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MESSER Gases for Life

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Gases for Life

The industrial gases magazine

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USING GASES

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Dear Readers,

The year 2018 – marking the 120th anniversary of our company – is drawing to a close. Looking back, I have fond memories of the many initiatives that enabled us to show how fit Messer is at 120. I am particularly pleased about our employees' involvement: their efforts and enthusiasm really brought these events to life in a wonderful way.

The outlook for the future is also very positive. Our business development in the current year can be given an unreservedly positive assessment. Ahead of us lies an exciting time when Messer will once again demonstrate its characteristic flexibility and responsibility in taking up new challenges.

Against this background, it is good to know that Messer will continue to be a family concern in the best sense of the word: my son Marcel and my son-in-law Cédric Casamayou are already actively involved in Messer and thus represent our family firm's fourth generation.

I wish you a happy and, above all, peaceful Christmas. The latter, in particular, seems all the more important at a time of social and international political uncertainty. I hope you have a positive and healthy start to the new year, and I look forward to welcoming you back as Gases for Life readers in 2019.

Stefan Messer
CEO and owner of Messer

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Natural CO_2 to meet growing demand

Hungary | Messer has successfully completed the construction of its third CO_2 production facility in Ölbő. High-purity carbon dioxide is extracted from a local natural source. The source itself lies at a depth of around 2,000 metres. The gas is supplied primarily to the beverage industry in Hungary and in neighbouring countries. To satisfy their rapidly growing demand, original output at the site has now been tripled. Besides extraction from natural sources, CO_2 is often obtained as a by-product of processes in the chemical industry, after which it is purified. Natural CO_2 has a high level of purity in comparison and can be obtained independently of other industrial processes. The facility in Ölbő is therefore one of the most reliable sources of CO_2 in Europe.

Mónika Zimányi-Csere, Messer Hungarogáz

Oxygen for African catfish

Czech Republic | This autumn, the agricultural company Mžany started operation of a modern aquaculture system featuring recirculating technology for fish farming at a disused cow farm in Stračov. Mžany is using it to farm African catfish, a species particularly well suited for aquaculture. In order to create optimal living conditions for the fish, the water is continuously enriched with pure oxygen supplied by Messer. The fish-farming technology being used for this purpose was developed in the Czech Republic.

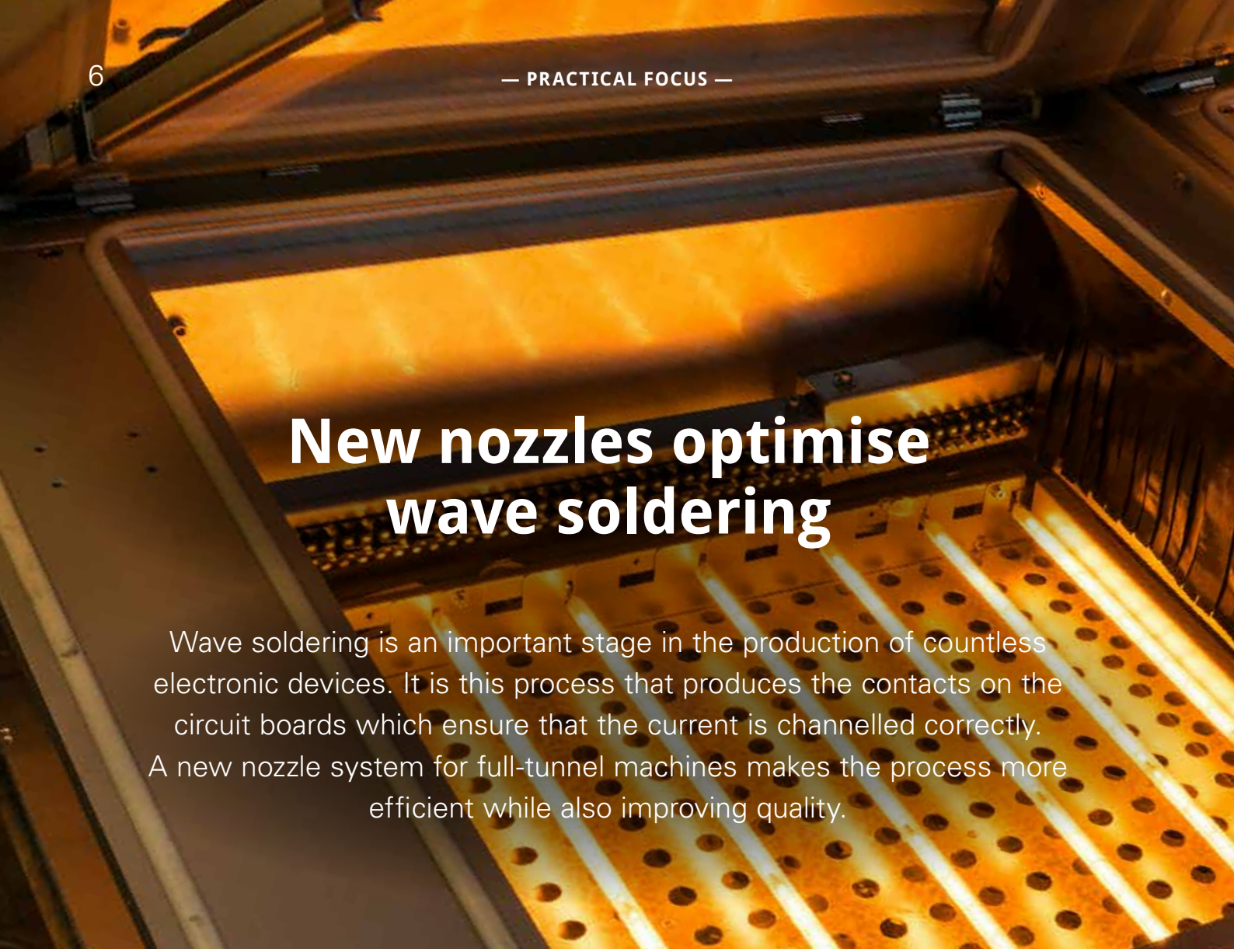
David Bek, Messer Technogas

Cold cement for mobile tower factory

Thailand | International construction company Max Bögl uses a cement cooling technique developed jointly with Messer in the construction of wind turbine generators. The company's subsidiary, Max Bögl Wind AG, has developed a mobile production facility for tower elements that enables the wind turbines to be installed quickly and with consistent quality. It is set up at each installation site. This significantly reduces the number of delivery trips made by heavy trucks.

With hub heights of up to 180 metres, the elements have to meet very high quality and safety requirements. Max Bögl relies on cement cooling to mix particularly stable concrete. Cryogenic liquid nitrogen is added when transferring the cement from the delivery trucks. The gas vaporises in the process and enters the silos along with the cement, continuing to cool the material. This ensures that the optimal temperature range is maintained during subsequent mixing of the concrete. The first production unit was put into operation in Huai Bong in Thailand, where the construction company is currently producing and assembling 90 wind turbine generator towers for the large-scale Korat Wind Farm project. The mobile factory can produce almost three towers a week. Messer in Thailand has installed a 50-cubic-metre tank for this purpose and is supplying the liquid gas.

Nawin Watanakitti, Messer Thailand, and Jens Tauchmann, Messer Group



New nozzles optimise wave soldering

Wave soldering is an important stage in the production of countless electronic devices. It is this process that produces the contacts on the circuit boards which ensure that the current is channelled correctly. A new nozzle system for full-tunnel machines makes the process more efficient while also improving quality.

A pump ensures that the glistening, silvery liquid solder flows over a small barrier. This produces the wave, which is actually a stationary flow – a strangely beautiful sight in an otherwise rather prosaic technical environment. The circuit boards are conveyed on frames at a shallow angle and have their underside wetted as they move over the tin hump. The contact pins on the electronic components protrude through the board from above and into the flowing solder. Small quantities of it adhere to the intended points and ensure electrical contact.

Oxygen forms dross

Dross is oxidised solder. It reduces adhesion as well as conductivity and may result in the production of rejects rather than properly functioning circuit boards. It also uses up solder. In order to prevent all this, wave soldering usually takes place in an inert nitrogen atmosphere. The residual oxygen level (ROL) should remain below 800 ppm wherever possible.

In order for full-tunnel wave soldering machines to serve their purpose, the circuit boards have to enter and leave again. The tunnel is not hermetically sealed. Nitrogen is therefore constantly fed into it. Flexible vertical blinds at the entrance and exit minimise the unavoidable loss of gas.

Measurements taken in machines that were in operation have shown that the residual oxygen value (ROL value) increases as they get older, often exceeding the limit of 5.000 ppm. This is largely due to a build-up of dirt, potentially leading to blockage of the nozzles that are used to feed the inert gas into the unit. In addition, most of them were not optimally placed, generating undesirable currents in the gas flow. With the inert gas flowing into the unit also being cold, it was not uncommon for flux residue and dross dust to condense on the injection nozzles.

Inert gas where it is needed

A new nozzle system from Messer avoids these problems. The gas is conducted through a square profile in the nozzles, thus producing an even flow without turbulence. The nitrogen is no longer introduced at the inlet and outlet. Instead, the main point of entry is now the wave section above and below the printed circuit board, where the inert atmosphere is needed most. In addition, the gas is heated before being injected. New measurements show that the targets that were set have

Photo: Kurtz Ersa

View of the inner workings of a Powerflow wave soldering machine

been achieved: The risk of dirt build-up has been reduced and inerting is now possible regardless of its extent. This allows the ROL value to be stabilised and dross to be significantly reduced. Furthermore, nitrogen consumption can also be reduced, but here the condition of the unit plays a part.

International automotive supplier Flex's Hungarian operation in Zalaegerszeg is one of the first users of the new technology. The facility had experienced an increase in maintenance due to solder spatter on the soldering frame, causing difficulties in usage of this frames. This problem has dramatically reduced since the new nozzle system was installed. The ROL value is lower, dross formation reduced by 30 to 50 per cent; cleaning and maintaining the unit now takes much less time.

Jens Tauchmann, Messer Group

Diverse capabilities

Electronic components are used in a wide variety of products and have one thing in common: the electrical connection is established by soldering. Modern soldering methods would not be possible without gases, as can be seen from the following examples.

- In the Romanian city of Iaşi, Romanian-German company EMS-ELECTRA produces electronic assemblies for household appliances and industrial electronics, using nitrogen for the selective soldering of components.

- The products manufactured by Elrad International in the Slovenian town of Gornja Radgona are used as components in hand tools and cars, among other things. The company also uses nitrogen to ensure an inert atmosphere during soldering.

Leader in ventilation technology

Slovakia | Messer supplies Technov Rumanova with liquid nitrogen in a cryogenic tank as well as oxygen 3.5 and welding gases for the production of ventilation and air conditioning systems, which have seen a massive boom in demand in recent years. Technov, one of the leading suppliers in Europe, possesses the hygiene certificate issued by the ILH air hygiene institute in Berlin. The recent construction of a new production facility has created more space for state-of-the-art laser cutting technology.

Michael Holy, Messer Tatragas

Convenient all-round service

Belgium | Messer provides customers in Belgium with an automated cylinder tracking system and monthly all-inclusive billing. This system offers great benefits, particularly for building contractors who use cylinder gases for welding and cutting at numerous construction sites. The cylinders are recorded in the system using bar codes, allowing their location to be identified at any time. This considerably reduces the number of unreturned cylinders, in turn lowering costs. The customer receives a total monthly bill that covers the recorded consumption of gases as well as all associated services such as transport or cylinder rental.

Customers benefit greatly by knowing the exact purchase price in advance and not having to wait for the bill before being able to invoice their own customers. All documents, such as invoices and delivery notes, are sent to customers in digital format.

Ilse Van de Velde, Messer Belgium

When developing its digital cylinder tracking system in Belgium, Messer cooperated with SPIE, a multi-technology service provider for building systems, facilities and infrastructure. Paul van Hove (SPIE), Gregory Robberechts, Victor Riga and Yves Flamand (Messer Belgium, l. to r.) were in attendance for the system's introduction at a new construction site.

Tran Thi Thuy

Tran Thi Thuy (34) is a cylinder gas dispatcher in the logistics department of Messer in Hải Phòng. She has been working for the Vietnamese subsidiary for ten years. She is married and the happy mother of a five-year-old daughter.

1. What has been your greatest success at Messer?
In my time here, there hasn't been a single significant accident in connection with the delivery of our products.

2. What would you say is a must-see for anyone visiting your country?
Hoi An at night is a beautiful sight, when the river and the old town are covered in lanterns. Ha Long Bay in the north of the country boasts wonderful scenery.

3. What three things would you miss least?
The circumstances accompanying our country's rapid development: the unbelievable traffic in Hải Phòng and the associated noise and air pollution.

4. Which famous person would you like to spend an evening with?
The singer Mỹ Tâm. I love her voice and her songs.

5. What else would you like to learn or study?
I want to learn to cook even better. I love good food and like the feeling of having prepared it myself.

The return of the family

For the sake of the family name: as the grandson of the company founder, preserving the tradition of his forefathers and accepting managerial responsibility is something Stefan Messer takes for granted. However, before it was his turn to take over at the helm, there was a turbulent interlude during which the company experienced what was probably the worst crisis in its history. He initiated the completely fresh start that laid the foundations for the Messer Group as we know it today, an owner-managed family concern. They have proved to be eminently viable, thereby enabling steady and healthy growth.

After leaving school in 1973, Stefan Messer embarked on a very varied period of learning and travel lasting a number of years. This took him across half the globe doing many different jobs before eventually taking on positions of responsibility at Messer Griesheim. When his father Hans retired in 1993, Stefan Messer was the Managing Director of the Dutch subsidiary. Later on he went to France in order to bring the local subsidiary out of the red. By then the family had already chosen him as their representative in the executive management.

Meanwhile, Herbert Rudolf was appointed CEO of Messer Griesheim, the first time that someone from outside the family had held this position. He had previously been in charge of the company's American operations. Rudolf prescribed an aggressive course of globalisation, which ultimately ended in failure. Numerous acquisitions and start-ups abroad, some of them highly risky, led to exorbitant debt without achieving the increase in earnings that had been targeted. At the end of 1999, the shareholders – the Messer family and the Hoechst chemical group – decided to terminate Rudolf's contract.

They replaced him with Klaus-Jürgen Schmieder, the then CFO of Hoechst. He managed to steer the ship back into calmer waters. However, this involved Schmieder and Stefan Messer having to come to an arrangement with new owners. The Hoechst group had been focusing on life sciences since 1994 and made several attempts to dispose of its two-thirds majority in Messer Griesheim. Following the repeated failure of discussions with various interested parties, the shares were finally bought by financial investors Goldman Sachs and Allianz Capital Partners in April 2001.

Stefan Messer, who continued to hold senior positions within the company, had made it clear that he wanted to maintain the family's influence in the group over the long term. In 1999, he bought Hoechst's shares in the Messer Cutting & Welding subsidiary for the family. A year later, with the backing of an American financial investor, the company took over Swiss welding specialist Castolin Eutectic. Within just a few years, the group became one of the main pillars of the family concern as Messer Castolin Eutectic.

Restructuring and new beginning

Restructuring and easing the debt burden were the top priorities for Messer Griesheim after the millennium. Investments were sold and the focus placed on selected core regions. The 'slimming diet' was having the desired effect, and the investors wanted to make money. Part of the family, led by Stefan Messer, now decided to take control of the company back into their own hands. 2004, they purchased the Goldman Sachs and Allianz shares and formed the Messer Group, which henceforth operated under the direction of Stefan Messer. To make this transaction possible, the family sold its gases business in Germany, the USA and Britain to a competitor. Since May 2004, Messer has been wholly owned by the family again, as has Messer Eutectic Castolin since the beginning of 2005.

There were two main strategic objectives at the outset: independence in terms of product supply and cautious growth in the core markets. In several regions of Europe, Messer was not yet in a position to supply its own gases. It was necessary to resort to competitors' products to meet customer requirements. For this reason, in 2007 alone, eleven new air separation units were in the planning stage or already under construction. Considerable funds were also being invested in China, which had become a driving force of the global economy with absolutely spectacular annual growth rates. Initially, on-site air separation units for steel companies were the main focus of activity, with business also expanding into the food, chemical and electronics sectors soon afterwards.

Return to the German market

The German industrial gases market was largely saturated, with the two industry giants – Air Liquide and Linde – calling the tune. Moreover, an agreement reached when the German business was sold meant that no gases could be sold

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1989

Stefan Messer becomes Managing Director of Messer Griesheim Nederland B.V. and builds up the gases business there

1993

The financial figures for 1992 have a sobering effect with a 4.2 per cent drop in sales

1995

Entry into Chinese market and rapid expansion

there under the brand name Messer until 2008. Stefan Messer therefore set up Gase.de Vertriebs-GmbH in 2007, with its headquarters in Sulzbach near Frankfurt. The company got its products from abroad and distributed them from the logistics centre in Siegen, primarily to customers in the states of Hesse, North Rhine-Westphalia, Baden-Württemberg and Saarland. In November 2007, Gase.de pulled off a remarkable coup in gaining Deutsche Edelstahlwerke as its first major customer.

When Gase.de became Messer Industriegase GmbH in May 2008, Stefan Messer was at the same time able to announce the company's second major customer in Germany: the new Messer company invested 50 million euros to supply Salzgitter Flachstahl GmbH with oxygen through a pipeline system for at least 15 years. With two key accounts and over 150 new cylinder gas customers, the company got off to a flying start. 100 tank facilities were installed at customer sites, while 16 sales partners ensured an extensive supply of cylinder gases.

1998

Stefan Messer is appointed to the management team of Messer Griesheim GmbH

2001

Goldman Sachs Funds and Allianz Capital Partners buy Hoechst's shares (Aventis)

2004

Messer Group GmbH founded: Messer is wholly owned by the Messer family again

Having benefited from a flourishing world economy up to that point, the Messer Group suddenly found itself in a much harsher climate in 2008. The global financial and economic crisis meant the group had a particularly difficult year in Central and Eastern Europe with its numerous customers in the steel and automotive industries. By contrast, the business picture was better than expected in Western Europe, where customers were spread over more sectors and total sales remained at the previous year's level. Furthermore, expansion in the German market had created a certain buffer against the crisis. In 2009, an even more important factor was the strong presence and economic success in China. The Messer Group profited considerably from a new joint venture with steel producer Panzhihua Iron & Steel, leading to three new production facilities for industrial gases. At the final count, the consolidated balance sheet was in the black, so there was no question of a serious crisis. However, the welding & cutting segment, which is Messer Castolin Eutectic's sphere of activity, was hit by the full force of the crisis along with the metal industry. This group's total sales shrank by about a third.

The shock of the recession did not last long, however, and was soon replaced by a phase of growth that has continued to this day. Messer continued to consolidate its good market position in China and began construction of its first on-site facility in Vietnam. The upturn in Western Europe was facilitated by a positive business climate in Italy, Spain and especially Germany. In 2011, the Messer Group achieved sales of over one billion euros for the first time.

New headquarters

In 2008, not far from Sulzbach, where the head office was located at that time, Stefan Messer purchased a property from Deutsche Bahn at the historic station in Bad Soden. The new headquarters for the company and the Messer family's two foundations were built there over a period of three years. For the first time, the management teams of Messer Group and Messer Eutectic Castolin Group were brought together under one roof. Next to the five-storey office building, the Adolf-Messer-Forum was built as a modern event centre. The same building houses a permanent exhibition on the history of the company as well as on the theme of industrial gases. In 2013, Messer had the historic station building renovated and turned into the Messer Lounge, which can be used for family celebrations, weddings or corporate events.

Growth markets

In China, the Messer Group continued its expansion and diversification strategy. In order to be less dependent on major customers in the steel industry, Messer started looking for new stable partnerships with companies in other industries.

In 2015, for example, a new plant for the production of specialty gases was put into operation in the eastern Chinese

Continued on page 14

2005

The Welding and Cutting division is wholly owned by the Messer family again

2006

Messer Group and Messer Eutectic Castolin exceed billion euro sales mark. Expansion of activities in Europe and Asia

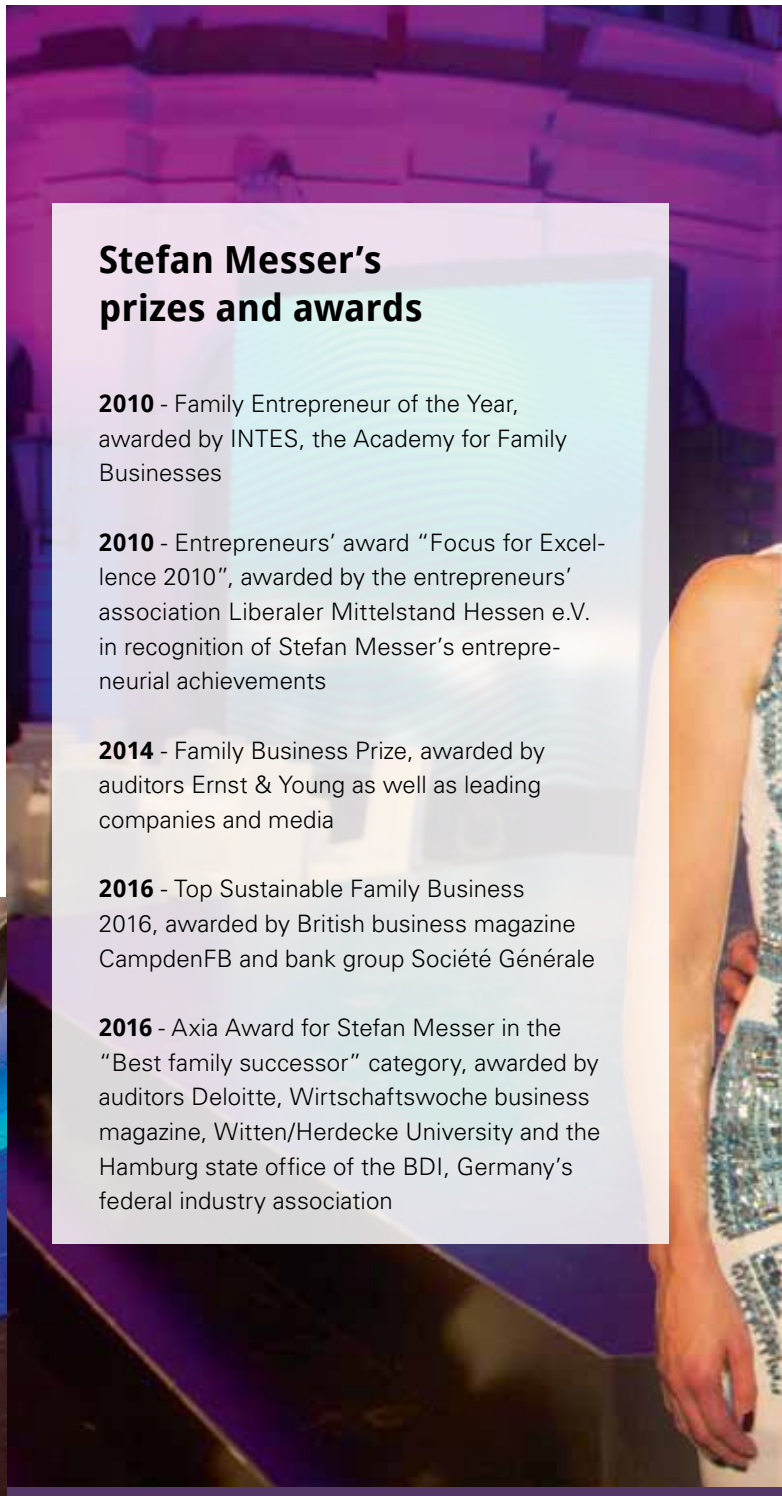
2008

Messer Industriegase GmbH founded in Germany

city of Suzhou. In the recent past, there has also been increased investment in the ASEAN countries, with a particular emphasis on Vietnam. In 2016, Messer put its third on-site unit into operation for Vietnamese steel producer Hoa Phat, with a fourth one under construction. Another two will go into operation at the new steelworks in Dung Quat in 2019. New partners have also been found in other industries. In 2016, Messer built a nitrogen production facility for Samsung in Hanoi. In 2017, Messer acquired a majority stake in Malaysian company Universal Industrial Gases (UIG). Sales companies have been established in Thailand and Indonesia.

In Western Europe, growth has been moderate in line with the general economic trend. The group pursues a niche market strategy and only has a small market share in the big markets. In Eastern and Southeastern Europe, the Messer Group continues to be well positioned in many small markets. It continually invests in the construction of new production facilities and operates very profitably as the market leader in several countries.

Dr Jörg Lesczenski



Stefan Messer's prizes and awards

2010 - Family Entrepreneur of the Year, awarded by INTES, the Academy for Family Businesses

2010 - Entrepreneurs' award "Focus for Excellence 2010", awarded by the entrepreneurs' association Liberaler Mittelstand Hessen e.V. in recognition of Stefan Messer's entrepreneurial achievements

2014 - Family Business Prize, awarded by auditors Ernst & Young as well as leading companies and media

2016 - Top Sustainable Family Business 2016, awarded by British business magazine CampdenFB and bank group Société Générale

2016 - Axia Award for Stefan Messer in the "Best family successor" category, awarded by auditors Deloitte, Wirtschaftswoche business magazine, Witten/Herdecke University and the Hamburg state office of the BDI, Germany's federal industry association

2011

Move to joint headquarters in Bad Soden – all the companies of the Messer World are under one roof for the first time

Stefan Messer with host Judith Rakers at the "Entrepreneur of the Year" award ceremony

Personal life

In 2008, in the midst of the global economic crisis, Stefan Messer was diagnosed with tongue cancer. The search began for appropriate treatment methods. There were extremely painful medical procedures, a number of relapses, and a complicated but ultimately successful operation. "I never expected to get such a serious illness. Perhaps it was my body reacting to the great strain that I was exposed to during the whole restructuring of Messer. It brought home to me just how important your health is."

In 2012 Stefan and Petra Messer divorced by mutual consent: "It was an amicable separation, so there was no impact on everyday business. We are still on good terms," Stefan Messer emphasises.

In 2015 he married Jenjira Najaroen and the following year the twins were born – Matteo Alexander and Moritz Stefan.

The family is currently in the process of preparing to pass on responsibility for running the business to the fourth generation. Stefan Messer's son Marcel (b. 1988) studied business management at the European Business School in London before doing his Master of Finance at the Frankfurt School of Finance and Management and going on to work for international asset manager Black Rock in London. Since May of last year, he has been working for Messer and getting to know the gases business from the ground up. Son-in-law Cédric Casamayou, who also has a Master of Finance degree, now works in the Group Finance Department following a two-year stint in the operational side of the business in Belgium. Daughter Maureen looks after the charitable foundations (Adolf Messer Foundation and Dr Hans Messer Social Foundation).

2014

Tenth anniversary of Messer Group GmbH

2017

Expansion of ASEAN business and signing of a joint venture agreement with UIG in Malaysia

2018

Messer's 120th birthday

Reducing the carbon footprint

The conventional use of coal as an energy source leaves quite a large carbon footprint. In Poland, much is being done to make coal environmentally compatible through green technology.

Poland is Europe's largest exporter and second largest consumer of hard coal. 80 per cent of the country's electricity is generated by coal-fired power stations. In the short and medium term, the country has practically no alternative to this not very environmentally friendly energy source. That is why there are intensive efforts to develop new technologies aimed at reducing greenhouse gas emissions associated with the continued use of coal. In most of these technologies, gases supplied by Messer already play an important role or will do so in the future.

Capturing methane

The process of mining coal involves the release of mine gas, which consists essentially of methane. This gas is 21 times more harmful to the climate than carbon dioxide. It is mainly released by the gob, which is what miners call the worked-out layers of rock. For them, methane also means an acute danger of explosion. Mine gas has therefore always been extracted, and a widespread practice in the past was simply to discharge it into the atmosphere. The Polish mining industry is increasingly going over to capturing the gas and using it like natural gas. Feeding nitrogen (N_2) into mines is an established method of controlling the risk of explosion underground.
It is now also used to displace the methane from the gob to allow it to be recycled. The N_2 is obtained from, among other things, pressure swing adsorption units (PSA) installed by Messer next to the pits.

CO_2 recovery

This year, one of the largest energy groups in Poland, started up a pilot facility for CO_2 recovery at one of the units of the coal-fired power station. The gas – along with sulphur dioxide – is separated from the power station's exhaust gas by amine scrubbing. This involves the use of a specially developed alkaline solution to absorb the gases. They can subsequently be removed from the solution again by heating. The facility can capture CO_2 with an efficiency of about 85 per cent of the total emissions. Carbon Capture Plant was designed and commissioned by the Polish research institute – Institute for Chemical Processing of Coal.

Synthetic natural gas

Another way of reducing carbon dioxide emissionsis to convert the CO_2 into synthetic natural gas (SNG). The core technology for the methanation reactor is to convert the carbon dioxide into methane (CH_4) with hydrogen in the highly exothermic reaction. Hydrogen is produced from water in electrolysis powered by excess and cheap renewable electricity from the grid. Oxygen is formed as a by-product. If the hydrogen is obtained from surplus renewable energy (for example surplus wind or solar power), this process can be used to create a "green" energy reservoir. When the synthetic methane is burned, the quantity of CO_2 generated does not exceed what was used in its production beforehand. The coal industry and research institutes in Poland are working on making these processes economically efficient as well. Among other things, Messer supplies hydrogen for research and development.

Hydrogen from the coking plant

The steel industry needs coal primarily in the form of coke. The process of converting the raw material in coke ovens by means of pyrolysis generates coke-oven gas, which consists of about 55 per cent hydrogen. It is a by-product of the coke production process. The Polish largest producer of coking coal operates such facilities in Poland and makes every effort to remove the hydrogen from the coke-oven gas in order to make it available for fuel cell cars and other uses. Messer supplies high-purity gases for analysis and supports development with its expertise in this area.

Dr Andrzej Ploch, Messer Polska

Oxygen for lead recycling

France | APSM uses oxygen from Messer to save fuel and minimize carbon dioxide emissions during lead smelting. The company, based in Pont-Sainte-Maxence, belongs to the ECOBAT group, the world's leading specialist in lead recovery and recycling. Discarded lead-containing products such as lead-acid car batteries are recycled at this French site. The oxygen which is blown into the furnace aims at increasing the flame temperature and improving the efficiency of the melting process.

Kristina Thomasset and Caroline Blauvac, Messer France

Sustainable independence

Nigeria | In the absence of a reliable power supply for their new bottling plant in Nigeria, a beverage manufacturer based there decided to produce the electricity it needs in-house using gas generators. ASCO installed two flue gas recovery units to extract the CO_2 present in the generator exhaust gases. The gas is purified to food standard on site, enabling it to be used straight away in the production of carbonated drinks. The company is therefore independent of CO_2 suppliers, and the fact that there is no transportation involved means that no additional CO_2 is produced.

David Oehler, ASCO Carbon Dioxide

Economical concrete cooling

Serbia | Messer supplies construction company Karin Komerc in Novi Sad with liquid nitrogen for concrete cooling. The building material is cooled directly in the concrete mixer during production – a first in Serbia. The process, which is primarily used for smaller quantities of concrete, was extensively tested beforehand.

Branka Malidžan, Messer Tehnogas

Gases for high-tech steel

Steel is a high-tech product these days. There are countless different ways in which this traditional material is refined to the highest standards, most of them involving the use of gases. The technology used in this process is constantly developing and evolving.

Have you been to a vintage car event lately? It is hard not to be impressed by the magnificent designs of many classic cars. But as soon as their engines are started up, you kind of look forward to noise levels returning to normal when the vintage automobiles set off on their rally. "When you get the chance, you should compare the running smoothness of a modern combustion engine with its predecessor of thirty or even twenty years ago," advises Hans-Peter Schmidt, a metallurgy application expert at Messer. "The modern engine purrs away quietly. One of the reasons for this is the dramatically improved quality of the ball bearings."

Gentle whirr of the ball bearings

The bearings benefit from the fact that the hardening process and surface finish have been developed to a new level of perfection by metal specialists in recent years. During carbonitriding of the balls and rolling carbon and nitrogen are introduced into the surface of the steel in a specific way. This produces extremely tough and wear-resistant steel which also allows a "smoother" – and quieter – bearing action.

The carbon is usually obtained from propane or natural gas. The nitrogen is introduced into the carburising atmosphere of the heating furnace – which has a temperature of 860 degrees Celsius – in the form of ammonia (NH_3). The two elements, carbon and nitrogen, accumulate in the surface zone of the treated steel and give it the specific properties required. Messer not only supplies the industrial gases but also installs the ammonia feed unit for its customers. "Carbonitriding has been continuously refined in recent years," says Hans-Peter Schmidt. "Each step of the process matters – from temperature control to precise metering of the gas feed."

Mirror finish at low temperatures

Many precision components and tools need highly robust and resistant surfaces. The necessary processing steps involve the use of gases such as hydrogen, helium, acetylene, nitrogen and argon. "What we are talking about here is the application of very hard coating layers consisting of materials such as chromium nitride or titanium carbide," explains Hans-Peter Schmidt. "To achieve this, the surfaces must first be completely degreased with hydrogen. After that, the high-purity gases are used to apply very thin coatings. This technology has made enormous advances in recent years." For example, it can now even be used at 80 degrees Celsius, making it suitable for the metallic coating of plastics as well. Apart from durability, visual appearance is also an important factor here. The mirror-finish surfaces of chrome trim and bathroom fittings are produced by this coating process.

Rollers for flat steel

These days, high-quality flat steel is a precision material that has to meet some very stringent requirements in terms of dimensional accuracy and surface quality. Akers Ravne, in Slovenia, manufactures steel rollers for the processing this raw material. "These core machine parts have to have extremely hard and smooth surfaces," explains Hans-Peter Schmidt. Akers Ravne uses liquid nitrogen in special cooling chambers to reduce undesirable residual austenite in the rollers and thus make them more dimensionally stable and resistant.

"In principle we see ourselves as partners and advisers to our customers," emphasises Hans-Peter Schmidt on behalf of the application technology specialists at Messer. "Our job is to facilitate efficient processes using state-of-the-art technology. That is why we maintain close ties with scientists working in this field. Not only do we supply the gases and relevant automatic control equipment, we also constantly exchange information with all our customers in this area. And this means that we can contribute quite a lot of specific know-how when it comes to optimising systems and processes such as thermal treatment or coating."

Editorial Team

Welding gases for pacesetters

Spain | Yasuni, an exhaust manufacturer based in Canovelles near Barcelona, gets the gases it needs for its welding and cutting processes from Messer. These include Inoxline and argon as well as oxygen and nitrogen for laser cutting. The customer particularly values the cylinder format with integrated pressure regulator (MegaTop). Welding processes are automated and are carried out by welding robots. The company produces exhausts for motorbikes and scooters. As a specialist for racing motorbikes, its innovative solutions have helped many motorcycle racers get optimised performance from their machines.

Marion Riedel, Messer Ibérica

Longer shelf life for sweet pastries

Albania | Lika gets the Gourmet A70 gas mixture from Messer for packaging its products. The company produces traditional sweet pastries in the capital Tirana and is one of the country's market leaders in this sector. Lika wanted to prolong the shelf life of its products, so it turned to Messer. In a series of tests with different Gourmet gases, the best results were achieved with Gourmet A70, which consists of 70 per cent argon and 30 per cent carbon dioxide. Thanks to modified atmosphere packaging (MAP), the shelf life of the products was increased from five to more than 90 days at a storage temperature of four to seven degrees Celsius.

Ilva Spiro, Messer Albagaz

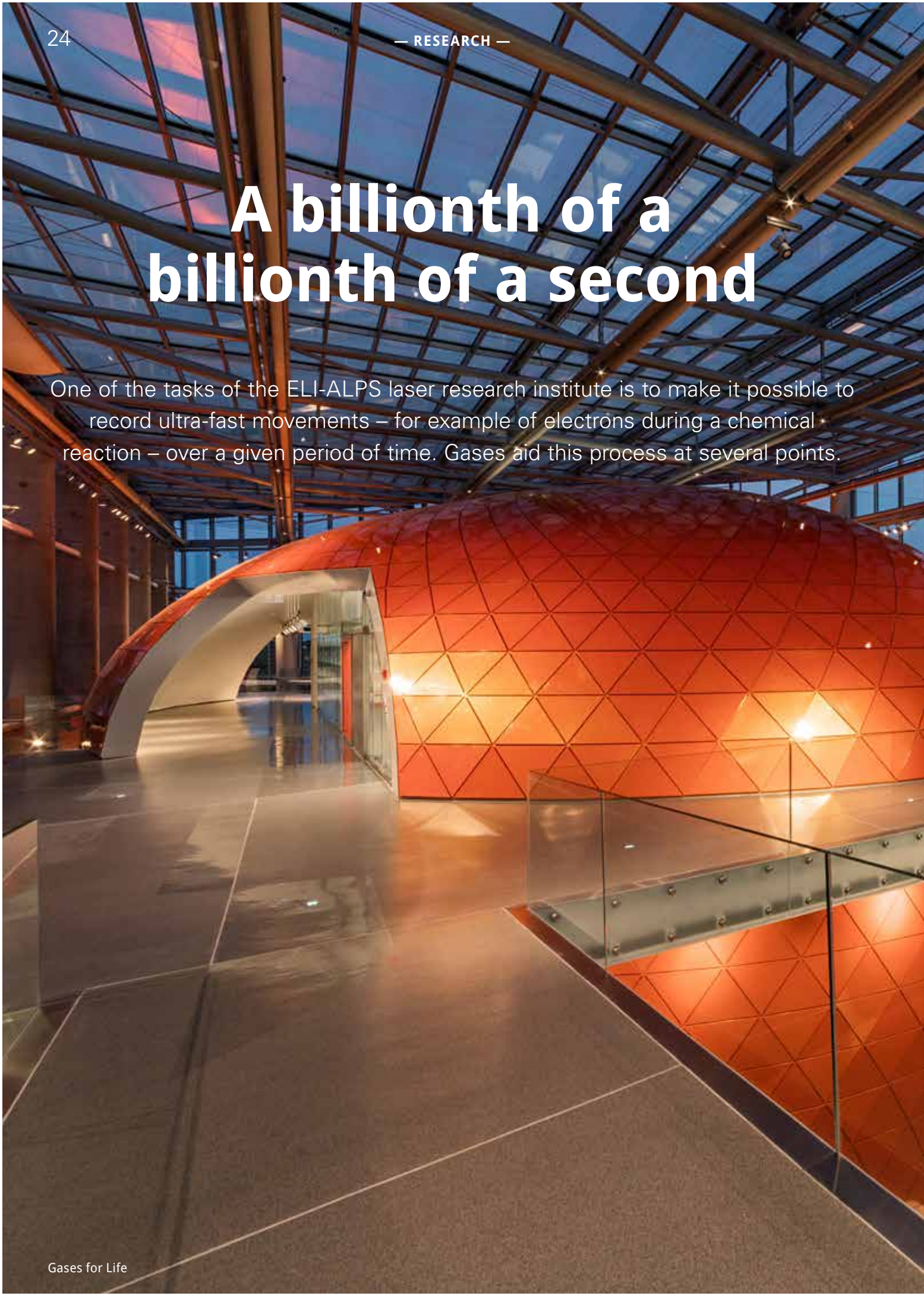
Maturing cheese with the help of robots

Switzerland | Cheese doesn't just mature all by itself without having to do anything. Cheese care involves, among other things, regular brushing, turning and washing. In many cheese dairies, this work is performed by robots supplied by Swiss machine building company JNJ Automation based in Romont. They can treat cheese wheels with a diameter of up to 75 centimetres and are also capable of retrieving them from shelves at a height of up to six metres. At the same time, they have to be resistant to the humid, salty atmosphere in the maturing rooms. Their build quality has to meet similarly high standards. The machine body is made of stainless steel and the frame welded manually. JNJ uses the inert welding gases Inoxline He3 H1 and Inoxline H5 from Messer.

Fabrice Bally, Messer Schweiz

A billionth of a billionth of a second

One of the tasks of the ELI-ALPS laser research institute is to make it possible to record ultra-fast movements – for example of electrons during a chemical reaction – over a given period of time. Gases aid this process at several points.



In 1999, Egyptian scientist Ahmed H. Zewail was awarded the Nobel Prize in Chemistry for successfully observing atoms and molecules over minuscule time periods during their reactions. Because these processes take place very quickly, Zewail used laser pulses which only last a few femtoseconds. A femtosecond (10^{-15} seconds) is to a whole second as a whole second is to 32 million years. However, this period of time is already far too long for current research. The shortest laser pulses are now in the attosecond range (10^{-18} seconds), which equals a billionth of a billionth of a second.

European network project

In May 2017, the Extreme Light Infrastructure Attosecond Light Pulse Source (ELI-ALPS) centre was officially opened in the southern Hungarian university town of Szeged. The research institute is part of a European network project. Its remit is defined by its name: to create sources of ultra-short light pulses that will enable scientists to explore processes at the (sub)atomic level.
The laser pulses generated at ELI-ALPS are not only extremely short; they are also generated with extremely high repetition frequencies. This allows the processes in atoms and molecules to be recorded just like with an ultra-high-speed camera. The Hungarian laser research centre can produce the world's shortest laser pulses in combination with the highest repetition frequency.

High harmonics

It is expected to take until 2021 for all the systems in Szeged to go into operation. However, the first tests with high-power lasers have already taken place. These also involved the use of GHHG generation, one of the key tools at the centre's disposal. The acronym stands for Gas High Harmonic Generation. This is an established method used to produce attosecond laser pulses in the extreme ultraviolet frequency range.
In this process, the beams from a primary source – the laser – are directed onto a jet of noble gas. The primary pulse causes the gas to generate so-called high harmonics. One can think of these light waves as harmonics, with the primary laser providing the fundamental tone and higher-frequency photons then being generated.

Gases in lead and support roles

ELI-ALPS uses the noble gases helium, argon, neon and krypton in this process. They also serve as objects of observation since they allow the movement of individual electrons to be studied with this technology.
The tests take place in vacuum chambers as the attosecond pulses would otherwise be "absorbed" by air. Before the chamber is evacuated for a new experiment, it is purged with nitrogen to get rid of any humidity that would disrupt the process. It is even more important to eliminate all traces of hydrocarbons, which are also present in air. Their molecules would be fused onto the optical equipment by the laser pulse, resulting in its destruction.
When carrying out checks of the systems, helium is used as a search gas for leak detection. The gas is particularly well suited to this purpose since the tiny helium atoms can slip through even the smallest of gaps. The enormous scope of the work carried out here will serve basic research at the highest level. ELI-ALPS is intended to facilitate completely new discoveries in chemistry as well as physics, medicine, biology and materials science.

Editorial Team

Ensuring a local supply

Bruno P. Eugster, Production Manager at **Dottikon Exclusive Synthesis AG**

What is Dottikon's core competence?
We develop chemical-pharmaceutical products to the point where they are ready for industry use. For example, let's say pharmaceutical researchers discover an active substance that can potentially be used to treat Alzheimer's. We get the structural formula of the molecule and produce it in the lab – in small quantities to begin with – for further testing. If successful, we then produce the active substance for our customer in larger quantities.

How do gases come into play?
We require a variety of gases in the lab during development. In production we mainly need hydrogen for hydrogenation of the molecules and nitrogen for inerting. We also use other gases for synthesis as and when required.

What do you expect from the gases and from your gas supplier?
We require the gases to have a precisely defined, generally very high degree of purity. We also depend on a reliable supply. We have just built a new laboratory building. The tender to supply the gases was won by Messer.

But you are not just a customer...
I was a member of the Verwaltungsrat [board of directors] at Messer in Switzerland from 2003 until last November. The board represents the shareholders and performs a business monitoring role. We were very interested in basic chemicals and gases being available locally, so I decided to take up the post. To rule out any conflict of interest, however, I was not involved in buying gases for Dottikon, nor, for example, did I have a part in the tendering procedure for the supply of gases for the new laboratory.

What is your view of Messer, having seen it from the inside and outside?
I was very impressed by the courageous and decisive expansion of the company's international presence initiated by Stefan Messer. This was done on a solid economic and technological basis, driven by a strong entrepreneurial spirit. In the gases business, price isn't the only factor to consider – you soon realise this if there is a problem with the supply or quality. But in that respect, you can always rely on Messer.

Thank you for talking to us and for your work as a board member!

Win a delicious prize

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

Since when Messer Group is wholly owned by the Messer family again?

Please send the correct year by e-mail with the subject line "Gases for Life Competition" to: **angela.bockstegers@messergroup.com** The deadline is 15 Febuary 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 25 is **Monika Stappen** from **Viersen, Germany.** The correct answer was: „John F. Kennedy"

The "Gases for Life" editorial team

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

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Aromatic atmosphere

It's a good job Count Dracula knew nothing about this: a vacuum robs garlic of its aroma. Vacuum packaging therefore isn't really suitable for the aromatic cloves, as the Albanian company Orgagro discovered. It specialises in growing and selling garlic for the European market.

Orgagro approached Messer looking for a flavour-protecting transport packaging solution. A series of tests established that the food gas Gourmet N provides the best protective atmosphere. Surrounded by pure nitrogen, the garlic lost none of its unique aroma even after two and a half months.

Ilva Spiro and Ilir Ajdini, Messer Albagaz

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