# EDI® Technology Solutions for Stretch Film Applications

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Nordson

# Keeping It Together

## Deliver film that provides durability for load retention and frequent handling.

As packaging and delivery are often part of the customer experience, stretch film producers must focus resources on transporting products securely and effectively.

### Deliver Effective Stretch Film

Now more than ever, it's critical that the stretch films used in packaging provide superior cling, clarity, and protection during handling. Ensuring these films can endure elastic recovery, strength, and tear resistance is no easy task - but with the use of the right extrusion equipment, it becomes much easier to produce highly effective stretch films.

### Your Partner in Success

Transforming polymer melt into high-quality film and sheet has been our core competence since 1971. EDI® systems are designed to further enhance end-product characteristics, making them suitable for various and demanding end markets, ranging from automotive to medical to packaging. We want our customers to experience trouble-free, highly automated processes for dependable and rewarding results.

## The Foundation: An EDI® Ultraflex™ Extrusion Die

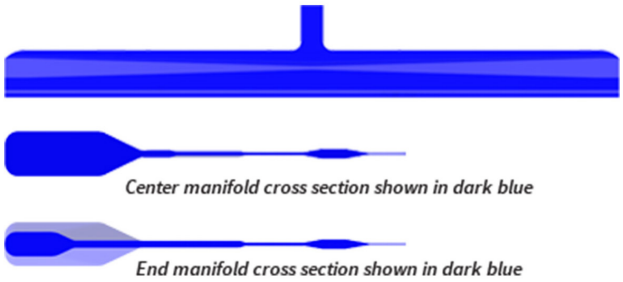
The key objective of a flat die system is to uniformly distribute the melt stream to a specified width and at a uniform velocity. Because of this, we put a great deal of emphasis on the front end of our order process, ensuring our die design meets each customer's specific processing parameters. This includes going through the various die options, collecting process details, and using proprietary flow simulation software to convert rheology data into a streamlined die manifold.

### Multiflow™ 10 Die Manifold

*US Patent 12,558,830*

Our Multiflow™ 10 manifold presents cast film processors with many benefits in an industry-preferred die body design. The manifold is designed with a faster purging flow channel (when compared to competitive designs) to provide the lowest residence time in a straight backline manifold die.

By uniformly distributing layers across the width, the Multiflow™ 10 manifold also helps processors quickly refine their production process to increase the output of saleable film.




The Multiflow™ 10 manifold features a moderate aspect ratio for coextrusion processes and is designed to keep deflection uniform in processes using high line speeds and down-gauging. The manifold shape also forces the flow volume to diminish at the ends of the die, promoting uniform film properties.

### Manual Lip Adjustments

Manual lip adjustments enable operators to adjust the die lip by using hand-operated tools to tighten or loosen the bolts. This tried-and-true method has been used in the field for decades whenever coarse adjustments to the die's lip gap are required.

*Push-Only Lip Adjustments*

#### Push-Only Lip Adjustments

A single thread allows for large movement per revolution (around 1mm/rev).

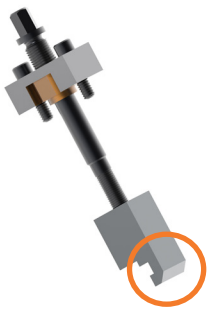
#### Differential Push-Only Lip Adjustments

The two-thread system enables finer movement per revolution (around 0.2mm/rev).

*Differential Push-Only Lip Adjustments*

#### Differential Push-Pull Lip Adjustments

The two-thread system enables finer movement per revolution (around 0.2mm/rev) and the pull feature assists with lip opening in lower-pressure applications.



*Differential Push-Pull Lip Adjustments*

## Stepping It Up: EDI® Autoflex™ Automatic Lip Adjustment Systems

Installed on thousands of dies worldwide, the Autoflex™ automatic lip adjusting system is the leading technology for precisely controlling the thickness profile of the film. In addition to making possible higher quality, more accurate products, the Autoflex™ system can generate substantial raw material savings compared to conventional manual adjustments.

The Autoflex™ system uses thermal expansion and contraction of the lip adjusting unit to make finer adjustments to the flexible lip than are possible with manual articulation.

Each lip-adjusting position is fitted with a block containing a heater and an air-cooling path. Inherent in the system is a complete manual override, so the approximate gauge uniformity is established conventionally before the thermal system is engaged. The thermal adjusting system utilizes an electrical source for each adjusting point to increase or decrease the temperature of the adjusting block, thereby changing the lip opening.

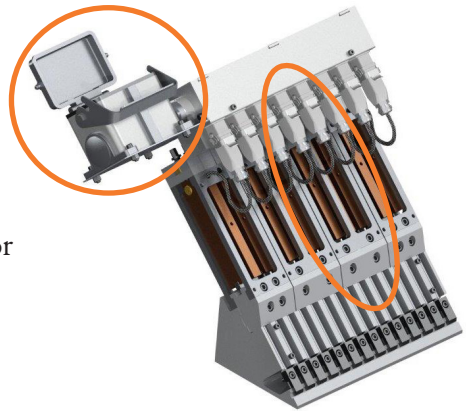
### Autoflex™ VI-RE Systems

*US Patent 10,518,459*

The most recent version of our proven Autoflex™ technology offers processors a smaller and lighter system than ever before, with the bonus of a streamlined design that is easily disassembled for maintenance. The combination of the Autoflex™ VI-RE system and a computerized gauge monitor typically yields closed-loop control that reduces gauge variation to about half of the minimum achievable with manual systems.


The system:

- Provides a 43% increase in the stroke of the lip adjusting system, without adding to response time, enabling the system to correct a wider range of process variations, often without the need of manual intervention
- May be operated in convective or forced-air cooling conditions
- Reduces downtime with a design that provides easy access to wearable parts during routine maintenance and cleaning
- Includes heater wiring routed directly into a junction box using a quick disconnect plug
- Features module sets, containing three or four adjustments each, allowing for easy access to wearable parts in a specific area of the system
- Is retrofittable to existing dies
- Offers additional module sets, which may be purchased as a spare set to use while repairing an original component



*Autoflex™ VI-RE System: Close-up of Modules & Heater Wiring*

## The Future Is Now: EDI® Prodigi™ Motorized Lip Actuator System

Conventional thermal die bolts have long been proven to be an effective means of controlling the die lip gap to improve product thickness uniformity. The technology generally requires manual pre-tuning of the die lip profile before the Automatic Profile Control (APC) system is engaged.

***But what if this could be done faster... and safer?*** The patent-pending Prodigi™ motorized lip actuator system allows for full remote control of the die lip gap articulation, removing the need for any direct-contact tuning by a technician.

### Prodigi™ Motorized Lip Actuator System

*Patent Pending*

Instead of using thermal bolts to control the lip adjustment, Prodigi™ relies on a series of motorized actuators, connected to the adjustment threads. These motorized actuators smoothly translate motor rotation into precise linear movement to locally open and close the lip. This is accomplished away from the hot die, at a user interface.

Development trials captured an original thickness variation of +/- 25%, which decreased significantly after 44 seconds. Within only three minutes of engaging APC, an almost perfect gauge over the complete length of the die was achieved. This compares to an average of 12 minutes to achieve the same tolerances using conventional thermal actuators, offering operations considerable time savings and the ability to exactly repeat their production cycles. This creates much less scrap and adds more productive time since final tolerances are achieved so quickly.

With this system, processors can:

- Increase their set-up speed by saving a gauge profile configuration, which may be simply relaunched for the next production cycle
- Gain additional stroke thanks to the motorized actuators, which can traverse the entire useful flexible lip travel range without the need for any manual intervention
- Achieve optimal repeatability, using the Prodigi™ system's computer-based programming to save the exact location of each bolt during a production run
- Boost energy savings since the actuators operate at a significantly lower temperature than conventional auto bolt translator blocks and because the system uses little to no additional power after it achieves steady-state operation
- Improve team safety by removing operators and technicians from the hot zone near the die surfaces and melt stream components

# Coextrusion Technology

Coextrusion technology enables processors to further improve their end product by combining materials to add strength, durability, and protective properties.

## Delivering the Ultimate Flexibility: EDI® Coextrusion Feedblocks

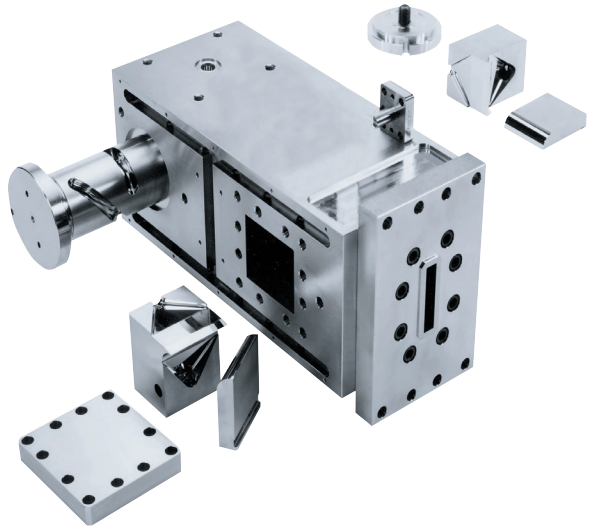
Our feedblocks combine polymers in a parallel path manner, achieving optimal layer ratio stability throughout a structure. Flexibility in the design means entrance locations can be customized, based on your line design and layout.

### Ultraflow™ I-S Fixed Geometry Feedblock

Our fixed geometry feedblock is an industry-proven design, enhanced by collaboration of coextrusion expertise between our world-class design engineers and industry partners.

This feedblock offers processors:

- Controllable linear valves, which allow for highly precise layer ratio changes
- Exchangeable flow inserts and plugs, as well as flush inserts, which are used to change layer sequences
- Selector spool(s), which enable the layer sequences to be prearranged upstream of the combining point, all without removing the feedblock from the production line
- A split body design that minimizes physical space requirements and is easier to clean



## Die Options

Our goal is to ensure you have the tools needed to successfully produce stretch film. The following features are optional but are certainly worth considering when trying to increase your operation's profitable output.

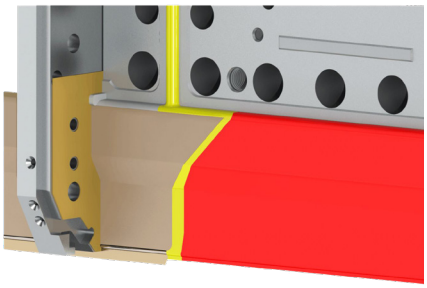
### Deckling

Deckles are designed to vary the product width by blocking off portions of the die slot from both ends of the die. Options for stretch film applications vary, depending on the customer's specific product and process needs.

#### Fixed Internal Deckles

Internal deckle systems include fixed deckle blades.

#### Adjustable or Fixed Encapsulation Deckles



Edge encapsulation is used on stretch film applications to avoid neck-in for high speed stability. With this method, a higher melt strength polymer is introduced at both edges of the film through manifolds located alongside the main manifold to stabilize the web and allow for thinner, higher speed processing. The encapsulation manifolds are designed to generate a single uniform flow front as the film leaves the die. The edge material must be compatible with the polymer in the main structure in order to create a bond.

### Die Insulation

Adding insulation can quickly benefit an organization. The insulation, made from inorganic materials, is sandwiched between stainless steel panels to optimize die temperature control, isolate the die from external drafts, and increase team safety.

## Chrome Plating & Optional Coatings

We recommend a hard-chrome plating be applied to each of our extrusion dies. Chrome plating provides processors with several benefits for a premium performance that lasts.

This includes:

- Scratch resistance
- Corrosion resistance
- Lubricity

Compared to other coatings which are costly and difficult to refurbish, chrome plating may be easily replaced or reworked in the future.

### Ultrachrome EX Coating

Ultrachrome EX is a ceramic coating that is impregnated and bonded throughout the micro-crystalline structure of the flow surface, offering improved slip release and rust prevention.

## Ancillary Equipment

We also offer several other components to add efficiency to your stretc film production.

### Adaptor Pipes

Adaptor pipes are used to connect the die and upstream components a variety of production settings.

### Autoflex™ Blower Systems

Autoflex™ blower systems are designed to provide additional forced air support for Autoflex™ dies, using a Spencer 2.5 horsepower regenerative blower.

### Ultracart™ System

Enhance workplace safety with the added mobility of a cart, which allows an entire die to be wheeled from the processing line to a maintenance area. The Ultracart™ system streamlines the cleaning process by rotating the die halves for easy access to the flow surfaces.

## Die Parts

We offer a selection of parts and cleaning materials to ensure that your organization has the proper tooling for a die shutdown, helping to significantly reduce your downtime. We recommend the purchase of a spare parts kit with every die ordered. Each kit includes our suggested quantity of replaceable parts, specific to the die's serial number, ensuring you have the correct parts in stock for planned maintenance events.

### Cleaning Kits

We suggest purchasing a cleaning kit with each die, ensuring you have the proper materials on hand to safely and properly clean your die. The cleaning kit includes die soap, scrapers, copper gauze, a feeler gauge, heater lubricant, and anti-seize.

## Additional Technical Support Available from Nordson

Extrusion and fluid coating die systems are not only a strategic investment, but also a critical aspect in the overall success of your business. Nordson employs a team of field service technicians to offer processors and converters both on-site and remote technical support. The technical service team offers seven days a week scheduled or emergency call service and is based throughout the world to provide regional service and support.

Their services include:

### Installation and Start-up Assistance

Our technicians are available to assist with start-up, commissioning, and process optimization.

### On-site Inspections and Repairs

Our team provides on-site inspections, repairs, and replacement of components and parts.

### Operation and Maintenance Training

Profit from our experience and know-how in plastics processing by having our professionals train your staff. A team of Nordson experts tailors each program to fit your requirements. Training courses can be held at one of our technology centers or at your location.

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