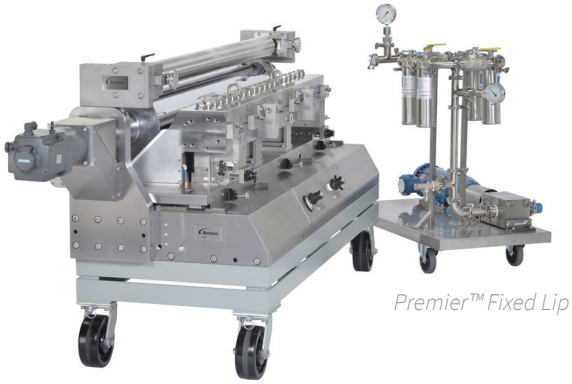
Slot coating technology offers several major benefits when compared to traditional roll coating technology. Customers have reported considerable cost savings and process improvements as a result of partnering with Nordson to make the switch to slot coating.

Nordson offers converters slot die coating systems that deliver a precise, uniform flow to the web at a constant rate.

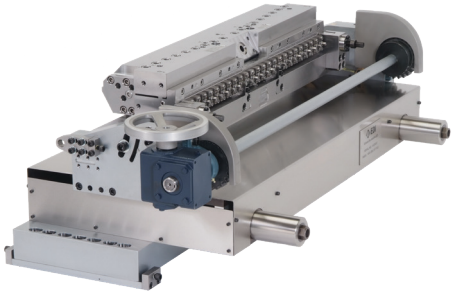
Premier™ Fixed Lip and Ultracoat™ Flexible Lip Slot Dies are custom designed for a wide range of fluids, including solvent and water-based coating, slurries, paint, hard coating, UV curable, adhesives, and many more.

At our dedicated facility, experienced technicians use state-of-the-art equipment to manufacture multi-layer slot dies to precise tolerances after precision grinding and hand lapping. The result is a die that is not only flat and straight, but also has an exceptionally uniform slot gap.

No matter what your coating needs are – from laboratory devices to production systems for adhesives, magnetic media, paint, solar, glass coating and more – a custom-designed slot die system will increase your production efficiency and provide significant cost savings.



Premier™ Fixed Lip Slot Die System



Ultracoat™ Flexible Lip Slot Die System

Benefits of Slot Coating vs. Roll Coating

- Improve coating fluid yields with a pre-metered slot die system that applies all of the coating fluid to the substrate via a positive displacement pump and slot die
- Achieve coating property consistency with a closed slot coating system, designed to reduce contamination and emission of volatiles while maintaining consistent fluid properties throughout the entire production run
- Boost end product yields with a uniform coat weight produced by the slot die's manifold geometry, which is designed to uniformly distribute the fluid based on its rheology
- Increase production rates with a slot coating system, allowing for better control of the cross-web uniformity and capability to increase the percentage of solids, thus reducing drying time
- Reduce downtime for product changeovers with a slot die designed for a large window of coating widths and thicknesses
- Expand production capabilities with a multi-layer slot die designed to apply up to 3 fluids in one pass

Features of Nordson Slot Die Technology

- Die manifolds are custom-designed to specific coating requirements using our proprietary die manifold software and fluid rheology supplied by customer for each fluid that will be used
- A variety of options available, including fixed lip dies for improved coating consistency and flexible lip dies for better control of coating process parameters
- Full System Solution: Single & Multi-layer Dies, Die Positioners & Stations, and Fluid Delivery Systems

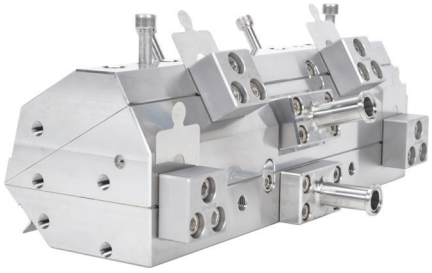
Nordson's experienced and knowledgeable fluid coating experts are available to help converters design their customized slot die system and are ready to help those considering the change from roll to slot coating.

Nordson

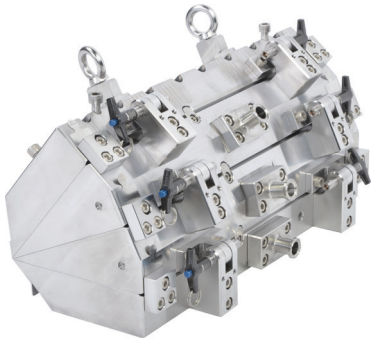
Advantages of Slot Coating Technology

Premier™ Fixed Lip Slot Dies

Premier™ Fixed Lip Single Layer Slot Die



Premier™ Fixed Lip Dual Layer Slot Die



Premier™ Fixed Lip Triple Layer Slot Die

Premier™ slot dies are designed to be extremely precise, while still easy to use.

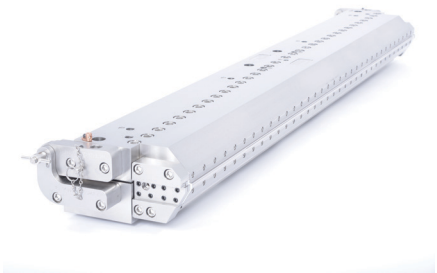
- Optional designs include slot, curtain, or slide curtain
- Optional features include hand-operated die opener on single layer dies, cored holes for liquid temperature control, and die cavity plugs to increase flexibility of die without sacrificing performance

Number of Layers:

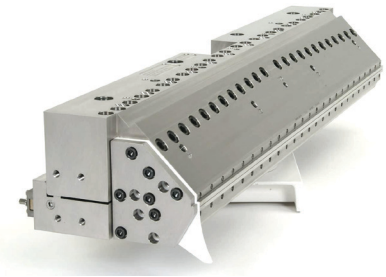
- Slot Dies: 1-3 layers
- Slot Curtain Dies: 1-3 layers
- Curtain & Slide Curtain Dies: 1-10+ layers

Lip Gap Adjustment	Fixed - Shims Available
Coating Thickness (Wet)	1µm (min.)
Coat Weight Accuracy	± 1 to 2%
Viscosity Range	1 - 175,000 cP
Coating Speeds	0.15 - 900 mpm 0.5 - 3000 fpm
Max. Coating Width	4800mm
Max. Operating Temp.	82°C (180°F)
Coating Applications	Non-contact Draw Tension Web (Free Span)

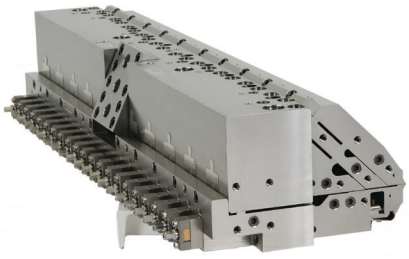
Ultracoat™ Flexible Lip Slot Dies



Ultracoat™ Flexible Lip Single Layer Slot Die



Ultracoat™ Flexible Lip Dual Layer Slot Die



Ultracoat™ Flexible Lip Triple Layer Slot Die

Ultracoat™ slot dies provide flexibility to adjust for variation in web thickness and process parameters.

- Manual and automated lip adjustments precisely control the cross-direction profile of the coating as it exits the die
- Coating width is set by a die shim and the slot gap is set by adjusting the flexible lip
- Optional features include cored holes, replaceable lip inserts, and automated flexible lip (Autoflex)

Number of Layers:

- Slot Dies: 1-3 layers

Lip Gap Adjustment	Manual or Automatic
Coating Thickness (Wet)	12µm (min.)
Coat Weight Accuracy	± 1.75 to 3.5%
Viscosity Range	1 - 250,000 cP
Coating Speeds	0.15 - 900 mpm 0.5 - 3000 fpm
Max. Coating Width	4750mm
Max. Operating Temp.	82°C (180°F)
Coating Applications	Contact - Wipe

Advantages of Slot Coating Technology

Fluid Delivery Systems

Premier™ Fluid Delivery System

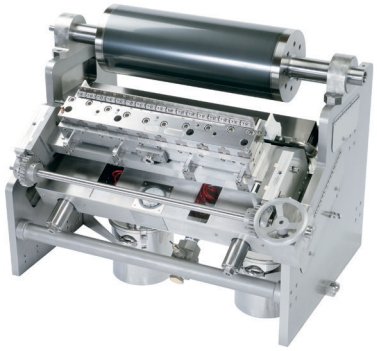
Nordson fluid delivery systems offer a simple, yet customized, approach to fluid delivery.

- Standard models include a lab/small production fluid delivery system, medium production fluid delivery system, and a large production fluid delivery system
- Customize various features, including filter type, pump type, and inclusion of a tank
- Options include in-line flow meters, fluid tank agitation, temperature control, explosion proof rating, and a fully automated system

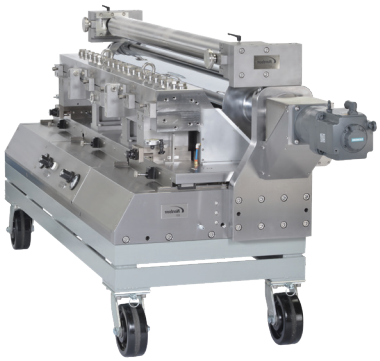
Features

- Sanitary Connections
- In-line T-valves
- Modular Pump & Gear Reducer Design
- 3-way Manual Ball Valve
- In/Out Pressure Gauges
- Pressure Relief Safety Valve
- Drip Pan with Drain Plug

Die Positioners & Stations



Ultracoat™ Support & Modular Coating Station



Premier™ Die Positioner

Nordson positioners & stations ensure precise, uniform, and repeatable substrate coatings.

- Premier™ die positioners are designed for on-roll or off-roll (tension) coating and may be used with Premier™ single layer fixed lip dies, multi-layer fixed lip dies, or double-sided coating applications
- Ultracoat™ support stations and modular coating stations are designed for use with Ultracoat™ flexible lip dies and feature pneumatic actuation via air cylinders and an optional vacuum box or regenerative blower
- Positioners and stations available for Premier™ and Ultracoat™ slot die systems
- Mounting options include table mounted, cart/platform mounted, or floor mounted systems
- Easily integrated into new or existing production or lab lines

Advantages of Slot Coating Technology

Considering a switch to slot coating? Nordson's experienced fluid coating experts can help!

Case Study Application: Electronic Components

Parameters	*Original Coating Method*	*New Coating Method*
Coating Process	Knife Over Roll Coating	Slot Coating
Base Web Material	Polypropylene	Polypropylene
Base Web Coating	None	None
Coating Width	300mm	300mm
Percentage of Solids	35%	35%
Coat Weight - Wet	22.9gsm	5.7gsm
Tolerance	± 4%gsm	± 1%gsm
Line Speed	10.0m/min	15.0m/min
First Pass Yield Percentage	10.0%	90.0%

Cost Comparison

Parameters	*Daily*	*Monthly*	*Yearly*
Fluid Material Cost	-$800.00	-$23,300.00	-$280,000.00
Web Material Cost	-$200.00	-$8,300.00	-$99,500.00
Final Coating Yield Loss	-$800.00	-$24,900.00	-$298,700.00
Labor Costs per Meter	-$1,600.00	-$47,400.00	-$569,200.00
Total Potential Savings	$3,400.00	$103,900.00	$1,247,400.00

Key Considerations:

- Coat weight thickness reduction to 5.7gsm
  - Self-metered slot technology with precision die to web gap control
  - Addition of vacuum system to control lay down of coating at thin coating weights
- Coat weight tolerance - yield improvement
  - High precision flatness of dies (< 2μm)

Success Factors:

- Thickness control
  - Cross web uniformity (2%)
  - Thinner coatings (2.5 micron dry)
  - No edge bead
- Yield increases
  - Reduce streaking
  - Eliminate bubbles and repellencies
  - Reduce web breaks

Case Study Application: PSA Label Adhesive

Parameters	*Original Coating Method*	*New Coating Method*
Coating Process	Roll Coating	Slot Coating
Base Web Material	Paper	Paper
Base Web Coating	Silicone	Silicone
Coating Width	1500mm	1500mm
Percentage of Solids	54%	54%
Coat Weight - Wet	37.0gsm	37.0gsm
Tolerance	± 4%gsm	± 2%gsm
Line Speed	130 m/min	260 m/min
First Pass Yield Percentage	87.0%	90.0%

Cost Comparison

Parameters	*Daily*	*Monthly*	*Yearly*
Fluid Material Cost	-$500.00	-$14,700.00	-$177,000.00
Web Material Cost	-$800.00	-$25,000.00	-$301,000.00
Final Coating Yield Loss	-$700.00	-$22,100.00	-$265,400.00
Labor Costs per Meter	-$1,600.00	-$46,600.00	-$559,100.00
Total Potential Savings	$3,600.00	$108,400.00	$1,302,500.00

Key Considerations:

- Supplying a bubble-free delivery system
- Quicker product changeover
- Operator training

Success Factors:

- Coat wider range of products
  - Thickness ranges from 10 to 200 microns
  - Viscosities from 20 cps to 3,000 cps
  - Coating width
- Yield Improvements
  - Downtime
  - Line speed increases
  - Defect reduction

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