Special K 2010 Issue – Visit EDI in Hall 2, Stand G-06

EDI Advances

News and Concepts from Your Global Partner in Extrusion, Coextrusion & Converting

ISSUE NO. 20

## Visit Us at K 2010

### Hall 2, Stand G-06

We cordially invite you to visit EDI during the show. It will be an opportunity to meet our executive, sales, and engineering staff from around the world and discover our latest technologies. Besides innovations, our exhibit will also feature established systems that customers have come to rely on. Here is a look at what will be on display:

***Adjustable Ultraflow® V feedblock.*** Being shown for the first time at K, this system eliminates need for interchangeable flow inserts (see the article on p. 1).

***EPC™ extrusion coating die for reduced downtime.*** Also brand-new at K, this die simplifies changes in product width and eliminates much of the deckle disassembly involved in cleaning and maintenance (see the article on p. 2).

***Compact 'layer multiplier' for microlayer structures.*** This system, available to purchasers without licensing or royalties, promises to extend the shelf life of retort, hot fill, and flexible food packaging, while increasing formability in thermoforming (see the article on p. 4).

***Contour™ cast film die.*** Its unique design reduces the downtime for lip adjustment required with each new product run, enhances gauge profiles, and yields a uniform layer structure in coextrusion. The die will be shown with a 9-layer feedblock.

***Biaxially Oriented Triple-manifold coextrusion die.*** On display will be a 1900-mm (75-in .) Autoflex® VI-R system with distribution block.

***Sheet die with restrictor bar.*** This 1220-mm (48-in.) die will be shown with a three-layer feedblock. ◆

# A New-Generation Feedblock Makes Layer Adjustment Even Easier

EDI's Ultraflow® feedblock, an industry workhorse for film and sheet coextrusion, is now simpler than ever to use. With the standard Ultraflow system, processors can fine-tune layer thicknesses without disassembling the feedblock by interchanging specially machined flow inserts. The new Ultraflow V feedblock eliminates even this step, reducing production downtime for multilayer structures ranging from the simplest sheet to complex packaging films.

Instead of flow inserts, the new-generation feedblock has adjustable combining planes where the melt streams join the central flow channel. The streams are combined in parallel to form the basic multilayer structure, or "sandwich."

The Ultraflow V can operate in two modes, each with a different advantage in terms of ease and adjustability:

***Eliminating feedblock adjustment by the operator.*** By leaving the adjustable plane in free-floating mode, operators can let the position be determined directly by the equilibrium pressure developed by flow from the extruders. "The combining plane responds to the pressures of the different mass flows from the extruder by achieving a state of *Continued on P. 3.*

***SIMPLER TO USE. New Ultraflow® V coextrusion feedblock for film and sheet eliminates need for flow inserts on previous models. Visible in recessed area at center of feedblock are two combining planes (with teardrop-shaped cross sections) on either side of central flow channel. When the planes are free-floating, their positions are determined by the equilibrium pressure of flow from the extruders. Alternatively, shafts connecting to the center of the planes permit manual fine-tuning to optimize layer-to-layer interfaces.***

# Edge Bead-Reducing Die Simplifies Width Changes, Adding Uptime in Extrusion Coating

A new generation of EDI's widely used EPC™ extrusion coating die increases productivity by simplifying changes in product width and eliminating much of the deckle disassembly involved in cleaning and maintaining the die.

As in the past, the EPC die incorporates a deckle system that can be adjusted to minimize the formation of edge bead, which wastes polymer and substrate as it is trimmed from the web. "What is innovative in the new-generation EPC die is an extensive enhancement of the deckle system that increases the ease and repeatability of width adjustments, simplifies clean-out of carbonized polymer buildup in the die, and makes possible rapid removal of the entire deckle assembly for a 'split and clean,' or complete opening of the die for maintenance," says Gary D. Oliver, vice president of technology and engineering.

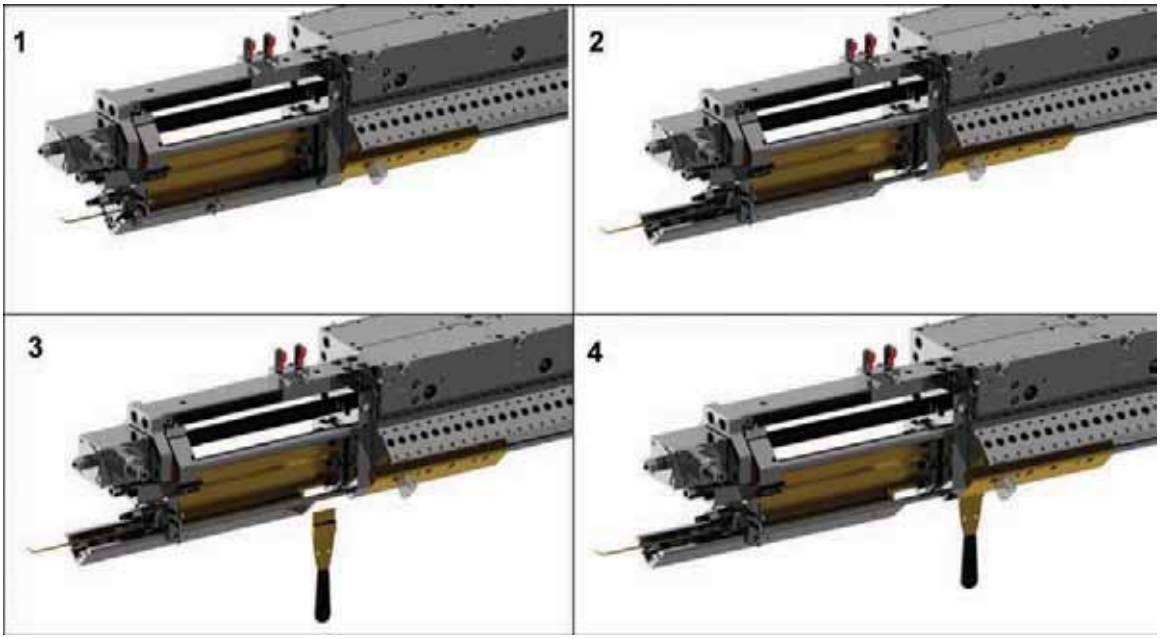
***INCREASED PRODUCTIVITY.*** *New-generation EPC™ extrusion coating die reduces downtime by simplifying width changes and eliminating much deckle disassembly. Entire deckle assembly at either end of the die can be removed as a unit by unfastening four bolts.*

## EPC™ Die Minimizes Edge Bead

Internal deckle systems used for fine-tuning the edge profile of a coating are effective because of the tendency of molten polymer to exhibit transverse flow if lateral barriers to flow are removed at the die exit. In the EPC die, the internal deckle components for adjusting the edge bead profile are located downstream of the primary manifold—one in the preland section, the second in the secondary manifold. By adjusting the positions of these components relative to one another, it is possible to reduce the flow of polymer at the extreme edges of the coating, thereby minimizing edge bead.

Deckles are mounted at either end of a die and used for varying the width of the coating. The EPC die includes an external deckle to prevent leakage and an internal deckle system with three independently adjustable components that seal off portions of the internal flow channel and can be positioned to minimize edge bead. The new-generation EPC die includes innovations that reduce downtime in four ways:

***Rapid and accurate changes in width.*** A more robust support structure and drive mechanism for the deckle ensures a more stable and repeatable width-adjustment system. Changes in width are carried out by means of a single movement of the entire assembly of deckle components. Once those components have been adjusted to obtain the desired edge-bead profile for a given polymer, that setting is preserved *Continued on P. 3.*




***SCRAPER INSERTS EASILY.*** *To clean away buildup that causes die lines, the operator can now retract the external and die-gap deckle components of the EPC die, as shown in Illustration 2, and insert a brass scraper (Illustration 3). The scraper reaches beyond the lip opening and into the secondary manifold. No disassembly is required.*

# EDI Promotes Andrei Stapinoiu to European Sales Director

*Andrei Stapinoiu*

Andrei Stapinoiu, who has become well-known to EDI's customers in Europe and the Middle East, has been promoted to the position of sales director for these regions. He has also taken on responsibility for sales in South Africa.

In addition to working with EDI's network of agents, Mr. Stapinoiu will now also supervise sales activities at EDI's German-based European subsidiary, EDI GmbH.

"Andrei has played a pivotal role in the growth of our sales to processors and OEMs in Europe and the Middle East," says Dennis S. Paradise, vice president of sales and marketing. "His understanding of the extrusion and web converting industries and his extensive background in international business have made him a valuable resource for our customers."

Andrei Stapinoiu joined EDI in 2007 as European sales manager, coming from EGS Gauging Ltd. (formerly Eurotherm), the supplier of measurement and control systems for web processes. He served that company for five years as sales and marketing director for western and central Europe, Russia, and the Mideast. In previous positions with other industrial companies, he held business development and sales responsibilities and supervised projects in Europe and the Mideast.

Mr. Stapinoiu holds a Master of Science degree in management from Purdue University in the U.S.A. and a B.Sc. in Sales and Marketing and an MBA degree from Budapest University. He speaks English, French, Russian, and his native Romanian.

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*Continued from P. 1.* equilibrium reflecting these differences," says John A. Ulcej, president. "In this way, a change in flow from one of the extruders causes a readjustment of the combining plane at the point where materials merge."

***Optimizing layer-to-layer interfaces.*** For polymers whose interaction at the point of confluence poses the possibility of disrupting or compromising the multilayer structure, the adjustable plane can be moved manually to fine-tune polymer flow. Shafts extending from outside the feedblock into the centers of the adjustable planes provide ease of operation. Simple settings will change the adjustable planes from free-floating mode to varying levels of responsiveness to melt flow pressure. Once adjusted, an adjustable plane remains in a fixed position.

The Ultraflow V feedblock illustrated is for a three-layer structure with three extruders. Ultraflow V feedblocks can be designed for any number of extruders or layers.

"We developed the Ultraflow V feedblock because our customers asked us to find a way to adjust the combining geometry in the feedblock without having to exchange flow inserts," says Ulcej. "The result is a device that is compact, easy to disassemble and clean, and streamlined for optimal flow." ◆

*continued from P. 2*

without variation through repeated changes in width.

***Easily inserted scraper to removed buildup.*** Operators can now quickly retract the external deckle components and insert a simple brass scraper which cleans away carbonized polymer that causes die lines. In the past it was impossible to remove such buildup upstream of the lips without complete disassembly, but the new scraper reaches beyond the lip opening and into the secondary manifold of the die—with no need for disassembly.

***Ready access for replacing seals and adjusting die gap.*** In the past, much of the deckle had to be disassembled to make it possible to replace end seals. The redesign of the EPC die makes it possible to carry out these tasks quickly and easily, without dealing with numerous fasteners and handling heavy deckle components.

***Fast removal of deckle system for 'split and clean.'*** It is now possible to open the die without completely disassembling the deckles at either end. Instead, each deckle assembly can be removed intact by unfastening four bolts. Another innovation is optional: External cooling by forced air makes it possible to cool end seals and deckle components. ◆

# ‘Layer Multiplier’ Increases Oxygen Barrier and Thermoformability in Food Packaging

Microlayer technology developed by EDI for thick film and sheet promises to extend the shelf life of retort, hot fill, and flexible food packaging, while increasing formability in thermoforming.

At the EDI Technology Center in Chippewa Falls, EDI is carrying out the first scientifically rigorous study of the benefits and limitations of layer multiplication, according to Gary D. Oliver, vice president of technology. “One result thus far is the development of a technique for selective multiplication of the barrier-resin layer of a multilayer film or sheet structure,” Oliver says. “By transforming a single layer of a resin such as EVOH into several microlayers, it is possible to reduce oxygen transmission rate (OTR) by 60 to 80%. And while EVOH is a crystalline, sometimes brittle material, replacing a single thick layer with multiple microlayers increases the flexibility of the barrier segment of the structure.”

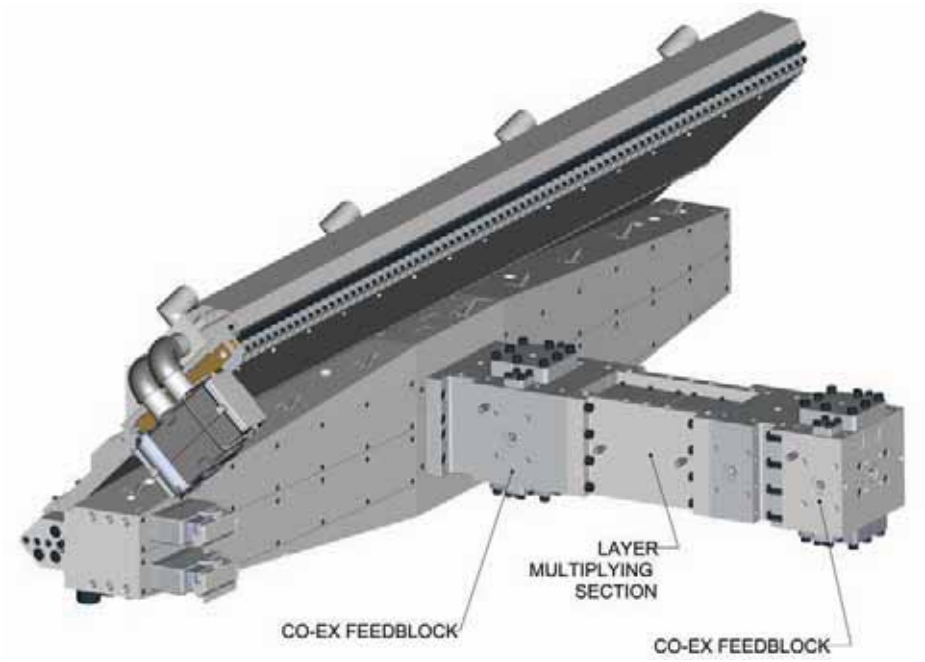
The resulting benefits for food packaging include:

***Prolonged shelf life.*** Layer multiplication reduces oxygen transmission rate (OTR) by 60 to 80% and substantially reduces total oxygen ingress over an extended period.

***Enhanced formability.*** Separating the EVOH content into multiple microlayers facilitates operations like thermoforming, shrink-wrapping, and gusseting. This may be most beneficial in the case of deep-draw containers where corner-thinning has been a problem with less formable materials

## Benefits for Food Packaging

The layer multiplier is a special tool that can be engineered to multiply some or all of the layers within a coextrusion “sandwich” provided by a feedblock. The resulting microlayer structure then passes into the manifold of an extrusion die, where it is transformed into film or sheet of target width and thickness profile. No matter how many microlayers there are in the structure, the overall thickness is no greater than that of a conventional coextrusion, and the structure contains the same amount of raw material.




***FOR PRODUCTS WITH STANDARD THICKNESS BUT MANY LAYERS. This computer rendering of a view from the rear of a die equipped with EDI’s compact layer multiplier system shows where polymer melt streams enter the layer multiplier system (at extreme right) and where microlayer film or sheet exits the die lips (at extreme left). As in standard coextrusion, multiple streams of molten polymer enter the layer multiplier by going through a feedblock, which produces a conventionally sized (4 by ¾ in., or 102 by 19 mm) “sandwich” of three to nine layers. The materials in this structure are subsequently multiplied in EDI’s proprietary layer multiplier modules. Finally, the resulting microlayer product enters a second feedblock, which produces another conventionally sized sandwich that passes into the manifold of the die, where the structure is expanded to the target product width.***

In 2009, EDI introduced an advanced system that is easier to deploy, more compact, more accurate, and more versatile than any other layer multiplier, including one previously offered by EDI. It is available to purchasers without licensing or royalties.

In the research at its Technology Center, EDI used its new system to multiply the EVOH core layer in sheet used for thermoforming single-portion retort cups, such as those for packaging fruit cocktail and diced peaches. EDI extruded the sheet and used a commercial cup mold to solid-phase pressure form sheet with one, four, eight, and sixteen EVOH layers.

All sheet structures were 50 mils in thickness, with thick (41 to 43%) skin layers of polypropylene and tie layers between the skins and the EVOH core. Barrier resins included a standard general-purpose EVOH and a “retort” grade of EVOH.

Thirty days after retort, cups with a single layer of the “retort” grade of EVOH exhibited three to six times higher oxygen transmission rates (OTRs) than cups where a layer of similar material had been multiplied. In that same period, total oxygen ingress was also three to six times greater (see table on next page).

*Continued on P. 5.*

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**With Appropriate Resin Grade, Multiplication of Barrier Layer Yields Substantial Improvement in Oxygen Barrier**

| Type of EVOH | No. of EVOH Layers | Film Side | Estimated Oxygen Ingress, $cm^3$ Days after Retort | | | |
|---|---|---|---|---|---|---|
| | | | 0 | 7 | 14 | 30 |
| Conventional grade | Sample 1 | A | 0.074 | 1.484 | 2.804 | 5.278 |
| | Sample 1 | B | 0.081 | 1.616 | 3.120 | 6.279 |
| | Sample 4 | A | 0.063 | 1.409 | N/A | N/A |
| | Sample 4 | B | 0.053 | 0.857 | N/A | N/A |
| Retort | Sample 1 | A | 0.013 | 0.230 | 0.430 | 0.848 |
| | Sample 1 | B | 0.011 | 0.166 | 0.298 | 0.524 |
| | Sample 4 | A | 0.002 | 0.034 | 0.068 | 0.138 |
| | Sample 4 | B | 0.003 | 0.049 | 0.081 | 0.154 |

***MICROLAYER STRUCTURE PROLONGS SHELF LIFE. At its Technology Center, EDI produced and tested thermoformed portion cups, comparing cups thermoformed from standard coextruded sheet with those from microlayer sheet produced with EDI's compact layer multiplier. Test results (table) indicate that microlayer sheet with a "retort" grade of EVOH barrier resin exhibited substantially lower oxygen transmission, though microlayer sheet with a general-purpose EVOH exhibited no such improvement.***

"Layer multiplication is especially promising for sheet and thick film packaging such as rigid retort and hot-fill containers, stand-up retort pouches, and vacuum skin packaging for meats," says Oliver. "Thickness matters—particularly in the case of barrier microlayers. Our researchers have found that barrier properties fall off as layer thickness goes below 1 micron. We recommend a target thickness per barrier layer of 4 microns."

Choice of barrier materials also matters, according to Oliver. "While barrier properties improved markedly with use of a retort grade of EVOH, we found that performing exactly the same tests but with a general-purpose EVOH yielded portion cups with markedly higher OTR and oxygen ingress."

Today EDI's Technology Center includes a fully equipped pilot plant for researching layer multiplication. Researchers are studying the effects on package production and performance of various adhesive layer materials, polymer-to-polymer interfaces, resin combinations, and layer combining sequences. Another area of inquiry is to determine if the enhanced barrier properties and formability achieved through layer multiplication can make it possible to save costs without compromising performance by, for example, down-gauging film or using less costly ingredients. While this research continues, however, EDI has already learned enough to be convinced that layer-multiplier technology promises to benefit many sectors of the packaging industry. ◆

***FORMABILITY IS ENHANCED. By using EDI's compact layer multiplier to transform a single layer of EVOH—which is a crystalline, relatively brittle material—into multiple microlayers, it is possible to increase the thermoformability of products like these pet food trays, and to reduce corner-thinning.***

## EDI Will Be There...

**Arabplast** (Jan. 8-11, Dubai): EDI to exhibit at stand of its agent, ACIS Plastic Technologies.

**Interplastica** (Jan. 25-28, Moscow): EDI to exhibit at stand of its agent, Invent Group.

**SPE International Polyolefins Conference** (Feb. 27-Mar. 2, Houston): Presentation by EDI.

**Intl. Battery Seminar** (Mar. 14-17, Fort Lauderdale, Florida): Presentation by EDI's William Kays.

**ICE U.S.A.** (Apr. 6-8, Orlando, Florida): EDI to exhibit.

**AMI Stretch & Shrink Film** (Apr. 11-13, Vienna): EDI to make presentation.

**SPE ANTEC** (May 1-5, Boston): EDI to make presentation.

**Chinaplas** (May 17-20. Guangzhou): EDI to exhibit.

**TAPPI European PLACE** (May 30-Jun. 1, Bregenz, Austria): EDI to make presentation.

**AMI BOPP Film** (Jun. 28-30, Vienna): EDI's Andrei Stapinoiu to make presentation.

**CPP Expo** (Sep. 25-28, Las Vegas): EDI to exhibit.

**Plastimagen** (Oct. 4-7, Mexico City): EDI to exhibit at stand of its agent, ABC Plasticos.

**SPE Vinyltec** (Oct. 16-19, New Orleans): EDI to make presentation.

**AMI Multilayer Packaging Films** (Oct. 25-27, Cologne, Germany): EDI to make a presentation.

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# Unique Technology Center at EDI Now Includes A 'Multi-Process' Line for Film and Coating

Soon to be up and running in the Technology Center at EDI's world headquarters in Chippewa Falls, Wisconsin is a new, fully equipped 1.6 meter multipurpose line that can be used for cast film extrusion, extrusion coating, or lamination. It is the latest addition to a process laboratory that already includes a slot die or fluid coating line, a sheet line with six extruders, and other product / process development capabilities. Besides using the lab for feedblock and die innovation, EDI makes these processing lines available for use by customers looking to do trial runs without tying up their own equipment.

"The new multi-process line can be used for work on product structures ranging from the very simple to the incredibly complex," says Dennis S. Paradise, vice president of sales and marketing. "Indeed, no other process laboratory worldwide is as diversified and capable as the one at our Technology Center."

The new line has five extruders and can produce single- or multilayer cast film up to 1600 mm (63 in.) wide at thicknesses from 8 to 125 microns. Speeds for 8-micron LLDPE / LDPE film average 230 m (750 ft.) per minute. Multi-layer film can range from standard coextrusions to innovative structures, produced with EDI's layer multiplier tooling, that can range to over a thousand microlayers.

The line also includes two unwind stations for converting film made on the process line itself as well as rollstock purchased from other sources.

"With outside trial-run facilities increasingly scarce, processors and converters are forced to use their own full-scale production lines at the cost of lost output and high levels of material waste," says Paradise. "At our Technology Center, these companies can carry out their market development work in the strictest confidence, affirmed in a nondisclosure agreement that we sign with every company that ultilizes our lab facilities." ◆

*LARGE PROCESSING LINE FOR FILM, COATING, AND LAMINATION. This new multi-process line at EDI's Technology Center has five extruders and can produce single- or multilayer film up to 1.6 meters wide at thicknesses from 8 to 125 microns. Speeds at 8 micron thickness range up to 750 feet (230 m) per minute. The line can also be used for extrusion coating or lamination. Two unwind stations permit converting of film made on the line or shipped to EDI as rollstock. Besides using this and other processing lines at the Center for its own research, EDI rents them to companies looking to do trial runs without tying up their own equipment.*