

No. 27 | May 2019

MESSER 
Gases for Life

Gases for Life

The industrial gases magazine

COVER STORY

Theory meets practice

PRACTICAL FOCUS

**Gases in car
interiors**

USING GASES

**Round-the-clock
service covering
every aspect of
industrial gases**

RESEARCH

**A glimpse inside
the volcano**



Dear Readers,

In the Messer World, the last few months have been all about the takeover of parts of Linde and Praxair in the USA, Canada, Brazil, Chile and Columbia.

Messer Industries GmbH, a joint venture between Messer Group GmbH and financial investor CVC (Capital Partners Fund VII), was set up specifically for this purpose. The acquisition was officially completed on 1 March 2019. Since then, the companies belonging to Messer Group and Messer Industries have been operating jointly under the “Messer – Gases for Life” brand.

Our next major objective is to (re)integrate the business activities conducted under Messer Industries in Western Europe and the Americas into the Messer Group in 2022. Ensuring customer satisfaction through innovative solutions and first-class support is an important step towards this goal. We fully expect it to be facilitated by our new technical centre, which we opened in June 2018 in Krefeld. You can find out more about the new facility in our cover story.

Stefan Messer
CEO and owner of Messer Group GmbH

Correction: In Issue 24, page 13, the statement “1931, Messer becomes the first producer of electric welding machines” is incorrect. This error arose as a result of the original wording having been shortened. It should read: “As the first manufacturer of oxyacetylene equipment, Messer commences production of electric welding machines in 1931”. We are grateful to our reader Mr Günter Aichele for drawing our attention to this matter.

Our cover photo:

Davor Spoljaric, Head of Messer’s Application Technology Department and Site Manager in Krefeld.





6

4 NEWS

6 PRACTICAL FOCUS

Gases in car interiors

Car interiors are becoming increasingly complex high-tech environments. Gases help to ensure that they fully serve their purpose.

8 NEWS

9 PEOPLE FOCUS

10 COVER STORY

Theory meets practice in the competence centres

Messer's competence centres with their wide range of technical facilities and equipment support customers in making the transition from theory to practical application.

16 NEWS

18 USING GASES

Round-the-clock service covering every aspect of industrial gases

Messer's E-Services make our customers' work noticeably easier – online, as an app or as customised email.

20 FOCUS ON CYLINDERS

22 NEWS

24 RESEARCH

26 INTERVIEW

Shiming Zhu, Magna Seat System Co.,Ltd.

27 COMPETITION / IMPRINT



10



18



24

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Marcus Nülken concocting an ice cream mixture

Dr. Icecream: the travelling ice cream laboratory

Germany | “Dr. Icecream” - Marcus Nülken - showcases his special ice cream creations at markets and fairs such as the Düsseldorf Kirmes. When he makes his delicious concoctions in his travelling ice cream laboratory, a lot of misty vapour is produced as cream, milk, sugar and fresh fruit come into contact with Messer’s liquid nitrogen, which

has a temperature of minus 196 degrees Celsius. The whole process – from mixing the ingredients to the finished product – only takes 60 seconds. By the end of it, the nitrogen has already vaporised. The one-minute ice cream is only available in three flavours – changing daily – so that all the perishable ingredients can be completely used up by the evening.

Heidemarie Böschen, Messer Industriegase

Gases etc. for machine service provider

Czech Republic | KOS Servis specialises in the repair and overhaul of woodworking machines, agricultural machinery and lifting gear. This requires the use of different technologies and involves working with a variety of materials. Here gases are needed for welding as well as thermal spraying and cutting. KOS Servis also uses numerous products from the extensive range offered by welding, brazing and thermal coating specialist Messer Eutectic Castolin. Last December, a Messer OmniMat flame cutting machine was installed at the company's site in Pacov. A stationary oxygen tank is also due to be installed there this year in order to simplify the cutting gas supply.

Jan Kašpar, Messer Technogas



At KOS Servis: Martin Voznik, CEO Messer Eutectic Castolin Slovensko; Vladimír Kos, CEO; Jan Kašpar, Messer Technogas; Libor Kos, CEO (from left to right)

More hydrogen for more heat treatment

Slovakia | Automotive supplier Witzenmann specialises in flexible metal elements. A furnace for brazing and solution annealing of automotive components was installed at the firm's site in Vlkavová in 2015. Since the furnace went into operation, Messer has been supplying the company with nitrogen and hydrogen. A second furnace was commissioned in December 2018, thereby doubling production capacity.

In order to meet this increased demand for hydrogen, Messer has installed a 95-cubic-metre tank at the factory site. It replaces the eight hydrogen bundles used until now. Safety regulations and local conditions necessitated the construction of an eight-metre-high protective wall around the tank.

Peter Mikula, Messer Tatragas



Travelling in comfort and safety

Without gases there would be no cars as we know them. And that is not just because of the various metalworking processes required for a car's body and engine. The mercurial helpers are also required for its interior in order to ensure comfort and safety.

Airbag

When the airbag has to perform its protective task, it is not filled with air but a mixture of nitrogen and helium. For one thing, these gases are completely inert and therefore non-flammable in the event of an accident. But most importantly, helium is extremely light. And the lighter the gas, the quicker it can expand from its compressed state and fill the airbag.

Upholstery

The upholstery material usually consists of polyurethane. For safety reasons flammable gases must not be used in the foaming process. That is why the inert gas carbon dioxide is used for this production step. It produces tiny bubbles and an even structure. The mechanical properties of the upholstery are much better than those produced with conventional foaming processes. This means more support, more comfort and more safety.



Seat frames

The seat frames, rails and fastening elements are made of metal, generally steel or aluminium. Even the process of manufacturing the primary products involves the use of gases, such as oxygen for the burners or nitrogen and hydrogen for the heat treatment furnaces. The frames are then welded, with the right gas mixtures ensuring the necessary weld quality.

Electronics

Our cars are slowly turning into mobile computer and communication centres, with their interiors also featuring more and more electronics. From the sat nav and the music system to automatic seat adjustment, there are small control units built in everywhere. Their circuit boards – like virtually all PCBs – are soldered in a protective nitrogen atmosphere.

Air conditioning

The use of conventional fluorocarbon (CFC) refrigerants in car air conditioning systems has been largely prohibited since 2017. The environmentally friendly alternative is carbon dioxide. The gas is used in a closed system in the car and helps keep the temperature inside the vehicle bearable even in hot weather. Prior to installation, the air conditioning system is leak tested with helium.

Damping elements

Rubber damping elements are placed between assembled parts to prevent whirring and clattering while driving. The flash and nipples that remain after these rubber parts have been moulded are removed with the aid of cryogenic nitrogen. The gas makes the material brittle, allowing any protrusions to be removed with minimal mechanical effort.

Leather and artificial leather

Lasers are used to cut virtually all types of material, not just metal. For example laser beams are used to make leather seat covers. Pure nitrogen is used as the cutting gas in this process. It protects the edges of the cut and purges the cutting slot in order to keep smoke and fumes away from the optics.

Kurt De Boeck and Davor Spoljaric, Messer Group







More taste and fragrance with dry ice

Hungary | The Brill Pálinkaház distillery produces particularly aromatic distillates from fruit, grapes and pomace. For mashing, the family business's distillers use dry ice to transfer as much of the raw material's ephemeral aromas into the end product as possible and to prevent the formation of undesirable flavours. The dry ice is used for cooling sensitive fruits and berries such as strawberries, protecting these from oxidation during the process. During directed fermentation, it also helps the pure tastes to develop. The additional effort seems to be worth it: Brill Pálinkaház's products have already won the title of "Hungary's best spirit" three times. Messer provides the dry ice and offers technical support for the application.

Eszter Buczilla, Messer Hungarogáz



Borche Kajokorovski

Borche Kajokorovski (39) has worked in the production department of Messer in Macedonia since 2001. He lives and works in the capital Skopje and is responsible for cylinder inspection and testing.

1. What has been your greatest success at Messer?

At the end of last year, following intensive training in non-destructive testing of materials, I obtained the "Visual Testing Level 2" and "Penetration Testing Level 2" certificates in accordance with the DIN ISO 9712 standard. I am very proud of this licence, which was awarded by a renowned German certification body. It means that I am qualified to inspect pressure vessels by means of visual testing as well as with liquid penetrants.

2. What would you say is a must-see for anyone visiting your country?

The Matka Canyon and Lake Matka. I recommend the boat trip to a small dripstone cave; the trip on the lake is simply breathtaking in itself. The canyon is not far from Skopje and easy to get to.

3. What three things would you miss least?

People with negative energy, bad drivers and traffic jams.

4. Which famous person would you like to spend an evening with?

The best tennis player in the world, Novak Djokovic. He is a very inspiring personality, not just as an athlete but also because of his social commitment. His foundation has helped many children, and he also supports schools, kindergartens and sports facilities in his native country.

5. What else would you like to learn or study?

I would like to learn foreign languages, especially German.

Theory meets practice in the competence centres

Innovation is the driving force behind development and growth. It is pursued every day in Messer's competence centres, where theory and practice meet. Apart from fulfilling a representative function, this allows experts to develop new processes and optimise them at pilot-plant scale before they are transferred to the industrial scale. This often takes place in close cooperation with the customer, accompanied by partnerships with universities or research institutes, for example in the form of internships and bachelor/master's theses.

The transfer of know-how to customers and employees of our national subsidiaries takes place in the form of theoretical and practical training sessions on site as well as via webinars. This covers an extensive range of processes in the Chemistry, Paper, Environment, Food Technology, Cryogenic Applications, Welding and High-Temperature Processes segments. The competence centres also prepare and maintain pilot plants for industry use and carry out tests of manufactured hardware prior to delivery.

Recycling is the future – cold grinding with gases

Cold grinding and recycling specialist Oliver Dietrich winks as he points to “his most important piece of equipment”, the anvil just next to the door to his office. He can find out a lot about a sample’s properties by immersing it in liquid nitrogen and subsequently bashing it with some heavy hammer blows: “I then know just how intensively the material can be embrittled and how effectively composite materials can be separated from each other by virtue of the different degrees of contraction of the individual components as a result of the thermal shock.”

But his department in the newly set up competence centre in Krefeld also has high-tech equipment such as a counter-rotating pin mill with connected precooler. This machine could just as easily be in operation in a modern industrial facility and used, for example, for the production of PVC powder from old garden hoses. The recycling of thermo-plastic polymers and elastomers is a particularly important area for cryogenic technology – along with the processing of spices. “The test centre allows us to optimise the technology for specific applications,” adds the expert. “Our

customers receive grinding samples from us, along with a mill configuration proposal and a detailed estimate of production costs.”

Cold grinding involves cooling and embrittling substances with cryogenic liquid nitrogen or carbon dioxide. This process allows particularly fine grain sizes to be achieved with no loss of product quality. The mill throughput capacity is also increased considerably. Particularly when grinding heat sensitive materials, the process of cooling with cryogenic gases prevents an increase in temperature as a result of the conversion of the mill motors’ electrical energy. This prevents any melting or sticking of the material being ground. All the grinding parameters, such as throughput, electricity and nitrogen consumption and particle size distribution are measured, analysed and made available to the customer. The whole facility serves as a reference as it is designed along the lines of a production facility. The results obtained here are also of particular interest for the very reason that they can be applied to large-scale production.



“The test centre allows us to optimise the technology for specific applications,”

Oliver Dietrich



Continued on page 12



“We have an extensive portfolio of proven technologies which we are constantly developing and refining so that we can offer each customer the optimal solution.”

Dr. Monica Hermans

Water treatment with gases

The gas should enter the liquid as evenly as possible and dissolve before it reaches the surface. How best to do this in widely varying conditions is one of the issues dealt with by Dr Monica Hermans' Environment section: “It is usually a question of producing the smallest possible gas bubbles and keeping them small for as long as possible. The smaller the bubbles, the greater the contact surface for the transition process.”

The bubble problem does not even arise when two liquids are mixed. This is the obvious method to use for neutralisation with carbon dioxide, which can also be introduced in liquid form. “However, some of the CO₂ is transformed into dry ice when it expands, which can lead to problems with nozzles. But the formation of lumps can be prevented with our Clapet nozzles and by precisely adjusting the pressure and flow conditions to suit the specific application,” the expert explains. In the competence centre's Environment section, the main focus is on hardware for dissolving gases in water. In-house developments as well as bought-in compo-

nents are tested and demonstrated in tube reactors or water tanks, adapted as necessary and eventually used at many customer sites. Typical customers include waterworks, industrial firms and wastewater treatment plants. They use gases such as oxygen, ozone and CO₂ in diverse processes to treat drinking water, process water and wastewater in an environmentally friendly and efficient way. For the gas to be effective, it must first be dissolved in water, and this has to be done with a high degree of efficiency while keeping energy consumption and hardware costs to a minimum. “We have an extensive portfolio of proven technologies which we are constantly developing and refining so that we can offer each customer the optimal solution. The know-how for this is one of the core competencies of the Chemistry, Paper & Environment division,” says Dr Monica Hermans. “The competence centre in Krefeld will now also help us in this regard.” Besides specific application development, the competence centre also offers rental equipment such as a compact injector, which is used to feed oxygen into clarifiers.

Maintaining the cold chain

The industrial kebab spit, weighing almost 800 kilograms, only just fit in the cabinet freezer – including numerous sensors to measure its temperature at different points and, in particular, at different depths. “We worked out how our customer can freeze the kebab spit as quickly and efficiently as possible and with minimal loss of water,” says Frank Gockel, who is in charge of the competence centre in Krefeld. “Conventional refrigeration involves the loss of around 40 litres of water. The customer was particularly happy about the fact that we managed to bring this figure down to almost zero by using nitrogen.”

The competence centre’s Food section is a reflection of the wider food industry in that it has a particularly broad range of facilities and installations. This includes cryogenic chilling and freezing equipment, a packaging machine complete with gas mixer for packaging different food products in the required

gas atmosphere, a mixer fitted with our patented Clapet nozzles for optimal product cooling during the mixing process and a pelletizer for producing frozen product pellets. Another important area is transport refrigeration. Here the competence centre develops and presents solutions for truck cooling, container cooling and for cooling small transportation boxes for the home delivery market. There is similar diversity when it comes to the development tasks that are worked on here. For example, how can insect eggs be placed in a wax matrix to facilitate subsequent automated distribution of the beneficial insects in greenhouses? How can the principle of the ink-jet printer be used to produce very fine product droplets of a defined size prior to freezing? How can live yoghurt starter cultures be frozen in pellets without damaging the cell structure? The competence centre finds the answers to these and similar questions.

“We worked out how our customer can freeze the kebab spit as quickly and efficiently as possible and with minimal loss of water.”

Frank Gockel



Continued on page 14

Centre for networking

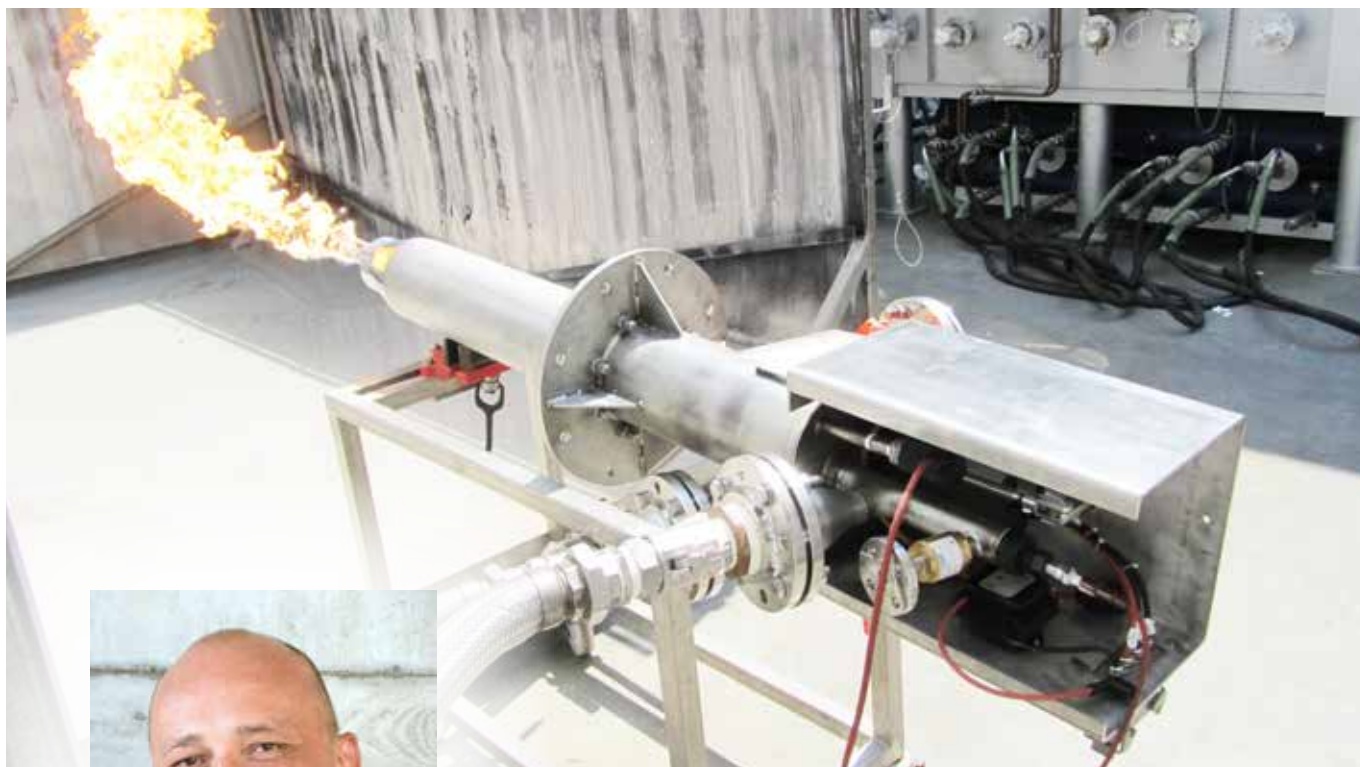
“For Welding and Cutting, the range of processes is too big to cover in one competence centre,” Dr Bernd Hildebrandt explains. “Our know-how in this area is mainly required for the development of new gas mixtures.” In the competence centre itself, the main focus in this field is on training, instruction and troubleshooting. This is because we regularly hear from customers who are not satisfied with their welds or cut edges and assume that the gases they are using are the cause of the problem.

“We have a very extensive array of measuring instruments here that allow us to get to the root of such problems,” the expert explains. “In almost all cases, it turns out that unsuitable components such as hoses and fittings or handling errors are to blame.” The competence centre also serves as an interface for networking with universities and specialist institutes, and above all with the company’s internal network. The various new additive manufacturing processes also play an important role in this cooperation.

“Our know-how in this area is mainly required for the development of new gas mixtures.”

Dr Bernd Hildebrandt





“In this high-temperature segment, we often have to deal with very large installations such as the tank, open reverb or reheating furnaces used in the metal industry.”

Davor Spoljaric

Reducing CO₂ and NO_x emissions through oxygen combustion

The competence centre for high-temperature applications, in particular oxygen combustion, is located in a new purpose-built centre in the Austrian town of Gumpoldskirchen near Vienna. It has received Austrian state support for more than ten years through various research and development projects. The centre optimises technologies that will also contribute to the decarbonisation of the economy in future. “In this high-temperature segment, we often have to deal with very large installations such as the tank, open reverb or reheating furnaces used in the metal industry. Many of them do not exist on a small scale, so we carry out the actual tests at the customers’ sites and then also take on the job of operating the units. Research and customer needs meet in the competence centre almost every day in the search for efficient, environmentally friendly production technologies,” Davor Spoljaric, Head of Application Technology at Messer, explains.

The open burner stand is used to inspect oxy-fuel burners with outputs of up to approximately six megawatts, and the

related control room provides a unique opportunity to examine a wide range of measuring processes for Messer and industry in parallel. Apart from a burner chamber, which is used to develop and inspect new oxygen burners, there is also a small forging furnace, in which the decarburisation rates of steel parts are checked at different levels of oxygen enrichment. A fluidised bed furnace and a glass feeder are also available as test units. The premises facilitate a smooth transition to in-house production: oxy-fuel burners and controlled systems are built and tested on site and inspected both by Messer’s national subsidiaries and by customers.

The employees’ eyes light up when they talk about the competence centres, their developments and their colleagues’ training sessions. These are all pieces of the puzzle that contribute to the company’s success. Tomorrow they will be back in the competence centre devising and implementing new ideas – a key factor in Messer’s success.

Editorial Team

E-bikes on the move thanks to Hungarian experts

Hungary | E-bikes are clearly a big thing at the moment. From electric leisure bikes to sporty e-mountain bikes to useful cargo bikes, there are now models available for every need. For the city of the future, they also offer an environmentally friendly alternative for daily commutes, local journeys or parcel services. One of Bosch's Hungarian plants, in Miskolc, makes electric drives for such bikes and exports them to 70 different bicycle manufacturers around the world. When soldering the components for the latest generation of e-drives, nitrogen from Messer provides the necessary inert atmosphere.

Kriszta Lovas, Messer Hungarogáz

CO₂ neutralises fibrous wastewater

France | The chemical company Solvay produces polyamide fibres at its site in Valence, southern France. The process generates alkaline wastewater. Solvay uses CO₂ from Messer to neutralise them. Carbon dioxide forms carbonic acid in the liquid and thus lowers the pH value to

the desired level. This is done in an environmentally friendly way and without forming additional salt, as opposed to the use of mineral acids. The high quality and highly resistant polyamide fibres are used, among other things, in the textile, furniture and automotive industries.

Caroline Blauvac und Florian Follut, Messer France



Photo: Bosch

Everything for cutting and welding

Serbia | Messer has delivered a cutting machine to Alfa Technics and installed a gas supply system for welding high and low alloy steels at the metal-processing company's new production facility in Svilajnac. In addition, an agreement has been signed regarding regular deliveries of liquid argon. The cutting machine – an OmniMat 6000 – features a 400-amp

plasma torch for bevel cutting, an ALFA oxyfuel torch, a marking tool and a drilling unit with a changer magazine. The gas supply system has more than a hundred withdrawal points. Alfa Technics' product range includes conveyor systems and assembly lines for the automotive industry.

Branka Malidžan, Messer Tehnogas

Round-the-clock service covering every aspect of industrial gases

Easier access to information about gases and their applications, a simplified gas purchasing process and straightforward stock management – at work or on the go.

Messer's E-Services are a helpful tool that effectively complements our personal support offerings.

Clear functionality and operation were particularly important to us in designing and developing our E-Services. As in every-day working life, excellent service is geared to the needs of customers. We therefore designed and refined a program for

electronic helpers based on numerous customer surveys. We have made it available for electronic data interchange (EDI) in the form of apps, on our website and via the data interface of the Messer planning systems.

Editorial Team

E-Connect

Our gases combine with each other – and we follow their example. Our EDI solutions involve our ERP system corresponding with those of our customers and dealing with the paperwork. The processes and data formats are defined once only, after which the systems automatically exchange orders and delivery notes, invoices and payment instructions, as well as quality certificates and many other documents.

E-Order

Online ordering is popular because it provides customers with a convenient, straightforward and quick way of performing traditional purchasing tasks. Messer's E-Order service offers the online option for repeat orders: Simply select the product and quantity and place the order electronically. This can also be done via the E-Order app, anytime and anywhere, for instance during a works tour or on site.

E-Invoice

Companies have a duty to act in accordance with the principle of sustainability. If all the paper invoices sent by Messer every year were stacked on top of each other, the result would be a paper tower 500 metres high. Our E-Invoice is sent by environmentally friendly email, besides which customers have access to their personal invoice portal via a personalised web page. Invoices can be imported directly into the customer's ERP system in XML format. They even have the option of accessing electronic order confirmations, delivery notes or rental documentation.

E-Stock

If a Messer gas cylinder has an own barcode, it is scanned at the time of filling, delivery, return and quality control. E-Stock makes this data available to our customers as individualised reports or in the form of statistics. That means they know the precise current status of every single cylinder in stock.

E-Monitor

Manufacturing companies that use gases in the manufacture of their products need to monitor the fill level of gas tanks. E-Monitor also provides answers to questions regarding the current stock of Messer gases, when the tanks were filled and whether gas consumption is continuous. Our customers get the information online as individualised reports and in the form of statistics – with the option of text message notification if they so wish – in order to avoid supply bottlenecks.

myLab

myLab is Messer's customer portal designed to help our customers manage their lab gas stocks. Certificates and safety data sheets for individual gas mixtures as well as specifications for standard gases can be easily downloaded or managed online. It is clear at a glance which of the calibration gases' stability period will expire soon or has already expired. They can then be easily reordered with one click.

E-ccts

The barcode on each gas cylinder offers even more advantages: E-ccts (Customer Cylinder Tracking System) also allows our customers to track the movements of ordered cylinders within their company. In this way they can be sure of complying with legal requirements.

All E-Services at

<https://www.messergroup.com/service>

Gases for laser cutting

Czech Republic | Metal Production, a family business based in Hostěradky-Rešov in Southern Moravia, manufactures steel structures, machines, vehicle bodies and trailers. An LVD laser cutting machine was installed last November to meet the growing need for metal die cutters for in-house production. The gases required to operate the machine are supplied by Messer. One of them is oxygen for laser gas-jet cutting of structural steel; the other one is nitrogen for high-pressure laser cutting of aluminium and stainless steel.

Jan Kašpar, Messer Technogas

Demonstration of triple savers

Bosnia-Herzegovina | In November Messer experts held a workshop at Mostar-based steel processing company SIK to demonstrate the advantages of ternary mixtures. They were supported by colleagues from neighbouring Serbia. The theoretical part of the workshop provided an explanation of the basics while the subsequent practical part involved the use of workpieces to demonstrate the application of the triple savers. With SIK already using the mixtures, the training workshop proved to be of great practical relevance.

Ana Perić, Messer BH



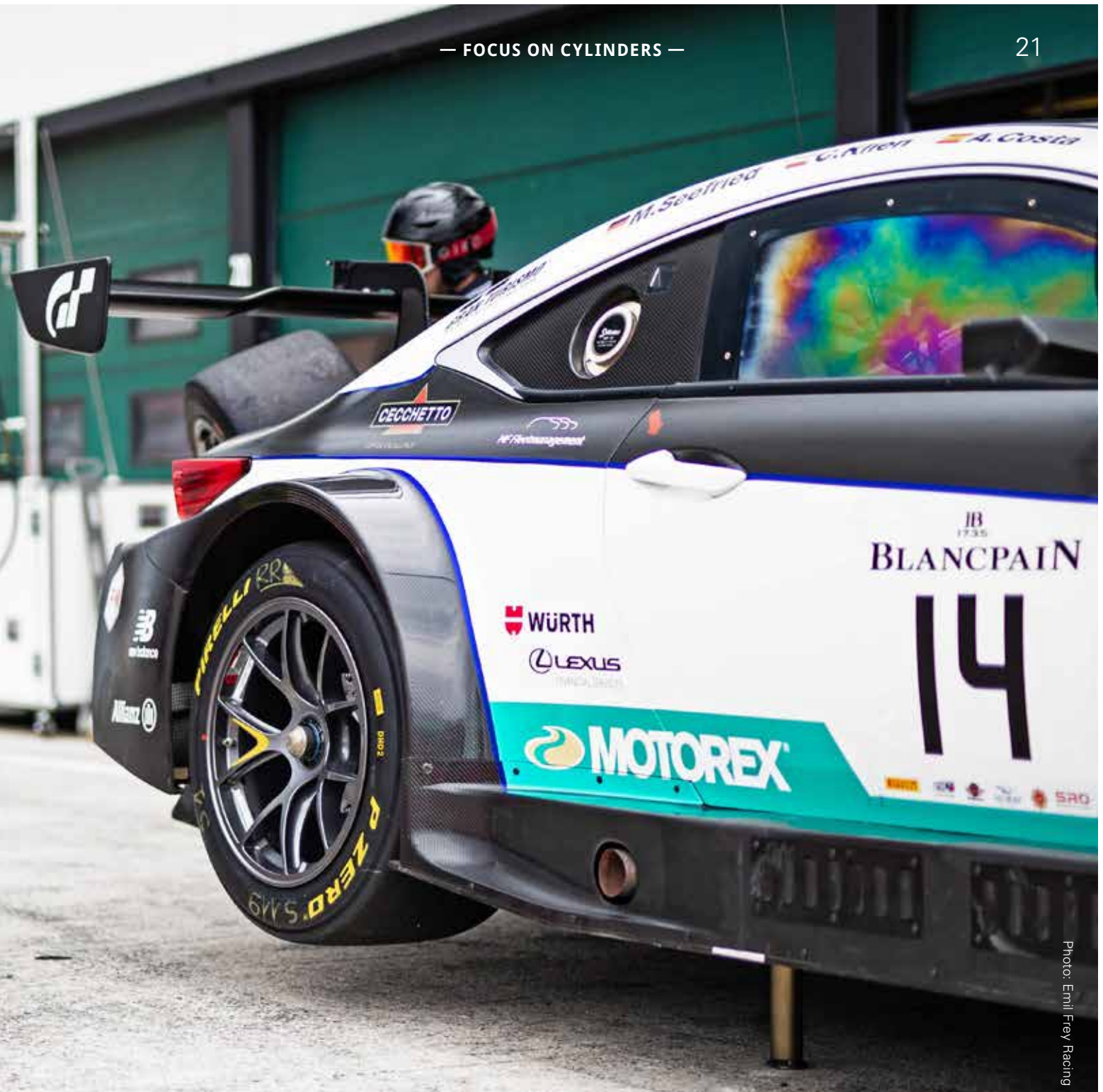


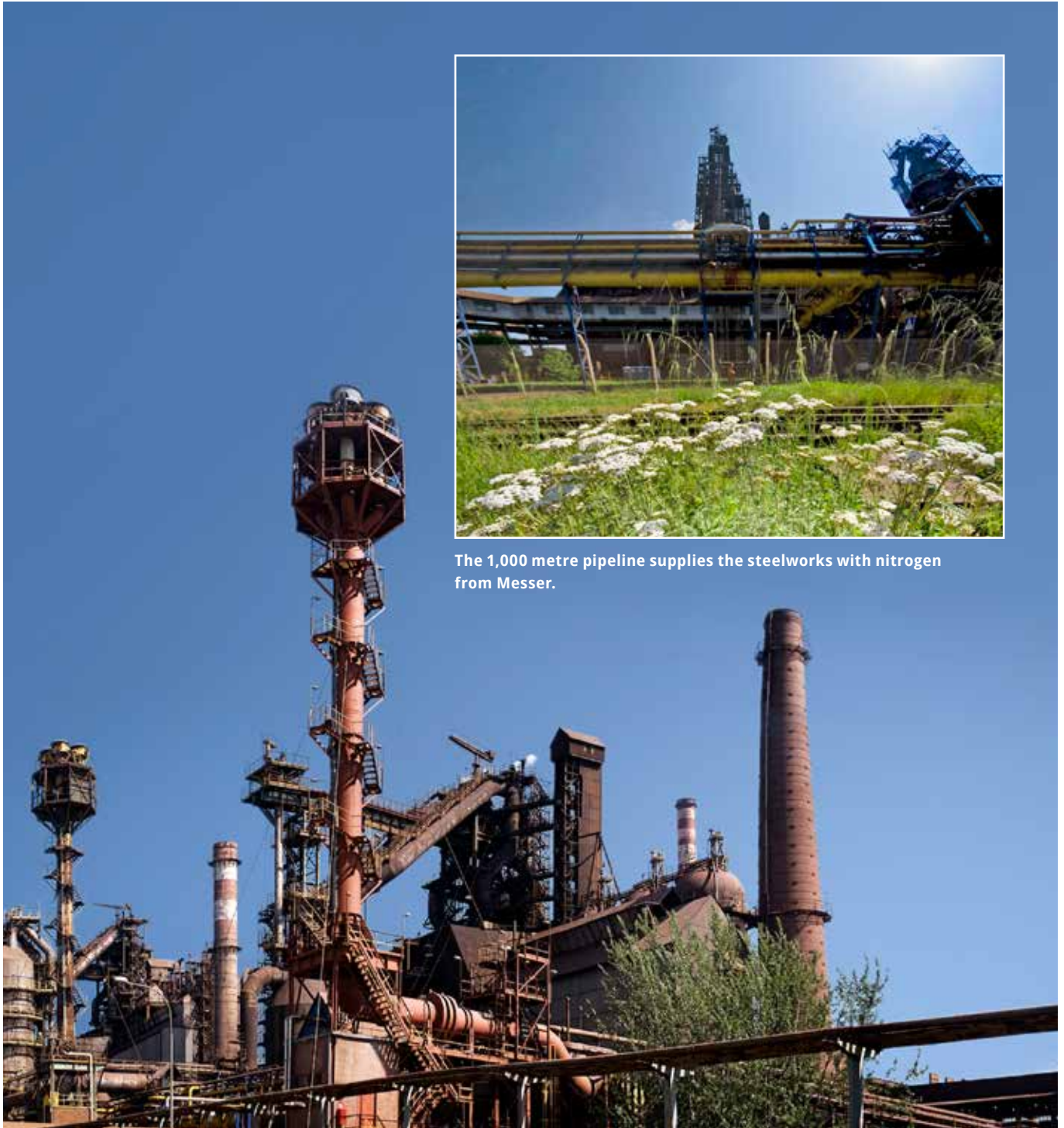
Photo: Emil Frey Racing

Fast tyre change

Switzerland | Speed is of the essence during a Formula 1 tyre change, and it is no different in the Blancpain GT Series. Swiss team Emil Frey Racing competed in last season's series with an in-house developed Jaguar and two Lexus RC F GT3. These racers have built-in "legs" which are extended using compressed air when the car needs to be jacked up. The compressed air is supplied by mobile stations that were built with support from Messer. The stations also supply compressed air to the pneumatic wheel guns that are used for changing tyres. In addition, the team uses Messer's Ferroline and Inoxline welding gases.

Reiner Knittel, Messer Schweiz

Speed is of the essence during tyre changes. The built-in "leg" lifts the car using compressed air.



The 1,000 metre pipeline supplies the steelworks with nitrogen from Messer.

A new nitrogen application

Serbia | Messer has installed a pipeline over 1,000 metres in length to provide a direct nitrogen supply to HBIS Group Serbia's steelworks in Smederevo in future. The gas is used to remove rolling emulsion in the cold-rolling mill. The emulsion consists of a mixture of lubricating oil and water and reduces friction between the roller and the steel strip. It also has a cooling function, thereby protecting the surface of both

the rollers and the sheet steel. The nitrogen blows it off the surfaces with a pressure of 7.5 bar, at the same time preventing unwanted oxidation. The nitrogen is produced as a by-product in two Messer air separation units located in the immediate vicinity, which already supply the steelworks with oxygen.

Branka Malidžan, Messer Tehnogas

Gases for tough ball bearings

Romania | Ball bearing manufacturer Koyo Romania uses nitrogen and ammonia from Messer as well as propane to enhance product quality. Nitrogen is used as the base gas, and together with ammonia and propane the process is called carbonitriding. In this heat treatment process, nitrogen and carbon – from ammonia and propane respectively – penetrate into the heated steel. Carbonitriding gives the material a good

balance of hardness and toughness. This results in a longer product life. Moreover, the ball bearings run more “smoothly” than they would without this treatment. Messer has also installed the supply system for all the gases at Koyo’s facility. The high-quality bearings are sold to the automotive industry, among others.

Carmen Bărăgan, Messer Romania Gaz



Dry ice for clean recycling

Switzerland | End-of-life steel elements from the structural and civil engineering sectors are a valuable raw material. Before the material can be melted down for recycling, any surface impurities such as paints or lacquers must be removed. PSB Umweltservice, a company based in the town of Stockach, carries out this kind of cleaning work in a controlled atmosphere using dry ice blasting machines from ASCO. This ensures an efficient and environmentally friendly process. No additional detergents are required, and there are no chemicals or contaminated wastewater to dispose of.

David Oehler, ASCO KOHLENSÄURE

Dry ice blasting in a controlled atmosphere

A glimpse inside the volcano

Gas-filled ionisation detectors can be used to detect the presence of subatomic particles and their trajectory. Hungarian particle physicists are using them to survey such things as the magma chamber of Sakurajima.

Volcanic eruptions cannot be predicted, because it isn't possible to look inside the potentially fire-breathing mountain. At least, it wasn't until now. Scientists have recently developed a prototype of a kind of geological "X-Ray camera" (muon detector) that's capable of doing just this. The device consists of particle detectors that use cosmic rays instead of x-rays. It's currently being tested on the Japanese volcano of Sakurajima that has minor eruptions on a near weekly basis.

Super-fast muons

X-rays can only be used to image objects in the 1-100 centimetre range, as their energy is insufficient to penetrate mountains. Particles from outer-space bombard the earth's atmosphere generating subatomic particles, so-called muons. Several hundred of these negatively charged subatomic particles arriving from all directions strike each square metre of the earth's surface per second. They travel at close to the speed of light and are able to pass through even thick layers of rock.

As with x-rays, the particles passing through the volcano may be absorbed depending on the density of the rock. The detectors positioned behind the mountain can measure the trajectory of the particles passing through. An image of the volcano can be generated from a directional count. Thanks to the outstanding resolution of the technique, it's even possible to determine the size of the magma chamber.

This muon detector consists of gas-filled ionisation detectors. The individual detectors are filled with gas that gets ionised by the high-energy particles that travel through it. The dissociated electrons are collected and multiplied using a powerful electric field. This allows the trajectory of the individual particles to be determined.

Welding gas for cutting-edge research

The detector comes from the Department for High-energy Physics at the Wigner Research Centre of the Hungarian Academy of Sciences. One of the fields they specialise in is developing such particle detectors. "We set up the device about three kilometres away from Sakurajima", explains physicist Gergő Hamar. "The images of the interior of the mountain have a resolution of less than one degree. That means that we can observe very small spatial changes, for instance, of the magma chamber." Particle physicists and geologists are working together on this innovative method of mapping the volcano. They hope that the new surveying technique could be used as an early warning system in addition to providing a greater understanding of eruptions.

The quality and composition of the gas mixtures used in gas-filled particle detectors can be paramount. In this case, it was important that the gas used in the detectors be non-toxic, economical and available in large quantities. It was decided to use a standard mixture of CO₂ and argon: Ferroline C18. It provides for outstanding functionality even at a consumption rate of around just two litres per hour.

This welding gas is easy to handle and enables sufficiently good results to be achieved outdoors during the tropical summers and cold winters. Long exposure times are necessary in order to capture the relatively few muons coming from the right direction, which makes the stability of the system of critical importance.

In their laboratories in Hungary and when conducting fundamental research – such as at CERN in Geneva – the scientists use speciality gases instead. Detectors for counting particles or recording individual electrons require special high-purity gas mixtures. Messer supplies gases such as argon, helium, neon, krypton, CO₂, methane and nitrogen to the academic institutes too.

Kriszta Lovas, Messer Hungarogáz



The Sakurajima volcano



Efficiency and quality improved

Shiming Zhu, engineer at **Hubei Hangjia Magna Seat System**

What does your company produce?

As a joint venture between automotive suppliers Magna and AVIC Hubei Aviation, we specialise in the manufacture of vehicle seats. Our customers include GAC Fiat and Geely, the largest private car manufacturer in China.

How much technology goes into a seat?

The seats can be adjusted in many different ways. Additional support can be added to the lower back. Contours and materials are selected with a view to spreading the passenger's weight as evenly as possible so as not to obstruct the blood circulation and to prevent the limbs from "going to sleep". Plus, of course, the seats are also designed for maximum safety.

Which gases do you use in production?

We use Ferroline C20 for robotic MAG welding of the seat frames as well as for manual welding when carrying out repairs.

How important is gas quality?

It has a considerable influence on the strength of the welded joint as well as the appearance of the weld.

What support do you get from Messer?

The gases we get are of a consistently high quality. Our welders have been trained by Messer, and this has contributed to improved quality in our welding processes. Messer also installed the gas supply system and sees to it that regular inspections and maintenance are carried out. They have helped us to streamline cylinder handling, increase welding efficiency and make production even more reliable.

What other expectations do you have of your gas supplier?

The development of new gas mixtures that will help us make further efficiency improvements and reduce costs.

Jasmine Yan, Messer China



Win a delicious prize

Simply answer our question about this issue of “Gases for Life” and win a food hamper with seasonal specialities:

In which city was the new competence centre opened?

Please send the correct answer by e-mail with the subject line “Gases for Life Competition” to:

angela.bockstegers@messergroup.com The deadline is 30 June 2019. Please include your name and address. The competition is unfortunately not open to employees of the companies of the Messer Group and their families. In the event of multiple correct answers, a draw will determine the winner. The result of the draw is final and not subject to appeal. By registering to take part in this competition, you consent to your name (first name, surname) as well as your place of residence (town, country)

being published in the next issue of Gases for Life, should you win. The participant is responsible for the accuracy of the information provided. No liability is assumed in connection with the publication of the name.

Congratulations!

The winner of the competition in issue 26 is **Merche Bikandi Jausoro** from **Vitoria-Gasteiz, Spain**. The correct answer was: “2004”



The “Gases for Life” editorial team

From left to right: Diana Buss, Annette Lippe, Dr Joachim Münzel, Angela Bockstegers, Marion Riedel, Zsolt Pekker and Kriszta Lovas (not pictured: Dr Christoph Erdmann, Marlen Schäfer, Reiner Knittel, Benjamin Auweiler, Johanna Mroch, Michael Holy, Dr Bernd Hildebrandt, Lisa-Marie Fierus, Dr Milica Jaric, Roberto Talluto)

Correction: In Issue 26, the answer to the competition question in Issue 25 was erroneously given as “John F. Kennedy”. The correct answer is “Edward Kennedy”.

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Steel symbol restored

It's a Slovenian tradition that every true Slovene should climb Mount Triglav. At the summit of the country's highest mountain, he or she can get temporary shelter from bad weather in the Aljaž Tower – or Aljažev-Stolp in Slovenian. The cylindrical structure was erected in 1895 on the initiative of Jakob Aljaž, a priest from the village of Dovje, and has been a national symbol ever since. Over time the inhospitable alpine environment

has taken its toll on the original galvanised sheet metal construction. Following an initial overhaul in 1922, another one was due in 2018. The bivouac was dismantled and transported by helicopter to metalworking firm Kov in Jesenice. Messer supplied the inert welding gases and took part in the restoration by providing technical support. Three weeks later the tower was put up again on the summit.

Edvard Bjelajac and Alenka Mekiš, Messer Slovenija

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