November 2021

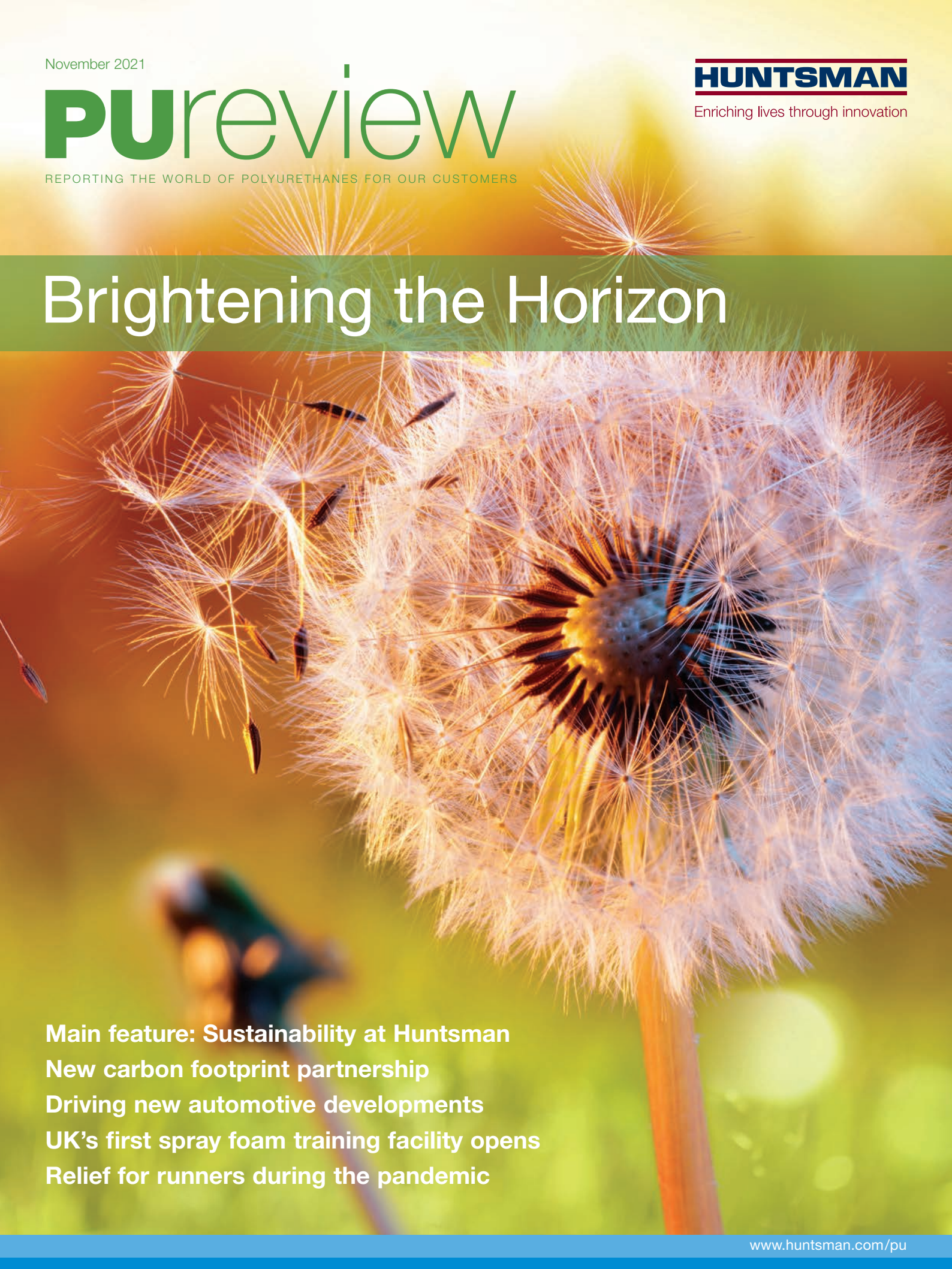
PUreview

REPORTING THE WORLD OF POLYURETHANES FOR OUR CUSTOMERS

HUNTSMAN

Enriching lives through innovation

Brightening the Horizon



Main feature: Sustainability at Huntsman

New carbon footprint partnership

Driving new automotive developments

UK's first spray foam training facility opens

Relief for runners during the pandemic

Enabling a more sustainable world

Tony Hankins, President, Huntsman Polyurethanes

As I write this editorial, COP26 – the United Nations Climate Change Conference in Glasgow, Scotland is drawing to a close. Attended by more than 120 world leaders, the Conference was a stark reminder of the challenges we face to ensure the sustainability of our planet. It is against this backdrop, that we've dedicated this latest edition of *PU Review* to sustainability.

At Huntsman, sustainability has long been central to our work. In fact, its roots go back to the founding of the Company in 1970, when the vision was to create a business that would make an active, positive contribution to society. Today, that ethos remains at the heart of everything we do, and we continue to see chemistry as a driving force for good that can help address the most pressing challenges of our time.

As a global team, we're committed to enabling positive change across all of the different markets that we serve. We are focused on developing innovative solutions that can help reduce carbon footprints, improve efficiency, reduce waste, increase product durability, improve the quality of human life and increase circularity. This year we set ourselves new sustainability goals, which includes the ambition to be fully circular and carbon neutral by 2050.

In addition to the main feature (pages 6 to 9) which expands on our philosophy and approach to sustainability, the magazine is full of real-world examples of how we enable sustainability for our customers. Read about our work to create new bio-based polyols and low emission technologies for the automotive industry; our TEROL® polyols, based on scrap PET bottles, that are used to create energy saving spray polyurethane foam; how we're taking post-harvest rice straw to create medium density fiberboard (MDF); and our award-winning fertilizer coating technology, to name but a few.

As always, I hope you enjoy reading this edition of *PU Review*.

KPX Chemical and Huntsman form joint venture in Korea

In September, KPX Chemical, a leading polyols producer for polyurethanes in Korea, and Huntsman announced the official establishment of a joint venture named KPX HUNTSMAN POLYURETHANES AUTOMOTIVE Co., Ltd. (KHPUA). Providing innovative polyurethane system solutions to Korean automakers, from a specialty MDI manufacturing facility at KPX Chemical's Ulsan plant, KHPUA will strengthen Huntsman's footprint in the automotive market in Korea.

The Korean automotive industry is undergoing profound changes and presents new opportunities for high performance and lightweight polyurethane system solutions. The new joint venture will accelerate growth in this sector by providing sustainable innovations and a high level of technical service support to its customers. KPX Chemical will leverage its 47-years' experience in polyol technology and know-how, by combining it with Huntsman's proven ability to develop high performance, differentiated, MDI-based automotive solutions for vehicle manufacturers and its fully integrated global supply chain.

Kim Moon-Young, President of KPX Chemical, said: "This cooperation is of great strategic significance to both parties. Together, under the banner of KHPUA, we will leverage the R&D and capacity advantages of KPX Chemical and Huntsman to become the industry's preferred innovation partner. It is an exciting time to be creating a new venture and we look forward to working with key players in the region to meet growing demand for autonomous vehicles and electric transport solutions that can support the country's carbon neutrality ambitions." |

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HUNTSMAN
BUILDING SOLUTIONS

Huntsman Building Solutions opens UK's first spray foam training facility

Huntsman Building Solutions has established the first spray foam installer training facility in the United Kingdom (UK). The investment at the Huntsman IFS production site in Kings Lynn, Norfolk, will help accelerate the adoption of energy-saving spray foam insulation throughout the UK construction industry.

The business has also started ramping up production of its spray foam products locally. Previously, Huntsman Building Solutions imported its spray foam insulation products into the UK from Canada. Onshoring the manufacture of spray foam via Huntsman IFS, will enable the business to eliminate the long-distance transportation of raw materials and achieve a big reduction in carbon emissions. Producing systems closer to customers will also make it easier to manage demand and product availability.

Iain Stanton, Managing Director of Huntsman IFS explains more: "A year or so ago, we recognized there was a clear need for a proper training program for UK contractors working in the spray foam industry to ensure technical, and EHS compliance, and give end-user customers the confidence to specify spray foam over traditional insulation materials. More than 60% of UK housing stock was built before 1960, when little thought was given to heat loss prevention and the environment. Urgent action must be taken to improve the energy efficiency of these buildings if the UK is to meet its climate change commitments. As the world's leading spray foam insulation company, Huntsman Building Solutions has a major role to play in this drive and is committed to working closely with the UK construction sector to encourage the use of spray foam nationwide."

At the Huntsman Building Solutions Centre of Excellence in the UK, contractors will be able to access a comprehensive training program, which will lead to a "Certificate of Application Training" and authorized contractors' status. In time, Huntsman Building Solutions hopes this certificate would result in National Vocational Qualification (NVQ) status of a standard comparable with recognised rade qualifications in other parts of the building trade.

Continuing, Iain Stanton, said: "At Huntsman we are committed to ensuring the very highest safety and application standards in all of our products – but particularly in the spray foam sector. As a result, we will only be authorizing contractors to buy and use our products, once they have successfully completed our training. Our course is incredibly comprehensive, giving participants access to the skills they need and unlocking the door to high performance spray foam technologies that can help mitigate heat loss across a wide spectrum of buildings. |

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Huntsman and Pursell Agri-Tech win CPI's Polyurethane Innovation Award

A technology jointly developed by Huntsman and Pursell Agri-Tech has won the prestigious 2021 Polyurethane Innovation Award from The Center for the Polyurethanes Industry (CPI) of the American Chemistry Council (ACC). PurActive™ is a polyurethane-based, controlled-release fertilizer coating, made using Huntsman's RIMLINE® polyurethane system, which uses a unique combination of novel chemistry and processing techniques to address the agronomic needs of today's crop growers.

By slowly releasing nutrients into the ground over time, this next-generation fertilizer coating technology can help enhance the nutrient-use of plants, increase yields and aid environmental pollution control – delivering substantial benefits at each step of the agricultural value chain. From a fertilizer production perspective, the system can also help improve manufacturing productivity.

Sustainability is at the forefront of the polyurethanes industry and this advanced controlled-release fertilizer coating shows the sector creating an innovation solution to a growing global issue. Commenting on the win, Jan Buberl, Vice President Huntsman Polyurethanes Americas, said: "Years of planning and joint development have led to this moment, and it is a well-deserved accomplishment for both Huntsman and Pursell Agri-Tech. The development of PurActive™ polyurethane-based, controlled-release fertilizer coating is set to have a positive impact on the world food crisis, which is a growing issue after the pandemic. We are excited about what this technology brings to the world and the magnitude of issues it can potentially solve." |

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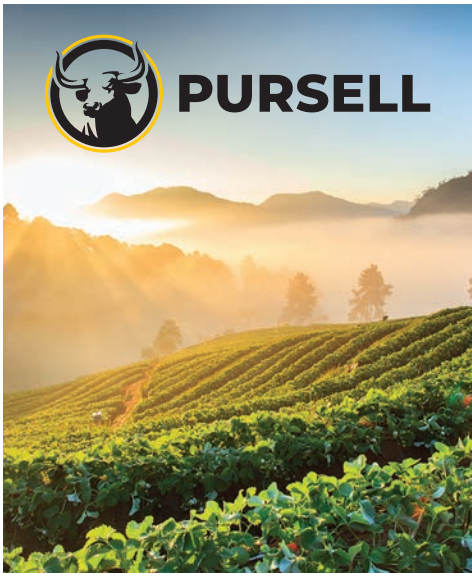

American® Chemistry Council

2021 Innovation Award Winner

Creating eco-friendly bedding products

Huntsman has signed a strategic partnership agreement with Ningbo Megafeat Bedding Co. Ltd. Together, the two parties will jointly develop a new series of eco-friendly and comfortable bedding products, using Huntsman's proprietary TEROL® polyester polyols and SPEEDLAM® hot-melt adhesives.

The partnership with Ningbo Megafeat will focus on the development of both slow-recovery and high-resilience sleeping products. Using TEROL® polyester polyols in their polyurethane flexible foam formulations, Ningbo Megafeat will be able to achieve better sustainability in its production process and better comfort in its bedding products. The ultimate goal is to redefine the concept of comfortable sleeping with advanced recycling technology. In addition, the two parties will work on several development projects. These will explore the possibilities enabled by TEROL® polyols to prolong the lifetime of bedding products and improve fire safety performance.

TEROL® polyester polyols contain up to 60% recycled PET materials. Owing to their unique chemical composition and structure, TEROL® polyols demonstrate consistently high quality, excellent performance and flame-retardant properties. Through active market development, polyurethane insulation solutions based on TEROL® polyols are already widely used in commercial buildings, cold chain storage and modern agriculture – cementing Huntsman's innovation position in PET recycling technology.

Kenny Pan, Vice President of Huntsman Polyurethane Asia Pacific, said: "Through joint efforts with Ningbo Megafeat, Huntsman has successfully introduced its TEROL® polyester polyols into the flexible foam market for pillows and mattresses. This is a technology breakthrough, expanding this unique product from its traditional application in polyurethane rigid foam."

Alongside the development of bedding products containing TEROL®, Ningbo Megafeat will also introduce SPEEDLAM® hot-melt adhesives into the production of its polyurethane foam mattresses. With zero VOC (volatile organic compounds) content, SPEEDLAM® hot-melt adhesives are safe to use for foam bonding and can meet consumers' demands for material safety and environmental protection.

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Huntsman technical support helps CalPlant launch rice straw MDF

In November 2020, California-based Cal Plant launched Eureka – the world's first ever, post-harvest, rice straw, MDF product. The development of this sustainable, high-performance product was made possible with assistance from Huntsman's Supply Chain team, who helped lay the groundwork for the project with a pre-production assessment of Cal Plant's facility and by providing staff training.

The Huntsman team was on hand to provide input on the installation of CalPlant's equipment – ensuring that all receiving lines, tanks, piping, and equipment were ready to receive its MDI, which is used to bind the rice straw together. Huntsman also guided the CalPlant team through the principles of receiving, unloading, and handling its MDI products safely. In addition, Huntsman's logistics team reached an agreement with a regional transload and carrier company to locate its material closer to the customer – enabling better inventory management and faster response times for rush orders.

In October 2020, following delays caused by COVID-19, CalPlant safely unloaded its first batch of MDI into the tank on its Eureka production line. Commenting, Jennifer Hao at Huntsman said: "CalPlant has always wanted to develop an environmentally sustainable form of MDF that looks and performs equally well or better than regular MDF. Nearly thirty years in the making, something that started with a vision, is now a reality. Partnering with a great company, and being part of something so ground-breaking, which utilizes environmentally sustainable materials, and can help the planet, is a fantastic achievement and something the team at Huntsman is very proud of."

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New carbon footprint partnership with Chinese Academy of Sciences

Huntsman has signed a strategic partnership agreement with the Chinese Academy of Sciences to quantify and measure the carbon footprint of polyurethanes products throughout their life cycle. The collaboration – Huntsman's first with a Chinese research institution on 'carbon neutrality' – will explore the methodology and standards needed to calculate the carbon footprint of polyurethanes products and their downstream applications. It will also identify effective ways for Huntsman and its value chain partners to reduce carbon emissions. This in turn will enable the transformation of the chemical industry and its downstream application industries for sustainable growth.

Kenny Pan, Vice President of Huntsman Polyurethanes Asia Pacific, said: "Since entering the Chinese market, Huntsman has been actively contributing to the country's economic and social development. The Chinese government's goal of 'carbon neutrality' by 2060 brings us both challenges and opportunities. The strategic partnership with the Chinese Academy of Sciences will help us build a trustworthy system for managing carbon emissions throughout the life cycle of polyurethanes products. Polyurethane materials are well accepted as high-performance energy saving insulation materials. The outcome from this project will scientifically prove the low carbon advantage of polyurethanes products and their downstream applications. This will support the sustainable growth of the polyurethanes industry and contribute to the transformation of China's chemical industry as it works to have a lower carbon impact."

Conducting assessments throughout the value chain

Working closely with partners throughout the polyurethane value chain, a joint research team will collect and analyze emission data from the production of primary raw materials upstream; the processing of intermediates and polyurethanes products; and the production and application of the chemistry in downstream sectors. Both direct and indirect emissions generated during production and application of polyurethanes products will be included in the carbon emission calculation.

The study will start by assessing several typical applications of polyurethanes products – quantifying their potential to save energy and reduce emissions. To ensure carbon emission reduction is measurable, feasible and can be monitored, Huntsman has introduced the index "carbon emission reduction effectiveness ratio". This is being implemented in the development of its low-carbon polyurethanes solutions, helping the polyurethanes industry and its downstream businesses move towards low carbon.

Wei Wei, Vice President of Shanghai Advanced Research Institute, Chinese Academy of Sciences, said: "The goal of 'carbon neutrality' by 2060 will definitely transform China's energy mix, industrial landscape and even our society. All industry leading companies should play a key role in this change. We are honoured to work with Huntsman, to pilot a carbon emission assessment for polyurethanes technology."

During the study, the Life Cycle Assessment (LCA) method will be used to generate a clear picture of total carbon emissions at all stages, being systematic, accurate and quantitative. The carbon emission assessment cooperation between Huntsman and the Chinese Academy of Sciences will include Huntsman's manufacturing sites for polyurethanes products in Shanghai and Tianjin and its key partners along the value chain, with a view to building a carbon database of polyurethanes products and typical downstream applications.

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Brightening the horizon: Sustainability at Huntsman

As governments and businesses around the world increasingly embrace the challenges and opportunities that sustainability brings, PU Review spoke to Erik Vangronsveld (EV), Global Materials & Industry Sustainability (GM&IS) Director at Huntsman Polyurethanes. He explained how sustainability runs through everything that Huntsman does and the role polyurethanes have to play in brightening all of our horizons.

PU Review (PU R): Erik – thanks for talking to us. Let's start by discussing what sustainability means at Huntsman?

EV: As one of the world's leading chemical companies, sustainability within our business is multi-faceted. From a product perspective, sustainability is about producing innovative polyurethane solutions that can make a better world possible for future generations. In the past this was largely about creating lightweight, more durable products and polyurethane technologies that could help save energy through, for example, the improved insulation of buildings.

Today, these value propositions go hand in hand with wider expectations about sustainable chemistry, recyclability, recycled and renewable content, and having a lower carbon footprint overall. As a business we are addressing these additional requirements by relentlessly pursuing continuous improvements across all aspects of our operations and through product innovation. At Huntsman, sustainability is also about being a reliable, long-term, trustworthy supplier, partner and employer. It is about ethics and compliance issues; occupational health and safety; cybersecurity; employee engagement and development; and more. Wherever we are, whatever we're working on, sustainability is integral to everything we do at Huntsman.

PU R: Has sustainability changed over the years?

EV: The essence of sustainability has stayed broadly the same – but two key things have changed. The challenges the world is facing have become more pressing and the consequences of mankind's actions are being seen more frequently and more intensively. When Huntsman was founded in 1970 there were only 4.5 billion people on the planet. Now there are more than eight billion. That increase brings its own sustainability issues in terms of carbon emissions and climate change, food and water security, energy management and infrastructure – all areas polyurethanes can help address.

Awareness of sustainability is now also much higher than it was among consumers, businesses, investors and governments. Customers and shareholders are now holding companies to account like never before. These converging dynamics are accelerating sustainability – creating new conversations and setting in motion a new level of momentum geared towards change.

PU R: How can a global chemical company claim to be working in a 'sustainable' way?

EV: It's quite straightforward really. Everyone at Huntsman knows our work is pivotal to creating a more sustainable future. Our focus is on developing innovative solutions that can help lower carbon energy pathways, improve efficiency, reduce waste, increase product durability, preserve human health, improve quality of human life, and increase circularity. Put simply, we are an enabler of sustainability.

Countries worldwide are now working towards carbon net zero targets, underpinned by legislative measures. There are different ways to achieve this ambition, but there is no real way to get there without the use of chemicals and polyurethanes. Given the scale of the environmental challenges facing the world, the onus is on companies like Huntsman to work harder. We need to develop more sustainable chemistries and continue to reduce the use of

substances of concern. We need to design more products that are recyclable or based on recycled and / or bio feedstocks. We must also innovate further when it comes to the production, transportation, and application of our technologies – ensuring they are contributing to a brighter future. At Huntsman we are actively embracing this responsibility. As a corporation, we recently reviewed our sustainability ambitions and are now aiming to become fully circular and carbon neutral by 2050.

PU R: : Do you see any barriers to achieving those targets by 2050?

EV: We recognize that the pace of our progress is not entirely in our control. Our targets are subject to long-term policies and regulatory frameworks; the availability of new low-carbon energy, waste recovery and recycling infrastructure; and the invention of new technologies. Nevertheless, we are fully committed in this area. To track our progress, we will be reviewing our targets every five years and reporting on our results in the annual Huntsman sustainability report.

PU R: Thinking specifically about polyurethanes, how can this chemistry help make the world a more sustainable place to live?

EV: There are countless ways in which our polyurethanes are enabling a more sustainable world. The major carbon contributors to our world are food production, consumption and transportation, and household energy – namely the loss of heat from poorly insulated buildings. Insulation is perhaps the most obvious sustainability application for polyurethanes. When it comes to preventing the transfer of heat through a structure, very few materials can compare in terms of performance. Our polyurethane-based insulating foams have been transforming the energy efficiency of buildings – old and new – for many years. Recently, we've taken this work one step further. We are now making insulation materials from our TEROL® polyols. Based on upcycled scrap polyethylene terephthalate (PET) bottles, TEROL® polyols are helping to improve the environmental credentials of our polyurethane insulation products even further.

PU R: Where else are polyurethanes helping to progress the adoption of more sustainable practices?

EV: The automotive industry is another key sector where the drive for sustainability has shifted up a gear with the help of polyurethanes. For many years, polyurethanes have been central to light-weighting vehicles and making them more fuel efficient. Now, polyurethanes are accelerating the production and performance of electric vehicles. Working with OEMs, we are pioneering ever-thinner, ever-lighter materials that can make a true difference to the overall driving experience while reducing CO_2 emissions. For example, our polyurethanes are used to create slimline seating foams that can deliver the same level of comfort as thicker, heavier materials. We have also recently developed a series of materials for lightweight battery housings for electric vehicles (see page 13).

PU R: What about the footwear industry?

EV: The footwear industry is another market where polyurethanes are making great strides in sustainability. Again, our work here is multi-dimensional. As a major supplier to the footwear industry, we are developing cleaner chemistries that can help cut waste. One such solution is a polyether system that has a lower carbon footprint than other materials and can be processed at lower temperatures. We are working to incorporate recycled and bio-based content into our footwear systems, including our TEROL® polyols. In addition, we are creating shoes that are more durable and longer lasting and developing materials that can be used in all the parts of a shoe. So called mono material shoes have a far better chance of being recycled at the end of their life. This can only be a good thing, given that 24 billion pairs of footwear are produced by the industry every year.

Feature

These three sectors are the tip of the iceberg. There are countless other examples. In coatings, our products help protect surfaces and extend the lifetime of products – dramatically reducing waste. In the composite wood sector, our resins help transform sawmill waste and wood chips into valuable construction and furniture materials such as OSB and MDF. The list is long and growing.

PU R: : Given how multi-layered sustainability is, how do you manage this as a business?

EV: Sustainability runs through all aspects of our business and is championed from the top down. We have an Executive Sustainability Committee that provides direction on our corporate sustainability program and submits regular updates to the board. We have a Sustainability Council, which cultivates a common framework for sustainability that ensures strategic alignment across our business. Our polyurethanes team also has a HPU Sustainability Steering Group (HPU SSG) to integrate sustainability in all of our processes and to support our leadership team in making well-informed strategic decisions. The team I lead, the Global Materials & Industry Sustainability (GM&IS) function, supports the HPU SSG – providing a future perspective on regulatory and sustainability challenges and on the opportunities that lie ahead for our industry and the materials we make.

PU R: As a global chemicals business, what will be the biggest sustainability challenge over the next decade?

EV: The (petro)chemical industry contributes about 5% of the world's total CO_2 emissions (numbers vary according to different sources) – so every company in the sector needs to assess how they can achieve reductions to compete at a product level. As new market dynamics have kicked in, a different competitive playground has been created. There is now high demand for products that offer chemical sustainability, low carbon and circularity. The winners will be those companies that can transform their product portfolio to offer the same technical performance, with the lowest carbon footprint, using sustainable chemistries and the least amount of resources, at the most competitive price.

PU R: : And what about the sustainability challenges facing your customers?

EV: The sustainability challenges our customers will face over the coming years will very much depend on the kind of market they are operating in. In automotive and footwear – both global industries – key players are typically ahead of the sustainability curve and driving the narrative. Working in close contact with end consumers, many are now demanding that suppliers offer products that provide sustainability performance ahead of what is actually required by regulators. In other sectors, like construction, where requirements are driven by national and sub-regional regulations, it's a different story. Here, short-term, the main challenge is to understand all of the regulations in each country – and keep pace with changes as they are made. More broadly, the challenge is to create a level playing field and ensure that the right technologies are available in the right places, to avoid negative socio-economic impacts around the world.

PU R: Managing regulatory disparities in different countries sounds complex. How do you handle this?

EV: This work tends to fall to our GM&IS. To keep pace with the changes being pushed through we have established regional radar teams. These teams look in depth at the massive wave of strategies, roadmaps, directives, and other types of legislation that are being developed or revised in different parts of the world. They also work together with industry associations to ensure polyurethanes are top of mind when it comes to solutions being recommended. Regulations relating to the retrofit of homes, to make them more energy efficient, is an example of a policy initiative that is applicable in all regions. In Europe this falls under the banner of The Renovation Wave. Launched in 2020, The Renovation Wave forms a core part of the Green Deal. Currently, around 75% of buildings in the EU are not energy efficient, yet 85-95% of these structures will still be in use in 2050. Renovating these properties is a core part of the Green Deal. Each country in Europe has published a long-term building renovation strategy. This will obviously create huge opportunities for insulation providers and the polyurethanes industry. Similar programs in other regions, but with a different emphasis and mechanisms, are being introduced to achieve similar objectives.

PU R: How about Asia? What are the sustainability drivers there?

EV: In China, the Government's 14th five-year plan is driving market and societal changes. The Government has announced plans to be carbon neutral by 2060. In parallel, it announced the country will be at its carbon peak by 2030. In acknowledging this, the Government has accepted that it will not be possible to significantly reduce its' CO_2 emissions in the next decade. Instead, over the next ten years, the administration will invest heavily in solar, wind and tidal energy; the electrification and gasification (LNG) of transportation; improving the energy performance of buildings; and developing a circular economy – with a prominent focus on reducing and recycling plastic packaging. In addition, cutting environmental pollution and the reduction of Volatile Organic Compound (VOC) emissions remain key focus areas. As the Chinese Government works to reach these goals, new pieces of legislation will be introduced and our regulatory radar team will

HORIZON 2025 TARGETS

2025

10% reduction in greenhouse gas emissions
10% reduction in energy use
10% reduction in hazardous and total waste volume

2050

100% reduction in greenhouse gas emissions
Fully circular and carbon neutral

be on hand – analyzing developments and engaging with our different functions to drive our innovation work forwards.

PU R: And America?

EV: In the Americas, things remain somewhat unclear. Although the Biden administration has clear ambitions in line with the EU, true change will only occur once different pieces of legislation, which are required to trigger a paradigm shift, have passed both the House and the Senate. Specifically, these are the Infrastructure Bill which President Biden is expected to sign before Thanksgiving, and the $3.5 trillion budget resolution. More recent negotiations have the budget bill at less than half of what was originally targeted, and what might ultimately get passed is still very much in question. Whatever the final package is that finally comes to fruition, we expect these to generate a wide variety of opportunities in the energy efficiency of buildings, and solar and wind energy. Changes are also anticipated in rail transportation, airports, shipping, and water transportation.

PU R: It will be fascinating to see how this all evolves over the coming decades. To end, can we return to Huntsman's own sustainability efforts? We've talked a lot about how Huntsman is enabling sustainability – but how is the business going to get to where it wants to be by 2050?

EV: That's a good question. It takes us back to the start of our conversation and my reference to pursuing continuous improvements. Huntsman is striving to be fully circular and carbon neutral by 2050. That target is a relatively long way out, but regulations are being developed as we speak, and for most markets and our customers, sustainability is top of their agenda – so it is happening today. To ensure we are progressing towards our goals, we continuously assess the needs of regulations, markets, and customers and revise our strategy to ensure it remains relevant to our markets, and to regulatory and technological developments. Our current five-year strategy is called Horizon 2025. Through this program we have set ourselves a series of aggressive but achievable goals that will help us benchmark our health, safety, and environmental performance short-term. Setting realistic goals is essential. As a business we don't want to over promise. Equally, we don't want to be seen to be 'green washing'.

By 2025 we are targeting a 10% reduction in greenhouse gas emissions. This will increase incrementally over the years that follow, until we reach a 100% reduction by 2050 – measured against our 2019 baseline. We are working with our value chain partners, who constitute two-thirds of our materially relevant non-operational greenhouse gas emissions, to develop their own science-based targets by 2026. In parallel, we are working to reduce our energy use by 10% by 2025. We are aiming to cut our use of water in water-stressed locations by 5% by 2025. We are also looking to cut both hazardous and our total waste volume by 10% by 2025.

To create a more sustainable planet, we all need to act now, but we also need to remember this is a long game. For change to be truly sustainable – and by that, I mean lasting – we need to work steadily. We need to make the right decisions at the right time, avoiding the need to go backwards. It is not about jumping on the bandwagon and trying to find a quick fix. It's about making carefully considered permanent changes. I've worked in the field of sustainability for many years, and it has honestly never been as exciting as it is now. At Huntsman, we have a solid foundation already in place and are ready to capitalize on the current wave of interest and create more products that can enable a brighter horizon for everyone.

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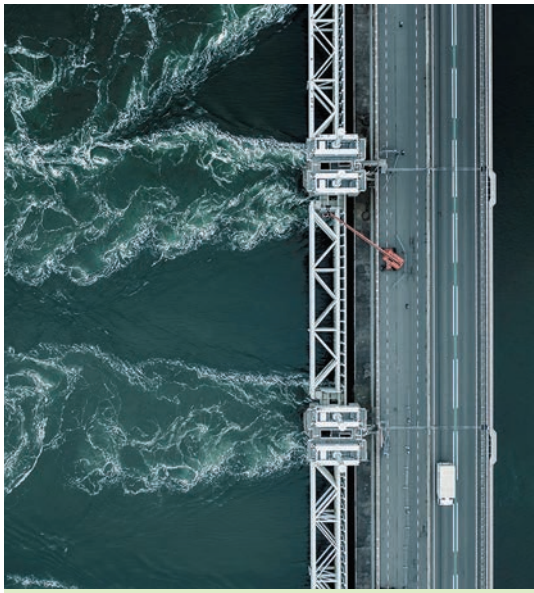

Rotterdam flicks switch to green electricity

Huntsman's Rotterdam plant has switched to using green electricity. As part of a site-wide initiative at the Botlek-based facility, which is located in the Port of Rotterdam, the business is now sourcing all of its electricity from hydropower.

Using green energy, Huntsman Rotterdam and its' neighboring companies in the business park have the potential to save 80,000 tons of CO_2 per year.

As is the case with domestic electricity, site occupants have the choice of buying grey or green electricity – depending on market availability and price. Grey electricity comes from fossil sources such as coal and gas, while green electricity comes from renewable sources such as the sun, wind and hydropower.

The site's use of green electricity has been ratified by an official certificate, will transform the facility's carbon footprint, and is a win-win for the environment and for Huntsman's own corporate sustainability ambitions.

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New IROGRAN® TPU for hose and textile applications

Huntsman has developed a new thermoplastic polyurethane (TPU) grade for technical extrusion parts and blown film applications that offers significant improvements over previous generation technologies when it comes to durability, production efficiency and reducing manufacturing waste.

IROGRAN® A 85 P 4394 HR TPU is the latest addition to a well-established family of elastomers products, which are renowned for their performance in a diverse range of industrial and consumer applications.

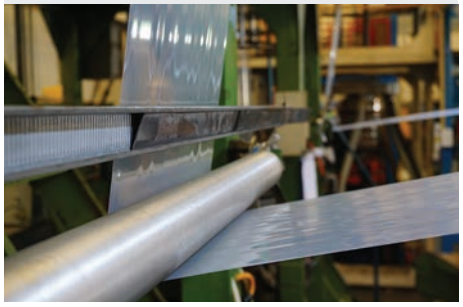
Developed in close partnership with Huntsman's customers, IROGRAN® A 85 P 4394 HR TPU has greater tensile strength than the standard IROGRAN® A 85 P 4394 elastomer grade, originally developed in 2004. The new grade also offers improved film extrusion quality and high melt strength, which makes it ideal for blown film applications. Delivering better resistance to force in its melted state, which makes it less likely that an extruded film will break during production, IROGRAN® A 85 P 4394 HR TPU can help to significantly lower scrap rates, improve manufacturing throughput and cut waste in blown film processing.

IROGRAN® A 85 P 4394 HR TPU

IROGRAN® A 85 P 4394 HR TPU is designed to solve the problems of customers in diverse markets including:

TPU lay flat hoses – used in high pressure industrial and municipal applications e.g., firefighting

Textile lamination as a breathable, waterproof layer for rugged performance apparel.



In the manufacture of TPU lay flat hoses, IROGRAN® A 85 P 4394 HR TPU is applied via the "extrusion through-the-weave" process. In this application, the product's greater tensile strength is highly advantageous – helping the resulting hoses cycle between periods of being tightly coiled and then extended and put under high water pressure levels. In the case of fire hoses, this pressure can typically be in the region of 8 and 20 bar (800 and 2000 kPa; 116 and 290 psi).

When it comes to textile lamination, IROGRAN® A 85 P 4394 HR TPU is an excellent material for creating a waterproof, breathable film in rugged performance apparel (including gloves and footwear). Blown to create an extremely thin layer, which is then added to fabrics, IROGRAN® A 85 P 4394 HR TPU provides the protective properties needed to create high performance outdoor garments. Adhering well to different kinds of fabrics, IROGRAN® A 85 P 4394 HR TPU can aid the stretch and recovery of the materials it is used on. The nature of the grade also means the resulting films can be engineered to have different surface finishes, including gloss, smooth and matte effects

Trent Shidaker, Global Marketing Director, Elastomers at Huntsman, said: "IROGRAN® A 85 P 4394 HR TPU is a highly versatile and durable elastomer. Soft to the touch, it's ideal for apparel applications that need to stay in contact with the wearer for hours at a time; but it's also strong enough to be used in municipal and industrial hoses that have to perform under the toughest conditions. Applying our development expertise, we've enhanced the processing properties of IROGRAN® A 85 P 4394 HR TPU, without compromising the key performance attributes expected of products in this range – namely excellent hydrolytic resistance; fantastic wear performance; and microbial resistance. The result is an elastomer that can enable manufacturers to work more efficiently, cut waste and create longer-lasting products; a compelling proposition for the markets we serve."

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Virtual teamwork during pandemic delivers relief for runners

During the early stages of the pandemic, outdoor activities such as running grew in popularity. Unable to go to the gym or exercise classes because of COVID-19, people took to pounding the pavement in huge numbers. To support new and experienced runners, 'functional footwear' specialist Joe Nimble launched its first recovery sandal for runners in Q2 2021 – with assistance from Footwear Innovation Lab GmbH and Huntsman.

The so-called 'recoverToes' sandals, which are designed to rehabilitate tired feet after exercise and are made from polyurethane, were developed virtually during the last half of 2020. The concept behind 'recoverToes' is simple. Forms of exercise, such as running, can cause feet to fatigue, get sore and tighten up. 'recoverToes' sandals provide relief from these symptoms. Working like braces do on teeth, the sandals optimize the alignment of the big toes with a special footbed that spaces out the toes. This significantly improves foot shape and structure, eases plantar pressure and stimulates foot nerve endings to improve circulation. Easy to slip on and off, and available in three colors, the sandals feature an adjustable "ToeRite®" toe spacer based on Joe Nimble's TOEFREEDOM® technology.

'recoverToes' sandals are made from two types of polyurethane from Huntsman. The use of Huntsman's material was recommended by Footwear Innovation Lab GmbH, which teamed up with Head of Joe Nimble, Sebastian Bär, to bring his recovery sandal concept to life in record time.

Explaining more, Sebastian said: "From the start we knew what we wanted to achieve with 'recoverToes' and we knew we wanted to use a very high-quality polyurethane material. After making a first prototype with Footwear Innovation Lab we discussed the properties we wanted the sandals to have and how best to scale up production. Having worked together in the past, Jens and the team at Footwear Innovation Lab quickly recommended Huntsman as our material partner."

Jens Schmidt, CEO of Footwear Innovation Lab, said: "When Sebastian approached us about 'recoverToes', we knew there was only one company that could take control of the chemistry. Huntsman is incredibly entrepreneurial, and its' team works in a really agile way. Always open to ideas, its footwear experts go out of their way to find solutions to technical challenges. With 'recoverToes' our mission was to find a polyurethane with excellent flowability that could replicate the complicated mould design. Huntsman delivered on that brief."

'recoverToes' is made using Huntsman's DALTOPED® polyurethane footwear system technology. DALTOPED® Aqua PUR, a low-density polyurethane, was used to make the soft inner part of the sandal. For the outer surface, which has an intricate design, Huntsman and Footwear Innovation Lab adapted a DALTOPED® Grip grade to work with the Stemma RPU spray concept. This unique system allows complex designs to be realized without having to worry about potential air bubbles.

Johan Van Dyck, Global Polyurethanes Elastomers Applications Manager at Huntsman, said: "From start to finish this was a fast-paced project and there was great dynamic between everyone involved – as evidenced by the rapid turnaround. When you consider that we only got involved in the project in October 2020 and that all interactions were virtual, it is remarkable. 'recoverToes' is going to be a hugely popular line for Joe Nimble."

Joe Nimble's 'recoverToes' sandals are available to buy online, in BÄR Shoes stores across Germany, and from international wholesale partners in Scandinavia, USA and Czech Republic – among others.

For more information go to: https://www.joe-nimble.com/int/recovery

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Game-changing ultra-low-emission systems for car interior components

Huntsman has launched a new, game-changing suite of ultra-low-emission polyurethane foam-based systems for automotive interior applications – which are in the final stages of evaluation by several leading global OEMs and interior component producers. The new ACOUSTIFLEX® LE and RUBIFLEX® LE product lines enable European formulators and foam manufacturers to produce high-performance polyurethane foams for use in cars, while significantly reducing interior emissions levels to meet the most stringent OEM norms – without compromising comfort.

The automotive industry is continually looking for new technologies that can help it address consumer preferences and meet increasingly tough legislative requirements governing Vehicle Interior Air Quality (VIAQ) as well as new international ISO standards and policies such as the Circular Cars Initiative EU Policy Action Roadmap.

The development of ACOUSTIFLEX® LE and RUBIFLEX® LE systems shows Huntsman responding to the challenges facing the automotive industry including, specifically, the need for lower emission interior components that are cleaner but also lighter, aligned with sustainability requirements, and capable of delivering advanced comfort.

Huntsman's suite of ACOUSTIFLEX® LE and RUBIFLEX® LE polyurethane systems are designed for use in automotive seating parts and in noise, vibration and harshness (NVH) insulation applications. They are also suitable for making a wide range of other standard automotive components – simplifying procurement and value chains for producers, who can reduce the different types of PU products they need to purchase.

Prior to evaluation by Huntsman's automotive customers, ACOUSTIFLEX® LE and RUBIFLEX® LE systems underwent rigorous testing by accredited external testing institutes. Analysis confirmed that these products can deliver consistent emission results and product performance levels not previously possible in low emission products – with no negative impact on the mechanical and comfort performance of interior components compared to existing commercial systems.

Irina Bolshakova, Senior Market Manager Transportation at Huntsman Polyurethanes, said: "The development of ACOUSTIFLEX® LE and RUBIFLEX® LE is potentially game changing for the automotive industry – both for business efficiency and sustainability. Formulated to create a safer and cleaner environment for every person travelling inside a car, these products are part of a wider program of innovation at Huntsman that is helping to accelerate the shift to cleaner and safer mobility – and ultimately supporting the drive to net zero and the creation of a carbon neutral and circular society."

"From a commercial perspective, these new products can help formulators and foam manufacturers deliver the required performance levels for their processing of polyurethane foams – with no modification to current production chains required. They deliver significantly lower in-vehicle emissions within the most demanding OEM thresholds. They can also help vehicle manufacturers minimize the number of materials they are using in interior applications. When developing ACOUSTIFLEX® LE and RUBIFLEX® LE we took a unique one size fits all technology approach. Where other emission-reducing technologies on the market require the use of different products for specific components, ACOUSTIFLEX® LE and RUBIFLEX® LE systems can be used across multiple interior applications. This obviously has huge implications for the industry and is a significant benefit that the companies we are talking to are very interested in." |

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Building better battery housings for electric vehicles

Huntsman's automotive team has developed a series of polyurethane solutions that can deliver significant weight reductions in the manufacture of battery housings for electric vehicles. As the drive to create more e-vehicles ramps up globally, Bart Vangrimde, Technical Manager, Composites at Huntsman Polyurethanes, explains more.

Governments worldwide are now setting deadlines for banning the sale of new petrol and diesel vehicles – clearing the road ahead for more electric forms of transport. The growth of electric vehicles presents huge opportunities for the polyurethanes industry. The process of light-weighting cars has been ongoing for years. Mass roll out of electric vehicles takes this work to the next level – increasing the drive for additional overall weight savings and opening up new applications in automotive parts design for polyurethanes producers. One area where polyurethanes have the potential to make a big difference is in the manufacture of housings for car batteries. This is an area Huntsman has been exploring for some time and we've now come up with three solutions for original equipment manufacturers (OEMs).

Consulting with customers to create solutions

Currently, a variety of different materials – including metals – are used to make battery casings. Specifiers typically have three requirements when developing battery housings. The top priority is reducing the weight of all components to optimize battery use. A material's compatibility with mass production technologies is also key. Maintaining the integrity of the housing structure long-term, to protect the battery inside from fire, impact and electromagnetic interference (EMI), is also essential. "Responding to these needs, we have worked in close consultation with our automotive customers to develop three resin-based material solutions for the manufacture of battery housings. Delivering weight reductions of up to 40%, these systems can open up new design opportunities and deliver new levels of thermal insulation that can increase battery efficiency.

Snap cure VITROX® system

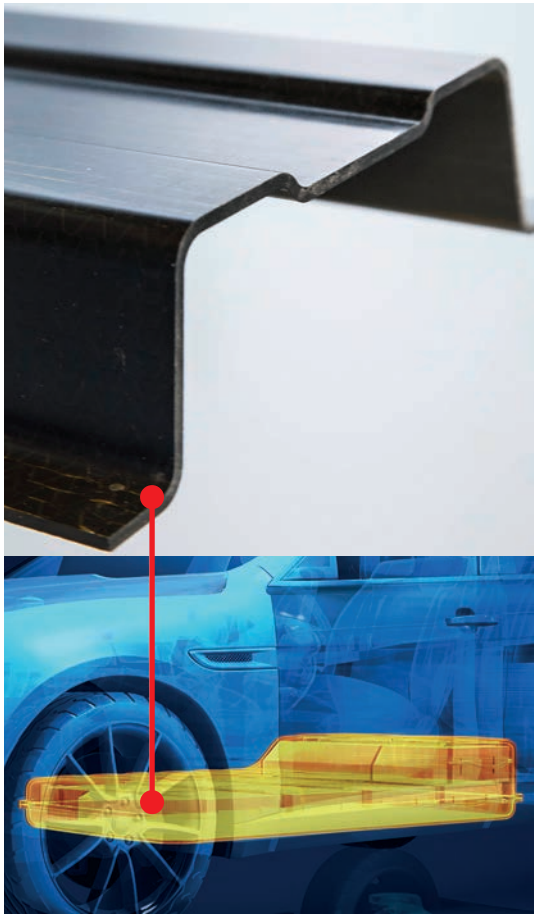
VITROX® RTM

Our first concept is a mass production resin system. Based on our snap cure VITROX® RTM technology, the system has a low viscosity and tuneable injection time. It has a short cure time after injection for fast demolding – which is compatible with mass production methods. With strong fiber-matrix adhesion properties, the VITROX® system delivers advanced toughness enabling good damage resistance. It also has the thermal resistance needed for semi-structural and structural applications thanks to a glass temperature of 100-130ºC.

RIMLINE® foam core

RIMLINE® FC

The second solution is a RIMLINE® FC (foam core) system that can be tuned to customers' manufacturing needs. Inset between two rigid skin laminates, the system offers an outstanding property balance and also delivers reliable process performance. Designed for cavity filling, the system has good flow characteristics, even at limited foaming pressure, and can be molded directly into a closed mold to create thin or thick and complex shapes. The RIMLINE® core offers good adhesion with the manufacturer's chosen sandwich skin and has a fast cure time, and low tool cleaning needs. This makes high productivity a possibility. The resulting foam has a wide density range of 150-300 g/l and high bending and torsional stiffness. Once demolded, the core is quickly ready for overmolding. Thanks to the system's ability to withstand high pressures and temperatures, this can be done with RTM and WCM techniques.



VITROX® HC spray system

VITROX® HC

We have also developed a spray molding product that has the potential to become the process of choice in battery housing applications. Originally designed for use in the production of automotive load floors, VITROX® HC polyurethane system can be sprayed on top of glass or carbon fiber reinforcements that have been laid over a flat thermoplastic sheet – e.g., polycarbonate honeycomb. The product is sprayed on both sides of a panel and is then compression molded. Like other VITROX® products, VITROX® HC has a tunable reactivity profile that can be adapted to a wide range of molding conditions. It can also be used to mold quite complex geometries without pre-forming and results in parts with a high stiffness to weight ratio – at a limited investment cost.

For more information about the products and technical support on offer from Huntsman's automotive team email:

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Easy-to-use elastomers take pain out of processing large parts

When creating high quality polyurethane components, parts manufacturers typically have to work within a relatively narrow set of processing parameters – particularly when creating large, hard-wearing, cast polyurethane components for heavy duty markets. However, the production of substantial parts for industrial applications has recently become a lot easier thanks to Huntsman's elastomers experts.

To give parts producers extra manufacturing flexibility, Huntsman has developed a new range of easy-to-use (ETU) cast PU elastomers that offer a wide processing window. Products in the ETU elastomers range have a long pot life and are tolerant to process temperature variations, which makes them easier to control. Compatible with standard manufacturing equipment, they deliver excellent part-to-part consistency – helping to reduce scrap rates. They can also be processed at significantly lower temperatures and do not require any post curing treatment – making them more energy efficient.

TECNOTHANE® ETU 1617G elastomer is the first product available in the ETU range. This 3K system can be tailored made to deliver a wide range of shore hardnesses from A45 to D60.

Ideally suited to casting large, hard-wearing, specialist components, the Elastomers team is targeting TECNOTHANE® ETU 1617G specifically at mining, oil and gas, and industrial applications. |

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Huntsman joins industry project to create bio-based polyols for automotive

CATALISTI
WE MEAN BUSINESS

Huntsman is proud to have joined BIOPOL4MOTIVE, an innovation project organized by Catalisti – the spearhead cluster that accelerates innovation in chemistry and plastics by building partnerships between companies, universities, research institutions, associations and governments in Flanders, Belgium. The aim of BIOPOL4MOTIVE is to make polyurethane foams for use in car acoustic interiors more sustainable by incorporating more bio-based content.

Huntsman is collaborating with Autoneum, the leading supplier of lightweight acoustic and thermal management solutions for vehicles; and Oleon – one of the leading producers of oleochemicals, on the project. Together, the three companies will create new grades of acoustic PU foam for automotive applications that will deliver a substantial level of bio-based content, without any functional loss, at an attractive price point.

PU foams are already the material of choice for car acoustic interiors due to their high performance at low weight and their competitive cost. As car manufacturers and their suppliers strive towards increased sustainability and seek to achieve a reduced CO_2 footprint, they are looking for ways to incorporate more sustainable materials into their PU foams. One such way is to use bio-based polyols. However, the chemical structure, inconsistent quality and cost of bio-polyols is currently curtailing their full potential. BIOPOL4MOTIVE will work to overcome this challenge – focusing specifically on the manufacture of flexible PU foams, e.g., high resilience and visco-elastic solutions. |

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Huntsman speakers to take center stage at UTECH conference

Huntsman is playing a major part in UTECH Europe when it returns to Maastricht, in The Netherlands in November. As well as exhibiting at the event, the team will present four technical papers – demonstrating the breadth of its polyurethane capabilities across a range of market sectors.

New approach to simulating large-scale fire performance of PUR / PIR foams

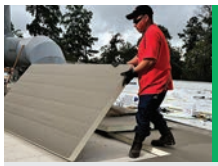
Xiaodong Guo, Computational Materials Research Scientist, will discuss a new approach to fire dynamics simulations that can determine the large-scale fire performance of PU rigid foams based on small-scale thermal analysis. Fire dynamics simulations help predict the performance of products in large-scale fire scenarios. However, obtaining good fire predictions requires accurate material properties. These properties can be obtained from small-scale thermal analysis tests such as thermal gravimetric analysis (TGA) and microscale combustion calorimetry (MCC). However, large discrepancies between predictions and experimental results may remain due to the insufficient consideration of thermophysical foam properties. Xiaodong will set out details of a new fire dynamics approach – devised by Huntsman – that can deliver quicker and more accurate predictions using three techniques: pyrolysis modelling; characterization of thermophysical parameters and foam degradation mechanisms; and fire simulation using computational fluid dynamics (CFD) models.

A low emission flexible foam that can meet stringent emission requirements

Annelies Vandevelde, Technical Manager, will outline details of a low emission flexible foam technology that meets the latest stringent automotive requirements. The automotive industry is continuously applying stricter emission standards for interior components in response to regulatory and consumer requests. Recently, requirements have become even more rigorous in relation to formaldehyde and acetaldehyde emissions. Consequently, some existing foam technologies may no longer fulfil norms. To help the automotive industry remain compliant, Huntsman has developed a novel low emission polyurethane system for the production of automotive seating parts and sound insulation components. The low emission results delivered by flexible foams based on this novel system have been validated via internal volatile organic compound (VOC) chamber tests and accredited external institutes. The results confirm the system meets the strictest emission targets of leading OEMs at a consistency rate not always achievable in the past. Crucially, Huntsman has achieved this without compromising the mechanical and comfort performance of final interior components.

A new era in seating comfort with a thin foam technology

Christophe Ponce, Technical Service Manager Europe, will explain how seating comfort in cars can be achieved using a thin foam technology that can be fine-tuned to suit requirements. Recognizing that the main challenge for seating producers is to engineer ever-thinner, ever-lighter foams, Huntsman has developed two polyurethane system technologies that can deliver the same level of comfort as thicker, heavier materials – with much less material. Currently, seat makers typically have to assemble different foam products in several steps to achieve the desired comfort levels. These stages can add costs and time to the manufacturing process. They can also require the use of additional products such as adhesives, which can affect indoor emissions. Christophe will provide more information about RUBIFLEX® HR GH (Gradient Hardness) and RUBIFLEX® HR AC (Advanced Comfort). These products can satisfy OEM requirements – helping them create thin, lightweight foams that can deliver the same level of soft comfort and vibration resistance as thicker, heavier materials – in a cost competitive manner.



Advances in rigid foam using a novel and sustainable PU additive

Around the world countries are setting themselves ambitious carbon net zero emission targets. In support of this goal, the construction industry is racing to erect buildings that are more energy efficient – while also retrofitting older properties with new technologies that can reduce their carbon impact. As legislation changes, polyurethane-based insulation is in pole position when it comes to insulating buildings. With all elements of building materials now scrutinised for their environmental performance – including the individual components that are used to make them – Huntsman has developed a novel, sustainable polyurethane additive that can be used in the manufacture of rigid insulation foam. Geert Dries, Application Specialist, will discuss the use of this additive in PUR and PIR foams and the benefits it brings in terms of a long working time, a fast cure time and good foam formation capabilities.

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Forthcoming events and technical presentations

UTECH, Maastricht, Belgium (16-18 November)

Construct Canada, Toronto, Canada (1-3 December)

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