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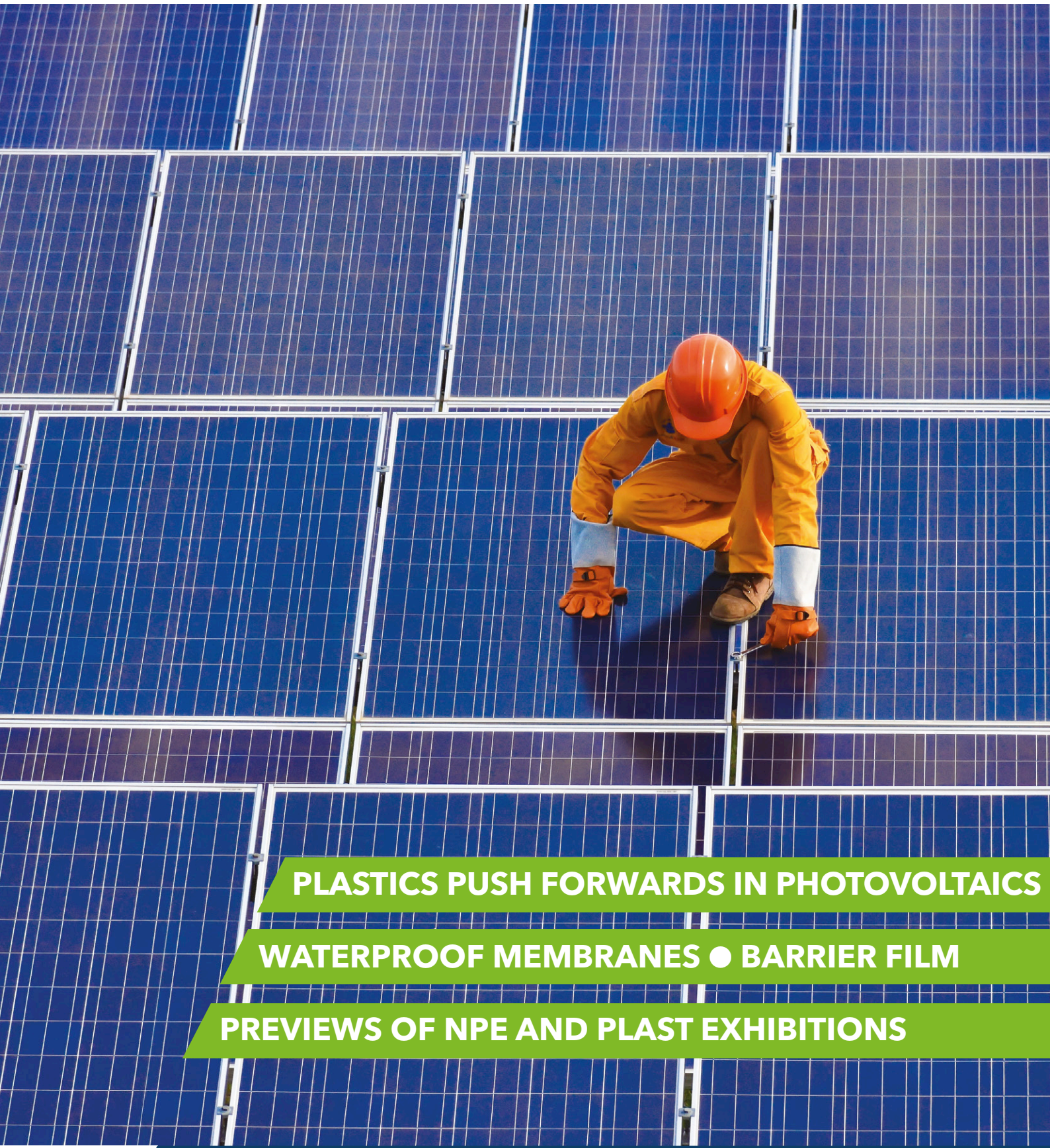
# Film and Sheet EXTRUSION



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Compounding WORLD

# Transcontinental completes takeover of Coveris Americas

Canadian flexible packaging giant Transcontinental has completed its US$1.32 billion takeover of Coveris Americas – which manufactures a range of flexible plastic products including bags and pouches and both co-extruded and shrink films.

Coveris Americas has 21 production facilities in countries including the USA, Canada, Mexico and the UK.

Transcontinental says the acquisition puts it in a strong position in a number of flexible packaging end markets, including dairy, agriculture and consumer products. It also expands Transcontinental's film manufacturing capabilities.

"This acquisition makes us a North American leader in flexible packaging," said François Olivier, president and CEO of Transcontinental. "We started building our packaging network four years ago. The acquisition of Coveris Americas marks a major milestone."

Coveris has also announced plans to sell its rigid packaging business to Lindsay Goldberg for €700m (US$837m). The sale is subject to regulatory approvals. The division generated sales of around €560m (US$670m) in 2017.

Once the sale is complete, Coveris will be fully focused on flexible packaging – with manufacturing facilities in five countries and more than 3,800 employees. Excluding the rigids business, its remaining operations generated sales of around €800m in 2017.

Jakob Mosser, CEO of Coveris, said: "Following the sale of our Americas business, this will further strengthen our balance sheet and focus Coveris on the flexible packaging market."

› **www.tc.tc**

› **www.coveris.com**


**ProAmpac will expand its expertise in pet food packaging with the acquisition of Gateway**

## ProAmpac grows in petfood packaging

US flexible packaging company ProAmpac is to acquire Gateway Packaging – a major producer of pet food packaging.

Gateway makes multi-wall bags, stand-up pouches and related products. Its products are also sold to the human care and institutional markets.

"The acquisition of Gateway expands our product offering – with the addition of multi-wall bags – while also increasing our manufacturing capacity of several pouch formats," said Greg Tucker, CEO of ProAmpac.

ProAmpac is based in Cincinnati and owned by PPC Partners, its management and other co-investors. By adding Gateway, ProAmpac will now have 33 sites globally with nearly 3,700 employees.

› **www.proampac.com**

## RPC buys Nordfolien of Germany

UK-based RPC has acquired Nordfolien of Germany for €75 million (US$90m).

Nordfolien is a leading producer of polyethylene (PE) films for industrial and consumer packaging, with two production sites – in Germany and Poland. Nordfolien's management will continue to operate the business.

The acquisition is subject to clearance from Polish and German authorities and is expected to complete in early 2019.

› **www.rpc-group.com**

## Tek Seng invests in plastic films

Tek Seng Holdings of Malasia is to invest up to RM20m (US$5m) to make plastic industrial film packaging.

Loh Kok Beng, group managing director, told *StarBiz* that the company plans to start the new production line in the second half of this year.

The company's main interest is PVC sheet, which accounts for nearly two-thirds of its revenue. In the first half of this year, it expects to raise sales in this division by at least 5%.

"About half of the PVC output goes to the domestic market, while the remainder goes to overseas markets in Africa, Middle-East, and South-East Asia," he said.

› **www.tekseng.com.my**

## Bangladesh plastics is booming

Bangladesh's plastic industry grew by around 20% last year, fuelled by both local and foreign demand for its products, says a report in the local *Daily Star* newspaper.

For the 2017-2018 year, the domestic market for plastic products reached Tk250bn (US$3bn), according to the Bangladesh Plastic Goods Manufacturers and Export Association (BPGMEA).

"Bangladesh has huge potential to grow further," said Kamruzzaman Kamal, director for marketing at Pran-RFL Group, a leading Bangladeshi plastics company.

Bangladesh currently has a 0.6% share of the US$546bn global plastic market, says BPGMEA – but has set a target of raising this to 3% by 2030, says the report.

› **www.bpgmea.org.bd**

# North America machine sales increase in 2017

Deliveries of US-made plastics machinery has risen – in both the final quarter of 2017, and the year as a whole.

Figures from the Plastic Industry Association's Committee of Equipment Statistics (CES) revealed that total deliveries of primary plastics equipment rose almost 10% in the final quarter of 2017, to reach almost US$400m.

For the full year, deliveries rose more than 6% compared to 2016 – and this is unlikely to be bettered in 2018.

"Given the recent trends in the new orders data, the pace of growth experienced in the second half of 2017 in the shipments data is not sustainable," said CES. "The annual forecast for shipments of primary plastics equipment in 2018 is a gain of 5%."

CES said that spending on plastics equipment could accelerate in 2018 if demand for plastics products grows more rapidly. However, it said that current estimates of growth were not high enough to "spark a large jump in demand for plastics machinery".

The vast majority of the market is accounted for by injection moulding machinery, which saw a 4% rise in order for the year.

However, extrusion machinery performed less well: single-screw extruders saw a 3% decline in sales to around US$83m – despite a 9% rise in volumes. However, CES predicts a 7% increase in sales this year, which would take the annual total to US$89m.

For twin-screw machines, sales fell 16% to around US$75m for the year. In 2018, sales are expected to rise by 19%, taking the annual total to US$89m.

The monthly capacity utilisation data for the plastics industry averaged 81.3% in the final quarter of 2017. CES expects this to rise gradually through 2018 and reach a level of 83% by the end of the year.

› **www.plasticsindustry.org**

## Huhtamaki acquires in Australia

Huhtamaki has bought 65% of Tailored Packaging, an Australian foodservice packaging distribution company with 130 employees. The acquisition, for approximately €35m (US$42m) gives Huhtamaki access to a national network of distribution centres across Australia.

› **www.huhtamaki.com**

# Tekni-Plex expands in tray production

US-based Tekni-Plex has acquired a manufacturer of food trays and its sister company, which makes extrusion machinery.

Tekni-Plex has bought Commodore Plastics – which makes traditional and custom polystyrene (PS) foam trays, including padded food processor, supermarket and industrial trays – and Commodore Technology, which makes PS foam extrusion systems, dies, thermoformers and other products to support its sister company's production needs.

The two Commodore companies will be brought under a newly-formed Tekni-Plex subsidiary called Dolco, which makes foam egg carton trays and PS trays for food processing and other applications.

"Tekni-Plex already has significant tray manufacturing capability," said Paul Young, chairman and CEO of Tekni-Plex. "This acquisition will allow us to benefit from Commodore's extruder and thermoforming equipment technology, and increase our manufacturing footprint."

› **www.tekni-plex.com**

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# Currency fluctuations blunt profits at Simona

German extrusion specialist Simona reported higher sales in 2017 – but said that profits were dragged down by currency fluctuations.

The company posted a 7.5% increase in sales to €394m (US$476m) in 2017, and saw revenues grow in all regions during the year. Growth in Europe approached 5%, and was particularly strong in Spain, Italy and the UK. Sales in the US rose more than 5%, while those in Asia boomed by more than 50%.

Sales in the pipes and fittings division grew, but at a slower rate than Simona had expected. Overall, the division grew by more than 4% to exceed €80m (US$476m). This was partly down to subdued civil engineering business, and a lack of lignite processing projects in Germany.

**Moyses: "Negative currency effects affected earnings, particularly in Europe"**

"Embracing a new strategy for pipes and fittings, we are looking to expand revenue and maintain a solid level of profitability in this division," said Wolfgang Moyses, CEO.

Despite expanding sales, profitability (EBIT) fell by 12% to €26.5m (US$32m).

"Negative currency effects of almost €6m (US$7m) proved an obstacle to achieving higher earnings, particularly in Europe," said Moyses. "Profitability in the US, which had already been good, was raised further."

The company has already announced preliminary results for the first quarter of 2018: sales of just under €99m, which is comparable to the same period last year. EBIT, at €8.4m, was also unchanged compared to last year.

› **www.simona.de**

# Constantia to double India sales

Constantia Flexibles says it will double sales in India in the next five years, following a recent takeover and expansion plans for its existing businesses there.

Taking a major stake in Creative Polypack has made Constantia India's third largest flexible packaging group, giving it sales of around €200m (US$239m) by 2022.

Alexander Baumgartner, Constantia Flexibles CEO, said: "Our production footprint covers the whole of the Indian subcontinent."

Its existing Indian subsidiary, Parikh Packaging, is investing a double-digit million Euro amount in a new greenfield site in Ahmedabad, to make polyethylene blown film from 2019.

Flexible packaging in India is expected to grow by more than 10% in the next five years, says the company.

› **www.cflex.com**

# Cosmo starts operations in Poland

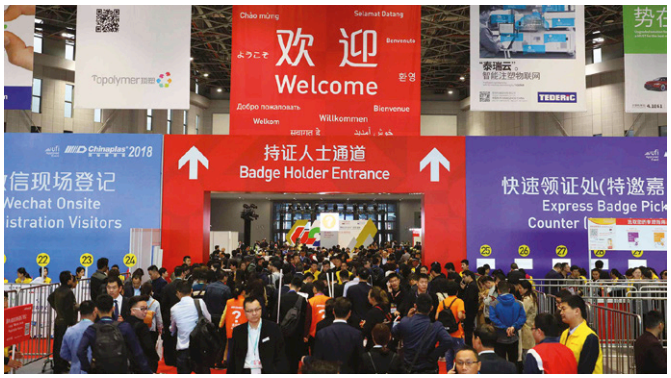
India's Cosmo Films recently set up in Poland to sell its BOPP and CPP films there.

"Poland is the biggest market for packaging grade film in Central and Eastern Europe and a convenient location,"said Daksh Malik, head of sales and operations for Eastern Europe at Cosmo Films.

The company will focus on its speciality products in the region – including barrier and lidding films, acrylic and PVDC coated films and metallised BOPP.

› **www.cosmofilms.com**

# Chinaplas 2018 concludes record-breaking event




This year's Chinaplas show has concluded, with organiser Adsale saying that this year's show hosted 3,948 exhibitors from 40 countries and regions. The event, held this year on 24-27 April, has been running since 1983.

"For the first time, Chinaplas' scale exceeds 300,000 sq m – an indicator of the massive demand for new technologies," said Stanley Chu, chairman of Adsale."

The show was hosted in the National Exhibition and Convention Center (NECC) in Hongqiao, Shanghai for the first time this year.

› **www.chinaplasonline.com**

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**Thousands of plastics professionals will head to Essen for the new focused expos**

# AMI expos attract new registrations

More than 2,000 people have already registered to attend the Plastics Recycling World Exhibition and the Compounding World Expo, which will take place on 27-28 June 2018 in adjacent halls at Messe Essen in Germany. The registrations received so far have come from more than 50 different countries.

"We have been delighted by the early response to our new focused exhibitions for the international plastics industry," said Claudia Effra-Hume, head of marketing at AMI, the organiser of the events. "Registrations passed 2,000 with more than two months still to go to the big event in Essen, and our daily booking rates are growing rapidly as we get closer to the show opening on 27 June".

In addition to attracting large numbers of plastics recyclers and compounders, the shows are also receiving registrations from hundreds of plastics processors, end-users and brand owners who are keen to learn about the latest developments in polymer technology and plastics recycling. They include Amtico, Bischof + Klein, Coca-Cola, Electrolux, Heineken, Johnson & Johnson, Kraft Heinz, Lego, Logoplaste, Mars Petcare, Mauser, McBride, Metro, P&G, PepsiCo, Reckitt Benckiser, Rehau, Renault, RPC, Schur Flexibles, Tarkett, Tetra Pak, and Unilever.

"The Compounding World Expo and the Plastics Recycling World Exhibition will feature more than 180 exhibitors, plus we will have three lecture theatres hosting technical presentations, business debates and training seminars," explained AMI's head of exhibitions, Rita Andrews. "This mix is attracting lots of interest not only from across Europe, but also from Asia, the Americas and the Middle East. These exhibitions are going to be truly international," she added.

If you would like to attend the Compounding World Expo and Plastics Recycling Exhibition, then register now for your free ticket **HERE**. This will give you free admission to both shows and their conference theatres. In addition, there will be a networking party for visitors and exhibitors immediately after the first day of the shows on 27 June.

For more information on the Compounding World Expo and Plastics Recycling Exhibition, including the current exhibitor list, stand booking details, conference programmes and online registration, please visit their respective websites:

- **www.compoundingworldexpo.com/eu/**
- **www.plasticsrecyclingworldexpo.com/eu/**

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***Solar energy is on the rise, and plastics have a key role to play – whether on conventional photovoltaics, or in a new breed of 'organic' solar cell. Lou Reade reports***

# Plastics make light work of photovoltaics

Alternative energies are on the rise – with applications such as wind power and solar energy slowly replacing conventional means of energy generation.

One promising area for plastics is in photovoltaics, where a variety of polymeric materials are used on conventional, silicon-based cells – but also on the emerging breed of 'organic' solar cells.

Researchers at **Ohio State University** say that organic solar cells – which use polymers, rather than silicon – could find their way into a promising range of niche applications.

In a review paper in the *Journal of Renewable and Sustainable Energy*, Paul Berger and Minjae Kim say that while organic solar cells are unlikely to replace silicon-based versions, they are likely to find use in applications such as microwatt sensors and wearable technology – and other devices that would otherwise require batteries.

For example, they could power 'freshness' sensors on food packaging using the overhead lights in grocery stores. Furthermore, they could go beyond store inventory control, and tie into a "smart kitchen" to reduce food waste and automate grocery lists.

"They have this ability to be flexible, because they are basically plastics, so you can put them on backpacks, jackets and even coffee creamer – a whole range of things where it's at the point of use," said Berger.

The polymers can be dissolved in solvents and printed onto a flexible backing using affordable roll-to-roll production. Long rolls of solar cells also open up new applications, such as covering vehicles, building facades and windows, says Berger.

Longevity is an issue, because the polymers and reactive metal cathodes oxidise when exposed to water and oxygen.

Encapsulating them is effective on glass, but more challenging on flexible surfaces such as food packaging, he says. ›

**Main image: A new production method, developed at Linköping University, simplifies organic solar cell manufacture**

**Above: Australian researchers are developing solar energy heliostats that use plastics instead of glass**

## Organic boost

Scientists at **Linköping University** in Sweden have developed a new, simpler method to manufacture organic solar cell modules.

The results have been published in the scientific journal *npj Flexible Electronics*.

"The organic solar cells can be used in many contexts, not least those in which their special properties are useful," said Olle Inganäs, professor of biomolecular and organic electronics at Linköping University, who heads the research group. "They are can be semi-transparent, soft and flexible, can be obtained in different colours, and are cheap to manufacture."

In a semi-transparent solar cell module, electrodes with two variants of the polymer PEDOT:PSS (commonly used in organic electronics) are used: one acts as the anode and the other as the cathode. The active layer that absorbs light and produces electrons is located between the electrodes.

When the electrodes and the active layer are printed as thin films on top of each other, defects in one layer will act as points of attack for the next layer to be printed. These defects cause short-circuits between the top and bottom, which until now has been solved by passing a current through the cell.

"The defects in each individual cell must be burned away," said Inganäs. "This is time-consuming, and it's not easy to gain access to all cells – so the reject rate for faulty units is quite high."

The researchers have now tested a method where the active polymer material is used as glue. Two plastic films, one with the anodes and the other with the cathodes, are covered by the active material before the complete unit is laminated together. Since only two layers are printed, there are fewer defects – and the chance of them being located exactly opposite each other during the lamination is negligible.

"This lamination method works with many different combinations of polymer, and the energy efficiency is just as high as that obtained by conventional manufacturing," he said.

The solar cell modules are being developed and manufactured by a spin-off company called Epishine, which has chosen to aim at the market for indoor cells. The cells absorb indoor illumination and create enough current to power, for example, sensors that measure the indoor humidity or temperature.

## Bright idea

Australian researchers have begun field trials to develop highly efficient solar energy heliostats that use plastics in place of glass.

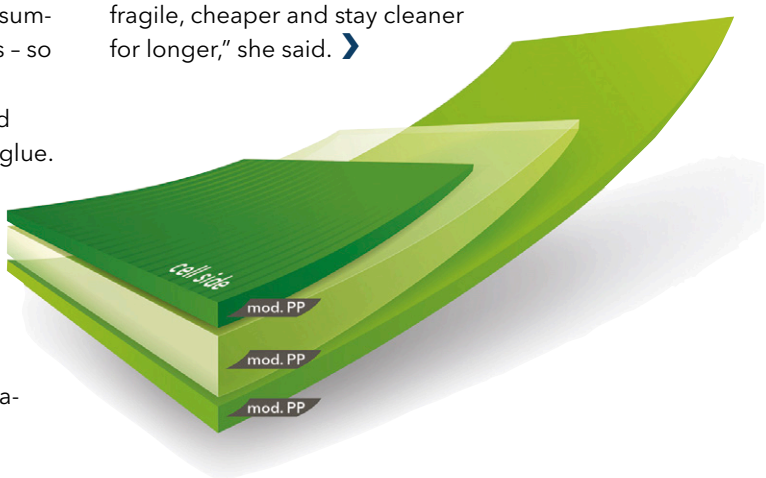
Car parts manufacturer Precision Components has teamed up with the **University of South Australia** to open the concentrated solar research field in Adelaide. The trial includes 25 heliostats each measuring 7.2 sq m and a 16m tall concentrated solar photovoltaic (PV) receiver, which can generate about 30kW of electricity per hour.

Heliostats concentrate sunlight onto a tower and – depending on the type of receiver unit – either heat molten salt (to generate steam to drive turbines that generate electricity), or convert sunlight directly into electricity. The tower at the site can be adapted to trial both technologies.

The heliostats are currently made of traditional glass, but the researchers are adapting their thin film coating technology to make lightweight, durable polycarbonate mirrors.

Tanya Monro, the university's deputy vice chancellor of research and innovation, said that all heliostats installed worldwide currently use glass with a thin layer of silver located at the rear of the glass. This means that the sunlight must travel twice through the glass – a material that is heavy, fragile and hard to install.

"If we can make plastic heliostats – where the coatings are on the front – they will be lighter, less fragile, cheaper and stay cleaner for longer," she said. ❯




**Right: Two Quentis grades of PP from Borealis were used in a co-extruded solar backsheet**

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## PP backsheets

**Borealis** has also developed a co-extruded polypropylene (PP) solar backsheet for photovoltaic applications.

The core and outer layers of the Icosolar CPO 3G backsheet film are made using Borealis' new umbrella brand for solar grades and products, called Quentys. Two grades of Quentys – SF700CL and SF900WL – will be sold directly to its new manufacturing partner, Isovoltaic, which then produces the solar backsheet at its plant near Graz in Austria.

Borealis says the backsheet will boost the operational reliability of PV modules due to: increased module output, thanks to high reflectivity; superior water vapour transmission rate (WVTR) and acetic acid permeability; and, high hydrolytic stability and insulation properties.

Because there are no adhesive layers, there is no risk of inner-layer delamination. Also, co-extruded PP – as a single-step production technology – ensures high production quality and homogeneity, and reduces manufacturing complexity, which further increases its appeal as a replacement for conventional PET-based backsheets, says the company.

In addition to the solar backsheets, Borealis plans to introduce other polyolefins for the solar industry – including grades to make encapsulant films.

## Honeycomb cores

**EconCore** says that its thermoplastic honeycomb sandwich panel technology – which is based on thermoforming – has been used in a number of new applications recently, including a new design of solar panel.

The panel, from Armageddon Energy, is one-third of the weight of a standard glass equivalent solar panel, due mainly to the design being based on EconCore's ThermHex technology.

"The potential of a lightweight, durable solar panel is huge and this development opens up new markets and application perspectives, including those beyond photovoltaics," said Tomasz Czarnecki, COO of EconCore.

The substrate is Zytel polyamide from DuPont that is produced continuously and can be in-line laminated with skin layers (DuPont's Vizilon thermoplastic composite) to deliver a cost-effective sandwich product uniquely suited to high volume production.

**Right: Heliatek's HeliaSol films have been used in the 'Solar Graffiti' project in Mexico**


**Below: Armageddon Energy has made a lightweight solar panel using EconCore's ThermHex technology**

## Mexican graffiti

French energy group Engie recently launched an international advertising campaign, 'Engie Harmony', whose first project is 'Solar Graffiti' – an installation on a sports field near Mexico City that combines the graffiti with solar films from **Heliatek**.

'Solar Graffiti' is a project in which the Gomez Farias sports ground is being revived with 'green' lighting. With the energy stored during the day, the sports field can be illuminated in the evening.

A total of 111 HeliaSol films were installed – both on the wall elements and above, in wave forms. HeliaSol is Heliatek's ready-to-use solar product solution that can be applied to flat and curved surfaces and is flexible and lightweight (1 kg/m²).

"HeliaSol organic solar films are a perfect fit for this urban installation," said Thibaud Le Séguillon, CEO of Heliatek. "Together, we bring decentralised, decarbonised power generation to city centres."

Engie owns an 8% stake in Heliatek, which has two production facilities in Germany.

**CLICK ON THE LINKS FOR MORE INFORMATION:**

- **www.osu.edu**
- **www.liu.se**
- **www.unisa.edu.au**
- **www.borealisgroup.com**
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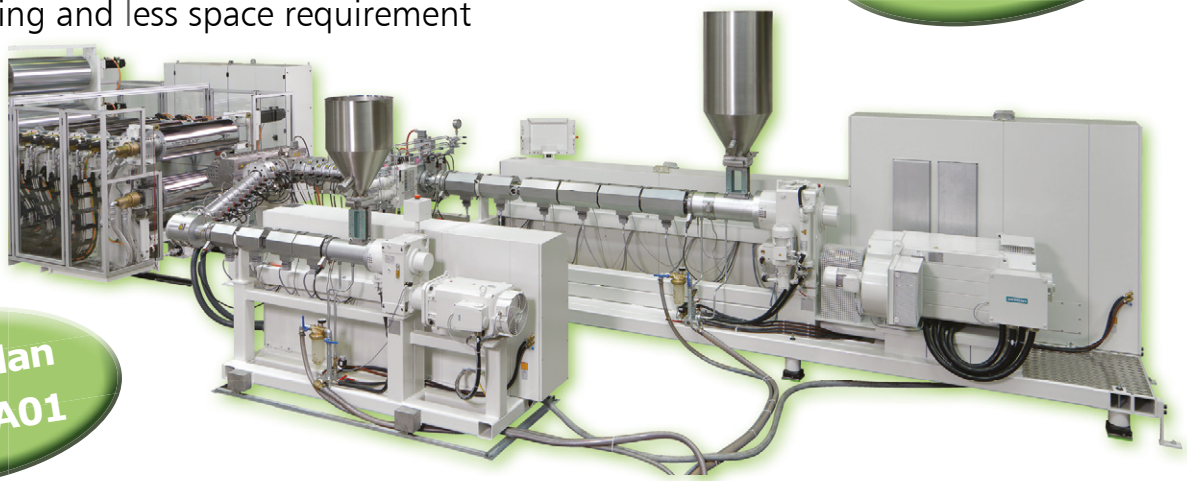

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***Research to understand the fundamentals behaviour of barrier materials continues to offer fresh insights – and generate new materials. Lou Reade reports***

# Blocking progress: latest advances in barrier materials

Gas barrier is a key material property, involving a complex interaction of chemistry and physics – which may explain why there is still plenty of fundamental research going on in this area.

Researchers at **North Carolina State University** in the US, for instance, have studied the morphologies of layer-by-layer (LBL) assemblies – comprising clay particles and polyelectrolytes. The clay particles were montmorillonite (MMT), while the two polyelectrolytes were PEI and sulphonated PET (called PETi).

Layer by layer deposition, which is mainly done by alternating immersion of substrates in oppositely charged solutions, can lead to multilayer films with a thickness down to only a few nanometres (nm).

The samples, prepared with these types of coatings on polystyrene, showed low permeability against gases like oxygen. Testing using techniques such as transmission electron microscopy and X-ray diffractometry showed an increased level of intercalation and orientation of LBL assemblies, below a certain range of MMT concentration in deionised water. Above this concentration, the LBL assemblies' gas barrier improvement levelled out.

Comparing the LBL assemblies formed from the two polyelectrolytes, the ones with PEI showed better orientation and regularity levels – which may be due to PEI making more significant interactions with the surfaces of the clay platelets than PETi.

Also, sandwiching the LBL coating between two layers of polymeric films could protect this high barrier coating from developing defects, which might otherwise occur by external abrasive stresses, said the researchers.

## Grease resistance

Closer to market, **Nova Chemical** has developed a family of HDPE films with high grease resistance – making them suitable for a range of food packaging applications. As part of the process, the company also devised a semi-quantitative method to measure the level of grease or oil permeation.

"It is now possible to develop cost-effective and recyclable PE film packaging structures with good grease barrier performance by using certain single site catalysed PE resin architectures," said the company's Dan Falla, in an Antec presentation.

Grease-resistant plastic packaging usually uses high spec resins such as EVOH, but these make recycling more difficult. Nova began a study to assess the effectiveness of its PE resins for grease

**Main image: Nova's grease-resistant HDPE films could make them suitable for a range of food packaging applications**


**Under certain conditions, a blend of LLDPE and EVOH can be extruded directly to produce "three-layer films" – but without using tie-layers, says Schulman**

resistance – and as part of this, developed a new measuring method.

Nova tested a range of three- and nine-layer films, containing recyclable and non-recyclable resins – including traditional high barrier materials like EVOH, as well as its own Surpass LLDPE and HDPE resins.

It found that some formulations using only polyolefins had a grease barrier the was comparable with EVOH – and that its HDPE had a particularly strong effect.

## EVOH protection

Guojun Zhang, an R&D engineer at **A. Schulman** in the US, told delegates at the same event that multi-layer barrier structures could be simplified if EVOH – the oxygen barrier layer – could be protected in a different way.

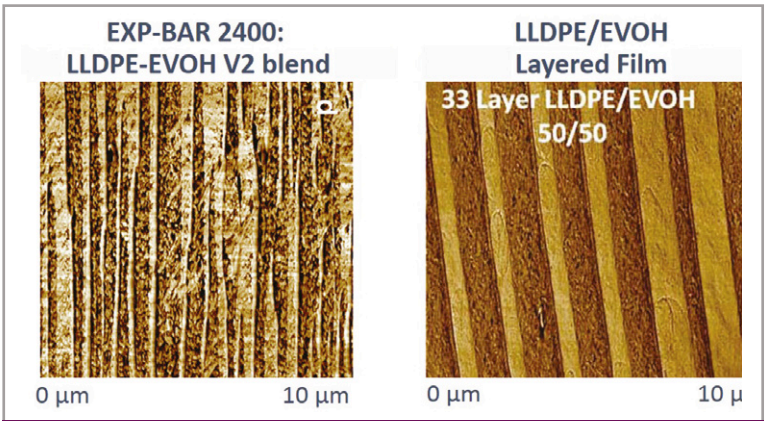
EVOH (ethylene vinyl alcohol) is commonly used in barrier structures because of its high oxygen barrier. However, its sensitivity to moisture means that it must usually be protected within a multi-layer structure of its own – which makes manufacturing the film more complex.

Rather than doing this – which usually means making at least a five-layer structure – he proposed protecting the EVOH by incorporating it into a polymer blend.

"This is a traditional method for improving the gas barrier of a polymer – by blending it with another higher barrier polymer," he said.

The approach is different to some previous efforts, he said, as it uses a pre-compounding process to ensure that the multi-layer morphology forms after resins are extruded into thin films. This is because the choice of polymeric compounds – in this case, EVOH and a highly dispersible polyolefin, with proper compatibility and a viscosity match – ensures that they will form into 'bands' when extruded, which approximates to the structure of a multi-layer film.

One formulation, called B24, gave similar barrier properties as actual multi-layered films. This film could easily be embedded into other multi-layer films, said Zhang.




**This AFM image shows that Schulman's directly extruded B24 blend (left) has a similar structure to a traditional multi-layer film (right)**

## Barrier performance

Barrier film is most commonly developed for food packaging, but it can also be used in agricultural film – to retain species such as fumigants and other chemicals.

Frank Balemans, senior regional technical sales manager at **Kuraray**, told last year's *Agricultural Films* conference how barrier properties were vital to total impermeable film (TIF) – which helps to reduce the use of fumigants by ensuring that it is not lost to the environment after dosing.

Methyl bromide, for instance, is used as a fumigant but is an ozone-depleting substance. For this reason, its use must be limited. Balemans showed a seven-layer TIF structure, incorporating a middle layer of EVOH.

"The EVOH layer should be less than 10% of the total structure to have good mechanical properties," he said.

Tests by the University of California Davis, for instance, showed that TIF helped to keep methyl iodide soil retention levels at 2,000ppm after 180 hours – where it was around 100ppm for standard LDPE film after the same period.

In a similar way, high barrier films can be used to improve the performance of silage film – preventing the degradation of feed such as wet corn. It can also prevent mould, infestation and aroma loss in harvest such as grains.

## Nylon boost

At AMI's recent *Multilayer Packaging Films* conference in Germany, **Ube** said that it had devised a new approach to retortable – or sterilisable – film,

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**Above: Barrier film can help to contain fumigants such as methylene bromide, when spraying crops**

by developing a nylon grade that can be used in the outer layer.

Ordinarily, barrier layers like nylon comprise one of the inner layers of a multi-layer film structure. This is because if they absorb moisture, their gas barrier generally suffers. However, Ube's hydrolysis-resistant 5033FD8 grade has been used in asymmetric film structures – in which the nylon constitutes the first and third layers in a five-layer design, for instance.

Using two nylon layers is appropriate for high barrier film – and also extends mechanical and optical properties. Alternatively, a single outer nylon layer – combined with several PP layers, for instance – can be used in medium barrier packaging.

At the same event, **Kompuestos** of Spain presented details of an advanced oxygen barrier for food packaging. It says that incorporating nanoclays into EVOH can improve its hermetic properties. It does this by increasing the 'tortuous path' that gas molecules must take in order to penetrate the material.

Adding a substance such as kaolin to EVOH, for instance, can produce a steep drop in oxygen transport. Because of this, it means that the thickness of the EVOH layer can be reduced by 50% – which saves around 30% in material costs.

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# Silver lining: developments in waterproof membranes

***Waterproof membranes are used in applications ranging from reservoirs to mining – and must stand up to punishing environmental conditions. Lou Reade reports***

Geomembranes are generally made of commodity polymers such as polyethylene (PE) – yet are often asked to perform at elevated temperatures for long periods while containing hazardous materials. It means that developers must work had to come up with robust formulations and designs.

**GSE Environmental** has been awarded a US patent for its high temperature geomembrane liners and masterbatch formulations.

The high temperature liner is engineered to withstand prolonged exposure to temperatures up to 100°C (212F).

Above 60°C, standard PE geomembranes typically begin to lose properties. Accelerated oxidation and UV degradation also reduce strength properties. GSE, in collaboration with resin producers, developed an innovative HDPE resin formulation for use at high temperatures. Used in conjunction with GSE's high temperature stabilisation formula, it led to the creation of a liner with high durability and chemical resistance – and retains these properties at sustained temperatures up to 100°C.

"The high temperature liner continues GSE's history of developing and improving products in response to industry needs, and through collaboration with our customers," said the company.

GSE products are used in a number of areas: to line or cap hazardous and non-hazardous waste landfills; to contain materials generated in certain mining processes; and to contain water, liquid waste and industrial products in structures such as ponds, tanks and reservoirs.

## Grass capping

Last year, GSE developed a patented synthetic grass capping system, for long-term closure of environments such as solid and hazardous waste landfills, coal ash impoundments and mining containment sites.

The company says that GSE LiteEarth is an economical alternative to traditional capping systems – which require 3-5 feet of soil, infill and grass.

Eliminating these materials reduces the cost of design, construction, and natural resources, as well

**Main image: GSE's patented high temperature geomembrane liners can be used up to 100°C**

**Right: GSE LiteEarth is an economical alternative to traditional capping systems**

as saving money in annual maintenance costs, it says.

The product comprises an EPDM geomembrane that is factory-bonded to synthetic grass. It is manufactured with a UV stabiliser to help retain its colour and tensile properties. The system installs quickly and easily using trenchless earth anchors and a seaming process that does not require welding, stitching or sand ballast.

GSE was recently acquired by **Solmax**, a Canada-based producer of polyethylene geomembranes. Both companies are global players in geosynthetic products, supplying containment systems for domestic, hazardous or industrial waste burial sites, retention ponds, fracking and heap leaching pads.

Jean-Louis Vangeluwe, president of Solmax, said the merger would create a company that can compete "in the highly fragmented market of PE geomembrane manufacturing".

He added that the merged company would have a broader manufacturing footprint and expanded commercial network.

## Special use

UK-based **Colloids** has developed two new speciality masterbatches for manufacturing HDPE geomembrane liners.

**Right: Black masterbatch from Colloids that resists UV weathering was developed specifically for geomembranes**

The premium UV grade, MPE9D2203, is carbon black based, and developed for high performance HDPE geomembrane polymer liners that need long term UV weathering properties and high resistance to degradation.

The lower cost geomembrane masterbatch grade, MPE9D2219, is aimed at less demanding geomembrane applications where UV resistance is not critical.

The new grades are formulated with a high quality stabilisation system in order to minimise degradation through oxidation at elevated temperatures.

The resulting benefits include: greater processing flexibility; a higher confidence that extruded sheets will consistently be within specification; and, a longer service life for installed geomembranes.

"A major geomembrane linings producer set us the technical challenge of developing a new HDPE speciality masterbatch – which would not only provide higher end use performance, but production benefits such as more latitude in the processing window," said David Helm, senior development technologist at Colloids. "We achieved all these objectives, and validated the technology by carrying out specified HDPE geomembrane tests – as well as getting positive customer feedback after sheet extrusion processing trials."

Using Geosynthetic Research Institute (GRI) GM13 test methods for HDPE geomembranes, the MPE9D2203 premium UV grade black masterbatch averaged 180 minutes Standard Oxidative Induction Time (OIT) – 80% above the minimum required OIT of 100 minutes (as per ASTM D3895, min avg. 5 samples), says Colloids. The more demanding Retained OIT after 90 days at 85 0C test recorded 70% retention of OIT results – outperforming current market leading grades in comparative testing, it said.

## Sheet degradation

Researchers at the **University of Minnesota** in the USA have devised a method for degrading polyethylene sheet samples in an oxidative environment, in order to assess stress cracking.

The model system is hot, chlorinated water – and this is applied in a water batch at 60-65°C. Under these conditions, the molecular weight of thin PE sheets was reduced by 60% – and the strain at break was reduced by 90% after 1,000 hours of exposure. ›

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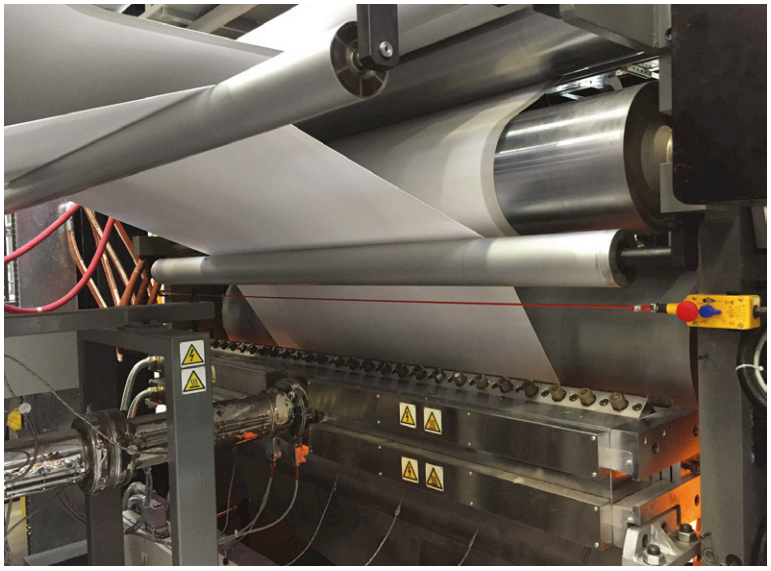

**Amut's geomembrane line extrudes TPO at outputs up to 2,200kg/h**

While many pipe samples are tested under similar conditions, the researchers said there was a need to test film in this way – to determine the performance of film-based products such as geomembranes.

In the experiment, PE samples of 45-60 microns in thickness – with an initial molecular weight of 169K – were exposed to chlorinated water for up to 1,000 hours. Molecular weight loss as a function of time was obtained.

"An extensive set of mechanical data as a function of molecular weight is required to develop a model for stress cracking," the researchers told Antec delegates. "Hence, it was important to verify that this combination of oxidative conditions and specimen material/thickness can lead to significant loss of molecular weight for a relatively short exposure time."

## High output

**Amut** of Italy recently sold a special line for geomembranes to China-based Jingmen Keshun – part of the CKS Group, which is involved in the production and distribution of waterproof coating, bitumen membranes, adhesives and any other chemical products for building and infrastructure.

The new line produces waterproof membranes in TPO at outputs up to 2,200kg/h – equivalent to around 7 million sq m annually. The maximum width is 2,000mm. The TPO granules and mineral filler powders are directly extruded through in-line processing.

Amut says the line produces three-layer reinforced membrane with a single calender system. The configuration can be with two or three layers with inner reinforcement in glass fibre or polyester scrim. It can also insert a non-woven reinforcement for the lower layer of the membrane.

The extrusion unit includes two co-rotating screw extruders for the inner and lower layer –90mm in size, with an L/D ratio of 40 and an output of 1,000kg/h each. There is also a single screw extruder for the upper layer, which is 75mm with an L/D ratio of 40 and an output of 500kg/h.

The line also includes an advanced thickness gauge system and a special winder to wind up in-line rolls of 30m length.

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# Looking ahead to Medical Fluid Bags 2018

*Europe's first conference on medical fluid bags will be held in Germany in June. We preview the expert presentations lined up for this two-day event*


**Main image: The latest developments in materials for medical fluid bags will be discussed by leading experts at the conference**

The Medical Fluid Bags 2018 conference, which takes place on 21-22 June in Cologne, Germany, will examine the latest advances in the design and production of polymer bags and pouches for fluid containment in a diverse range of medical applications.

Organised by **AMI**, it will be the first European conference focused on this subject and will follow on from the debut Medical Fluid Bags event which was held in Boston, MA, USA last year.

The conference will cover new developments in this dynamic market including plastics and additives options, film calendaring and extrusion technologies, plus bag production techniques. Expert speakers will look at design trends and new market opportunities. They will also address critical issues such as product testing and compliance requirements.

The scope of the conference will cover the broad range of medical applications where fluid bags and pouches play a vitally important role. These include blood bags, intravenous bags, nutrition bags, collection bags, irrigation bags, drain bags, and mixing containers.

The Medical Fluid Bags conference will take place immediately after AMI's Medical Tubing 2018 conference, which is being held at the same hotel on 19-20 June.

Special rates are available for delegates and exhibitors wishing to attend both events.

## Bag developments

The opening session of the conference will focus on the development of medical fluid bags to meet the evolving requirements and standards of the medical market.

One of the highlights will be **Robin Van Landeghem**, who is technology director for global films at **Tekni-Plex**, a leading supplier of medical packaging materials. At the event, he will discuss the development of pharmaceutical films with low extractables for liquid drug reservoirs used in medical devices.

Another leading producer of materials and films for this market, **Renolit** will be represented at the conference by **Peter Robben**, the global product manager for Renolit Medical. His presentation will cover how to assess and prepare for the future

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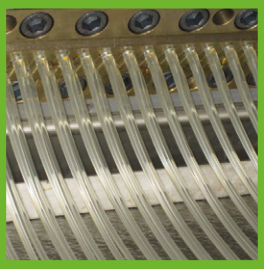

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**Above: The critical issue of extractables and leachables in blood bags will be one of the conference themes**

requirements and standards of the medical fluid bag market.

Important changes in three major ISO 10993 standards will be addressed by **Dr Albrecht Poth**, senior toxicologist at **Dr. Knoell Consult**. He will analyse the challenges and consequences of these changes for the medical device industry.

## Vinyl formulations

PVC is widely used in medical fluid bags because of its excellent performance and cost competitiveness. However, the material is facing some regulatory challenges and the industry's responses to these will be covered in a dedicated session on advances in PVC formulations.

The latest developments in plasticised PVC bags for medical applications will be covered by two representatives from **BASF** – **Dr Rainer Otter**, VP, regulatory affairs and **Dr Angelika Langsch**, senior manager regulatory affairs.

## Alternatives to PVC

Although the European commission found that there is inconclusive evidence suggesting that medical devices containing DEHP pose a health-risk to humans, tighter regulations and public concern is driving the industry to develop other polymers for medical applications. The challenges that these alternative materials face, from performance to cost-competitiveness, will be discussed in this session.

Opening the session will be **Sara Galero Mateos**, PE film technical engineer at **Repsol**. She will discuss advances in tailoring of the properties of polyolefins, including LDPE and EVA copolymers, to meet the demanding requirements of medical fluid bags.

Developments in EVA for medical fluid bag applications will be discussed in more detail in the next presentations, which will be delivered by **Dr. Christian Schneider**, manager T&I at **Celanese**.

**Borealis Healthcare** will be represented at the conference by **Paulo Cavacas**, who is business development manager innovation at the major polyolefins producer. He will explain how new polyolefin materials for pouch systems can meet demanding healthcare market requirements.

## Extractables and leachables

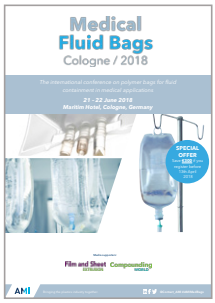
Extractables and leachables testing is required by various standards bodies around the world for many medical devices. Medical fluid bags can pose an increased risk to patients, for example when receiving IV solutions or blood directly from a bag. Studies of extractables and leachables in medical fluid bags are crucial to guarantee patient safety. Our selection of expert speakers will review studies from different angles.

The challenges of testing extractables and leachables migrating from bag systems to parental solutions will be discussed by **Karen Pieters**, who is senior study director at **Nelson Labs Europe** (formerly **Toxikon Europe**).

**Jianfeng Hong**, who is senior research scientist at leading medical device manufacturer **Fresenius Kabi**, will be the next speaker to cover extractables and leachables in medical fluid bags materials. He will examine how to perform effective extractable and leachable testing for medical grade material.

The conference will also feature a debate featuring leading players from the medical fluid bags supply chain discussing the latest developments impacting on the selection and specification of materials for this critical and dynamic market.

## More information




In addition to two days of high-level presentations, the conference will provide excellent networking opportunities during the coffee and lunch breaks, plus the evening drinks reception which will be held in the exhibition area.

Registration is now open for the Medical Fluid Bags 2018 conference in Cologne, Germany, on 21-22 June 2018. For more information on participating in the event as a delegate, exhibitor or sponsor, contact conference organiser Kaja-Marie Beiswanger on +44 117 314 8111 or email: **kaja-marie.beiswanger@ami.international** .

Alternatively visit the **conference website**, where you will find the full programme, conference brochure and booking details.

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# Materials handling: highlights at NPE


**Main image: Maguire's MMT combines several pieces of equipment into a single machine**

***Among the technologies on show at NPE 2018 are an updated vacuum conveyor, a bulk material mixer for gentle homogenisation and a system for small-volume plastics processing***

Materials handling devices will form a small sub-set of the technologies on show at this month's NPE show in Orlando, Florida. Items on show include a redesigned vacuum conveyor, a bulk material mixer that offers gentle homogenisation and a raw materials handling device that is designed for small-volume plastics processing.

## Feeding frenzy

**Coperion** and **Coperion K-Tron** will present a variety of feeding, conveying, bulk material handling components and solutions for plastics processing, including a USA-manufactured Coperion ZRD rotary valve – which will significantly shorten delivery times for bulk solids industry customers – and the new Mix-A-Lot bulk material mixer for high-speed, gentle homogenisation of fed material.

In order to shorten delivery times for customers in the Americas, Coperion K-Tron has started US production of German-designed Coperion rotary valves type ZRD. Local production, along with an investment of stocked inventory, will allow the company to deliver and repair valves for the local market much more quickly.

Standard grey cast iron and stainless steel ZRD rotary valves will now be available to customers within four to six weeks, says the company.

The ZRD rotary valve is designed for plastics, mineral, chemical and food applications. It is engineered for heavy-duty industrial service with pressure differentials up to 21 PSI(g) [1.5 bar(g)] and temperatures up to 100°C (212F), though higher temperature options are available. The ZRD is often used as a discharging and metering valve for conveying products in powder and granular form.

A range of sizes is available, with throughputs ranging from 500 to 400,000 lbs/hour. The valves have a pressure shock rating of 145 PSI(g) [10 bar(g)], and are suitable for isolation according to NFPA standards (for select sizes up to 12in). The ZRD comes standard with air purged seals completely mounted with plastic or stainless steel tubing, solenoid and filter regulator with gauge.

The new Mix-A-Lot ensures efficient, high-speed and gentle homogenisation of fed material. The accessible, easy-to-clean mixer is available in three sizes for throughput rates up to 5 tonnes/h, and there is also an ATEX version. The surface of the mixing chamber can be electro polished.

## Towering performance

**Maguire Products** will introduce its MMT Micro Tower – a raw material handling device for small-volume plastics processing that combines loading, dosing, mixing, and dispensing into one system, governed by a single controller.

It mixes up to three materials – such as virgin resin, regrind, and masterbatch – in 10lbs (4.5kg) batches for extrusion processes with throughputs up to 100lbs (45kg) per hour. The compact tower mounts at the throat of the processing machine, with no floor space required for a vacuum pump. ›

**Six entrants to Motan's innovation award will present their ideas to the jury in July**

# Jury decides in innovation award

Away from NPE, **Motan** has moved closer to picking a winner in its biennial innovation awards – choosing six entrants to present their ideas to the competition jury in July.

All six nominees will present their ideas in detail. The winner will be announced at an award ceremony at the Fakuma exhibition in Germany, in October.

The award is held every two years.

Motan says that award encourages entrants to come up with "resourceful ideas" – and exploit them to the full.

"Too many good ideas are never developed or pursued," said Sandra Füllsack, managing director of Motan. "As a result, the industry loses enormous potential. We want to find these treasures which are often found inside people's heads and left to languish."

The nominated project ideas are:

- Adaptive central vacuum control (Stefan Endres);
- Controlled conveying of bulk solids (Peter Haupt);
- Gravimetric, selective throughput control with batch traceability (Reinhard Herro);
- Local visualisation and control on a mobile device (Phillip Mählmeyer);
- An efficient, flexible system to install material and vacuum lines (Bernd Michael); and,
- Gentle pneumatic conveying of materials (Karl Wolfgang).

The most important criteria for the jury of four were: degree of innovation; relevance for practical use in the plastics industry; and, feasibility and market potential within materials handling.

After the presentations, the six nominees will be whittled down to three finalists. The winner will be announced at Fakuma. The jury will decide on the overall winner – and how the €20,000 prize money will be divided between the three finalists.

As well as prize money, winners will receive support with patent applications, and development of their innovation until it is ready for market.

To ensure accuracy, the loader and three material hoppers operate on a loss-in-weight basis under simultaneous direction by the controller.

"The MMT Micro Tower replaces elaborate and often over-sized combinations of separate pieces of equipment with a single system for low-volume production," said Frank Kavanagh, vice president of sales and marketing.

The blower in the MMT is driven by a lightweight brushless motor. Filters are cleaned by Maguire's patented dust-clearing blow-back system, and it is backed by a five-year warranty.

## Conveying update

**Conair** has updated its Wave Conveying materials handling system.

The system now gives processors a range of options to control the vacuum conveying process. The patented system now makes it possible to move any resin, at virtually any speed, with higher throughputs, over longer distances without the damage to materials and equipment normally associated with conventional, dilute-phase vacuum conveying, says Conair.

With material lines running through Conair's booth, the system will be a major feature of the company's display at NPE.

"We originally introduced this technology under the name R-Pro, or resin-protection conveying system," said Chad Stover, marketing communications manager at Conair. "Our focus then was on slow-speed, dense-phase conveying in order to prevent problems like angel hair and pellet fracturing. Since then, we have refined the concept to give processors the freedom to move different materials at the ideal speed for each application."

The system can also change speeds automatically when different resins are called for.

Conair says the Wave Conveying system is the first vacuum-powered material-handling system to give processors precise control of material speed and material flow. It does this through the interaction of Conair's FLX-128 Plus conveying control, a vacuum pump with a variable-frequency drive, and a control valve, with standard receivers and tubing. Starting at speeds of about 300 ft/min, the system draws material through in the form of compact pulses or waves, each separated by an air space. As velocity increases, the interval between the pulses becomes shorter, and the waves flow faster. Pellets do not become suspended in conveying air as they do in conventional high-speed systems. Instead, they look like waves as pellets roll and tumble along the bottom of the conveying line.

The system's ability to regulate the conveying

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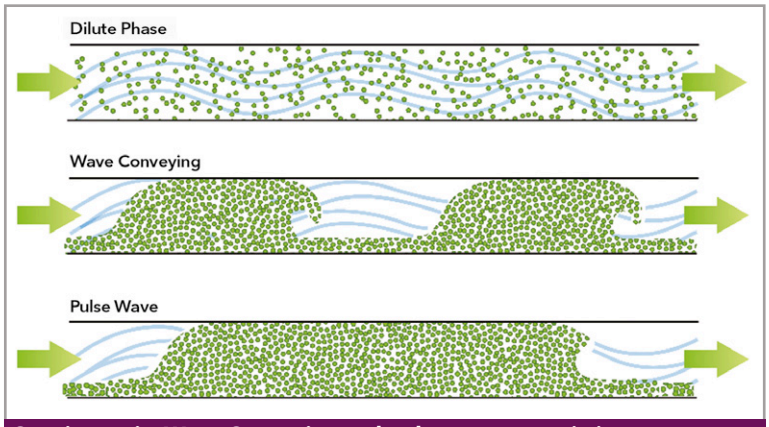
process – even to allow for programmable resin-conveying 'recipes' to be stored in the FLX-128 Plus – is found in a series of patented control and equipment innovations. These include:

■ Using a Conair LDP Series vacuum pump equipped with variable frequency drives. Unlike typical vacuum pumps, which are 100% on or off, LDP pumps with variable-speed drives can operate at the precise level of capacity and power consumption needed to maintain a specific material velocity in the system, which can result in substantial energy savings;

■ The Wave Conveying hardware, together with the FLX-128 Plus control, regulates material flow – fine tuning both the vacuum level and the influx of material from the material supply point to the conveying system; and,

■ A new type of conveying speed sensor – which measures material velocity, not air velocity – monitors the speed of material moving in the mixed-pulse and wave phases. It provides feedback, helping the system maintain correct material flows.

Other benefits of Wave Conveying include: higher throughput (up to 2.4 times greater than dilute phase systems); better powder handling;




**Conair says its Wave Conveying technology moves resin in compact slugs of material that move at much slower speeds**

longer conveying distances – up to 1,000 ft horizontally and 250 ft vertically, compared to about 600 ft horizontally and 70 ft vertically for dilute-phase systems.

**CLICK ON THE LINKS FOR MORE INFORMATION:**

- **www.conairgroup.com**
- **www.coperion.com**
- **www.maguire.com**
- **www.motan-colortronic.com**

# Testing times for processors

***Experts in polymer testing will share their knowledge at AMI's conference in Pittsburgh in September***

With polymer testing and analysis underpinning all stages of successful plastics processing, we preview the second annual *Polymer Testing & Analysis* conference for the US market, taking place in Pittsburgh, PA this September.

This two-day event, which takes place on September 11-12, is now established as an important meeting place for scientists, laboratory staff, researchers and R&D professionals who develop, test and analyse new polymer materials, formulations and products. It provides a unique opportunity to discover and debate the latest innovations in testing, characterisation and analysis techniques specifically for plastics materials and products.

Leading experts will gather at *Polymer Testing & Analysis US 2018* to discuss advances in analysis and understanding of polymer performance. Speakers will evaluate the modification of polymers, gain insights into melt behaviour and predict performance in demanding applications. In addition, the conference covers advances in polymer testing techniques for stress cracking and weathering.

Ahead of the event, we take a closer look at the line-up of expert speakers.

## Characterisation and analysis

The opening session of *Polymer Testing & Analysis US 2018* kicks off with a paper on how size and shape matter with regards to the challenges and strategies for difficult molecular weight and polymer architecture analysis from **Adam Kozak**, Senior Research Scientist at **Cambridge Polymer Group** in the US. **Sarah Fezzey**, Senior Scientist at **L&L Products** in the US, then looks at the utilisation of pyrolysis-gas chromatography - mass spectroscopy for material characterisation and failure analysis. How to simplify the identification of DSC curves is then addressed by **Dr Yanxi Zhang**, Technical Sales Support at **Netzsch Instruments North America** in the US.

The next session takes a closer look at the modification of polymers and **Elizabeth Kidd**, R&D Chemist at **BTG Labs** in the US, showcases how to utilise water contact angle measurements to validate surface modification of polymers. This is followed by a talk which evaluates the effectiveness of polymer additives from **Paul Kinosian**, Laboratory Technician II at **SI Group** in the US.

## Performance and melt

The conference's third session provides an opportunity for delegates to find out how to understand PE-based blends by leveraging multiple analytical techniques from **Dr Menas Vratsanos**, Chief Scientist at **Intertek Chemicals and Materials Allentown** in the US. A paper focusing on electrical testing of high-performance engineering plastics is then presented by **Dr Mithun Bhattacharya**,

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NPE 2018
THE PLASTICS SHOW

**West Hall, Level 2,
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7–11 May 2018**

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**Hall 15, Booth D 82
29 May – 1 June 2018**

**Speakers at Polymer Testing & Analysis US include – top row, from left: Sarah Fezzey, Senior Scientist at L&L Products; Adam Kozak, Senior Research Scientist at Cambridge Polymer Group; Dr Liang Fang, Principal Scientist at West Pharmaceutical Services. Bottom row, from left: Dr Ilias Ali, Research Engineer, Printpack; Dr Mark Pothecary, Separations Product Manager – Americas at Malvern Panalytical; Matt McGreer, Senior Product Manager at Atlas Material Testing Technology**

Scientist & Lean Six Sigma Green Belt, Advanced Technology Group at **Greene, Tweed & Co** in the US. **Dr Ilias Ali**, Research Engineer, **Printpack** in the US, closes the session by focusing on advanced characterization tools and techniques for high barrier PP/PS multilayer food packaging materials.

The fourth and final session of the day features **Professor Joao Maia** from **Case Western Reserve University** in the US who talks about new developments in real-time on-line rheological and chemical characterisation in extrusion-based processes. **Dr Bhattacharya** from **Greene, Tweed & Co.** again takes to the podium to focus on the rheology of high temperature elastomers. To close the day **Tim Haake**, General Manager at **Goettfert** in the US discusses how to get the most from your rheometers and other measurement instruments.

To round off the day's proceedings, a networking drinks reception is held in the exhibition area, where delegates and speakers debate the conference so far and attendees have the opportunity to network with industry peers.

## Demanding applications

Day two of *Polymer Testing & Analysis US 2018* is opened by **Dr Liang Fang**, Principal Scientist at **West Pharmaceutical Services** in the US, who looks to predict the stress cracking of polymers. A paper on developments in the reliable measurement of the weld strength in thermoplastics is then delivered by **Ken Holt**, Senior Applications Engineer at **Dukane** in the US. **Matt McGreer**, Senior Product Manager at **Atlas Material Testing Technology** in the US, then questions whether the laboratory weathering testing you're doing is wrong.

After the morning refreshment break and networking session, **Jiraporn Nomai**, Assistant Researcher at Chair of Composite Engineering (CCe) at the **Technische Universität Kaiserslautern (TUK)** in Germany, discusses the efficient analysis and determination of environmental stress cracking of polymers in different environments. This paper is co-authored by Professor Alois Schlarb, Chair of Composite Engineering (CCe) at the Technische Universität Kaiserslautern (TUK).

The third and final session of the day features **Dr Nikhil Gupta**, Associate Professor, Mechanical and Aerospace Engineering at **New York University, Tandon School of Engineering** in the US, who debates the testing of polymers across time, temperature and strain rates. **Bill Tobin**, Senior Weathering and Corrosion Technical Marketing Specialist at **Q-Lab Corporation** in the US, then looks to understand the relationship between chamber set points and specimen temperatures during accelerated weathering. A focus on new concepts in powder rheology testing is then presented by **Mark Lavach**, Manager, Analytical and Systems Research, **Arkema** in the US. Closing the conference will be **Dr Mark Pothecary**, Separations Product Manager – Americas at **Malvern Panalytical** in the US, with a paper on correlating early and late stage polymer testing with advanced GPC and rheological measurements.

# About Polymer Testing & Analysis US 2018

Don't miss this opportunity to learn from the experts. AMI's 2nd *Polymer Testing & Analysis US* conference takes place on September 11-12 at the Pittsburgh Marriott City Center hotel in Pittsburgh, PA. It provides the perfect forum to discover new ways for testing of raw materials and products for quality assurance. For further information about attending the event, taking a table top exhibition space or sponsoring the conference with one of our unique marketing packages, please contact the organiser Kelly DeFino, Senior Conference Coordinator at **kelly.defino@ami.international** or call +1 610 478 0800 for more details about attending this event. Visit the **conference website**.

# Polymers in Flooring 2018

## New developments and opportunities in polymer flooring

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Following its highly successful launch in 2017, AMI is pleased to announce the 2nd US edition of Polymers in Flooring. The conference provides a unique forum bringing the polymer flooring industry together to debate technical and market trends, whilst networking with key stakeholders from the industry.

An international line-up of expert speakers will discuss new developments in polymers, additives, compounds and other key topics aimed specifically at flooring products.

Highlights from 2017:

- Over 110 attendees
- 15 international flooring producers
- 10 countries represented
- Full 2-day conference program with interactive presentations
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# NPE 2018: Global plastics industry heads to Florida

## *The triennial NPE show returns to Orlando this year, with more than 2,000 exhibitors. Here, we preview the show with those exhibits of particular interest to film and sheet producers*

NPE, the huge plastics show for the North American market, returns this year, and is again held in its 'new' home of Florida.

For the second time, the show will take place at the Orange County Convention Center in Orlando – having earlier been held in Chicago for many years.

The **Plastics Industry Association** – the organiser of NPE – says that the latest edition of the show is the largest in its history, with more than 1.2 million sq ft of exhibition space sold. As of early April, 2,150 exhibitors had secured space at the show.

"We are thrilled that our exhibit floor is in such high demand – and we're still providing space, so our numbers continue to grow," said Susan Krys, vice president of tradeshows and marketing at the association.

In addition to the exhibition, the show has a number of seminars – including the huge Antec technical conference. Other events include: a sustainability and recycling summit; a series of seminars in Spanish; and a set of 'Super Sessions', including a session on trends and material solutions in the packaging market, presented by A. Schulman.

However, the main focus is the exhibition itself – and there is plenty on show of interest to plastics extruders.

This year's show takes place on 7-11 May. ›

**Main image: NPE returns to the Orange County Convention Center in Orlando this year**

### NPE 2018 – Key Information

**Dates:** 7-11 May 2018 **Venue:** Orange County Convention Center, Orlando, Florida, USA
**Opening hours:** 9am to 5pm daily (until 3pm on final day)
**Organiser:** Plastics Industry Association **Website:** www.npe.org

**Addex**, which supplies auto-profile and other cooling systems for blown film lines, will showcase its latest Intensive Cooling technology at NPE.

The company will launch its 'Height-Adjustable' Intensive Cooling twin-stack system, which is designed to optimise performance for both high- and low-melt processes.

It offers an enclosed, two-level, stacked Intensive Cooling system with a lower element that mounts flat to the die and a second, height-adjustable element just below the air ring. The system is adaptable to changes in materials and supports fast changeovers.

The fully-enclosed Intensive Cooling Twin-Stack elements can be separated over a range of 1in to 16in, allowing the operator to change the height between the cooling elements to control the effect. For super low-melt materials, a short distance between the elements is ideal. For high-melt strength operation, the cooling zone can be extended to its maximum by the push of a button. The Height-Adjustable Twin-Stack system can be fine-tuned across a broad range of products without time-consuming equipment changes and while the line is running.

The original fixed-height Twin-Stack system can increase output by 15-20% for very low-melt strength materials, and by 40-50% for high-melt strength materials. The Height-Adjustable version of the Twin-Stack is expected to produce even greater increases.

Addex will also highlight its dual-flow air rings, available for retrofit since 2016. These replace the standard low-velocity lower lip with a single Intensive Cooling element, delivering 10-15% greater output and better bubble stability – though some processors report up to 40% gains in output rate versus the competition, it says.

PolyExpert, a Canadian producer of PE film, has bought several single-element Intensive Cooling air ring systems and reported improved output. The air rings are installed with Addex's auto-profile system.


**Right: Intensive Cooling systems from Addex can boost output on blown film lines**

"Intensive Cooling products will continue to evolve, fuelled by customer feedback and the learning curve, as more systems are put into operation on a variety of processes and materials in production," said Bob Cree, president of Addex.

› **www.addexinc.com**

**Albis**, a global distributor and compounder of technical thermoplastics, says that many of its compounds are now made at its newly installed facility in Duncan, South Carolina.

"Our more than 50-year commitment to the US market has been strengthened by the opening of our new plant in Duncan," said Stefan Fuhlendorf, president and CEO of Albis. "This enables us to offer our NAFTA-based customers local production using global specifications."

It will show a number of these grades at NPE, including its Altech Prime and Altech Eco. Altech Eco compounds are based on post-industrial feedstock and provide recycled content of up to 100% for a range of applications. They are characterised by a positive ecological balance, 'Near-to-Prime' quality, tailor-made features, cost efficiency, and good workability, says Albis.

› **www.albis.com**

**Amut** will present its updated Amut Dolci Extrusion division, following its full merger with Dolci Bielloni earlier this year.

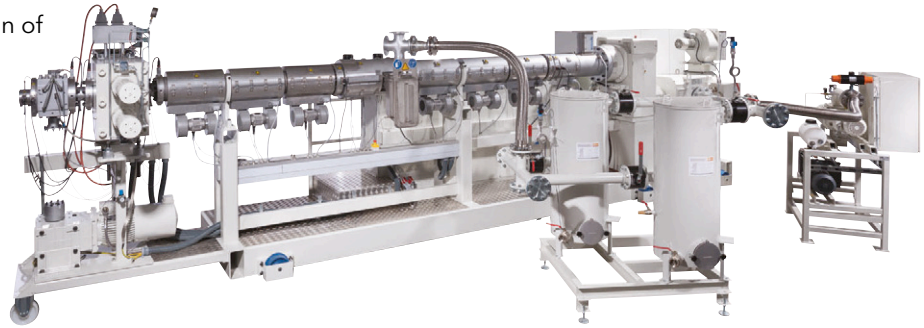
The division is dedicated to flexible packaging,


**Below: Amut's new Amut Dolci Extrusion division is dedicated to flexible packaging and other film products**

manufacturing machinery for the production of stretch film (both cast and blown technology) and cast PP film rolls. It has already finalised several contracts for stretch film lines, says Amut.

The group will also highlight some other areas of its expertise: thermoforming machines (both in-line and off-line solutions); extrusion lines for rigid products such as sheets and membranes; and recycling – such as washing plants for PET and PE post-consumer items.

› **www.amutgroup.com**



**Above: Battenfeld-Cincinnati's StarExtruders are ideal for direct PET processing**

**Baldwin Technology** will showcase its Film Cylinder cleaning system at NPE.

The system offers fully automatic chill cylinder cleaning, which is performed during operation. This process maximizes productivity and safety by eliminating manual cleaning, while improving film quality, increasing machine equipment uptime and reducing waste, says the company.

Ahlbrandt, a Baldwin subsidiary since last year, will show its Corona surface treatment systems at the same time. These are tailor-made for each type of surface finish, and have high- performance electrodes that promote effective surface finishing with enhanced ink and glue adhesion. With a slim design, these systems can easily integrate and retrofit into most areas of a production line, and the Corona's cassette rail system is quick and easy to service.

› **www.baldwintech.com**

**Battenfeld-Cincinnati USA** will present the SolEx NG single screw extruder, ConEx NG twin screw conical extruders and the Star Extruder at NPE. All are equipped with the latest Industry 4.0-compatible BCtouch UX control. The extruders are used to make products for the infrastructure, construction and packaging divisions, for the

# Polymer Foam

## Pittsburgh / 2018

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pipe, profile and sheet industries.

The ConEx NG is a conical twin screw extruder with a flexible design that covers a wide range of outputs for applications including sheet extrusion. Its innovative design allows for energy savings of up to 20%. The mechanical design platform offers many configurations for primary or coextrusion applications.

It also offers a choice of extrusion systems for thermoforming sheet. Its StarExtruders combine a single screw for plastification with a planetary roller section for efficient degassing – making them ideal for direct PET processing. Energy savings can be achieved thanks to reduced drying times.

The company also has experience in multi-layer sheet extrusion, with products including high-speed extruders with 75 and 45mm diameter screws and – depending on customers requirements – standard three-roll roll stacks or the Multi-Touch roll stack for high-speed extrusion.

› **www.battenfeld-cincinnati.com**

**Brampton Engineering** has expanded its Vector air ring product line.

The new Vector S offers an auto gauge option by using segmented air. It reduces starting gauge by up to 80% compared to conventional air rings, says the company. It also has very high resolution, as it has 180 digital control points adjacent to the lip compared to the usual 60-80 controls in conventional air rings.

Brampton engineers used aerospace engineering to create the Vector line – distributing chilled air uniformly around the bubble using a single inlet while controlling the flow to secure stable 'bubble-lock' and boost output on the blown film line.

Vector reduces starting gauge variability thanks to uniform airflow around the lip, while Vector S offers a more precise level of control by using segmented air, says the company. At NPE, Brampton will show a full-scale model of the Vector air ring.


**Above: Brampton's Vector S air ring uses segmented air to reduce starting gauge by up to 80%**

At the same time, Brampton says that its SCD 4.0 die technology will now be available for retrofit on all existing lines – regardless of age, model and manufacturer.

"The market demands more layers and SCD 4.0 is the only co-extrusion die that enables producers to process each polymer in a multi-layer barrier film structure at its ideal temperature," said Gary Hughes, Brampton CEO.

Brampton says that the die has a direct path from the extruders and streamlined melt channels, to achieve "the shortest melt residence time and lowest wetted surface area in the industry".

› **www.be-ca.com**

**Cloeren** will showcase its Edge Bead Reduction (EBR V) die for extrusion coating applications at NPE for the first time.

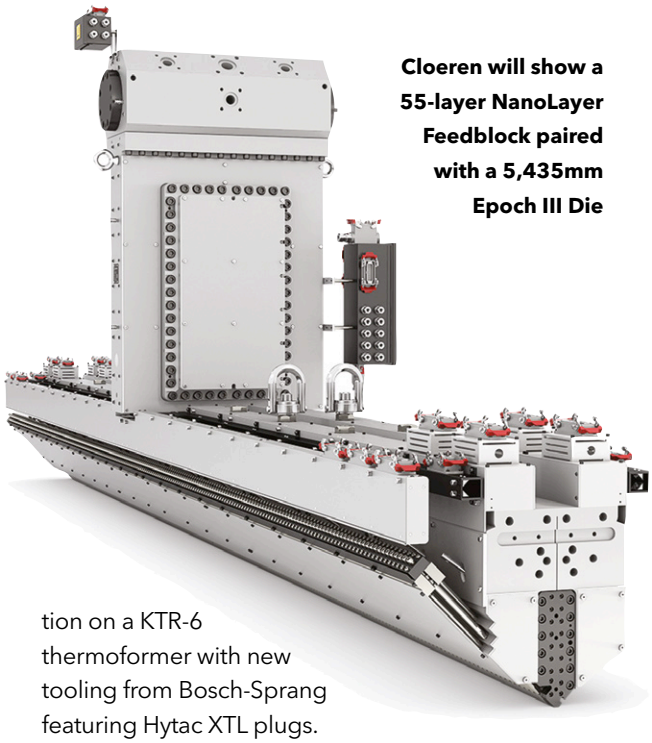
The EBR V is the most advanced design in its EBR series, and has an installed base of over 50 units. EBR dies are a key technology for extrusion coating and lamination, which require frequent web width and formulation changes. The EBR V deckle system can minimise the volume of material at the edge bead, which gives economical and

environmental benefits, says Cloeren.

The company will also show its NanoLayer system, comprising a 55-layer NanoLayer Feedblock paired with a 5,435mm Epoch III Die. At the show, it will produce the third Generation (G3) of NanoLayer stretch films – which it says offer enhanced performance in high speed power pre-stretch applications.

Cloeren will also display its Moebius manifold die, which has an internal geometry that is suited to processing polymers with sensitive residence times, including PVC formulations.

› **www.cloeren.com**



**Cloeren will show a 55-layer NanoLayer Feedblock paired with a 5,435mm Epoch III Die**

**CMT Materials**, which develops thermoforming plug-assist materials, will show its range of Hytac syntactic foams at NPE.

The materials will also be featured at the booths of several leading thermoforming machine manufacturers including: Germany-based Illig, Kiefel, and Gabler; Italy-based Wrapping Machinery and OMG; and US-based Sencorp, Brown Machine Group, and Irwin Research & Development.

Illig, for instance, will use an RKDP 72 thermoformer to run a 6-up tool for PET tray production at 42 cpm, while Kiefel will demonstrate PP K-cup production on a KTR-6 thermoformer with new tooling from Bosch-Sprang featuring Hytac XTL plugs.

**Below: CMT's thermoforming plug-assist materials will be demonstrated by several companies during NPE**

"We continue to enjoy strong growth for copolymer and thermoplastic plug materials as the global plastics packaging market continues to evolve and grow," said Conor Carlin, sales and marketing manager for CMT Materials.

Carlin noted that the increased growth is largely focused in food packaging applications in Europe and Asia, with material shifts away from PS to PP and new multilayer films.

"These more complex polymers require more sophisticated plug assists beyond our basic epoxy-structured materials," he said.

In the last 18 months, CMT has expanded production capabilities by 30% at its US headquarters, to keep pace with global demand for Hytac syntactic foam.

› **www.cmtmaterials.com**

**Davis-Standard** will showcase its Super Blue and direct drive groove feed extruders at the show.

The 65mm direct drive groove feed extruder has

a Helibar design with a grooved intake zone and helically grooved barrel, and new barrier-mixing feedscrew technology. This combination offers increased processing flexibility due to higher regrind levels and improved pressure stability, says the company.

It also enables processing of a wider range of polymers at lower internal pressure and with improved energy efficiency. The Helibar design is advantageous in terms of higher throughput, improved melt pressure build-up, lower melt temperatures, improved melt homogeneity, reduced barrel wear and a shorter residence time, says the company.

It is suitable for a wide range of applications, including sheet extrusion.

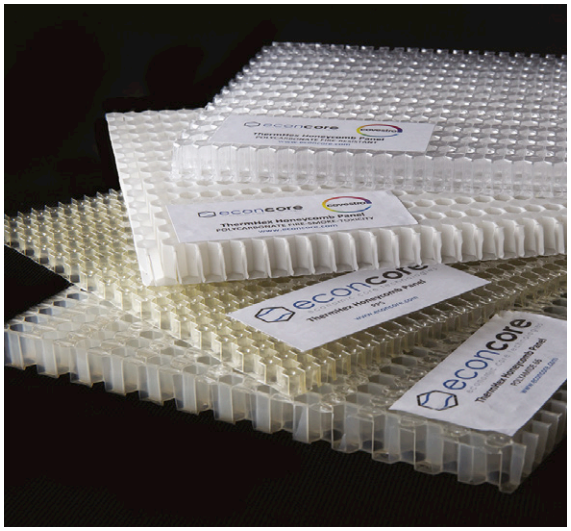
The Super Blue is available in sizes ranging from 2in (50mm) to 4.5in (114mm), each with the option of a 24:1 or 30:1 L/D ratio. At NPE, the Super Blue will be shown with the DS-eTPC II, the second generation of Davis-Standard's touchscreen control.

› **www.davis-standard.com**

**EconCore** of Belgium, whose ThermHex technology is used to make polypropylene (PP) honeycombs and sandwich materials, will highlight a recent automotive project during NPE.

Fynotej, a manufacturer based in Mexico City that makes automotive non-wovens and industrial carpets, is EconCore's first North American licensee to focus on automotive applications.

It went into production earlier this year with a range of honeycomb sandwiches for automotive interiors, including the trunk space. The products, branded Fynocore, have a PP honeycomb core with skins – thermally bonded in-line – in either solid PP sheet or with a non-woven surface finish. They combine low weight with high performance and aesthetics.




**Left: EconCore's ThermHex technology is used to make PP honeycombs and sandwich materials**


**Above: The Super Blue is available in sizes ranging from 2in to 4.5in (50-114mm)**

"Fynocore products combine our expertise and experience in non-wovens with EconCore's ThermHex honeycomb technology," said Daniel Kalach, VP of manufacturing at Fynotej. "They fit well with automotive market trends: they are recyclable and moisture inert, conversion is clean and fast, parts have high performance and low weight – and costs are competitive."

The products are available in North America. Kalach says Fynotej is already looking at building and industrial applications of the panels.

Tomasz Czarnecki, COO at EconCore, says the start-up of the Fynotej production line is a significant step forward for lightweight thermoplastics honeycomb composites in the North American automotive sector.

He also highlights another licensee in North America – Wabash National – which makes semi-trailer and truck bodies, and has used EconCore technology to make thermoplastic honeycomb cores with metal skins.

"The light-weighting efforts of Wabash National fit well into the market trends," he said. "The transportation and logistics markets, with regards to fuel efficiency regulations but also in view of pure cost savings targeted by fleet managers, are asking for a change."

At its booth, EconCore will also provide information on its process capabilities to enable production of thermoplastic honeycombs. A further development enables production of what it calls organosandwich – honeycomb cores with continuous fibre reinforced thermoplastic skins.

› **www.econcore.com**

At NPE, **Gneuss** will show a complete Gneuss Processing Unit (GPU), as well as a Multi Rotation System MRS 130 extruder, RSFgenius 150 melt

**Above: The Gneuss Processing Unit (GPU) has been successfully used in PET sheet extrusion**

filtration system and an online viscometer VIS, for the processing of 2,000lbs/h of undried and uncrystallised polyester (PET).

The technology has been particularly successful in PET sheet extrusion. As well as producing high quality rigid sheet, Gneuss now offers the option for its PET sheet extrusion lines to switch to physically foamed PET sheet by adding its new PET foam module. Foamed sheet, with a weight reduction of 50%, can be extruded with a consistent foam structure and mechanical properties – using up to 100 % post-consumer material.

Strong and consistent growth in North America has allowed the company to move forward with an expansion of its US facilities in Matthews, NC. The larger facilities offer a larger laboratory as well as more space for spare parts.

› **www.gneuss.com**

**GN Thermoforming Equipment** will showcase its GN800 thermoformer for the first time in North America.

It offers many standard features in order to meet manufacturers' needs, including a forming capability of 5in above and below the sheet line, in-mould-cut capability, auto-grease, heavy-duty bearings in the toggle system, and high-efficiency solar heaters.

A top priority is to improve productivity and ensure that customers produce the most finished parts per pound of sheet. Over the years, GN has perfected common-edge-cut tooling technology for its contact-heat series of thermoformers. Common-edge tooling offers the ability to form a series of square or rectangular trays in a row or multiple rows while eliminating all web between the edges of the products.

The GN800 is designed to work with minimal thicknesses of plastic materials and – in combination with the common-edge system – can increase finished part output per pound (kg) of material.

At NPE, the company will demonstrate a common-edge-cut tool that was developed for the GN800 thermoformer in collaboration with Gravolab, a toolmaker from Romania. GN will run a meat tray in PET/PE laminate with a 12-cavity mould while maintaining a reduced scrap rate of 18%, said Jerome Romkey, GN's business development manager.

› **www.gncanada.com**

**Graham Engineering** will exhibit a range of its systems for a variety of extrusion operation, including sheet system from its **Welex** subsidiary.

The Welex Evolution sheet extrusion system – a complete production line for use in sheeting, winding, and in-line thermoforming applications – is equipped with XSL Navigator control.

While the equipment on display at NPE will be for thin-gauge polypropylene, the Evolution system can be customised for widths from 36 to 90in (90 to 230cm), gauges from 0.008 to 0.125in (0.2 to 3.2mm), and throughputs up to 10,000lbs/hr (4,535kg/hr.). Monolayer or co-extrusion systems are available, with up to nine extruders.

In addition to a customised roll stand, the Evolution system can be equipped with screen changers, melt pumps, mixers, feedblocks, and dies. Additional features of the line on display include a proprietary roll-skewing mechanism for thin-gauge applications while maintaining quick roll change and electric gap adjustment under full hydraulic load without interrupting production.

› **www.grahamengineering.com**

› **www.welex.com**

**Maag** will use NPE to showcase a variety of its products and processes.

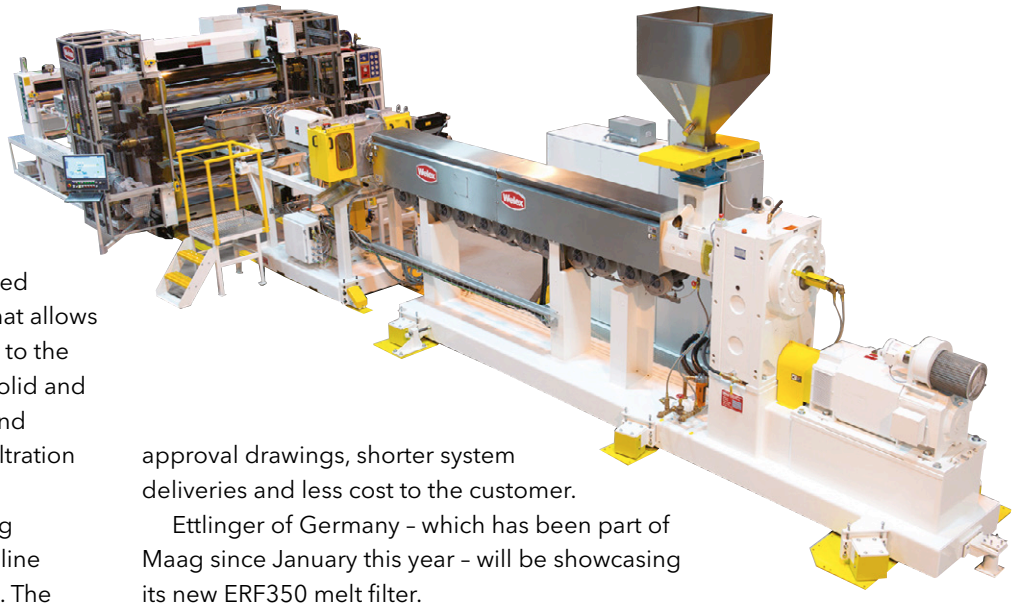
Its Extrex X6 class gear pump delivers volumetric


**Right: At NPE, GN will demonstrate a common-edge-cut tool that was developed for its GN800 by a Romanian toolmaker**

efficiency at high counter pressures and with the lowest amount of shear stress, it says. This results in a reliable and gentle transfer, boosting and metering for a wide range of thermoplastic polymers, with no adverse effects on product quality.

At the same time, its FSC plate screen changer for extrusion processes is equipped with a pressure-adaptive sealing system that allows the required sealing forces to be adjusted to the actual melt pressure automatically. Their solid and robust construction, available in all sizes and designs, ensures a reliable and leak-free filtration of molten polymers.

Its new extrusion cart has a space-saving moveable tripod design, which reduces inline footprint compared to four-wheel designs. The modular system allows for one size cart to handle the four most common size extrusion pump models for 3.5, 4.5 and 6in extrusion lines. With a simple adapter plate change, the original cart can handle a larger pump or gearbox, without replacing the cart should the customer need a pump change for more output. This new compact design is done in 3D technology allowing for quicker approval drawings, shorter system deliveries and less cost to the customer.



**Above: Welex equipment on display at NPE will make thin-gauge polypropylene**

Ettlinger of Germany – which has been part of Maag since January this year – will be showcasing its new ERF350 melt filter.

Depending on the type and level of contamination in the melt and the selected screen size, it achieves a maximum throughput of 8,300 lbs/hr, an increase of around 28% compared to the earlier ERF250 using the same filtration surface.

Volker Neuber, managing director of Ettlinger, said: "There is a huge demand in the US for high quality regrind and also for our filters." ›


**Right: Milacron's SV350 single screw extrusion machine is available for quick delivery**

ERF filters are suitable for filtering all standard polyolefins and polystyrenes as well as engineering plastics such as styrene copolymers, TPE and TPU. Foreign particles can be reliably removed from base materials containing up to 18% contaminants.

All filters are self-cleaning with a rotating, perforated drum, through which there is a continuous flow of melt from the outside to the inside. A scraper removes contaminants that are held back on the surface and feeds them to the discharge system. This enables the filter to be used fully automatically and without any disruptions. The advantages are ultra-low melt losses and good mixing and homogenising of the melts.

› **www.maag.com**

**Below: Maguire's VBD-600 dryer achieves hourly throughputs of 600lbs (275kg)**


At NPE, **Maguire Products** will exhibit a new, intermediate-range model in its VBD line of vacuum resin dryers – which expands throughput and introduces an energy-monitoring capability that will be available with all VBD models.

Its VBD-600 dryer achieves throughputs up to 600lbs (275kg) per hour. This capacity is suitable for the manufacture of sheet and many other extruded extruded parts. With the new model, Maguire now offers vacuum drying systems with hourly throughputs of 30 to 1,000lbs (15 to 450kg).

The VBD-600 dryer shown at NPE2018 will include a new controller display that monitors energy consumption and enables processors to track consumption over time. This is the latest addition to an intuitive control system which enables operators to manage all drying parameters simply by means of a touch screen.

"The new energy consumption display makes the radical energy efficiency of vacuum drying immediately measurable," said Frank Kavanagh, vice president of sales and marketing. "The substantial reduction in energy consumption made possible by the vacuum dryer can yield a rapid return on investment for the equipment."

In comparison with desiccant dryers, the VBD vacuum dryer consumes up to 80% less energy, dries resin in one-sixth of the time, and reduces the heat history to which polymer is exposed. The speed with which the VBD system removes moisture makes properly dried polymer available for production only 35 minutes after a cold start, says Maguire.

› **www.maguire.com**

The SV350 single screw extrusion machine from **Milacron** is robust and flexible, with a practical design that can meet the needs of a range of extrusion processes, including sheet.

As a stock machine, it is available for quick delivery and comes in sizes of 2.0-4.5in, in 24:1 L/D ratio.

Milacron designs and builds full extrusion systems in-house, maintaining complete control of precise equipment needs – from extruders and new or rebuilt extrusion barrels to screws, dies and downstream equipment.

It says that its demonstration and development laboratories have helped to optimise processing via natural compression – creating a customisable approach for customers that increases productivity, output and accuracy while reducing costs.

› **www.milacron.com**

**NDC** will introduce several new measurement systems at NPE, including its new Low Energy X-Ray Sensor – which is ideally suited for thickness and basis weight measurements of lightweight extruded film and sheet, and offers excellent narrow streak resolution.

A highly stable, precisely tuned power supply runs at or below 5keV, providing high signal-to-noise characteristics and optimum measurement performance.

At the same time, NDC's new Web Surface Inspection Systems provide 100% product coverage, enabling manufacturers to achieve zero defects.

Systems include powerful capabilities to detect, classify, document and record all optical defects across a broad scope of web materials.

› **www.ndc.com**

**Neutrex** will showcase its latest developments in its range of Purgex purging compounds for applications including plastics extrusion.

At the show, Neutrex will discuss the latest compounds that speed up colour changes, eliminate contamination, reduce rejects, and decrease downtime. They are engineered to clean the barrel, screw and other parts of the system.

It will also feature a number of seminars on its stand, including one from consulting engineer Allan Griff, called 'The Ten (11) Key Principles of Extrusion'.

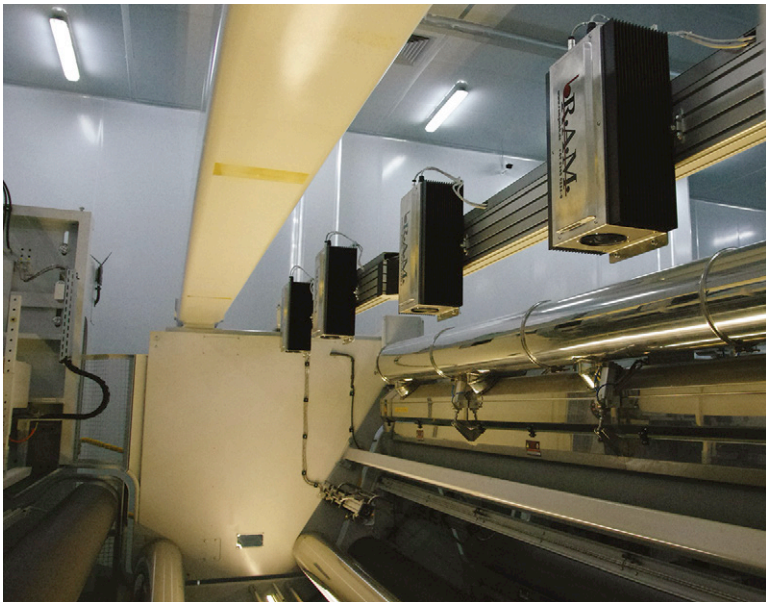
Purgex grades comprise active ingredients with a resin carrier and are engineered to clean thoroughly and quickly to maximize colour/resin change turnaround and reduce scrap, says the company. Most are designed for versatility and are effective on a broad range of resins and multiple production methods.

› **www.purgexonline.com**

**Next Generation Recycling** of Austria will showcase a range of recycling methods, including its P:React LSP (or 'liquid state polycondensation') reactor. NGR says this is the first time it has highlighted the technology at a North American show.

Because PET is converted to the liquid phase during LSP, harmful chemicals can be quickly removed while still offering high process stability. The FDA has given approval for 100% food contact to the LSP recycling process.

In sheet manufacturing, the high process stability cuts process downtime, meaning higher production volume in the same time frame. Also, users achieve more consistent sheet thickness, and allows downgauging without loss of properties – both of which lead to material savings. The LSP process can use 100% post-consumer rPET – such as bottle-flakes – so no virgin material is needed.



**Above: NDC's new Web Surface Inspection Systems help manufacturers to achieve zero defects**

As well as pellet manufacturing, P:React is increasingly being used for direct production of sheet and film, which combines recycling and manufacturing into a single step. Avoiding the additional energy and handling steps of a separate production process helps to boost efficiency.

A special feedback loop allows users to control the exact output Intrinsic Viscosity (IV) even with variations in input IV, to create higher value rPET.

In addition, NGR Connect gives the user a live digital connection to their recycling process. Operating parameters on the NGR system are recorded and made accessible to the user on any end device (such as a tablet or smartphone). In conjunction with P:React, for instance, NGR Connect monitors decontamination performance.

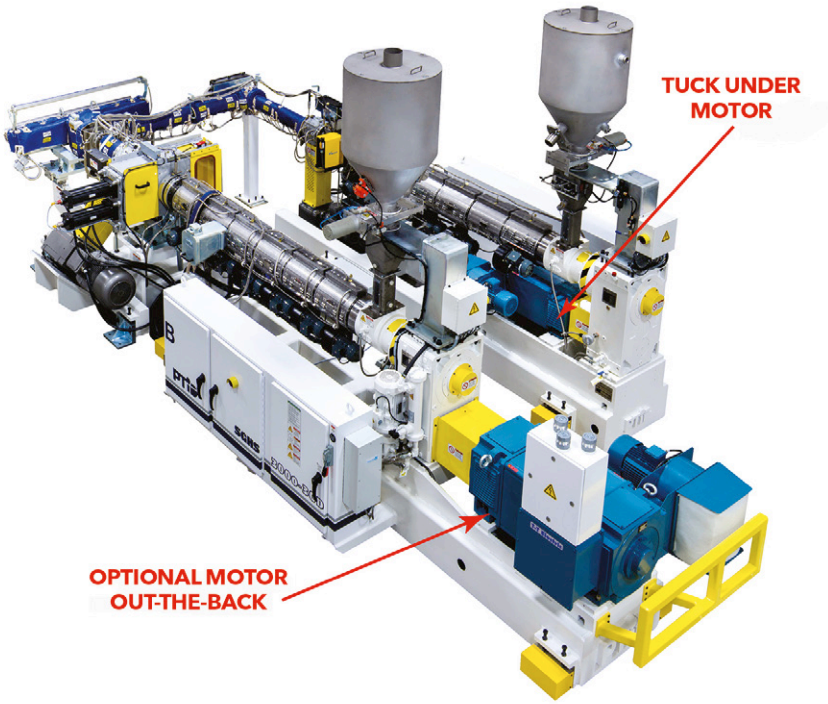
› **www.ngr.at**

**Left: NGR's LSP process removes chemicals quickly while maintaining process stability**

**Processing Technologies International** (PTI), which makes sheet extrusion machinery, has reduced the footprint of its Super-G HighSpeed Extruders, to give what it says is the highest extrusion output per square foot in the industry. It will showcase the extruders at NPE.

The superior manufacturing output is made possible by the introduction of a tuck under motor which creates a smaller footprint for both the models used to process polypropylene (PP) and high-impact polystyrene (HIPS) for packaging

"Our high-speed extruder technology sets a new industry standard in terms of




**Above: PTI has shrunk the footprint of its Super-G HighSpeed Extruders by one-third, which it says gives an unequalled extrusion output per square foot**

output per unit area thanks to the tuck under option," said Matt Banach, senior vice president of sales and marketing for PTI. "Our Super-G technology has set the standard for high-density manufacturing, now delivering unprecedented output per square foot."

PTI's Super-G SGHS3000-36D has a vertical U-configuration and tuck under motor that reduces the machine's footprint by more than 33% to 12ft 8in (compared to 17ft 7in for the original model). It is equipped with a 500hp motor and runs at a maximum speed of 1000rpm. For processing of PP, it has a production output of approximately 3,000lbs/hr.

The SGHS3000-42D model is also offered with the tuck under option and offers comparable footprint reduction and similar output gains. It has a 600hp motor and runs at a maximum speed of 1200rpm.

The tuck under option is commercially available and several machines have already been installed in the USA.

PTI's high-speed extruders feature carbide-lined barrels and Colmonoy hard-faced feed screws versus case-hardened screws as featured on competitive models.

The Super-G high-speed extruders have an oversized feed section that promotes higher regrind feed rates (up to +70%) along with a streamlined feed hopper with support, delivery chute, and tramp metal protection. Other key features include feed screw removal out-the-back of the unit, an easy-cleanout vent chamber, and linear bearing barrel glide support (patent pending).

Special air-cooled heater and blower assemblies limit the exterior heater temperature for safety and efficiency purposes (< 110F) versus competitive models which can be as high as 500F.

› **www.ptiextruders.com**

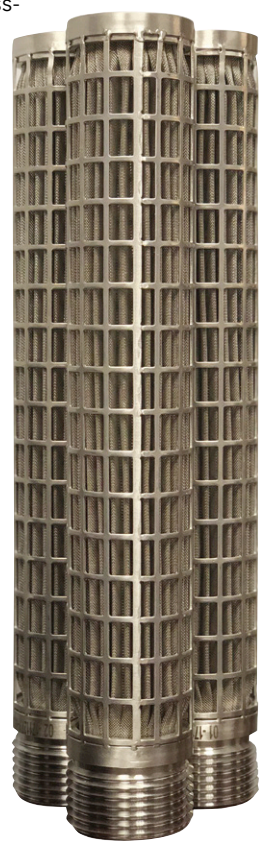
**PSI-Polymer Systems** will introduce a new melt filtration system at NPE.

Its ILF-55 in-line filtration system is a discontinuous, high capacity filter aimed at long batch production runs where the extrusion process cannot be disturbed – and where ultra-high filtration levels must be maintained continuously.

ILF filters are typically used where screen changers are either too large for the application or cannot satisfy the filtration level requirement without incurring an unacceptable pressure drop.

ILF vessels can be fixed in line or interchangeable and are supplied with three or seven filter tubes. The interchangeable vessel option accommodates fast changeouts. Standby vessels can be preheated to minimise downtime. Vessels can be arranged for electric heat or jacketing for steam/oil heat systems.

Filter tubes offer micron ratings from 0.5 – 250 and can be re-usable (pleated filters) or single life (slip-on wire cloth tubes). All pleated filters are bubble tested for pore size verification.



**Right: PSI's ILF filters are aimed at long batch production runs**

All models are designed for operating pressure up to 4,500psi (310 bar) and process temperatures to 750F (400°C)

› **www.psi-polymersystems.com**

**Starlinger** has developed a technology that neutralises the smell of recycled plastics on a permanent basis.

The three-step procedure (material preparation, degassing, and post-treatment) works without the use of additives and removes even deeply embedded odours. At NPE, visitors can smell the input material and the improved regrind at a laboratory table with sample stations.

A number of materials can cause an unpleasant smell when recycled – from polyolefin containers that were filled with detergents, to food packaging film whose surface has organic contamination.

At the same time, the company will highlight its PET recycling technology,

which is helping customers to use rPET flakes as input material for their tape extrusion lines. The high recyclability of PET means that big bags can theoretically be recycled indefinitely.

Two types of packaging made from 100% rPET bottle flakes will be shown at NPE: an rPET FIBC for large product volumes; and rPET PP Star pinch bottom bags for dry bulk goods.

Another application for rPET is sheet production: the Starlinger Viscotec solution DeCon/ViscoSheet can process 100% rPET, in-house waste, and virgin material at guaranteed IV levels for direct food contact.

The final product has a high-quality appearance and superior mechanical properties, says the company.

› **www.starlinger.com**

**Left: Visitors to Starlinger's stand can smell how effective its odour removal technology is**

**Struktol** is expanding its line of additives for recycled plastics and for polymer compounds that contain recycled content.

Its products are used in a variety of different resin systems from polyolefins to engineered plastics, and are targeted at compounds containing 100% recycled material or materials with varying levels of post-consumer or post-industrial recycled content.

For instance, its TR 052 is a compatibiliser and blending aid that allows regrind or recycled product to be incorporated into a wide range of polymers. Processors can realise improved physical properties and overall improved processability of compounds requiring some level of recycled content, says the company. TR 052 has been shown to significantly improve the processability and performance of mixed recycled streams used when separation of the resins is not done beforehand. The additive compatibilises dissimilar polymer systems allowing for expanded use of these mixed recycled streams.

› **www.4struktol.com**

**Tosaf** of Israel will feature a range of custom-made solutions for four key industries – including packaging, agriculture, home sports & leisure and building & construction.

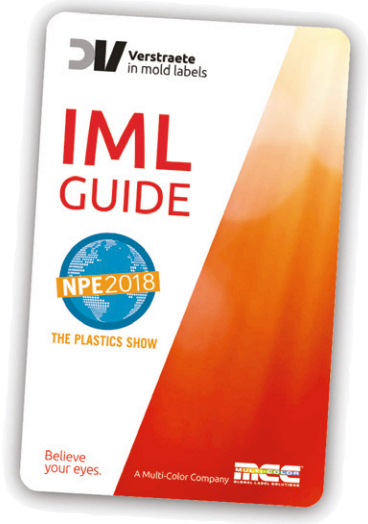
It will also exhibit its portfolio of additives, compounds and colour masterbatches.

Tosaf's technical experts and R&D team will be available to discuss some of its recent developments – which include a new anti-fog barrier masterbatch for film and packaging, a high chemical resistance UV masterbatch for agriculture, a halogen-free flame retardant (HFFR) masterbatch for construction, a matte product with a low SIT (seal initiation temperature) for BOPP, a white masterbatch for extrusion coating, and a selection of special effect colour masterbatches.

› **www.tosaf.com**

**Verstraete** has created a special IML guide for NPE visitors (available at **www.imlguide.info**), which locates more than 24 IML-related companies at the show.

This guide shows where to find injection moulding and thermoforming projects using Verstraete's in mould labels, and gives an insight into the technical information of the 11 IML systems being displayed. Applications include various cups, a bioplastic coffee capsule, a bucket and a wet wipes container.




**Below: Verstraete's guide lists IML-related companies at the show**

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*Italy's huge plastics exhibition, Plast, returns to Milan this year, co-located with four other shows. Here, we preview some of the technologies of interest to film and sheet extruders*

# Plast 2018 makes Milan the centre of attention

Plast, the Italian exhibition for the plastics industry, returns to the Fiera Milano this year.

Figures released in March show a total of 1,100 exhibiting companies. Of these, 870 are direct exhibitors – of which one-third are from outside Italy. This foreign participation is up 21% in number compared to the last show, said the organiser, **Promaplast**.

Overall, this accounts for around 52,000 sq m of exhibition space. At the last edition of the show, in 2015, there were 1,584 exhibitors across nearly 55,000 sq m.

Promaplast is making much of the fact that Plast is now co-located with four other shows that have some overlapping interests with the plastics industry.

Some of these shows – which cover packaging, printing, meat processing and logistics – will be of interest to film and sheet extruders.

## Joint affair

Ancillaries company **Piovan**, for instance, will exhibit at both the Plast and Ipack-Ima shows.

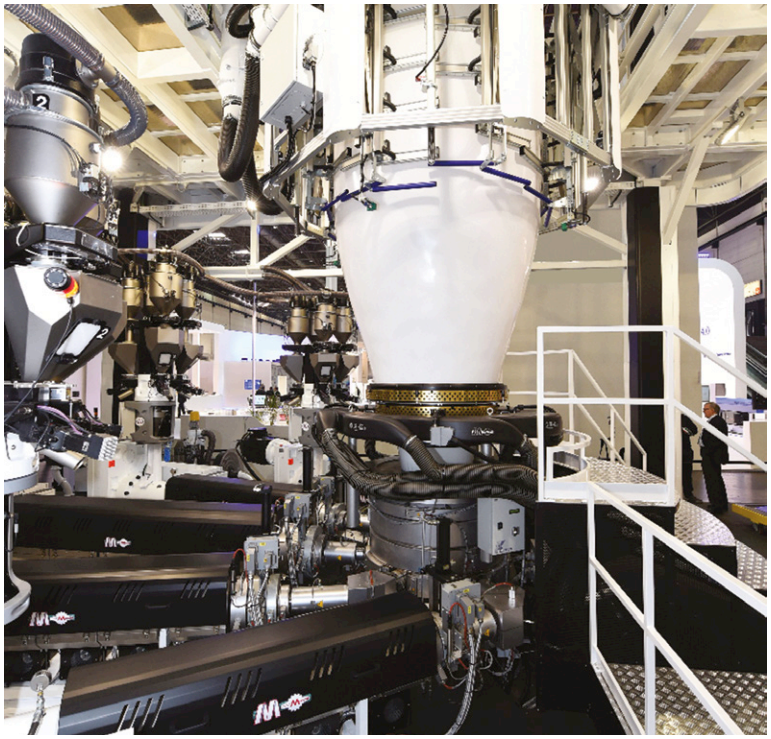
"The concurrence of the two shows is the ideal opportunity to offer new products, and high-level engineering for both the plastics and the food processing worlds," said the company.

At Plast, it will mainly feature its Aquatech brand, which specialises in industrial cooling, such as its Easycool+ range of air-cooled chillers. The show also sees the Italian debut of Easytherm, its new temperature control line, which it says is "Industry 4.0 digital factory-ready thanks to the OPC-UA protocol".

A new internal and external layout, redesigned ergonomic controls and high-end components make this a versatile unit that allows smart energy use management, it says.

Piovan will also show its Winenergy and Winfac-

**Main image: Plast returns to the Fiera Milano again this year**



**Above: Macchi will demonstrate a five-layer POD blown film line at Plast**

tory 4.0 will be featured on touchscreens. Winenergy is the energy use monitoring and analysis system comprising proprietary software that is connected to a series of measuring devices – which acquire data about a variety of physical parameters including power, electricity, thermal energy and temperature. It can be installed on its own or in combination with Winfactory 4.0, to maximise system control and efficiency.

Piovan will also show its Quantum E gravimetric batch blender with continuous extrusion control, and demonstrate a system with a Pureflo filterless granule receiver, Modula series auto-adaptive drying system, and Quantum Q7 batch blender for medical applications.

## Film demonstration

**Macchi** will display and run a five-layer POD line which has been engineered to produce films for applications such as lamination, heat shrink, stretch and silage with high quality and productivity.

Through close cooperation with Dow Chemical – which has developed a number of material formulations with Macchi's technical department – the five-layer POD blown film line on display will run faster than 1000kg/h, despite the venue putting a restriction on the height of the tower.

Nearby, Macchi will host a Siemens information point where its German partner will give visitors the chance to investigate the implementation of Industry 4.0 systems. There will also be a new line management software developed by Macchi's IT department.

## Blown film workshops

**Bandera** will run a series of workshops at its plant in Busto Arsizio – not far from the Fiera Milano – for the duration of the show.

Here, it will demonstrate a blown film co-extrusion line, as well as thermoforming equipment.

At its headquarters it will run a newly manufactured blown film extrusion line, of the five-layer polyolefin-dedicated PO5 series, which has hourly outputs of more than 1,000kg, and a useful film width of 2,600mm.

In addition, it will show a full extrusion line for rigid PET, PP and PLA film, with a gross output of 1,200kg/h, useful film width of 1,450mm and thickness range of 0.14-1.5mm.

There will also be a range of machinery for agricultural and geo-liner blown film, for both civil and industrial waterproofing applications. At the same time, Bandera will show a new Pure unit, for the production of FDA/EFSA-approved rigid packaging films, using post-consumer recycled PET.

Bandera will provide shuttle buses for the 15-minute journey to Busto Arsizio.

## Drying on demand

At Plast, **Moretto** will show its Eureka Plus drying system – which combines four patented technologies in a single system. The four technologies are:

- Moisture Meter Manager – an in-line polymer moisture measuring system that manages the drying process based on actual needs of the process;
- X Max – a multi-bed dryer with consistent dewpoint;
- Flowmatik – a dynamic airflow management device; and,
- OTX – a series of drying hoppers with high mass flow drying characteristics.

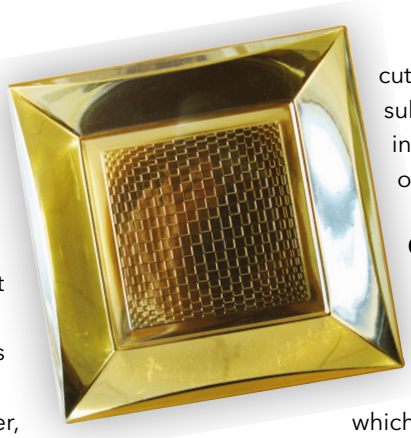
Moisture Meter Manager measures each granule's residual moisture (in ppm) in-line – and applies the data to an adaptive drying system. It consists of the devices MM Box and MM Crown. The double control of the granule's moisture content at the hopper's input (through MM Box) and output (through MM Crown), allows the system to manage the dryer's work conditions by maximising process performances.

Power-Peak technology – which measures the dielectric characteristics of the granule – boosts the system's measurement capability, says Moretto.

Moisture Meter Manager creates 'on demand drying', says Moretto, as it focuses on the real drying needs of the polymer at any given time and manages drying in response to internal and external variables – which interfere with moisture levels. ›

## Top gear

In addition to a range of pelletisers, **Maag** will show its Extrex x6 class gear pump at this year's Plast show. The new melt pump design delivers high volumetric efficiency at the highest counter pressures and with the lowest amount of shear stress, says the company. This results in a reliable and gentle material transfer, boosting and metering for a wide range of thermoplastic polymers, with no adverse effects on product quality, says Maag.



Claudio Bonafede, general manager, said: "In addition to our Maag products, Ettlinger – which recently joined the Maag family – will display its ERF350 melt filter, which was introduced to the market at the end of 2017."

The ERF350 filters plastic melts with impurities such as paper, aluminium, wood, elastomers or unmelted plastics. Impurity levels as high as 18% can be removed with low melt losses. It achieves a maximum throughput of 3,800kg/h, depending on the type of melt, degree of impurities and selected filtration rating.

"It is suitable for all commonly used polyolefins and polystyrenes as well as a large number of engineered plastics," he said.

## Gold standard

**WM Thermoforming Machines** of Switzerland will exhibit its FC 780 E IM2 Plus thermoforming machine at Plast – producing gold-coloured plates.

The plates, made from PET, will be 230 x 230mm square and made from 0.4mm thick film. They will be made in a six-cavity mould at a rate of around 13,700 plates per hour.

The machine itself has a forming area of 780 x 570mm, which allows forming and cutting of the product in the same forming station – or allows the cutting in a second inline station with subsequent stacking and discharging of the piles of counted products on a conveyor belt.

**Right: WM will thermoform gold-coloured plates during Plast**

## On the calender

**Comerio Ercole** will introduce a new calendaring machine called Flexi at Plast.

The multi-purpose calender, which has high-precision hydraulic roll positioning, is designed to work with four or five rolls according to the product being made (plasticised or rigid PVC sheets).

A new inverted L calender configuration, designed and patented with its subsidiary CKA, gives the calender high quality performance for a wide range of applications, it says.

During the show, it will exhibit a large calender with 7m-long rolls that is designed for the production of thermal/acoustic insulation materials at

**Below: Bandera will host Plast visitors at its nearby facility during the show**

# Masterbatch

## 2018

*The international conference and exhibition for the masterbatch industry*

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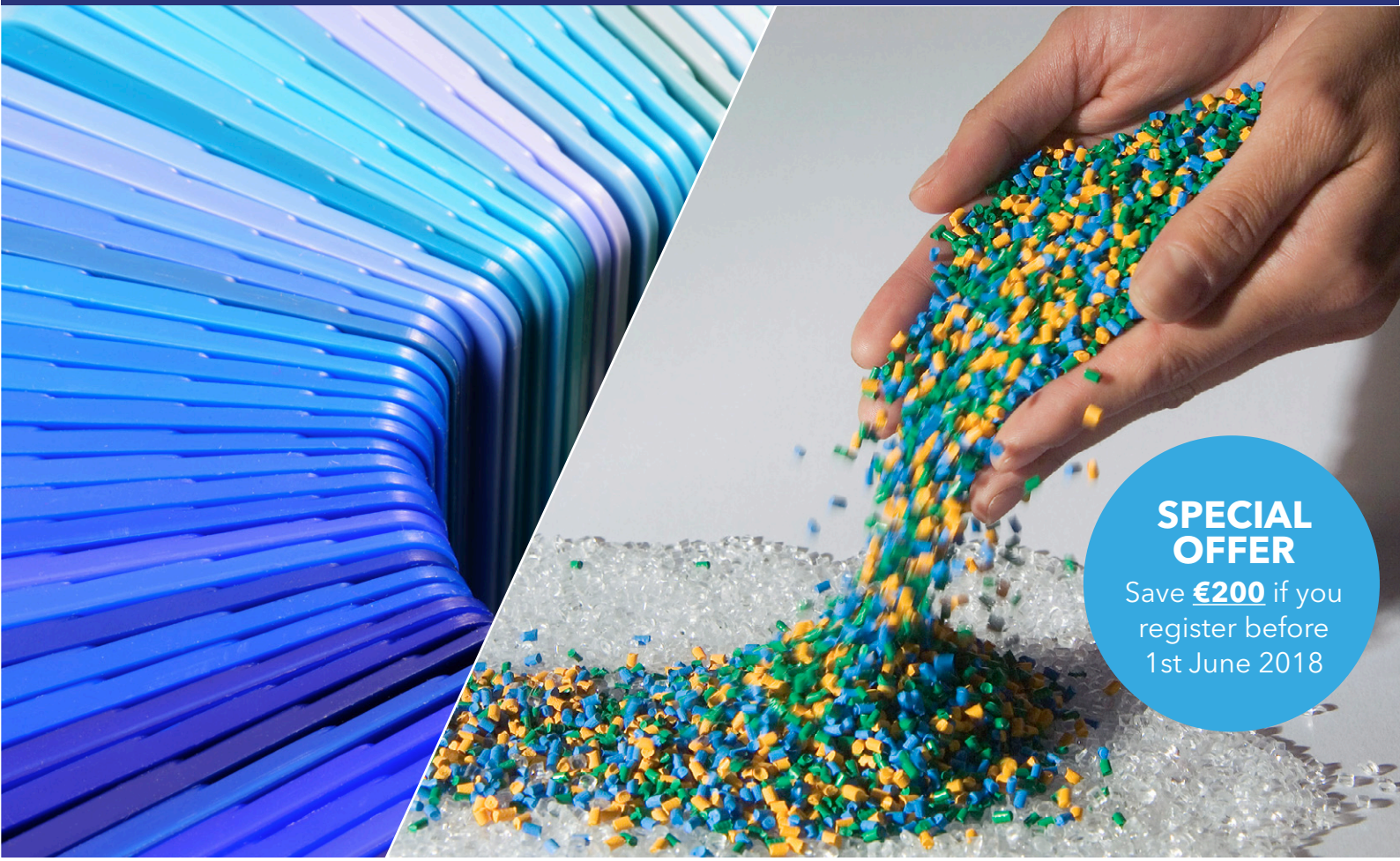


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temperatures up to 260°C. The first one has already been commissioned, and started up during 2017. The customer has already ordered a second line, for delivery in 2018.

## Data integration

**NDC Technologies** will debut several new measurement systems at Plast – which have data integration and connectivity down to the gauge level.

The company will showcase its latest FilmPro infrared gauge for the film, sheet and coating industries. It uses advanced optical techniques to measure a wide range of film and sheet properties with high precision. The modular device can measure the thickness of clear, voided, pigmented, cavitated, porous, translucent coloured and even black-tinted films. The measurement capability extends to single- or multi-layer products including thin, biaxially-orientated films, cast films and CPE stretch films. It can simultaneously measure the individual thicknesses of up to six different layers in co-extruded films.

At Plast, the gauge will be running on NDC's Mini-Trak O-Frame Scanner and Pro.Net TDi Web Gauging System platform which includes NDC's latest iView Pro Operator Work Station (OWS).

At the same time, NDC's new Low Energy X-Ray Sensor is aimed at thickness and basis weight measurements of lightweight extruded film and sheet products and offers good narrow streak resolution. A stable, precisely tuned power supply runs at or below 5keV providing high signal-to-noise characteristics and optimum measurement performance.

## Offline inspection

**Sikora** will showcase its new optical offline inspection and analysing system called Purity Concept V – which combines a light table with automatic material control.

The system analyses transparent and coloured plastic pellets. The material to be tested moves automatically through the system and contamination such as black specks are visualised. The system is suitable for sample testing of produced material and for incoming goods inspection.

Until now, sample testing of pellets has been carried out mainly by optically illuminating it on a light table, followed by manual inspection, says Sikora. This relies on the examiner, and provides limited repeatability. Other limitations are: the size of the contaminants; and, their classification by size. Alternative systems feed the test material into a hopper and through a channel into the inspection area. This records images successively, and sorts out contaminated material. Due to the blending of the sorted out material, a clear allocation of the contamination to the graphic material as well as a follow-up inspection are impossible.


**Left: Sikora's Purity Concept V combines a light table with automatic material control**

Purity Concept V combines the advantages of a light table with automatic offline material control. The system moves the test material on a tray through the inspection area. Within seconds, it is inspected automatically by the colour camera – and contaminated material is marked directly on the sample tray by a beamer. By analysing the recorded images, surface contamination of transparent and coloured material is automatically detected, visualised and evaluated.

A clear allocation of the contamination and follow-up inspection are possible at any time, so the system helps quality control and process optimisation, says Sikora.

**CLICK ON THE LINKS FOR MORE INFORMATION:**

- **www.plastonline.org**
- **www.piovan.com**
- **www.macchi.it**
- **www.luigibandera.com**
- **www.moretto.com**
- **www.maag.com**
- **www.wm-thermoforming.com**
- **www.comercole.it**
- **www.ndc.com**
- **www.sikora.net**

**Plast 2018 – Key Information**

**Dates:** 29 May-1 June 2018 **Venue:** Fiera Milano, Milan, Italy **Hours:** 9.30am to 6pm daily
**Organiser:** Promaplast **Website:** www.plastonline.org

# Wear-Resistant Plastics

2018

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# Download these new product brochures

**Simply click on the brochure cover or link to download a PDF to your PC or smartphone**

## BG PLAST: FOIL AND SHEET PLANTS


This brochure provides information on BG Plast's Complete Extrusion Plants for producing foils and sheets for multiple uses including thermoformed packaging, chemical tanks and containers, applications in cars, household appliances, footwear, lighting and construction.

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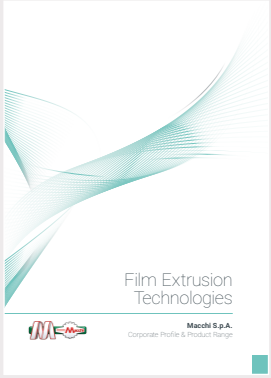
## MACCHI: FILM EXTRUSION




This 28-page brochure from Macchi covers the company's wide range of film extrusion technologies including coextrusion lines, wide webs, die heads, take offs, winders, trim recovery and control systems.

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## COLINES: BARRIER FILMS


This new brochure from Colines focuses on extrusion lines for the production of barrier films for vacuum and modified atmosphere packaging to preserve foodstuffs and medical products.

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## W&H: VAREX II FILM SYSTEMS


Varex II is Windmöller & Hölscher's latest universal system for high output blown film production. This publication details the critical Varex II system features that ensure production of the highest quality films with minimal scrap and highest plant efficiency.

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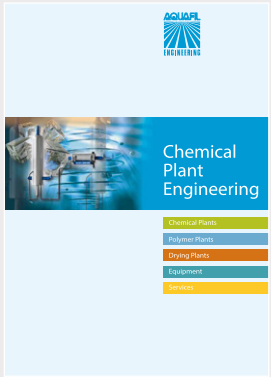
## AQUAFIL: PLANT ENGINEERING




This 12-page brochure from Aquafil Engineering details its comprehensive range of chemical plant engineering capabilities, which include polyamide polymerisation, polyester condensation and polymer drying installations.

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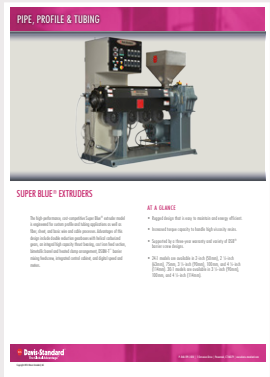
## DAVIS-STANDARD: EXTRUDERS




The Super Blue range of single screw extruders from Davis-Standard is designed for cost effective production of a wide variety of polymer products. This brochure details the key features of the range, which extends from 50.8mm to 114.3mm screw diameter.

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**If you would like your brochure to be included on this page, please contact Claire Bishop claire.bishop@ami.international. Tel: +44 (0)1732 682948**

# Expert data and robust research for the industrial and agricultural films sector

## Reports published by AMI consulting:

Published February 2018

### Polyethylene films, the global market 2018

The rapid projected growth in production of polyethylene films in some regions of the world, including North East Asia, will give rise to increased levels of global trade in certain types of films and bags during the next five years and beyond.

This report will enable your company to formulate coherent plansfor its future progress within the polyethylene film industry and prepare meaningful market strategies to fully exploit business opportunities.

### Agricultural films, the global market 2017

Rapid growth in the use of innovative plastic films drives developments in sustainable, efficient and smart farming. Find out about the market drivers and inhibitors, growth prospects and who the leading global producers of silage, mulch and greenhouse films are.

### Palletisation films, the global market 2017

The global palletisation films industry dramatically consolidates -a result of major cuts in margins. Find out who is left among the leading producers of pallet stretch wrap, shrink hoods and stretch hoods, understand the competitive dynamics between the film types and learn about their future prospects.

**AMI Consulting offers a full range of strategic client services and is Europe's largest consultancy dedicated to providing business research and analysis for the global plastics industry.**

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Collation films, the European market 2016 **40%** discount

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For more information please email sarah.phillips@ami.international or our website www.ami.international/cons

# Learn more about AMI's upcoming conferences

**Click on the relevant brochure cover or link to download a PDF of the full conference programme**

## POLYMER SOURCING & DISTRIBUTION


Taking place in Barcelona, Spain, on 15-17 of May 2018, AMI's 13th Polymer Sourcing & Distribution conference brings together polymer producers, distributors, traders and processors to explore critical strategic and market developments.

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## SINGLE-SERVE CAPSULES USA


This brand new North American conference takes place in Chicago on 19-20 of June 2018 and brings together a line-up of industry-elite speakers to deliver expert insight into the fast growing market for single-serve capsules.

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## MEDICAL FLUID BAGS 2018


AMI's first European Medical Fluid Bags conference takes place in Cologne in Germany on 21-22 June 2018. This high level event looks at the newest innovations in design and production of polymer bags for fluid containment.

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## BIAX FILMS 2018


AMI is launching Biax Film, the only global conference dedicated exclusively to the bi-oriented film industry. This unique forum for the entire BOPP, BOPET, BOPA and BOPE supply chain takes place on 19-21 June 2018 in Vienna, Austria.

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## HEAVY DUTY SACKS 2018


The 2nd edition of AMI's international Heavy Duty Sacks conference will take place on 19-20 June 2018 in Cologne, Germany. Find out how advances in film technology and materials are helping plastic industrial sacks displace multi-wall paper sacks in key markets.

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## AGRICULTURAL FILM 2018


AMI's well-established Agricultural Film conference series continues on 17-19 September 2018, in Madrid, Spain, bringing together agricultural and horticultural cover specifiers, raw material and film manufacturers and agricultural stakeholders at a must-attend event.

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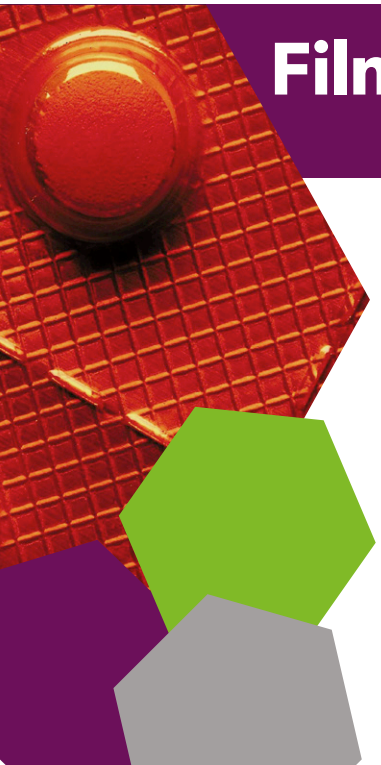
**To see our full line-up of more than 50 plastics industry events over the next 12 months, please visit www.ami.international/events**

# Respack

| | |
|---|---|
| **Head office:** | Kedah, Malaysia |
| **Managing director:** | CK Wan |
| **Founded:** | 2011 |
| **Ownership:** | Private |
| **Profile:** | Respack was established in 2011 as a plastics recycler and resin distributor, but a joint venture with Prior Packaging of Australia saw it move into manufacturing. It set up its first plant that year, making wide web films. It has since added new production facilities, to make products including pallet wrap and stretch film. |
| **Product lines:** | The company's main line is its Raptor range of multi-layer cast stretch film that is used for pallet wrapping. It is available in hand, machine and speciality versions and is made on two production lines. Its hand pallet wraps include its lightweight Xforce and stiff Xtreme brands, while its speciality grades include niche products such as anti-static and anti-UV products. The company recently launched its Airmax film, which it says is the first macro-performated pallet wrap produced in Asia. Flexpack products are made on 40 lines, while it also produces a range of 'eco packaging' made from compostable and recycled plastics. |
| **Factory locations:** | Respack's main production facility is its 80,000 sq ft plant in Kedah, where it makes blown film products including films and bags for the construction and agricultural industries. In 2014 it created its pallet wrap division, Respack Polyfilm, which has a 320,000 sq ft facilty making multi-layer cast stretch films. It began with a line from Colines of Italy, with an initial output of 700 tonnes/month – but doubled production in 2015 after buying a similar line from SML of Austria. The company has since doubled its surface area at its main plant – after buying neighbouring land – and will create a facility to make food contact packaging. |

To be considered for 'Extruder of the Month', contact the editor on lou@filmandsheet.com



## Film and Sheet EXTRUSION FORTHCOMING FEATURES

**The next issues of Film and Sheet Extrusion magazine will have special reports on the following topics:**

**June 2018**
Printing equipment
Blown film dies
Thermoforming ● Plastic pouches
Show preview: CWE/PRWE 2018

**July/August 2018**
Converting/Bag making equipment
Stretch & shrink film
Masterbatch ● Bioplastics
Show reviews: Plast; CWE/PRWE

**Editorial submissions should be sent to Lou Reade: lou@filmandsheet.com**

**For information on advertising in these issues, please contact:**
**Levent Tounjer: levent.tounjer@ami.international Tel: +44 (0)117 314 8183**
**Claire Bishop: claire.bishop@ami.international Tel: +44 (0)1732 682948**

# Keep informed: read our latest editions

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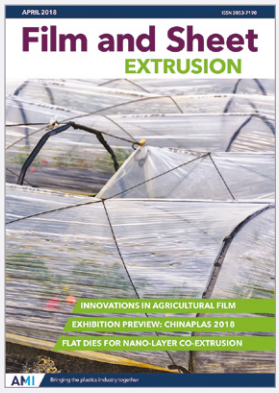


**Film and Sheet**
**April 2018**
The April edition of Film & Sheet Extrusion looks at the latest innovations in agricultural film. Also in this issue is an article from Cloeren on how nano-layering can enhance the properties of film and sheet structures.

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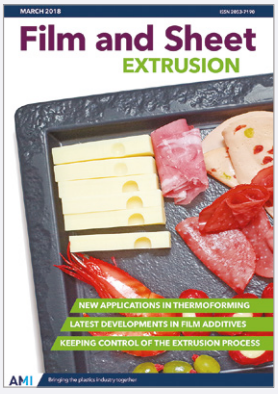


**Film and Sheet**
**March 2018**
The March 2018 issue of Film & Sheet Extrusion has a feature on the growth of applications in thermoforming. It also covers performance additives for films, plasmonic UV absorbers, control software and screw design.

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**Compounding World**
**May 2018**
The May edition of Compounding World looks at how the EU's Construction Products Regulation is placing new demands on the cable industry. Plus Industry 4.0 technology developments and a preview of NPE 2018's compounding highlights.

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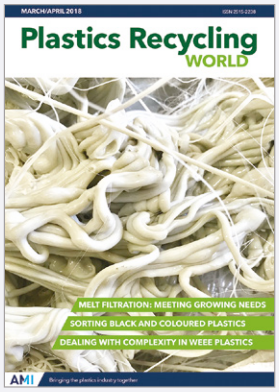


**Plastics Recycling World**
**March/April 2018**
The March-April edition of Plastics Recycling World finds out about growth in melt filtration products. It also has features on WEEE plastics recycling, label removal and an article on the NIR Sort project.

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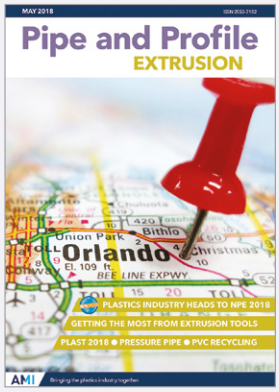


**Pipe and Profile**
**May 2018**
The May issue of Pipe and Profile Extrusion looks at the latest developments in pressure pipes, testing and PVC recycling. This edition also provides tips on tooling maintenance, as well as our guides to NPE 2018 and Plast 2018

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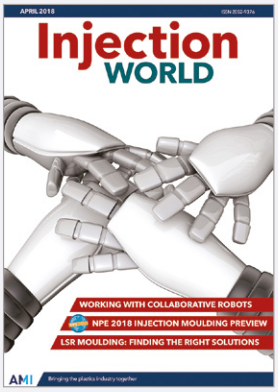


**Injection World**
**April 2018**
The April 2018 edition of Injection World explores how cobots – collaborative robots – are being used in the mould shop. It also looks at the latest developments in LSR moulding and thin wall packaging. Plus, we preview the US NPE plastics show.

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Film and Sheet EXTRUSION
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Plastics Recycling WORLD

## GLOBAL EXHIBITION GUIDE

2018

| | | |
|---|---|---|
| **7-11 May** | NPE, Orlando, USA | www.npe.org |
| **9-11 May** | Plastic Japan, Osaka, Japan | www.plas.jp |
| **15-18 May** | Elmia Polymer, Jönköping, Sweden | www.elmia.se |
| **22-25 May** | Plastpol, Kielce, Poland | www.targikielce.pl |
| **29 May-1 June** | Plast, Milan, Italy | www.plastonline.org/en |
| **11-14 June** | Argenplas, Buenos Aires, Argentina | www.argenplas.com.ar/en |
| **19-20 June** | Plastics Design & Moulding, Telford, UK | www.pdmevent.com |
| **20-23 June** | Interplas Thailand, Bangkok | www.interplasthailand.com |
| **27-28 June** | Compounding World Expo, Essen, Germany | www.compoundingworldexpo.com |
| **27-28 June** | Plastics Recycling World Expo, Essen, Germany | plasticsrecyclingworldexpo.com/eu |
| **2-4 August** | Plasti & Pack, Lahore, Pakistan | www.plastipacpakistan.com |
| **15-19 August** | Taipei Plas, Tapei, Taiwan | www.taipeiplas.com.tw |
| **19-22 September** | Indoplast, Jakarta, Indonesia | www.indoprintpackplas.com |
| **24-28 September** | ColombiaPlast, Bogota, Colombia | www.colombiaplast.org |
| **28 September-1 October** | Koplas, Seoul, South Korea | www.koplas.com |
| **14-17 October** | Pack Expo, Chicago, USA | www.packexpointernational.com |
| **16-20 October** | Fakuma, Friedrichshafen, Germany | www.fakuma-messe.de |
| **7-9 November** | Expo Plasticos, Guadalajara, Mexico | www.expoplasticos.com.mx |
| **5-7 December** | Plastic Japan, Chiba, Japan | www.plas.jp/en |
| **5-8 December** | Plast Eurasia, Istanbul, Turkey | www.plasteurasia.com/en |

## AMI CONFERENCES

| | |
|---|---|
| **19-20 June 2018** | Heavy Duty Sacks, Cologne, Germany |
| **19-21 June 2018** | Biax Film, Vienna, Austria |
| **21-22 June 2018** | Medical Fluid Bags, Cologne, Germany |
| **5-6 September 2018** | Single Serve Capsules, Vienna, Austria |
| **17-19 September 2018** | Agricultural Film, Madrid, Spain |
| **25-26 September 2018** | Thin Wall Packaging Asia, Bangkok, Thailand |
| **4-5 October 2018** | Medical Fluid Bags, Woburn, USA |
| **9-10 October 2018** | Smart Packaging, Hamburg, Germany |

**For information on all these events and other conferences on film, sheet, pipe and packaging applications, see**

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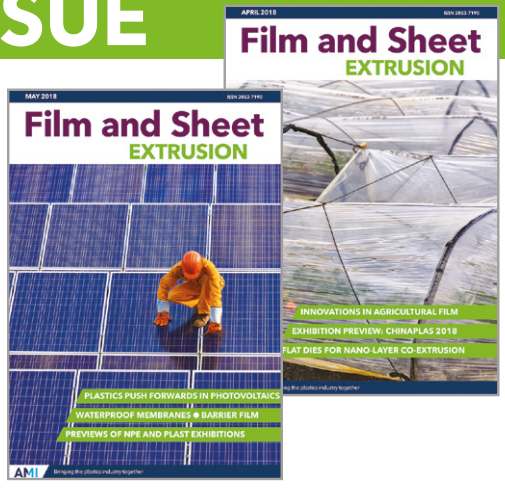


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