

No. 28 | September 2019

MESSER 
Gases for Life

Gases for Life

The industrial gases magazine



COVER STORY

Trans-Atlantic momentum

PRACTICAL FOCUS

It's all in the mix

USING GASES

Let the gases flow

GREEN PAGE

Raw material
without
crude oil

Dear Readers,

Presumably you already know that Messer is active in North and South America again. By taking this step – actually a great leap – we have once and for all become a global player in our industry. At the same time, we have successfully consolidated our position as the world's largest family-run industrial gases specialist.

Since the official launch of our overseas operations, I have experienced with growing enthusiasm how Messer people on both sides of the Atlantic are pulling together. Our cover story features the first results of this outstanding effort.

I myself will do everything in my power to promote the existing dynamism, support the process of integration and make our enlarged company a productive, innovative and strong overarching entity.

Our aim is to become the supplier of choice across all the markets in which we operate – these being Europe, Asia and America – and to continue to grow as we move forward.



Stefan Messer

Owner and CEO of Messer Group GmbH

Our cover photo:

Courtney Hunter, truck driver at Messer Americas





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Axia Award for Messer

International | Messer was presented with the “Axia Best Managed Companies Award” in Düsseldorf. The award is given to very well-managed medium-sized companies by audit and consultancy firm Deloitte, German business magazine WirtschaftsWoche and the Federation of German Industries (BDI). “Like all the award winners, Messer is a model of exemplary management that combines strategic vision with innovation, a sustainable management culture and good corporate governance,” said Lutz Meyer, partner and head of Deloitte’s medium-sized business programme. The prestigious award was accepted by Marcel Messer, son of CEO Stefan Messer. Alongside his brother-in-law Cédric Casamayou, Marcel is the second member of the fourth generation of the family to have joined the company.

Editorial Team

Marcel Messer at the award ceremony in Düsseldorf

In the service of health

Colombia | Messer's gases business in Columbia offers our customers the full range of industrial gases solutions as well as specific products and services for the healthcare sector. The broad range of products and services for inpatient and home care has made Messer the market leader in the South American country.



Hospitals

As in other countries, Messer in Columbia supplies hospitals with medical gases and helps them develop and expand their gas supply systems. However, while the end supply point of these systems is usually just the hospital room or operating theatre, in Columbia it is the patients themselves. Besides the fixed installations that are part of the building's infrastructure, Messer also supplies inhalers and respirators as well as other accessories that are needed to supply individual patients with medical gases or breathing air.

Home care and Messer's own clinics

Messer supports more than 36,000 home care patients who rely on additional oxygen to help them with their breathing. Besides cylinder gas, more and more of them are being supplied with concentrators which make oxygen taken from the ambient air available to them in concentrated form. In addition, as part of its REMEO programme, Messer runs six clinics of its own across the country for a total of around 350 patients with serious chronic respiratory diseases who are dependent on constant care. These facilities offer state-of-the-art care in a friendly, homelike environment. At the same time, this specialised type of care is more cost-effective in terms of health insurance compared to standard hospital-based treatment. The REMEO clinics also have sleep laboratories for treating nocturnal respiratory disorders. In total, Messer employs some 1200 nurses in Columbia, who are specially trained and can significantly enhance their professional skills and knowledge by working at REMEO.

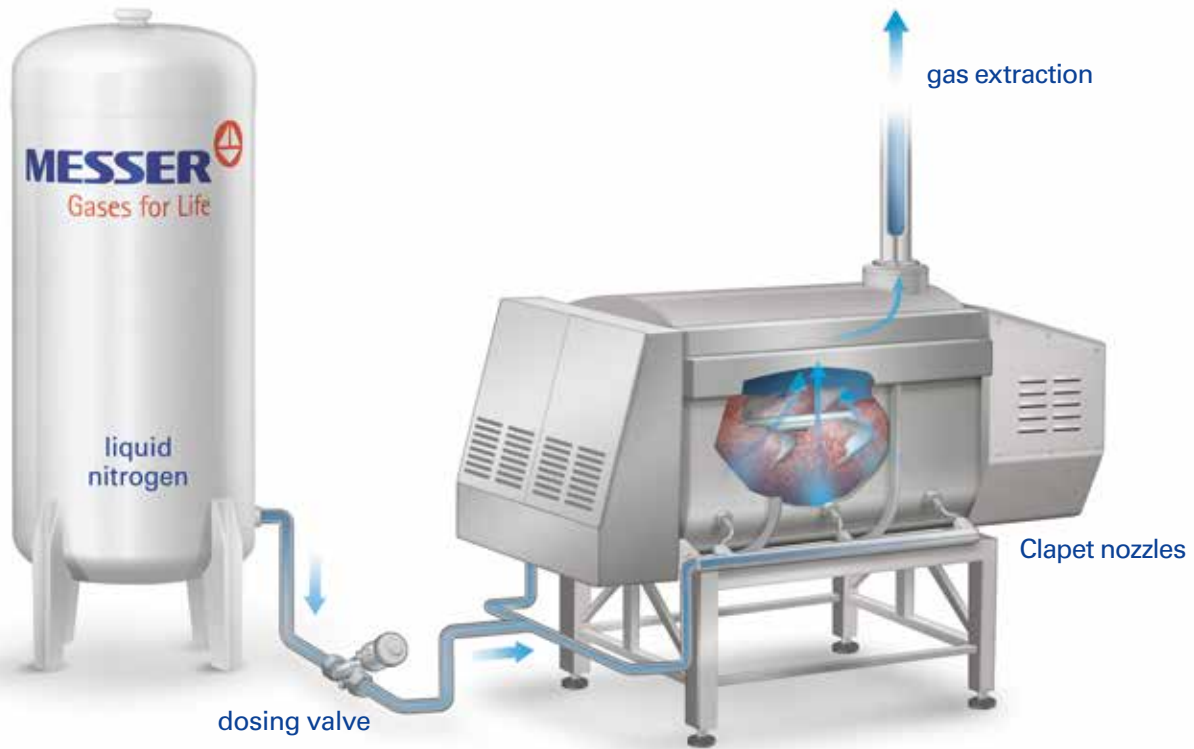
Gina Gibbs Foster, Messer Americas



It's all in the mix

Functional, healthy and sustainable – these are the buzzwords associated with current food trends. Strict requirements must be met with regard to careful processing. Cold gases perfect the essential mixing processes.





The subject of food is omnipresent – whether you are flicking through magazines at a station kiosk, channel-hopping on the TV or browsing social media on your device. The steady increase in demand for new, healthier products shows that fewer and fewer people are prepared to settle for food that just tastes good and satisfies their appetite.

The idea behind functional food is that it provides additional benefits, whether it's for the intestinal flora or the immune system. Thus, additional dietary fibre is added to muesli, vegetables to fruit drinks and probiotics to yoghurt. Consumers are looking for products with fresher and more wholesome ingredients that have been processed with greater care.

Specific solutions for a broad product range

People now also have a greater awareness of the link between food and global climate. The trend towards more vegetable protein, including in conventional diets, is reflected in the growing number of vegans and vegetarians. According to a recent article in trade journal Food Dive, the days of bland veggie burgers are numbered. Imaginative creations with peas, lupin seeds or even insects are taking the chilled sections by storm.

They all have one thing in common with conventional meat products: state-of-the-art food technology, which is necessary to ensure that they taste good and also look appetising in the packaging. The mixing of ingredients is always a crucial step in production, with temperature being one of the important factors. Since the mechanical movement of the mixers generates heat, cooling is necessary in order to comply with stipulated temperature requirements and preserve the desired product consistency.

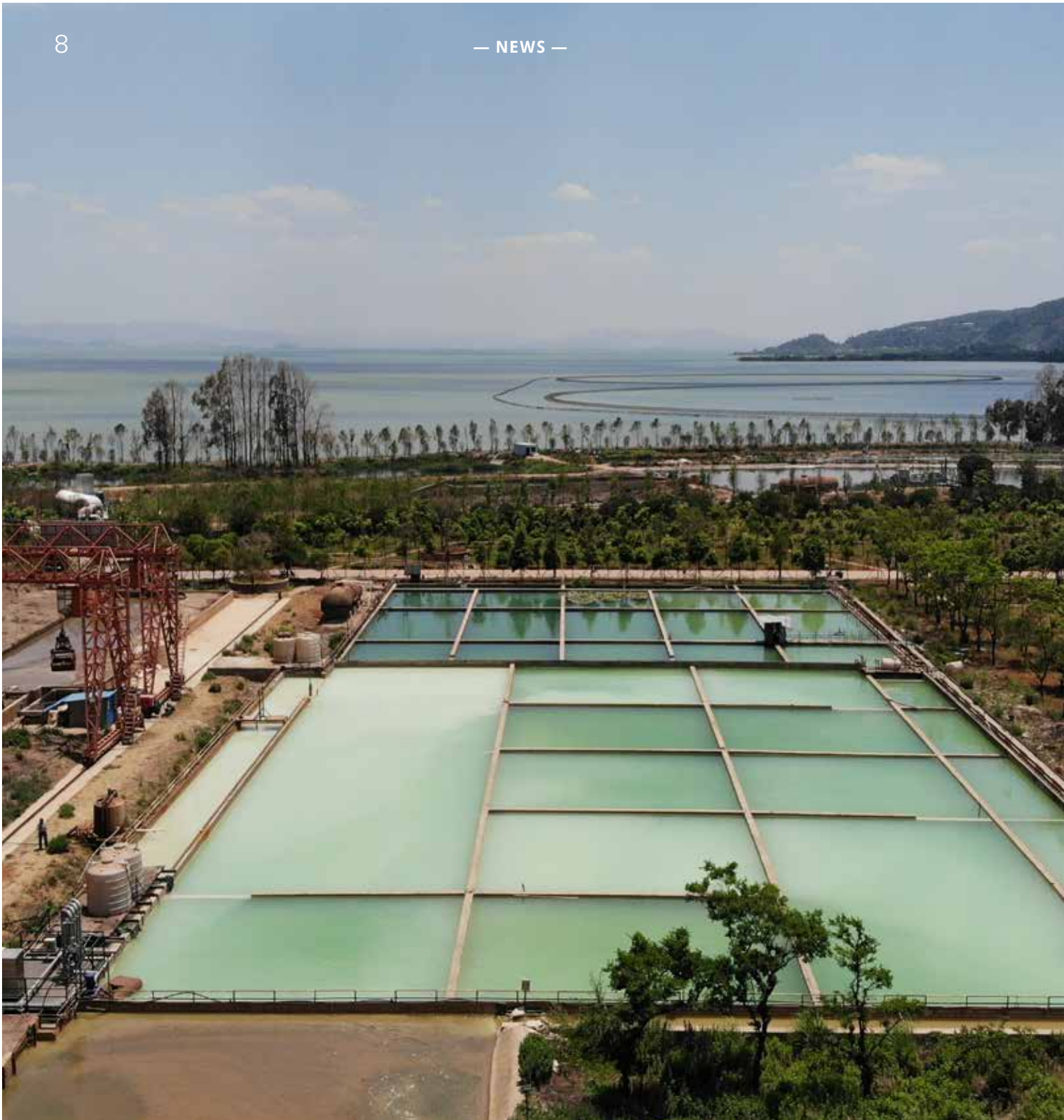
Conventional cooling involves either cold brine being fed into a double-skin mixer trough or flake ice being added directly to the mixture. The cooling effect of the brine is indirect and slow. Flake ice has the effect of diluting the product, while automated introduction is practically impossible.

Undiluted, precise and fully automated

By contrast, cooling with cryogenic nitrogen or carbon dioxide has a number of advantages. The gas – with a temperature as low as minus 196 degrees Celsius in the case of liquid nitrogen – can be fed directly into the mixture, where it very quickly generates a tremendous cooling effect before vaporising without trace. The introduction of the gases can be automated at little expense. The gas supply essentially consists of a tank, a supply line, valves and the nozzles in the mixer.

Messer's patented Clapet nozzles allow the gas to be fed into the mixer trough from below so as to achieve maximum possible "cold gain". They are opened solely by the pressure of the gas as soon as it starts to flow. At the same time, an integrated, spring-loaded non-return valve prevents the ingress of product residue or liquid and thus ensures perfectly hygienic operation. Automation of the process couldn't be simpler. When using nitrogen, a single on/off valve often suffices to control all the Clapet nozzles in a mixer. The virtually immediate effect of the cold gas allows very precise temperature control. In this way it ensures that the food products – whether pea fritters or beefburgers – both taste and look good.

Editorial Team



The sludge treatment plant at Lake Dian in Yunnan, China

Neutralising and saving money with CO₂

China | Messer is supplying CO₂ and hardware to Gezhouba Environment & Engineering to neutralise alkaline wastewater. The company cleans sludge pumped from Lake Dian. The largest inland lake in the Yunnan Province is polluted as a result of over-fertilisation. Water is extracted from the sludge using an alkaline calcareous medium. This process wastewater is strongly alkaline afterwards, containing around 500

milligrams of lime per litre. Carbon dioxide fed in via tube reactors constructed by Messer lowers the pH and reduces the hardness of the water. In contrast to the previously used hydrochloric acid process, no chloride ions are liberated as a result. The treated wastewater can then be returned directly to the lake. As an added benefit, process costs have been reduced by over 30 percent too.

Jasmine Yan, Messer China

Cold crust

Czech Republic | Meat processor Maso Jičín uses cryogenic gases from Messer to crust freeze its products. Animals supplied for slaughter by Czech breeders are cut up and processed to produce raw meat, sausages and ham at the company's facility in Jičín in Eastern Bohemia. Crust freezing of the product optimises the cutting process: this is achieved by transporting it through a four-metre-long tunnel freezer into which liquid nitrogen is introduced. When the meat comes into contact with the evaporating gas, it is frozen practically immediately to a depth of several millimetres, giving it a firm consistency which offers the desired resistance to the cutting blade. This allows even slices with particularly smooth surfaces to be cut more quickly and with minimal losses of weight.

Jana Pokorná, Messer Technogas

Daily bread (and salad)

Hungary | Food retailer SPAR, one of Hungary's largest chains for everyday products, has commissioned a new production facility in Üllő for convenience products under the SPAR enjoy brand. The sandwiches and mayonnaise salads produced here are packaged in a modified atmosphere consisting of Messer's Gourmet N70 (70 per cent nitrogen, 30 per cent CO₂). The gas is supplied in bundles. Messer was also responsible for installing the gas supply system. A mixing station is due to be added in the course of this year in order to be able to handle the planned expansion of production. From Üllő, SPAR supplies its stores throughout Hungary with convenience products. Four tonnes of mayonnaise salads and 20,000 sandwiches reach the stores' refrigerated shelves every day.

Kriszta Lovas, Messer Hungarogáz



Gina Gibbs Foster

Gina Gibbs Foster is Vice President Communications in charge of Communications and Branding at Messer Americas. She already held this position when Messer took over Linde's American operations on the 1st of March.

- 1. What has been your nicest "gases experience"?**
The celebrations on "Day one" when the 5,400 employees across all our locations marked the launch of Messer in North and South America. At the same time, we launched the new website, sent out mailings and started a campaign to raise Messer's profile in the countries where we operate.
- 2. What would you say is a must-see for anyone visiting your country?**
New York City. No other city can match the energy, diversity and round-the-clock excitement of the Big Apple. And it's a short trip from there to our head office in Bridgewater.
- 3. What three things would you miss least?**
Traffic, winter weather and hurricane season.
- 4. Which famous person would you like to spend an evening with?**
Oprah Winfrey. With all of the famous personalities she has interviewed, she is bound to have some fascinating stories to tell.
- 5. What else would you like to learn or study?**
I love learning in general. At the moment I am learning classical guitar. Improving at golf is next.

Trans-Atlantic momentum

It is not often that an M&A deal is launched with such good all-round prospects. Our acquisition of the majority of Linde's Americas business is a good fit in terms of scope and content, while our employees feel that they are in good hands within the Messer team, and our business performance allows us to look to the future with optimism.

Continued on page 12





Melinda Billig, Zone Production Engineer,
Messer Americas

The competition authorities defined the baseline situation, having made their approval of the merger of Linde and Praxair subject to clear conditions. One of them was that Linde had to sell the majority of its business in North and South America. This presented Messer with a unique opportunity to once again become a serious gas business player in the western hemisphere, as well, and to double the size of the Group overnight.

Dimensional leap without pitfalls

There have certainly been cases in economic history where such a dimensional leap has proved tricky, but in this regard we are aided by the laws of our industry, which state that gases may only be produced and sold regionally. The additional entities will continue to run their business and be managed by proven local management teams. The synergy gains will emerge from our combined know-how and the agility of our family-run company.

Financial investor CVC Capital Partners has been taken on board for the financing and implementation of the project. Messer had already had years of successful experience, based on mutual trust, with the current Managing Partner

of CVC, Dr Alexander Dibelius, when the company went through the process of becoming wholly family-owned again (2001-04). The two companies set up the joint venture Messer Industries as a framework for the acquisition. The Messer Group holds a majority stake of 58 per cent in this joint venture. The medium-term plan envisages CVC withdrawing and the family assuming full ownership of the company.

Numerous facilities in the Americas

In North America, Messer has gained 70 production facilities, including world-class air separation units, CO₂ plants, a hydrogen facility, a helium source and helium filling plants, as well as a broad-based cylinder gases business in Canada. In Brazil, Columbia and Chile, the additional facilities include an extensive network of state-of-the-art air separation units, CO₂ plants and hydrogen facilities, as well as extensive healthcare and home care activities in Colombia. With some 5,400 employees, the operations acquired from Linde in the USA, Canada, Brazil and Colombia, together with the Chilean business bought from Praxair, generated sales of 1.8 billion US dollars (1.6 billion euros) in 2018. The Messer Group generated consolidated sales of 1.3 billion euros in 2018.

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“Messer has become a global player in the industry and consolidated its position as the world’s largest family-run industrial gases specialist,” says Stefan Messer, owner and CEO of the Messer Group. “I can already see how the impetus from both sides of the Atlantic is creating new synergies. This applies to the Pacific perspective as well, of course, where our companies on both sides of the ocean can now also have a productive exchange. We want to harness this momentum and achieve strong growth in all the relevant markets – Europe, Asia and America.”



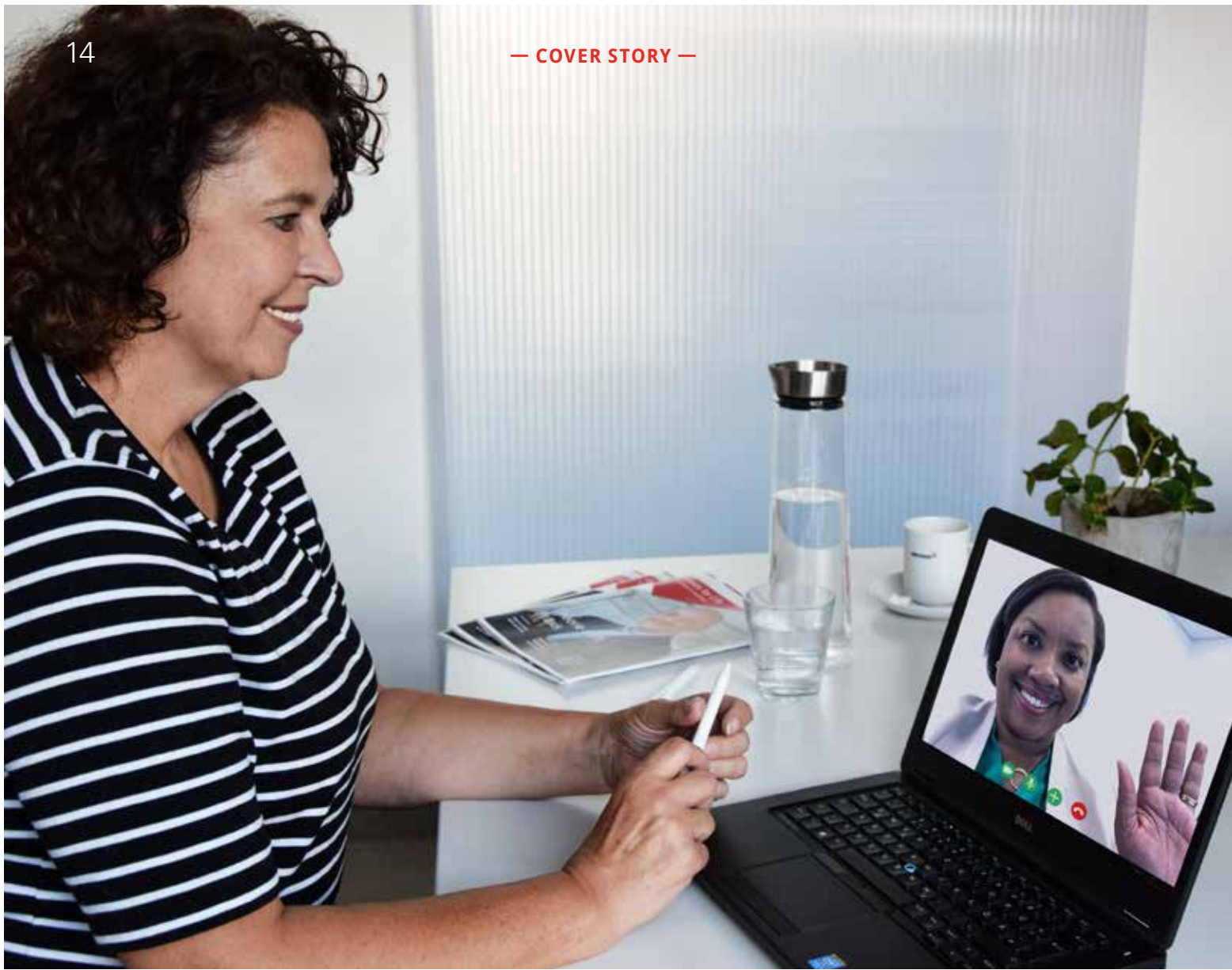


New branding on all levels: from building signage in Mississauga, Ontario, Canada, ...



... to work clothes, as shown here by Jay Navel, Area Transport Manager, Messer Americas.





#ProudToBeMesser

The acquisition kept the Communications experts on both sides of the Atlantic busy. Gina Gibbs Foster (Vice President of Communications, Messer Americas, Bridgewater, New Jersey, USA) and Marlen Schäfer (Senior Manager Marketing Services, Messer Group, Krefeld, Germany) share how they got to know each other and began working together.

How did it all start?

Marlen Schäfer (MS): Once the takeover had been officially confirmed at the beginning of September, we got in touch with the communications department in Bridgewater and sent them our Corporate Identity Manual. Before the end of the month, our American colleagues responded by producing a

draft "Welcome Package" with proposals for building signage and rebranded trucks, outdoor advertising, promotional gifts and a host of other elements. It has been a thoroughly pleasant and professional relationship from the first phone call.

How did you feel when you learned that you would be working for Messer in future?

Gina Gibbs Foster (GGF): We could see the opportunities from the outset. Messer has an excellent reputation as a people-centred company with a strong brand. CVC are known for their strategic investments for long-term growth. Our expectations were more than borne out by our initial contacts. The tone was friendly and collaborative from the outset, and we received terrific materials and support to enable a smooth transition to the Messer brand.

What did this involve?

MS: The plan was to change all important materials to Messer’s corporate design by “Day One” on the 1st of March. They did a huge amount of work and in rapid succession, we were sent countless drafts to look at and correct. We discussed them intensively and saw how our new colleagues were negotiating a very steep learning curve. Our corporate design was assimilated really quickly in Bridgewater, and before long we were only required to answer queries where there was an element of doubt.

How is the work culture within Messer?

GGF: With Messer, things are done very quickly, openly and efficiently. It is all about pragmatic solutions and doing what makes the most sense for the business and our customers.

To a large extent, the head office gives us free rein to take action based on local market needs and specifically encourages us to make decisions independently within the region. From a Communications perspective, the general rule is: You know your market and your customers – you decide what the message and content should be, in partnership with area business management.

What has been your favourite part of the process?

MS: The “Proud to be Messer” hashtag. Here in the head office, we have been very impressed by the many great posts shared by our American companies. Their natural and enthusiastic use of social media is just great!

How did the idea come about?

GGF: The idea of this Day One social media campaign arose from a brainstorming session within our Americas Communications team. We encouraged all to post photos from their local Day One celebrations on social media and to tag them with #ProudToBeMesser. Many did, with great enthusiasm. Since then, #ProudToBeMesser has evolved into a full-blown campaign, as our employees continue to share their company pride via posts on multiple social media platforms, bearing this hash tag. This example demonstrates the extent to which our Americas team already identify with the Messer brand.

Editorial Team



Two of many posts published under #ProudToBeMesser.

New CO₂ plant in California

USA | In March, Messer began construction of a new CO₂ plant in the northern California town of Keyes. It is expected to produce 450 tons-per-day of carbon dioxide, with plant completion expected by year-end. The gas will be used in the food and beverage industries as well as in electronics manufacturing and other sectors. “This investment represents our commitment to strategic U.S. expansion to meet growing market demand,” explains Jens Luehring, President and CEO of Messer Americas. “We’re dedicated to providing a reliable supply of industrial gases to our customers and look forward to breaking ground on this plant to further meet that need.” Messer already operates two CO₂ plants and two air separation units in California.

Gina Gibbs Foster, Messer Americas



The raw gas for the CO₂ plant in Keyes, California, is extracted from local sources and then purified.

“Helium” – Messer’s audio logo since 2008

International | Messer’s “helium” audio logo has complemented the visual identity of the Messer – Gases for Life brand since 2008. It consists of three audio elements that blend into one another: the sound of a gas diffusing from a gas cylinder, a 6+1 audio motif as a melody logo

(M – E – S – S – E – R), and human exhalation. The highlight is a bell sound, which supports the Messer boat logo and has the clear quality of a signal. The rhythm chosen is in the mid-tempo range, thereby conveying sustainability and the willingness to combine tradition and history with modernity.

Editorial Team





Site of Eissmann Automotive at Bor, Czech Republic

Cutting leather with a laser

Czech Republic | Eissmann Automotive uses nitrogen supplied by Messer as a cutting gas in its leather working processes. The company is one of the leading vehicle interior suppliers. Its products include leather-covered components. The natural material is cut with a laser at the production site in Bor. The nitrogen is needed to protect the leather and the cutting optics and ensure that the cut edges are smooth.

Jan Kašpar, Messer Technogas



Regenerative thermal afterburning for cleaning of solvent-containing exhaust gases with integrated heat recovery for hot air and steam.

High-quality plants for heat recovery

Switzerland | Rising energy prices and the need to reduce CO₂ emissions are making waste heat a valuable resource. Allenspach Apparatebau in Hermetschwil builds custom heat recovery systems that are able to efficiently extract and use the heat from the exhaust gases produced by industrial processes. The materials used must be chosen specific to the plant in question, as they have to be able to withstand,

for instance, acidic or alkaline solutions formed during the condensation phase. Ferroline C12 X2, Ferroline X4, Inoxline C2, forming gas and argon cylinder gases supplied by Messer, contribute to the high quality of the Allenspach plants. They are used during the manufacture and assembly of the heat recovery systems and other high-temperature process equipment.

Michele Lorusso, Messer Schweiz

A man with a beard, wearing a dark blue long-sleeved shirt, a bright yellow high-visibility safety vest, and grey work gloves, is focused on adjusting several brass gas valves on a large green industrial gas cylinder. He is looking upwards and to the right. In the background, there are several large, coiled metal gas lines hanging from the ceiling. The setting appears to be an industrial or manufacturing facility.

Let the gases flow

Delivering the product is only half the job: Messer also installs on-site gas supply systems to ensure that the gases get to where they are needed and that this is done in an efficient way.

Magna is one of the three largest automotive suppliers in the world. Formerly a joint venture between Getrag and Ford of Europe over a period of 14 years, the company operates a site in Kechnec, Slovakia, and has expertise in all areas of automotive manufacturing. Two thirds of vehicles coming onto the market in 2019 will be fitted with Magna products and systems. Magna Powertrain offers one of the world's most extensive manual, dual-clutch and hybrid

transmission product portfolios for cars and light trucks. Car transmissions have to meet very high standards: they are exposed to tremendous forces over a long period of time; at the same time, their components have to work together with maximum precision to ensure powerful and quiet performance. The surface quality of the large number of meshing gear wheels plays a particularly important role here.

Hardness and plasticity

Carburising and finely tuned heat treatment are among the techniques used to ensure a perfect combination of hardness and toughness. At the beginning of this year, a new line with vacuum furnaces for low pressure carburising was put into operation at the plant in Slovakia.

In the hardening cycle, carbon from acetylene penetrates the hot steel surface. Quenching involves the use of hydrogen (H₂) and helium (He) at a pressure of 20 bar. In addition, nitrogen (N₂) is used as a protective and purge gas. The entire carburising process is controlled using “recipes”, which are proposed by a special software.

Supply engineering experts

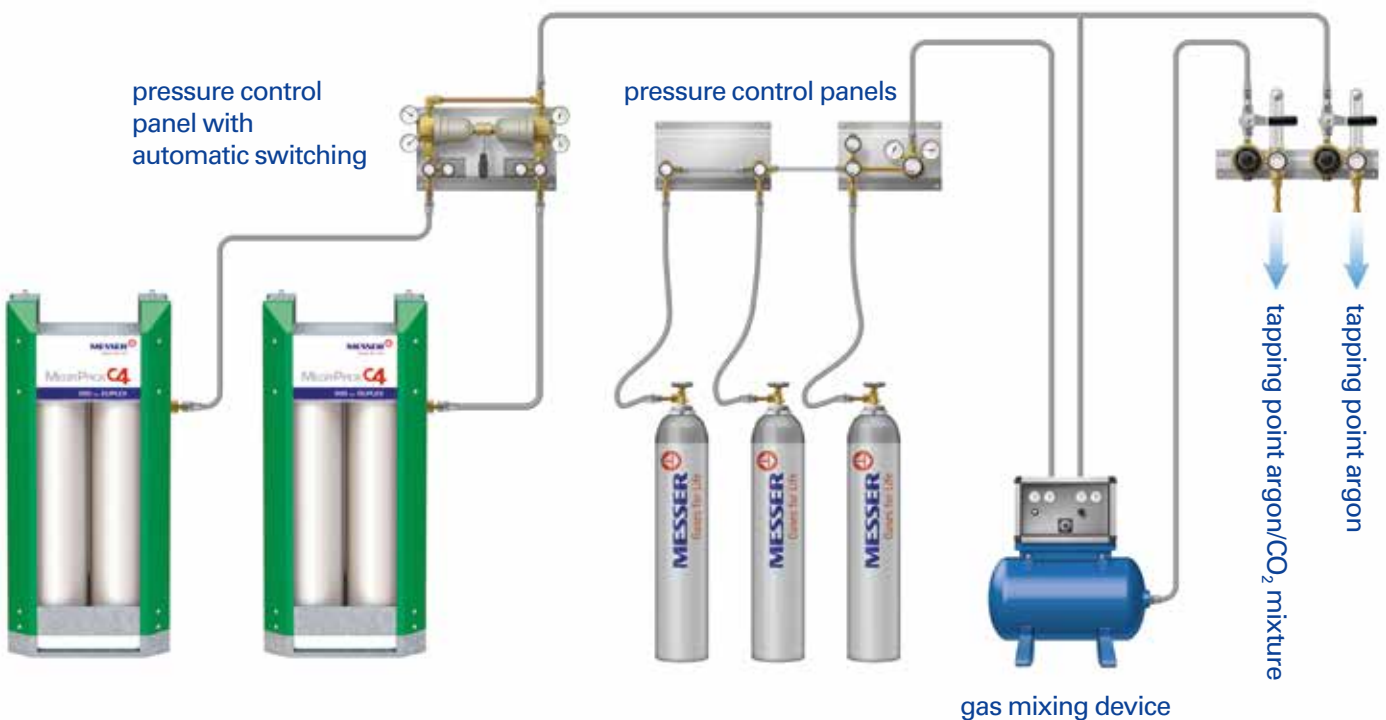
Messer has been supplying Magna, formerly Getrag Ford, with gases since 2007. It therefore also made sense to give the long-standing supplier the task of installing a turnkey gas supply system for the new facility. “We signed the contract in October 2018 and immediately started discussions with the plant engineering firm,” recalls Jozef Šuška, Metallurgy Expert at Messer in Slovakia. “First of all, the nitrogen and helium supply cycles had to be increased. The new heat treatment line also uses a different operating pressure, so it was necessary to install a new, additional regulator unit for

nitrogen. We installed twelve bundles with twelve cylinders each for the new acetylene supply. Six of the bundles are used for operational purposes while the other six serve as a reserve, which was one of the requirements stipulated by the technology supplier. The acetylene station has a special air conditioning system. In winter, on the other hand, the gas has to be heated in order to ensure an even flow. We also put up a new station for the helium and hydrogen supply.”

H₂ and He first flow into a mixer, where the ratio of the two gases is optimised before the mixture is conducted through the new pipe system to the furnace. Messer coordinated the installation of the pipes and the electrical cables, which was carried out by local companies. The work on gas-specific equipment such as valves and sensors was personally supervised by experts from Messer in Slovakia.

The furnace was then put into operation on schedule in February. “Since everything revolves around gases for us, we also have the know-how to plan and install an optimal gas supply,” emphasises Jozef Šuška. “Of course, this applies to all areas of application, not just metalworking. What’s more, it’s always fun to work closely with customers on such projects.”

Editorial Team



A large solar collector field is visible in the foreground, consisting of several rows of rectangular panels. The background features a deep blue lake, a small town on the shore, and a range of rugged, forested mountains under a clear sky.

Welding gases for solar thermal energy

Serbia | Messer supplies argon, methane, oxygen and acetylene to Master Solar in Šimanovci near Belgrade. The company manufactures thermal solar energy equipment. Besides collectors, this also includes stratification cylinders for the water that is heated by the sun. The high-quality systems supplied by Master Solar have also proved them-

selves in extreme climatic conditions. The gases are used for different welding processes, including CMT (cold metal transfer) welding, which produces particularly high-quality welds with virtually no spatter. Other processes include robot welding of aluminium profiles as well as manual welding of copper components

Branka Malidžan, Messer Tehnogas

Airborne gas leak detection

Switzerland | Pergam-Suisse's Airborne Laser Methane Assessment (ALMA) is a state-of-the-art laserbased leak detection system for natural gas pipelines. The Zurich-based company uses methane from Messer to test its instruments and provide training in their use. Methane is the main component of natural gas. When released into the atmosphere, its climate impact is 25 times greater than that of carbon dioxide. In order to prevent gas leaks and the resulting harmful impact, European directives require regular inspections of natural gas pipelines using helicopters. ALMA can reliably detect even the tiniest leaks from a distance of up to 150 metres. It uses a pulsed diode laser which is directed onto the pipeline during the inspection.

Reiner Knittel, Messer Schweiz



Below the helicopters fuselage a part of the measuring equipment is visible, that helps to detect leaks in natural gas pipelines on the spot.

Nitrogen cools recycling mill

Czech Republic | Enviropol is a leading Czech processor of waste electrical and electronic equipment. The company's plant in Jihlava can recycle up to 95 per cent of the material, making it one of the most modern in Europe. In order to increase the mill's capacity, the company decided to carry out a test with liquid nitrogen last year. The purpose of the gas was to ensure more effective mill cooling. A nitrogen tank was installed following a trial run with positive results. As well as supplying the gas, Messer installed the necessary piping as well as a nitrogen control system in spring of this year.

David Bek, Messer Technogas





Aerial picture of the air separation unit in Dung Quat, with the Hoa Phat steelworks in the background

Icy-cold production advantages of using CO₂ snow

Hungary | Flex Hungary is a company that manufactures numerous automotive and electronic components. They are produced on fully automated production lines and the plastic parts of the components need to be cleaned prior to the coating process. Flex Hungary performs this task with the quattroClean snow cleaning technology, for which Messer in Hungary supplies liquid CO₂ as the cleaning agent. Together

with our partner acp systems, we have also supplied the necessary application technology for gas pressure and temperature control. The advantage of the quattroClean snow cleaning technology is that a fine CO₂ snow jet involves a combination of thermal, mechanical, sublimation and solvent effects after impacting the surface to be cleaned. Thanks to these four effective cleaning mechanisms, the



The Vietnamese team of engineers

New ASU for new steelworks

Vietnam | Messer has commissioned a new air separation unit (ASU) in Dung Quất, Quảng Ngãi Province. It is one of our company's largest production sites worldwide and supplies Vietnam's largest steel producer, Hoa Phat, with gases for their new steel plant. The design of the ASU had to take account of the extreme temperatures in Dung Quất and the high humidity during the summer months. Two teams of engineers from Vietnam and Europe worked together on the design and construction of the unit. Piles measuring a total of 33,000 metres in length were used in the foundations, while 17,000 cubic metres of concrete was poured and more than 200 kilometres of cable laid. The unit produces oxygen, nitrogen and argon at different pressure levels. Just in case, a reserve is available in the form of liquid gases in large flat-bottom bulk storage tanks.

Editorial Team

system reliably and reproducibly removes particulate and filmic contamination from the entire surface or, if required, only from a specific area. The cleaning process is so gentle on materials that it can even be used to clean delicate and finely-structured surfaces. In this way, Flex Hungary ensures greater efficiency and consistently high product quality, along with reduced amounts of waste.

Kriszta Lovas, Messer Hungarogáz



Photo: acp systems AG

Raw material without crude oil

Until now, isobutene has generally been extracted from crude oil. However, the important basic component of many petrochemical products can also be produced sustainably from organic resources using a new fermentation process.

Isobutene (C₄H₈) is a versatile and indispensable raw material for the petrochemical industry. As a basic technical chemical, the hydrocarbon forms the basis for a wide range of products, from cosmetics to plastics and plexiglass to rubber products and fuels. More than 15 million tons of the sweet-smelling, flammable gas are processed every year.

Isobutene is currently produced on an industrial scale in refineries by cracking crude oil. However, dependence on the fossil resource is problematic for two reasons: On the one

hand, cracking requires energy, releases emissions and leaves behind problematic waste water and sludge. On the other hand, oil reserves are limited and will eventually run out. Therefore, the search was on for safe, sustainable and at the same time environmentally friendly production processes for the raw material.

Microbes make gas from sugar

Global Bioenergies has developed a forward-looking alternative. The French biotechnology company, headquartered in Evry



The demonstration plant in Leuna, near Leipzig, Germany, is equipped with state-of-the-art technologies to develop the isobutene production process before implementing it in a commercial scale plant.

south of Paris, relies on an enzymatic fermentation process that converts renewable resources such as sugar beet, corn and cereals, as well as agricultural and forestry waste, into isobutene.

The principle is quite simple: the plant substances or organic waste are filled into a bioreactor (fermenter) and special genetically modified micro-organisms are added. The metabolism of these microbes processes the sugars contained in the raw material – glucose, sucrose and xylose – directly into the gaseous hydrocarbon. It is then separated from air, carbon dioxide and steam in a purification process. What remains is pure isobutene.

The process is presently being developed up to the point of market maturity in a demonstration plant near Leipzig, Germany, since 2017. The first industrial commercial plant producing isobutene from renewable resources is expected to be built in the forthcoming years as a joint venture with Cristal Union, a French sugar beet processing cooperative.

No research without specialty gases

In addition, the company wants to tap into further resources for isobutene production. „In February this year, we made isobutene from straw in a pilot plant that we have been operating for four years in cooperation with various industrial groups“, reports Marc Delcourt, CEO of Global Bioenergies. They are also working on processes which could enable the use of industrial emissions. Carbon monoxide and carbon dioxide should therefore be used for the production of the raw material instead of being discharged into the atmosphere as waste gas.

At the Genopole, a French biocluster in Evry, Global Bioenergies operates a state-of-the-art research and development laboratory. The laboratory uses high-purity special gases from Messer, including synthetic air, carbon dioxide, argon and nitrogen. The gases are needed to carry out the test procedures; they ensure reliable results. Argon and nitrogen, for example, function as carrier and purge gases for gas chromatography.

Editorial Team



At this demonstration plant, Global Bioenergies produces high purity isobutene at ton scale, which will be converted into plastics, fuels, rubber or cosmetic ingredients.

Feel-good atmosphere for embryos

Dr Szabolcs Mátyás, Senior Embryologist,
Kaáli Institute Budapest

What do you store in the Kaáli Institute's cryobank?

We mainly store embryos that have not been used in IVF treatment. We also keep male and, to a lesser extent, female germ cells. Ova and embryos are particularly sensitive and are therefore cooled using a new method known as vitrification. We store them in liquid nitrogen at minus 196 degrees Celsius. At the same time, we also use the conventional method whereby, for example, male germ cells are kept in gas-phase boxes with a temperature ranging between minus 130 and minus 150 degrees Celsius.

What does vitrification involve?

At approximately 1.2 microlitres, the cell samples are very small, which means that they can be cooled and warmed very rapidly, at a temperature change rate of up to ten thousand degrees per minute. Together with the special solvent used here, this method also prevents the formation of ice crystals in the cells' environment. This allows us to achieve a sample survival rate in excess of 90 per cent, which is a major improvement compared with conventional slow cooling methods.

How long can you keep the cells fresh?

By law, the permissible period is ten years. However, physically, up to 200 years would be possible if you managed to maintain the right temperature all the time. At a temperature of minus 196 degrees Celsius, there is no longer sufficient energy for biochemical processes. The 200-year limit was calculated on the basis of the harmful effects of cosmic background radiation.

Do you use any other gases other than for freezing?

We also use gaseous nitrogen, carbon dioxide and oxygen as well as N-Carbogen 6/5, which consists of 89 per cent nitrogen, 6 per cent CO₂ and 5 per cent oxygen. These gases are used to fill the incubators in which the germ cells and fresh embryos are grown.

Why is this mixture used?

The equilibrium between the gases and the nutrient solution ensure a pH value of 7.1 to 7.2, which corresponds to that of natural physiology.

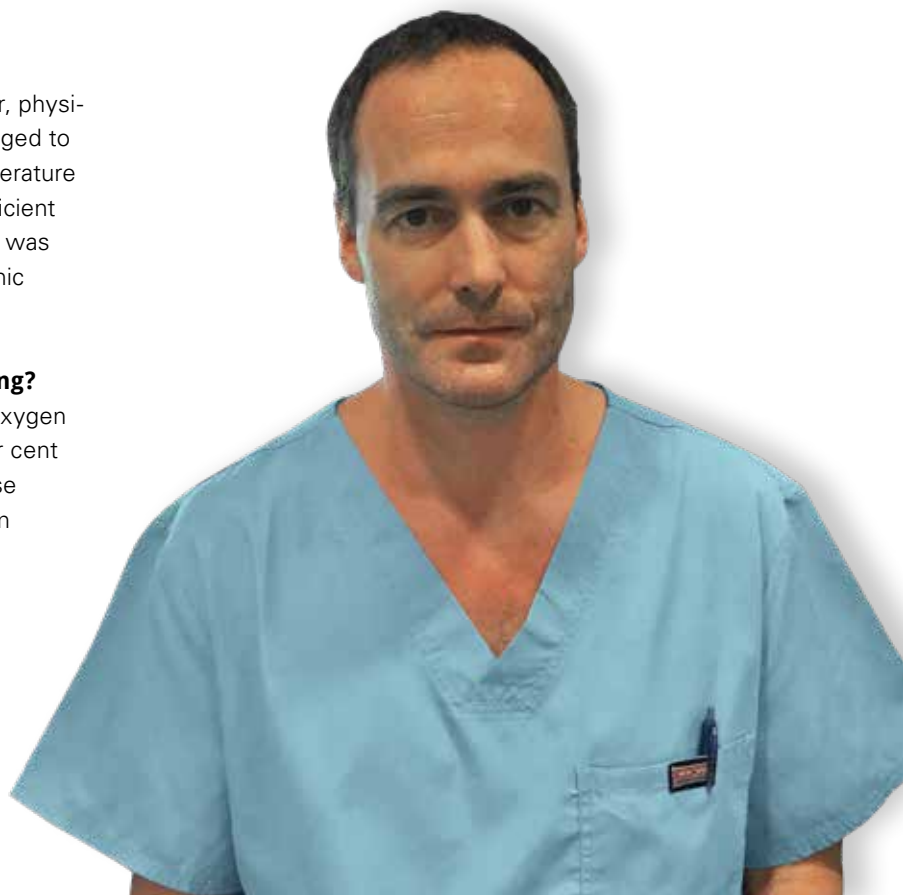
How do the gases get into the incubator?

A central supply system supplies the incubators with gases. The incubators are fitted with processor-controlled solenoid valves that regulate the inflow. Messer has installed a very reliable gas supply system for us which ensures that the gas pressure required for incubation is maintained. In the newer benchtop incubators, the original atmosphere is restored within 30 to 60 tenths of a second of opening the valve.

What do you expect from your gas supplier?

The survival of the embryos also depends on the quality of the gases. So we always need medical purity – and, of course, a reliable supply at all times.

Kriszta Lovas, Messer Hungarogáz



Win a delicious prize

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

How many production facilities has Messer gained in North America?

Please send the correct answer by e-mail with the subject line “Gases for Life Competition” to:
angela.giesen@messergroup.com

The deadline is 25 October 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 27 is **Gerhard Bergauer** from **Bad Soden, Germany**.
The correct answer was: “Krefeld”

The “Gases for Life” editorial team

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PUBLISHED BY

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Don't worry, it's only beer

Liquid Fear, Hard Decision and Shock Doctrine – the names on the labels sound a bit ominous. But that doesn't put off real beer lovers! In fact, they are crazy about the contents of the bottles from La Pirata. At the Barcelona Beer Challenge 2019, the company was even chosen as the best brewery out of 220 contenders. Its use of ironic contrast between name and taste can be savoured with nine varieties of beer. The sparkling bubbles are supplied by Gourmet C from Messer.

www.messergroup.com

