

March 2019

Pureview

REPORTING THE WORLD OF POLYURETHANES FOR OUR CUSTOMERS

HUNTSMAN

Enriching lives through innovation

FOOTWEAR

A sector that's taking
giant steps forward



Praise for Huntsman-led MDI Consortium

Helping out the Hutterites

New DaltoPIR® insulation technology

Improving comfort for cinema-goers



Footwear: at the heart of our business

Tony Hankins, President, Huntsman Polyurethanes

Welcome to *PU Review* – our twice-yearly magazine which showcases the product innovations and new developments at Huntsman Polyurethanes. In this edition, we have a special feature (see pages 8-11) on one of the most dynamic and innovative industries that we serve – Footwear. From acquisitions made in the 1980s to today’s 3D printed shoes, footwear has long been at the heart of our business, and it is very close to my own heart too. Earlier in my career, following the acquisition of AVALON Chemicals – the polyurethane systems house of Clarks, the famous British footwear brand – I led the global footwear business for a number of years and witnessed first-hand the excitement and challenges of this fashion-driven industry.

On reflection, the acquisition and development of the AVALON systems house was an early foundation stone for our current business strategy, which is focused on driving downstream – through both organic growth and M&A – to provide innovative, differentiated products to our customers. Over the years, we’ve grown our network of downstream formulation facilities, and now have more than 30 systems houses located close to our customers worldwide.

It’s encouraging to see (page 3) that our most recent downstream acquisition, spray foam insulation leader Demilec, won the 2018 Polyurethane Innovation Award from the Center for the Polyurethanes Industry of the American Chemistry Council for its Heatlok® HFO spray foam technology. Congratulations to the Demilec teams in Arlington, Texas and Boisbriand in Quebec, Canada.

Another exciting and important new product that’s featured in this issue is the fire-rated PIR-based foam solution for insulated metal panel (IMP) manufacturers, which has been developed by our innovation team in Europe. This new technology delivers optimal fire and smoke retardant properties, without compromising processing performance or durability.

Throughout the magazine you’ll see how, through close collaboration with our customers and other partners, we are delivering winning products and solutions for downstream applications across key polyurethane markets. I hope you enjoy this edition of *PU Review*.



New water-blown soling system offers better quality footwear finish

Huntsman’s polyurethane footwear experts have developed an innovative, fully water-blown, polyether soling solution that provides excellent flow and surface definition for better looking, better feeling, shoe soles.

DALTOPED® AquaPUR technology can produce the high-quality surface finish that footwear producers would typically associate with physical blown systems. Designed to deliver better quality soles across a range of footwear applications, including casual, comfort shoes, DALTOPED® AquaPUR technology is suitable for the direct-on processing and casting of unit soles and midsoles.

Available in a range of densities, DALTOPED® AquaPUR technology delivers all the standard features expected of a polyether material, including good cold flex properties; hydrolysis and slip resistance; and excellent processing properties.

It is compatible with standard polyurethane processing machines and has excellent flow characteristics, which enable complex designs. The material also has superior blend stability in the machine tank and can be processed at room temperature – helping to reduce energy consumption and shorten the production cycle.

Alfons Tremml, Business Development Manager and Technical Service Manager for Footwear EAME at Huntsman, said: “Huntsman was one of the earliest pioneers of water-blown systems for the footwear industry. Our new DALTOPED® AquaPUR technology joins an already extensive family of water-blown DALTOPED® systems designed for footwear applications. By mirroring the smooth finishing effects that can be achieved with physical blown systems, DALTOPED® AquaPUR technology is the ideal solution for customers wanting to make the switch to water-blown systems – but who don’t want to compromise on quality.” |





Spray foam applicators attend launch of Heatlok® Soya HFO

In 2018, Demilec became the first spray foam manufacturer to release a hydrofluoroolefin- (HFO) based spray foam insulation product to the market, which can pass the challenging CAN / ULC S705.1-15 Canadian standard.

Heatlok® Soya HFO spray foam insulation provides better energy efficiency and a significantly lower global warming impact by leveraging the Honeywell Solstice® liquid blowing agent – a zero ozone depleting potential (ODP) technology that delivers ultra-low global warming potential (GWP).

To mark the launch of Heatlok® Soya HFO spray foam insulation, Demilec held a special event for applicators at its Boisbriand facility in Quebec, Canada. At the launch, Demilec's executives, building science, sales and R&D teams showcased the product's features and demonstrated its benefits to CUFCA-certified applications, journalists and other invited guests.

During the event, CUFCA-applicators had the opportunity to test Heatlok® Soya HFO

spray foam – and the feedback was incredibly positive. Attendees reported that they were pleased with the quality of the product; its ease of spraying; its adhesion properties; and the reductions they experienced in gun clogging.

Applicators were also given product samples and literature to take away and share with their colleagues and customers.

Doug Brady, Vice President, Strategic Marketing at Demilec, said: "Organizing this event enabled us to reinforce our leadership when it comes to advancing building technologies and providing environmentally sustainable solutions." |

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Demilec scoops CPI's top innovation prize for HFO spray foam

Demilec Inc. – the leading spray polyurethane foam (SPF) business in North America, which Huntsman purchased in March 2018 – rounded off an exciting year by scooping up the 2018 Polyurethane Innovation Award from the Center for the Polyurethanes Industry (CPI) of the American Chemistry Council (ACC).

One of three finalists, Demilec was presented with CPI's top award for its Heatlok® HFO SPF technology – a highly renewable, recyclable, closed-cell foam system for the insulation industry, which is made using soy oil, and has zero ozone depleting potential (ODP), as well as ultra-low global warming potential (GWP). Heatlok® HFO High Lift, with its R-7.5 / inch, innovates for the residential builder; while Heatlok® HFO Pro, at R-7.4 / inch, creates a Class II vapor retarder and air / water barrier, and thermal insulation at 1 inch – making it an ideal solution for commercial buildings.

Commenting, Lee Salamone, Senior Director of CPI, said: "The CPI Innovation Award is a top honor in the polyurethanes sector. Demilec embodies the spirit of innovation that

will help our industry flourish for years to come. Together with the rest of this year's conference attendees, the business is helping to pave the way for a very bright future. Each year, our finalists shine a spotlight on our industry-wide goal of creating new products and technologies that can benefit consumers around the world. I am always inspired by how hard members of the polyurethanes industry work to improve upon decades of achievements."

Doug Brady, Vice President of Strategic Marketing at Demilec, said: "We are honored to receive CPI's Innovation Award for 2018 and are excited that Heatlok® HFO is redefining the standard of excellence in the closed-cell spray foam industry."



Congratulating the Demilec team on its win, Tony Hankins, President of Huntsman Polyurethanes, said: "Innovation is the lifeblood of our business and this achievement reflects Demilec's deep understanding of both its markets and customer needs alike. It's terrific to see that knowledge translated, rapidly, into commercial products that deliver real benefits to contractors, home owners and the environment." |

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New PU cinema seats offer comfort levels fit for Bollywood royalty

Everyone has heard of Bollywood and understands how popular cinema-going is in India. But, did you know that Bollywood films have a run-time that is typically twice as long as a regular movie? With the average Bollywood film lasting three hours, cinema owners need to offer their customers seats that will keep them comfortable throughout their movie-viewing marathon!



The cramped movie theaters of old are long gone – with most of the big chains now offering spacious, reclining seats to lure in more customers.



Demonstrating the comfort levels that polyurethane seating systems can bring to movie-goers, whatever they are watching, Huntsman has recently completed a pilot project with Indian company, KQ Seats Private Limited (KQ Seats). Part of the Krishna / SKH Group, which makes seating systems for some of the world's biggest automotive brands, KQ Seats produces seats for theaters, auditoriums and convention centers, as well as many of India's leading multiplex chains.

Nilesh Nalawade, Assistant Manager, Product Development, Huntsman Polyurethanes India, explained more about the project: "We'd been in discussions with the Krishna / SKH Group for some time – talking about our polyurethane-based foam systems and the fact that they can deliver significant weight savings in automotive seating applications, without compromising comfort. Interested in what we could offer, our contact suggested that we conduct a first trial of our low-density comfort foam systems with KQ Seats. After being introduced to the company's quality and production associates, our foam technologists started to analyze the specifications that the customer needed to fulfill in the production of its cinema seats. Identifying an MDI-based system, which would offer the right results, we quickly moved into the trial phase of the project. After several attempts, we were able to establish our system on KQ Seats' production line and deliver all the properties they required, from superior processability to final seats that weigh less overall, but are still supremely comfortable."

Following the trial, KQ Seats has started using Huntsman's comfort foam technology to create theater seats for a major cinema chain.

Amit Jain, Sales Manager, Huntsman Polyurethanes India, said: "Around the world, cinema seating has been changing for some time. The cramped movie theaters of old are long gone – with most of the big chains now offering spacious, reclining seats to lure in more customers. With more elbow room, more leg space, and super comfortable seats and headrests, which can be adjusted to just the right position, movie goers can curl up and watch a film as if they were at home on the sofa! We're delighted that our polyurethane technologies are helping to increase overall comfort for movie lovers across India – helping to make their trips to the cinema that little bit more luxurious!"

The Krishna / SKH Group is well known for producing components for leading automotive original equipment manufacturers in India and globally. The group has 34 manufacturing facilities spread across the Northern, Southern and Western regions of India. Focused on meeting the challenges involved in delivering dynamic, sophisticated automotive interiors and high-tensile sheet metal components, the Krishna Group specializes in the production of seating systems, head rests, arm rests, seat trims and injection molded door trims. |

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Composite technologies take center stage in Gent design exhibition

Composite products, based on polyurethane technologies from Huntsman, are taking center stage at a design exhibition at the Design Museum Gent, Belgium.

Fibre-Fixed: Composites in Design showcases a range of products that use fiber-reinforced composite materials. Open until April 21, 2019, the exhibition is curated by Ignaas Verpoest from KU Leuven and Lut Pijl from the LUCA School of Arts, in conjunction with the Dutch design collective, envisions.

Huntsman is a key sponsor of the *Fibre-Fixed* show, providing financial support to the event organizers and two display items. The business is exhibiting a window frame based on RIMLINE® glass fiber-reinforced pultrusions and an ultra-lightweight license plate holder developed for the KTM 1290 Super Duke R motorcycle – a high performance bike with a powerful 1300 cc/170 HP V-engine.

The window frame uses Huntsman's RIMLINE® resin technology, which results in a tough profile with excellent strength and weathering resistance, in combination with low thermal conductivity. The innovative motorcycle license plate holder is based on Huntsman's VITROX® resin technology and was created as part of Project R.A.C.E., an industry initiative led by KTM Technologies – an engineering company with extensive know-how of composite and hybrid materials and their applications.

Irina Bolshakova, Senior Market Manager Transportation EAMEI at Huntsman, said: "We are proud to be a part of this exhibition and to be working together with its curators to demonstrate the unique designs that can arise from combining fibers and plastics into composite structures. Composite materials are becoming increasingly commonplace in the world around us, helping to reduce the weight of vehicles, create stronger construction materials, and produce furniture that is more comfortable to sit and sleep on. Focusing on composite breakthroughs from the past five years, this exhibition is also designed to provide attendees with a clear overview of what they can expect to see coming out of the world of composites in the future."

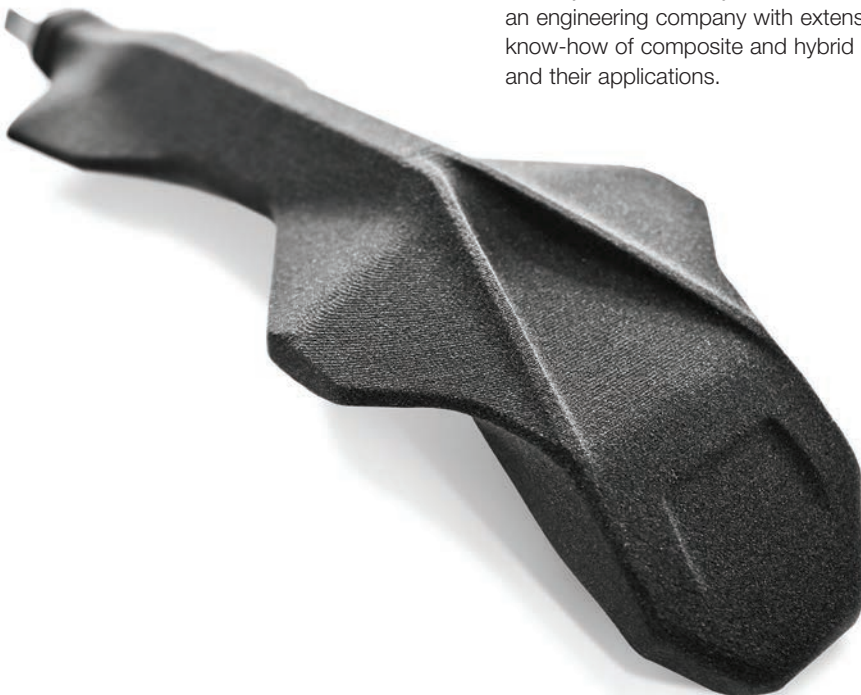
Bart Vangrimde, Technical Manager Polyurethane Composites EAMEI at Huntsman, said: "Huntsman is committed to developing plastic technologies that can enable the design of products that are more durable and more sustainable. Versatile, easy and safe to use, our polyurethane-based composite technologies make it possible to manufacture fiber-reinforced plastics that can be used to create exciting designs for ordinary objects that we encounter every day." |

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VITROX®

The innovative motorcycle license plate holder is based on Huntsman's VITROX® resin technology.



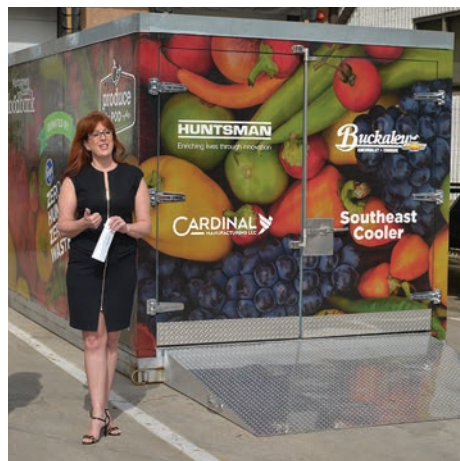
www.designmuseumgent.be/en/events/fibre-fixed

Huntsman helps food bank develop prototype storage pod

Huntsman's polyurethane insulation technology has been used to create a prototype, mobile, refrigerated, food storage container (produce pod) for a food bank, which helps to feed people in need in Montgomery County, Texas – home to Huntsman's corporate headquarters.



The Produce Pod can store more than 700,000 pounds of fresh produce annually.



Allison Hulett, President & CEO MCFB, explains how the Produce Pod went from a vision on a piece of paper to a reality.

Companies involved in the produce pod project include Dyplast Products, a manufacturer of insulated metal panels; Kroger, the largest supermarket chain in the United States; Cardinal Manufacturing, a metal products fabricator; and Southeast Coolers, a manufacturer of walk-in coolers / freezers.

The Montgomery County Food Bank's (MCFB) prototype pod can store 210 boxes of produce – enabling the food bank and its partners to distribute fresh, healthy fruits and vegetables to an additional 735 individuals per day.

Capable of storing more than 700,000 pounds of fresh produce annually, the pod features IMPs, supplied by Dyplast, which utilize Huntsman's polyurethane-based technology. The insulation works so well, that the entire unit can be refrigerated to a constant temperature of 42 degrees Fahrenheit with a simple, modified, window-mounted, air-conditioning unit, that runs off a regular 110-volt power source. This allows the refrigeration unit to be dropped off at various location and plugged into a standard outlet.

The issue with many mobile food storage pantries is that they don't have the capacity to hold fresh produce. Many don't have refrigeration units, so they have no way of keeping perishable items cold. Fitted with the latest insulation technology, the produce pod will help alleviate that problem in Montgomery County.

Commenting, Steve Burns, Vice President – Americas, Huntsman, said: "Approximately 50% of the world's food would spoil without refrigeration. Polyurethane insulation helps preserve perishable food items by enabling temperature-controlled conditions to be maintained throughout the cold chain; from production and processing to transportation and storage. We are excited that our polyurethane technology has been used to construct the MCFB produce pod. It's great to know our insulation technology is helping to prolong the shelf life of fresh produce for those in need of some additional support, in and around Huntsman's home county." |

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New DaltoPIR® XHFR insulation technology

The insulation team at Huntsman has developed a new fire-rated PIR-based foam insulation solution for insulated metal panels (IMPs). DaltoPIR® XHFR insulation technology was launched at the PPA-Europe / IFBS Panels and Profiles* conference in October in Greece.

Describing how DaltoPIR® fire-rated insulation products work, Kurt Jander, Sales Leader Insulation Systems at Huntsman, said: “With excellent thermal properties, our patented DaltoPIR® insulation technology delivers optimal fire and smoke properties, without compromising on processing performance or durability. Now, IMP producers can be assured that they are using the right systems available to create solid performance, in the most efficient way possible.”

Huntsman's new DaltoPIR® insulation technology offers a different viscosity build-up in rising foam, thereby enabling more stable and more consistent processing. This, in turn, can help panel producers achieve better panel planarity and quicker line speeds. Furthermore, the resulting foam has very low friability, which contributes positively to the long-term properties of the panels.

During PPA-Europe / IFBS – in a conference presentation entitled ‘DaltoPIR® Insulation Technology: Fire-rated PIR-based Foam Insulation for Composite Panels’ – Huntsman outlined the solid results the new technology achieved in durability tests, where panels were subjected to long temperature cycles and aesthetic properties were continuously monitored.

Huntsman's new DaltoPIR® insulation technology is fully integrated into a novel product portfolio, which contains a range of different foam systems for various laminator conditions and fire rating standards. |

APPLICATIONS

Commercial and industrial buildings

Roofs and walls

Commercial and residential entry and garage door panels

Commercial refrigeration

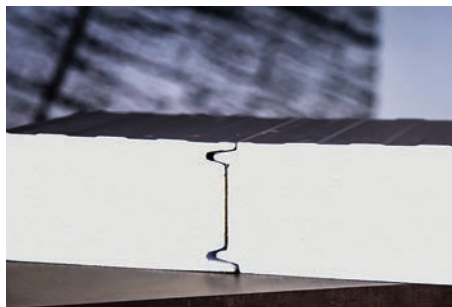
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SOLID PROCESS

Combining the performance of PIR with the processability of PUR

Making DaltoPIR® insulation technology as processable as PUR, while still offering all of the performance advantages of PIR, was one of the main goals of Huntsman. With a reaction profile optimized to allow easy and consistent foam processing at high production speeds, Huntsman's leading-edge, fire-rated, DaltoPIR® XHFR foam technology offers panel producers the flexibility to quickly and efficiently manufacture different panel types of varying thicknesses.



SOLID PRODUCT

Combining desired fire ratings with excellent foam properties

DaltoPIR® XHFR foam technology offers a Bs1d0 rating in single burning item (SBI) tests, when combined with a suitable panel design. With a panel thickness of just 100mm, a fire resistance of 30 minutes can be achieved. The already low thermal conductivity of Huntsman's DaltoPIR® insulation systems can be reduced further, if required.



SOLID RESULTS

Combining the advantages of PIR technology with long-term aesthetics and durability

DaltoPIR® foam insulation technology has been extensively tested for long-term durability. With excellent results in prominent durability tests – even at the highest temperatures – DaltoPIR® insulation systems are designed to remain aesthetically pleasing over the long-term.

Photo credit: Easy Wand della ditta Alubel SpA – installatore AT srl

* PPA-Europe is the European Association of Panels & Profiles and IFBS is the International Association for Metal Building Envelopes.

FOOTWEAR

A sector that's taking giant steps forward



The footwear industry has changed dramatically in recent years. *PU Review* spoke to Craig Roberts, Global Marketing Manager for Footwear at Huntsman, to find out how the company is helping footwear manufacturers respond to new trends and manufacturing techniques. Craig also walked the editorial team through Huntsman's history in footwear and what's around the corner in terms of innovation.

PU Review (PU R): Can you remind us when Huntsman first became involved in footwear?

Craig Roberts (CR): Huntsman's first step into footwear officially dates back to 1999 and its acquisition of ICI Polyurethanes. However, the foundations of the business that exists today actually go back much further. ICI Polyurethanes was a leader in the development of MDI-based systems for a range of industries. At the time of its acquisition by Huntsman, the business owned various plants that were producing materials for the footwear industry. ICI Polyurethanes had itself grown through acquisition, purchasing a number of footwear companies over the years.

One of its most notable acquisitions occurred in the late 1980s, when it bought AVALON Chemicals – the polyurethane systems house of the British footwear retail brand, Clarks. Located in Shepton Mallet in the UK, AVALON Chemicals produced adhesives, resins and polyurethane compounds for Clarks and other global footwear manufacturers and, at the time, was regarded as the most advanced pre-polymer plant in the world.

Before its sale to Huntsman, ICI Polyurethanes had also acquired a significant footwear business based in Deggendorf, Germany. This deal gave the business a dedicated production plant located at the heart of Germany's sports shoe industry. Much like the AVALON acquisition, this purchase gave ICI Polyurethanes a ready-made team of footwear experts, who came with in-depth experience and relationships with some of the biggest brands in the sector.

Almost 20 years after the ICI Polyurethanes acquisition, the plant at Deggendorf remains a key part of our global footwear offer – with many of the original Deggendorf team still working for the business. The AVALON Chemicals name also lives on in both our products and people. Ask the team about AVALON Chemicals and they'll quickly point you in the direction of a number of associates who worked for the business – myself included. AVALON® is also the name of Huntsman's portfolio of TPU footwear materials. The AVALON® product family, which has expanded considerably under Huntsman's stewardship, now sits alongside a much wider range of TPU and PU footwear solutions, which the business has developed. Other key products include smartLite® and DALTOPED®.

PU R: How big is the footwear market worldwide?

CR: Annually, on a global basis, the footwear industry produces around 24 billion pairs of shoes. On average, that's three pairs for every person on the planet.

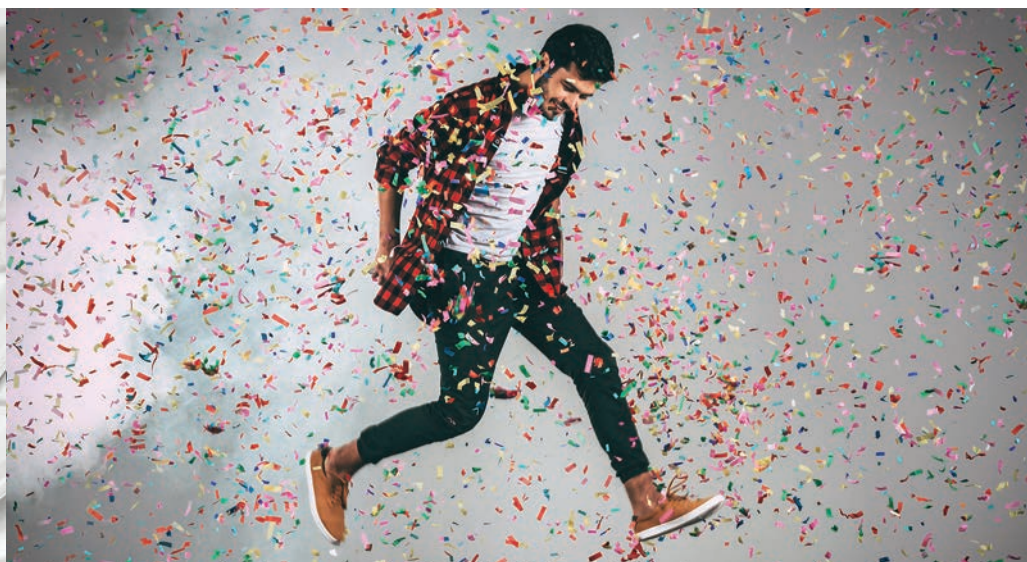
PU R: What's unique about Huntsman's footwear offering?

CR: Obviously, there are lots of businesses around the world supplying the footwear industry. At one end of the spectrum there are small systems houses, specializing in one specific area of the sector or in the production of one kind of material. At the other, there are big global players that provide a full range of materials that manufacturers can use to make insoles, midsoles, outsoles and other design components. Huntsman falls into the latter

category. One of just a handful of global polyurethane players active in the industry, we offer a full portfolio of polyester and polyether, thermoplastic polyurethane and hybrid systems.

In terms of uniqueness, the way our team is structured is what sets us apart. We have one global footwear team, working in one business unit, providing both PU and TPU solutions. This means we can recommend materials based on what our customers need and what will work best in a particular application – not what we have or want to sell.

We're also hard to beat when it comes to our technical and commercial offering. Very few companies can match the market, customer and technology experience of our footwear associates. As already mentioned, many of our footwear professionals have experience dating back 20 or 30 years. This knowledge is invaluable when working on customer projects. As a team, we are proud to work with many of the biggest names in footwear. These companies choose to work with us because of our know-how and our commitment to working in partnership. They like the fact we build relationships based on knowledge, trust and experience. They like the fact that we really listen to what they need. They also like the solid relationships we have along the footwear value chain with manufacturing and machinery companies.



Feature



PU R: What about Huntsman's R&D capabilities?

CR: Again, this is an area where we really stand out. A major global supplier to the footwear industry, we can support our customers with innovation projects, wherever they are based, and wherever they want to make their shoes. Worldwide, we have dedicated footwear facilities, fitted with the very latest manufacturing equipment. Part of a much larger global network of manufacturing plants and innovation and customer care centers, these footwear hubs enable us to offer design, prototyping, testing and technical support to footwear brands. This work helps ensure that our customers experience a

smooth production start up, whatever the size and scale of their work. We've recently completed a series of equipment investments to boost the range of services we can offer to our footwear customers and their manufacturing partners, worldwide. Giving us the ability to mirror the manufacturing set up of footwear companies using both PU and TPU materials, we now have extra capabilities in the field of polyurethane casting; direct-on production; multi-section injection molding; and TPU injection molding. In the last year we've also set up a Technical Service and R&D center in Vietnam to complement our existing facility in Thailand, which supports customers in Southeast Asia.

shortening supply chains and partly by sustainability – but, rising labor costs in China, and customization are also having an influence.

If you think about sustainability, footwear brands now have a responsibility to ensure that the products they are producing have the best possible environmental impact. When it comes to manufacturing, this means using materials that are recyclable and made without the use of solvents that can have a detrimental impact on the environment. It's also about cutting down on the transportation of finished goods.

Footwear production has always moved around, shifting from country to country, following cheaper labor. This started in the 1980s, with many of the world's biggest shoe brands moving their manufacturing operations to Asia to take advantage of lower wage costs. In the last few years, this situation has slowly started to reverse. Rising wages in China have made the country less cost effective as a manufacturing base. In parallel, the footwear industry has worked out how to automate the production of shoe soles. With new production techniques at their disposal, some major brands have started to shift aspects of their operations out of Asia and back to Europe and the Americas. We're also seeing movement within the regions. As Chinese wages have increased, major footwear production centers have grown in Vietnam, and we now see similar signs of growth in Cambodia, Indonesia and Bangladesh. The same thing has happened in the Americas, with manufacturing migrating south to countries like Mexico.

PU R: So what are the big trends in footwear manufacturing right now and how is this changing the market?

CR: The footwear industry is experiencing unprecedented change right now and, as a result, material innovation is more important than ever. The conventional manufacturing model still exists, but more automated, more inventive ways of working are coming through strongly. These are having a big impact on the sector, enabling footwear brands to make shoes more quickly and efficiently, and crucially much closer to customers.

Producing shoes, close to customers, has always been the preferred option of smaller and mid-sized brands. But, over the last few years, we've seen many bigger brands set up specialized factories in different parts of the world – adopting a more local for local approach. The desire to produce shoes closer to customers is being driven partly by



The next big geographic shift will happen when the footwear industry works out how to automate the production of shoe uppers. This is still some way off, but there are some interesting solutions starting to emerge. When these solutions are ready to go mainstream, the changes in the sector could be dramatic. Unhindered by labor costs, footwear brands will be free to put their production wherever they like. This is unlikely to occur in the short-term – but it is definitely something that's going to happen.

PU R: What about customization?

CR: Customization is the other major trend we are seeing in the footwear industry right now. Increasingly, consumers want a highly personalized experience when it comes to buying footwear. This is particularly true when it comes to specialty shoes for sports, such as running. Look at the work being undertaken by Fitstation by HP, which has created an end-to-end hardware and software solution for creating customized shoes. Using a platform that combines advanced 3D scanning and dynamic gait analysis equipment with 3D printing and injection molding capabilities, Fitstation by HP can create shoes that are precisely personalized to an individual's feet and optimized to deliver greater levels of comfort and performance. This technology is already in place in several retail outlets in North America and will undoubtedly grow in popularity.

PU R: What are the main challenges that manufacturers face as automation and customization increases, and as the focus on sustainability continues?

CR: In all three of these areas, material selection is key. In terms of automation and customization, the Holy Grail is specifying systems that can be adapted to different production processes and parameters without losing any of their performance properties. In terms of sustainability, our emphasis is on creating materials that have a longer life span; in other words, which deliver better wear and tear resistance. As a material provider, we're also conscious of the need to cut the amount of energy used during the footwear manufacturing process. In all three of these areas, polyurethane-based solutions offer a lot of advantages over other materials, such as EVA and vulcanized rubber.

PU R: Are there any innovation projects that Huntsman is involved in that you can tell us about?

CR: With relationships throughout the footwear value chain, and R&D laboratories located worldwide, we are involved in a number of



pioneering projects that are changing the way that shoes and boots are made. Most of our work in this area is confidential, so I can't say much about it – but I can talk generally about the areas of innovation we are involved in. As a company, we're innovating all the time for our footwear customers. Sometimes our development work is collaborative and focused on the creation of materials for customers who have specific projects and requirements in mind. But, we also run our own innovation program, aligned with the big trends we are seeing in the sector. As already mentioned, the main game changer will be the automation of upper production. Footwear companies have made advances in soling automation and further improvements are envisaged, however, the upper is where innovation is needed, as that's where most of the labor costs still exist.

There is a lot of work going on in this area. Take, for example our work with Simplicity Works (as seen in the October 2018 edition of *PU Review*). Simplicity Works has developed a revolutionary way of joining together two-dimensional components that requires no stitching and no lasting. The result is a seamless three-dimensional upper that is 100% bonded. With no seams to stitch, the overall production process is less labor-intensive, which reduces overheads.

Material costs are also lower as there is less waste. With no knitting or stitching lines, and no overlapping material, shoes have fewer friction and pressure points.

As a business, we are also actively looking at the development of TPU films and polyurethane resins that can be used to improve the look and feel of knitted uppers. We're also working with footwear producers on the practicalities of printing shoes, and the kind of additive manufacturing (3D printing) materials they need to make this a reality on a large scale.

Suffice to say, it's a very exciting time to be a polyurethane provider in the footwear sector. This fast-paced industry has always been a hotbed of innovation – and polyurethane chemistry offers manufacturers something really unique. The beauty of the material lies in its sheer versatility. As well as being a good adhesive, you can use polyurethanes to make hard or soft, flexible or rigid, or high- or low-density materials. The sky really is the limit right now and the more creative you can be as a material provider, the bigger the rewards on offer! |

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Giving a helping hand to the Hutterites



Polyurethane associates based at Huntsman's Mississauga (PEEL) facility in Canada and at the Huntsman Advanced Technology Center (HATC) in The Woodlands, Texas, have been working on a fascinating project, helping a group of Canadian Hutterites set up a multi-million dollar insulated metal panel (IMP) manufacturing plant – from scratch.



The colony decided to branch out and build a major IMP production plant on land in Arden, Manitoba – approximately 1.5 hours drive from Winnipeg.

Hutterites are communal people, who live in small, isolated colonies, scattered throughout the prairies of Northwest America and Canada. Typically, Hutterite settlements are inhabited by around 15 families, who live and work together. Farming the land and rearing animals, Hutterites lead simple, self-sufficient lives, away from the hustle and bustle of modern life – but are incredibly entrepreneurial. Like other farming communities, Hutterites have diversified over the years, coming up with new revenue streams to supplement their income and ultimately help fund the set-up of new Hutterite communities.

For one group of Hutterites, based in Manitoba, Canada, diversification – and the desire to establish a new colony – led them to explore the production of insulated metal panels. In 2015, the Sommerfeld Hutterite Colony, including Terry Gross and Levi Hofer, spotted a gap in the Canadian construction market. Realizing that most building producers in Western Canada were sourcing IMPs from companies based in the U.S., the colony decided to branch out and build a major IMP production plant on land in Arden, Manitoba – approximately 1.5 hours drive from Winnipeg.

With up to several million dollars of savings to invest in the plant, which would sit at the heart of a brand new Hutterite community, Terry and Levi started to research all aspects of IMP production. Already producing a highly

profitable line of single skin wall and roof panels, Terry and Levi quickly identified an IMP line producer in Italy that could supply them with all the necessary manufacturing equipment. The next step was to find a chemical company to supply the foam chemical system.

Terry Gross takes up the story: “When it came to finding a chemical company to work with, we reached out to an industry contact for a recommendation. They came back to us straight away with details of four potential polyurethane companies. From the list of names provided, they made it clear that Huntsman was their personal preference and gave us contact details for Paul Wilkinson. They told us to ring Paul, have a chat about our requirements and talk through potential product solutions and costing models. Within a few of days of speaking to Paul, and explaining our aims and objectives, six of us were en route from Canada to The Woodlands to find out more.”

Michael Ritchie, Technical Service Senior Staff Specialist at Huntsman, said: “When we invited Terry, Levi and their team to The Woodlands, we knew it would be useful to show them our products in action – so we arranged for them to visit one of our existing customers, located nearby. The customer was kind enough to let us show the Hutterite team the extent of their operations and explain the kind of support they receive from Huntsman.

To date, the team has produced thousands of panels, which have been shipped to different parts of western Canada.



Separately, we gave Terry, Levi and their colleagues a tour of our technical center – introducing them to the wider insulation team they’d be working with. We also set out, in detail, Huntsman’s values and ethos. A few days later, Terry rang and confirmed they wanted to work with us.”

Over the next two years, Paul and Michael worked closely with Terry and Levi, visiting the new production site several times to specify the correct foam technology for the panels that the Hutterites wanted to produce. As the construction of the 84,000 square foot manufacturing plant progressed, Paul and Michael began providing hands-on training to the team on site – educating them in every aspect of polyurethane foam chemistry. With members of the Hutterite community knowing very little about polyurethane insulation technology, this work began with a rudimentary introduction to the mixing and handling of rising foam, and gradually moved into other areas, including more detailed EHS training.

In early 2018, the Hutterites’ new plant went into operation, producing an initial range of EcoSpan IMPs for the construction of outbuildings and barns. To date, the team has produced thousands of panels, which have been shipped to different parts of Western Canada. The next step is for the Hutterites to get their panels fully certified, so they can be used in residential and commercial construction projects.

Continuing, Terry said: “From the start, the knowledge and teaching that the Huntsman team provided us with was invaluable. Given that we knew so little, they came up with a full package that covered absolutely everything we needed to know.”

“Working with a start-up is tough, and we’ve had our share of struggles, but Paul and Michael have been incredibly patient and with us at every step. Over the last two years, they have received a lot of calls and messages. Numerous times, we’ve rung to say, we need you here. Not once have they said, “it’s too far” or “we’re too busy.” The response has always been the same: “Tell us when you need us, and we’ll be there.”

“Today, our relationship with the insulation team at Huntsman is not just based on doing business. The time and effort they’ve invested in supporting this initiative, means we’ve developed a lasting friendship, that everyone in the Hutterite community at Sommerfeld is truly grateful for.”

Concluding, Paul Wilkinson said: “It’s rare to be involved in a project at such an early stage, and even more unusual to work with a team that knew almost nothing about polyurethane chemistry. It was an honor to work with the Hutterite community from start to finish – adding value to a project that means so much to the people involved. It has been wonderful to see this project evolve, from our initial work in specifying a foam technology; to explaining the basics of mixing and handling foam; to seeing a range of high quality panels roll off the line. We look forward to working with the team at Arden, as it gains the necessary qualifications for its products and as demand for its panels continues to increase.” |

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Paul and Michael worked closely with Terry and Levi, visiting the new production site several times to specify the correct foam technology for the panels that the Hutterites wanted to produce.



New lab-scale method for evaluating foam kinetics wins best paper award at CPI conference

Foam scientists from Huntsman have developed a novel rheological method for investigating the kinetics of rising foam and improving demold performance. Outlining their work in a paper delivered at the CPI Polyurethanes 2018 Technical Conference, Long Han, Ruth Pinto, Yangjun Cai and Lifeng Wu won the Best Paper award in the event's technical session about PIR additives and rigid foam.



The flow and demold performance of rigid polyurethane foam products are important characteristics that specifiers are constantly looking to improve. This is particularly true in the appliance industry, where productivity can be improved by reducing demold times.

In practice, reduced demold times can have a detrimental effect on foam quality. Foams that are demolded too quickly are prone to developing two types of defects: demold swelling and demold splitting.

Demold swelling describes what happens when foam increases in thickness when a mold is opened. In the appliance sector, excessive swelling of this kind can cause visibly bowed walls in a refrigerator or freezer, which is unacceptable. Demold splitting refers to an internal defect that can cause rigid foam to get torn apart during the demolding process. With the potential to harm energy performance and also cause unacceptable bowing in an appliance, the impact of demold splits cannot be underestimated.

Traditional methods for evaluating foam flow and demold performance include high-pressure machine evaluations. However, these machine evaluations generally lack any insights into foaming kinetics. They also consume large amounts of material and



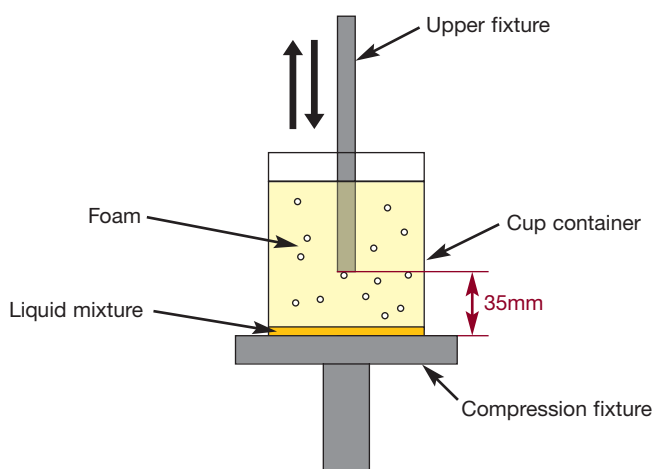
manpower. To overcome this, Huntsman has developed a new lab-scale method. The technique compares the flowability of a foam and its demold performance by monitoring the development of its mechanical properties using dynamic mechanical analysis (DMA).

This new DMA method can measure stiffness build up – over several orders of magnitude – as the reacting material transitions from a liquid mixture into a rigid foam and dramatically expands in volume; something that is not easily achieved on a traditional rotational rheometer.

The additional information that this new method provides can help to guide formulation work and ensure foam materials can deliver optimal performance in line with application requirements. The DMA test also requires a relatively small amount of material and manpower – meaning it has the potential to be developed into an effective bench-scale screening tool for accelerated development of new PU rigid foam formulations. |

To find out more about Huntsman's work in this area or to obtain a full copy of the team's paper, please contact:

long_han@huntsman.com



To begin a test, a small amount of liquid reactant is mixed together in a cup and placed on a bottom fixture. During the test, an upper fixture collects data on foam flowability and stiffness build up as the liquid material expands 30 times in volume and transitions into a solid foam. The whole process can take just a few minutes for a typical appliance formulation, allowing for rapid screening.

ECHA / Estonia Competent Authorities MDI evaluation concludes



The European Chemicals Agency (ECHA) has concluded its evaluation of 4,4 MDI and announced that no further regulatory actions are needed regarding the use of the substance. This long-awaited decision is the result of the substance evaluation led by the Competent Authorities of Estonia under the European Union's Community Rolling Action Plan (CoRAP).

In an announcement following the decision, ISOPA (the European diisocyanate and polyol producers association), commended the 'outstanding efforts of the MDI Consortium, led by Huntsman.' The MDI Consortium is a group of MDI producers that cooperated under REACH legislation to provide the Estonian Competent Authorities with all the information they required for its evaluation.

Over the past five years, MDI Consortium companies and global industry experts, helped the Estonia Competent Authorities and ECHA conclude that there are no further health or environmental concerns regarding the use of 4,4' MDI, and that further regulatory actions are unnecessary at this stage. |

www.isopa.org/news/echa-publishes-conclusion-on-4-4-methylenediphenyl-diisocyanate-mdi/

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Forthcoming events and technical presentations

JEC World 2019, Paris, France (12-14 March)

European Coatings Show 2019 Nuremberg, Germany (19-21 March)

Foam Expo North America 2019, Novi, Michigan (26-28 March)

DOMOTEX asia/CHINAFLOOR 2019, Shanghai, China (26-28 March)

SinoFlexPack 2019, Shanghai, China (8-11 April)

UTECH Las Americas 2019, Mexico City, Mexico (10-12 April)

2019 PMA Annual Meeting, Las Vegas, Nevada (5-7 May)

Chinaplas 2019, Guangzhou, China (21-24 May)

LIGNA 2019, Hannover, Germany (27-31 May)

NE Materials Show, Wilmington, Massachusetts (6-7 August)

W Materials Show, Portland, Oregon (14-15 August)

China Composites Expo 2019, Shanghai, China (3-5 September)

ABRAFATI 2019 International Coatings Congress & Exhibition, São Paulo, Brazil (1-3 October)

CPI 2019 Polyurethanes Technical Conference, Orlando, Florida (7-9 October)

K 2019, Dusseldorf, Germany (16-23 October)

SPE Automotive Composites Conference & Exhibition (ACCE) 2019 in Novi, MI, (4-6 November)

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We create better comfort and durability. **Together.**



At Huntsman Polyurethanes, we believe that working in true collaboration with customers is the only way to solve complex problems and find the solutions that will deliver real innovation.

So, we strive with a passion and determination to build the deep understanding of our customers that's required to get to the heart of their needs and establish lasting partnerships.

We provide customers with a wide choice of footwear solutions, based on many different polyurethane chemistries. From fully formulated grades and tailor-made polyesters to polyether-based systems and TPU grades, we give footwear companies the freedom to design innovative shoes, boots and sandals in step with the latest fashion trends, manufacturing techniques and environmental concerns. Combine our knowledge of polyurethanes with your expertise, and we'll create better footwear... together.

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