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MESSER

Gases for Life

The industrial gases magazine

Gases make beverages sparkle and keep them fresh for longer

Pleasant, invigorating and extremely useful

Aircraft construction:

Baking carbon fibres and saving kerosene

Heating element production:

Perfect look for hidden helpers

Double-glazed windows:

Benefits of gas in glass

Dear Readers,

This summer, Stefan Messer (centre) welcomed colleagues from all over the world who were visiting the modern industrial gases exhibition at the new company headquarters in Bad Soden.

You have before you the first summer issue of "Gases for Life". In it, we look at a subject that is inextricably linked with summer refreshment, namely sparkling cool drinks – no matter if the summer of 2011 has been hiding behind grey clouds now and then.

It is carbon dioxide in soft drinks, mineral water and beer that creates this inimitable tingling sensation on the tongue. But there are also other gases and gas applications that play a part in ensuring every sip is enjoyable: nitrogen and carbon dioxide protect beverages against unwanted oxidation throughout processing; a single drop of nitrogen gives a PET bottle the necessary stability for handling; dry ice pellets produced with the help of CO_2 are used to cool grapes immediately after harvesting, while carbon dioxide delays the start of the fermentation process, which has a decisive bearing on a wine's aroma.

The subject of "cryosaunas" is also appropriate for summer. Instead of hot conditions, these involve extreme cold of -140 degrees Celsius. The low temperatures produced by nitrogen form the basis of the treatment called cryotherapy, which allows the human body to recover more quickly from strenuous exertion or shock. Pain, too, can be alleviated by spending a short time in a cryosauna.

If you are planning to fly somewhere to escape a rather cool summer, then this too will involve the use of products that have been manufactured with the help of Messer gases. In this case, we are talking about ultra-light carbon fibre aircraft components that have been "baked" in a protective atmosphere consisting of nitrogen.

With this in mind, I wish you an enjoyable summer wherever you are.

Best wishes

Stefan Messer

Contents

Cover photo: Refreshing – Monika Lammertz, Manager Application Technology Food at Messer, enjoys a Coke with the tingling sparkle provided by carbon dioxide.

Good for you and the environment

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Germany: Partial oxygenation

Full load in spite of retrofitting

The wastewater treatment plant in Bad Rappenau near Heilbronn has two activated sludge tanks which are currently undergoing successive retrofitting. While work is carried out on one basin, the other has to deal with the entire wastewater load. Of course, the existing aeration systems are not designed for this double load. That is why oxygenation tubes were laid in order to inject pure oxygen into the tank. This partial oxygenation, as it is called, supplies the required amount of the reactive gas to the biodegradation processes, thereby maintaining the biological cleaning capacity and ensuring that the outflow limits are reliably complied with. The pure oxygen also helps prevent unpleasant odours from forming in the first place. This is particularly important as the wastewater treatment plant is located in a nature reserve and recreational area.

Stefan Kosock und Helmut Gottschalk, Messer Industriegase

Germany: Concrete cooling in tunnel construction

Stability for ICE line

A new high-speed rail link is currently being built between Erfurt and Nuremberg. To ensure that the ICE can maintain its speed, a 3.8-kilometre tunnel is being built under the Eierberge hills near Bad Staffelstein in Franconia. The quality of the concrete that is used in the construction has a decisive bearing on the stability of the tunnel. That is why a large part of the approximately 300,000 cubic metres of concrete required is cooled. As a result, stress cracks are avoided and better structural quality is achieved. The use of cryogenic liquid nitrogen allows the temperature of the fresh concrete to be adjusted precisely within a wide range and tuned in accordance with the requirements of the particular construction phase.

Jens Tauchmann, Messer Group

Raphaela Savelsberg checks out the tablet PC from Messer's industrial gases exhibition at the new company headquarters.

Czech Republic: Gas and equipment

Nitrogen for microelectronics

Nitrogen is required in the manufacture of electronic products at Foxconn Network Technology Ltd. in the Czech Republic. The Taiwanese company is the world's largest manufacturer of electronic and computer components. Its product range includes components for mobile phones and personal computers; the list of clients includes companies such as Hewlett-Packard, Intel and Apple. Foxconn supplies Apple with parts for the Mac mini, iPod, iPad and iPhone among others. Nitrogen is primarily required for the safe and reliable soldering of circuit boards and other electronic components. This year's expected nitrogen requirement is 750,000 cubic metres. Gas consumption is expected to double in 2012 after the completion of additional production lines.

Petra Plevová, Messer Technogas

Poland: Carbon dioxide snow as coolant

Optimal mushroom growing substrate

In Poland, Messer has won the custom of two producers of mushroom growing compost. The two compost producers "Mykogen" and "Unicost" produce special culture substrate that is suitable for mushroom cultivation. In order to regulate natural fermentation in the compost, the temperature must not exceed a permissible maximum level. Messer helps achieve this with its carbon dioxide coolant. The carbon dioxide snow cools the special compost and prevents it from suddenly starting to ferment and becoming unusable.

Romuald Maciąg, Messer Polska

The temperature of the fresh concrete can be adjusted in next to no time.

Péter Szúnyog (Zollner) and László Ferencz (Messer Hungarogáz) next to the newly installed nitrogen tank in Vác

Hungary: Soldering with nitrogen

Quality and process reliability

Oxidation is extremely undesirable when soldering electronic components. That is why Zollner, based in Vác, does its soldering in a nitrogen atmosphere, which largely prevents unwanted oxidation of metal surfaces. Surface wetting with the solder is also much better under nitrogen. This reduces the number of soldering defects and improves the quality of the solder joints. Overall, nitrogen enhances process reliability, increases yield and expands the soldering machines' process window. Zollner is a system service provider in the Electronic Manufacturing Services (EMS) sector, offering an extensive range of product-related services. Having invested in additional machinery this year, Zollner now has a significantly greater gas requirement. Messer therefore increased the nitrogen supply volume by 1.6 million to 3.6 million cubic metres in June of this year.

Anita Kötél, Messer Hungarogáz

Switzerland: Beer production with ASCO equipment

High-tech for traditional brewery

St. Gallen has a brewing tradition stretching back centuries. The Schützengarten brewery was founded in the eastern Swiss town in 1779, making it the oldest brewery in Switzerland today. At the same time, it is one of the country's most state-of-the-art breweries thanks to a process of continual modernisation. Schützengarten also uses high-tech solutions when it comes to handling carbon dioxide (CO_2): the gas, which is recovered from the brewing process, is stored in liquid form in a 20-tonne-capacity tank. An atmospheric CO_2 vaporiser converts up to 500 kilogrammes per hour of this liquid CO_2 to the gaseous state in order to prepare it for use as a protective gas for various steps in the brewing process as well as bottling and keg filling. In addition, Schützengarten has almost 2,000 CO_2 cylinders which are used for drawing beverages in the catering trade. Schützengarten uses an LH800AR CO_2 cylinder filling system to fill the cylinders. This system was supplied by ASCO, along with the tank, vaporiser and cylinders.

Nicole Urweider, ASCO Carbon Dioxide LTD

Tim Lieser, a trainee at Corporate Communications, likes Ethical Coffee too.

France: Protective gas for coffee capsules

Environmentally friendly coffee capsules

Coffee machines that brew up the hot drink using single-portion capsules are becoming increasingly popular. However, for each cup of coffee, the empty capsule, generally made from aluminium, is left as waste. In order to cut down on the use of this energy-intensive raw material and reduce waste, the Swiss-based Ethical Coffee Company (ECC) has developed a coffee capsule made from corn starch and fibre. At the end of the coffee-brewing process, the capsules can go to compost along with the coffee grounds, where they biodegrade. What is more, the corn pod is 20 per cent cheaper than the aluminium product.

ECC's new plant in Ville-la-Grand, France, has seven new production lines, including five high-speed filling systems in order to meet the growing demand. Each year, 1.5 billion capsules are to be produced in this factory. Food-grade nitrogen is used during capsule production. Close cooperation between Messer Schweiz and Messer France led to the signing of a gas contract with ECC for 1.5 million cubic metres of liquid nitrogen.

Angélique Renier, Messer France

Nitrogen protects production of ultra-light aircraft components

Baking carbon fibres and saving kerosene

Modern commercial aircraft are expected to be more fuel-efficient while at the same time becoming quieter and quieter. This is not just an ecological challenge – the manufacturer reaps direct economic benefits from each advancement in this area: whoever builds the most economical aircraft gets the most orders. For example, at the beginning of July, 567 orders had already been placed for the new A350 long-haul aircraft which Airbus wants to put into service at the end of 2013. The fuselage and wings of this model consist mainly of carbon fibre composites, which are both light and stable. The individual components are "baked" in huge autoclaves prior to assembly. Large quantities of nitrogen are used to provide an inert atmosphere and fire protection.

Image: Premium Aerotec GmbH

The Airbus A350's fuselage and wings consist of lightweight yet high-strength carbon fibre components. Their production demands the utmost precision.

According to Airbus, the A350 will use 25 per cent less fuel than comparable aircraft in operation today. While this efficiency gain also has to do with optimised engines and surfaces, the main factor is the aircraft's lower overall weight. In order to reduce the weight, the fuselage structure is made of carbon fibre material. The wings, which have a span of 64.7 metres, are made entirely from this super-light material. According to the manufacturer, the new Airbus will therefore be the most economical and environmentally friendly aircraft in its class.

Carbon fibre composite material, also called CFRP (carbon fibre reinforced plastic) for short, basically consists of two components – the highly stable carbon fibres and a resin in which the fibres are embedded. The parts are then "baked" in their finished form in order to bond the two materials firmly together and harden them. This colloquial expression is a quite accurate description of one aspect of the process: at around 180 degrees Celsius, the required temperature is approximately the same as that

The carbon fibre composite materials for the A350 are "baked" under high pressure in an autoclave like the one shown here. Flooding the chamber with gaseous nitrogen prevents the atmosphere inside the pressurised oven from igniting.

Image: Premium Aerotec GmbH

of a conventional oven. However, that is where the similarity ends: the oven for CFRP parts is called an autoclave and is much bigger than the kitchen model. Moreover, the baking is done under high operating pressure.

The autoclaves for the A350 are operated by Premium Aerotec in Augsburg and Nordenham as well as by Aerolia in the French town of Méaulte. They are each between 20 and 30 metres long and have a diameter of up to nine metres. At a pressure of approximately 11 bar, the parts are left in the huge pressurised ovens for up to twelve hours, depending on their size and form. The autoclave is filled with nitrogen in order to prevent the fuselage and wing segments from catching fire. Approximately 60 per cent of the gas is required in the first half hour. Depending on the system, 20,000 to 60,000 cubic metres per hour needs to be supplied.

To make these quantities of gas available, a different solution has been found at each of the three locations. The nitrogen, which is supplied in liquid form, first needs to be converted to the gaseous state before it is injected into the autoclaves. In Nordenham, an air vaporiser is used for this, which brings the nitrogen to the boil with the energy of the ambient air. This involves the moisture in the air condensing to form mist, which can be drained without any significant disruptive effects at the northern German site. In Augsburg, mist formation would affect adjacent production and traffic areas. For this reason, a closed vaporiser system – fired with natural gas – was installed here. In Méaulte, where the autoclave technology differs from that used at the German sites, the waste heat from the pressurised oven is used to heat the gas, again in a closed system.

The increasing use of CFRP components in the aviation industry is opening up a significant new market for nitrogen. The two autoclaves in Augsburg and Nordenham alone will require around 5.7 million cubic metres of the gas in 2015, when production of the A350 is scheduled to be in full swing.

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The customers

The EADS subsidiary **Premium Aerotec GmbH** manufactures aircraft components in Germany and Romania. The company's core business encompasses the development and production of aircraft structures made of metal and carbon fibre composite material. Premium Aerotec is the world's largest supplier for the new Airbus A350, supplying more than half of the fuselage.

Aerolia also builds aircraft structures, mainly specialising in the production of aircraft noses. The company has plants in France and Tunisia.

France: New CO_2 plant

Green gas source

Messer France has teamed up with Spain's Abengoa Group to build a new CO_2 production facility in Lacq, in the Pyrénées-Atlantiques département. Abengoa is the largest biofuel producer in Europe. The production unit will reach a capacity of eight tonnes per hour and is expected to produce 70,000 tonnes of carbon dioxide per year. In total, around 12 million euros is being invested. Every aspect of the facility has been designed for environmentally friendly operation. The CO_2 is a waste product from the production of bioethanol, which is added to vehicle fuels in France, accounting for seven per cent of the fuel mix. The gas is generated from the fermentation of maize. Moreover, the CO_2 that is generated during bioethanol production is purified with CO_2 rather than with water. This means that the production facility uses water only for cooling purposes. This environmentally friendly concept also extends to transportation. Most of the surplus carbon dioxide is transported by rail via the new rail terminal in Blanquefort near Bordeaux. This investment will provide Messer with a reliable future source of CO_2, which hitherto has mainly come from ammonia/fertiliser production. The plant is scheduled to go into operation at the end of 2012.

Angélique Renier, Messer France

Fabrice Orecchioni, Richard Perrayon, Antonio Vallespir, Egon Glitz (left to right)

Vietnam: Liquid gases for iPhone production

"Touch it!"

Liquid nitrogen is required in the manufacture of touch panels for iPhones and iPads.

Nguyen Canh Duong, Messer Haiphong Sales (r.) and Pham Thanh Duong (l.) are happy about the contract with Wintek.

Wintek, a Taiwanese manufacturer of LCD touchscreens for Nokia and for the Apple iPhone (AAPL), is investing 150 million dollars in a new plant in northern Vietnam. The factory, which is under construction in Bac Giang province, will produce touch panels for iPhones and iPads. Production is already due to start in the third quarter of 2011, with an initial production capacity of ten million thin-film transistors a month and "several million" touch panels. Messer Haiphong has signed a five-year contract with Wintek to supply 500 to 800 tonnes of liquid nitrogen a month. Large quantities of the nitrogen will be used for the storage of electronic components. A contract to supply 200 cylinders of argon a month has also been concluded with Wintek.

Ivan Perez, Messer Haipong

Former Messer trainee Katharina Butzen with a sample of cryogenically ground recycled material which forms the basis for new products.

Spain: Cold grinding with ecological benefits

Recycling with a small grain size

Granulates and powders are important intermediate products in polymer processing. In order to produce uniform granulates without unwanted agglomeration, the grinding process has to be cooled for some starting materials. The Spanish recycling specialist Zartu S.A. is one of the leading suppliers of cryogenically ground polymers in southern Europe. The company is based in Perafort near Tarragona and has a total of nine production lines, two of which use cryogenic nitrogen. In 2010, Messer supplied a total of 1.2 million standard cubic metres of liquid nitrogen for these lines.

As director Juan Blázquez explains, the main advantage of cold grinding is the consistent product quality it delivers. The smaller the grain size, the more valuable the product. Zartu uses cold grinding primarily to process plastic bottles and packaging material. The granulates are predominantly sold to the chemical industry. Zartu's customers include companies such as Repsol, PEMEX, Basell and Celanese. They use the recycled material in the manufacture of products for numerous sectors. These include car mats, shoe soles, adhesives and paints, particularly for master batches – pigments with special effects for a wide range of synthetic resins. The granulates are also used in the production of non-woven materials such as conveyor belts.

The recycling of waste products not only helps to reduce the consumption of raw materials, but also to save money. Recycled plastic products are around 35 per cent cheaper than new products.

Marion Riedel, Messer Ibérica de Gases

People Focus

6 questions for

Ivan Perez

Ivan Perez (31) is a graduate chemist who joined Messer in 2007. Since the beginning of 2011, he has been strengthening Messer's application technology and market development activities in Vietnam. He is married with two children and has been living in Hanoi (Vietnam) with his family since 2011.

1. **My biggest professional challenge at Messer so far has been ...**
   ... adapting to life in Vietnam in order to provide technical support to our subsidiaries there.
2. **What typifies Messer for me is ...**
   ... the ability to take swift action for our customers thanks to the excellent cooperation that exists in our international organisation, and a high degree of decision-making autonomy.
3. **My strengths ...**
   ... are personal commitment, spontaneity, perseverance, readiness to take risks, and the ability to learn quickly.
4. **I have a weakness for ...**
   ... Mediterranean food. Best enjoyed with the family, good friends and a glass of red wine.
5. **What fascinates you about gases and gas applications?**
   I find my present area of work – cryogenic solvent recovery and waste gas cleaning – as interesting as it is complex.
6. **The most important invention of the last century is ...**
   ... the laser with its different applications, such as in nanotechnology, which allows matter to be manipulated at an atomic level.

Pleasant, invigorating and extremely useful

Actually, nature intended the nose and lungs for the physical absorption of gases. But even in the ancient world, people enjoyed the experience of drinking mineral water in which tiny bubbles would rise up and cause a tingling sensation on the tongue. And when it came to beer, people not only enjoyed its alcohol content, they liked its frothiness too. The tingling and frothiness were caused by the carbon dioxide which ended up in these beverages as a result of natural processes and without human intervention. The past century saw the start of the global success of sparkling beverages that contain additional CO_2. Today, gases play an increasingly important role in the processing and filling of beverages.

Image: Krones AG

Carbon dioxide is frequently used when bottling drinks.

Man's first and – until the 18th century – only encounter with sparkling mineral water was at mineral springs with a natural CO_2 content. These springs are usually found in areas that experienced a lot of volcanic activity in the past. As the magma cools, it releases carbon dioxide, which dissolves in the natural mineral water. This is what happened in Selters an der Lahn, a small place in Hesse, where a world-famous mineral water is bottled. "Selters" – and the Anglo-Saxon variant "Seltzer" – has thus become internationally synonymous with sparkling mineral water. Natural mineral water or soft drinks can be enriched with naturally sourced or process-sourced carbon dioxide. This was first done in 1772 with CO_2 that escapes during beer fermentation. Getting carbon dioxide into a liquid is not difficult in principle. CO_2 dissolves so well in water that you can do it by merely blowing through a straw, at least for a small amount. The colder the liquid and the higher the pressure, the better the gas dissolves, however. Cooling and positive pressure are therefore used in the production of carbonated beverages. In many cases, the gas is only added to the liquid at the bottling stage. If beverage manufacturers do not have access to CO_2 of their own, they usually get it from carbon dioxide plants or gas suppliers such as Messer. Naturally, the beverage industry's peak CO_2 demand is in the summertime.

→ *Continued on page 12*

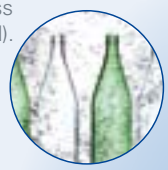
"Our gases and applications are as varied as the beverages themselves."

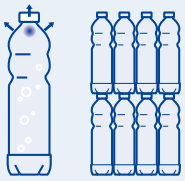
Monika Lammertz, Manager Application Technology Food at Messer in Krefeld

Applications of gases in the beverage industry

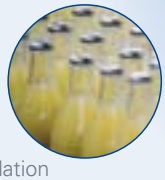
Mineral water

- **CO_2** ensures sparkling freshness and a long shelf-life (carbonated).
- **Liquid nitrogen** stabilises thin-walled PET bottles and cans and makes them stackable (non-carbonated).

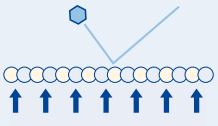


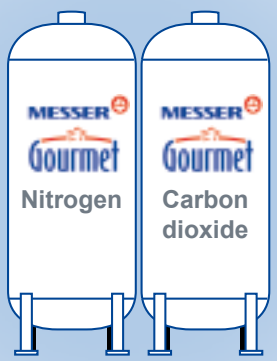


Juice



- **Nitrogen** protects against unwanted oxidation and prolongs shelf-life.
- **Liquid nitrogen** provides the internal pressure required in thin-walled PET bottles and cans.





Wine

- **CO_2 dry ice** cools the grapes and mash and protects them from premature fermentation during the grape harvest. During inertisation and blanketing, inert gases prevent oxidation and protect against undesirable changes in flavour or colour. **CO_2** is used for white wines, while **nitrogen** or **nitrogen-argon** mixtures are used for red wines.

Beer

- During **inertisation**, purging of tanks, transfer pumping, pressurising or bottling, CO_2 prevents oxidation and ageing of the beer after fermentation.

Soft drinks

- **CO_2** ensures long-lasting freshness, a long shelf-life and pressure stability (carbonated).
- **Liquid nitrogen** stabilises thin-walled PET bottles and cans.
- **Nitrogen** protects against oxidation and prolongs shelf-life (non-carbonated).

Messer and ASCO products for the beverage industry

- Carbon dioxide (CO_2) for beverage carbonation and as pressure retainer during filling
- Nitrogen for protection of beverages and as additional pressure for mechanical stabilisation of thin-walled containers
- Argon as protection against oxidation in winemaking
- CO_2 in the form of dry ice for cooling
- CO_2 revert recovery systems
- Atmospheric CO_2 vaporisers
- CO_2 cylinder filling systems with automatic weighing system
- CO_2 transfer pumps
- CO_2 testing equipment
- Detectors for monitoring the CO_2 concentration in the ambient air

Naturally sourced carbon dioxide is obtained from mineral water springs that have excess CO_2. However, most carbon dioxide is obtained as a by-product of industrial processes such as ammonia synthesis. After thorough cleaning it has food-grade quality, which has to be checked on a regular basis. Carbonated beverages not only taste nice, they also stay fresh for a long time as CO_2 inhibits the growth of microorganisms. This is achieved, firstly, by displacement of the air, and thus the oxygen, from the container, and secondly, by means of a change in the pH value, since a small proportion of the CO_2 combines with the water to form carbonic acid. Although this acid is very weak, microbes don't like this environment, with the result that carbonated drinks stay fresh for a long time.

Gases also help to keep beverages fresh during storage, transfer and bottling. Nitrogen, carbon dioxide and mixtures of the two – for example the Gourmet mixtures from Messer – protect them against unwanted oxidation throughout processing. The question as to which gas is used depends on the product and whether carbonation is required. Thus, for example, nitrogen in the form of fine bubbles is used to remove the oxygen dissolved in a liquid. In the storage tank and in the sales/merchandise container, inert gas rather than air fills the headspace, preventing oxidation and microbial growth here too. If a positive pressure is required for still beverages, then the addition of a liquid nitrogen drop will help to mechanically stabilise thin-walled receptacles such as PET bottles and make them stackable.

Meanwhile, microorganisms are positively welcome in winemaking, for without yeast fungi there would be no fermentation. But if the wine is to taste good, fermentation must not begin too soon or take place too quickly. The higher the temperature the greater the risk. Again, carbon dioxide can help here: in the form of dry ice pellets or dry ice snow, it cools the harvested grapes or the must without diluting them, thereby slowing down the work of the yeast fungi. In

addition, the carbon dioxide gas that is released in the process displaces the atmospheric oxygen and thus inhibits oxidation. When inerting and blanketing wine vats, nitrogen and nitrogen/carbon dioxide mixtures are the most widely used gases for preventing changes in taste and colour as a result of oxidation. Instead of nitrogen, it is also possible to use the heavier but just as inert noble gas argon in order to preserve the wine's existing quality. Breweries, too, use inert gases to try and keep oxygen away from the beer in order to prevent oxidation and maturation of their beer after fermentation. Large breweries use the carbon dioxide that is generated during fermentation itself while others are supplied by gas producers such as Messer. It is used in the production process in a variety of ways. Inert gases – in this case mostly CO_2 – help with inerting, tank purging, transferring to storage tanks or filling road and rail tankers, priming barrels or preserving the quality of the beer during bottling.

Beverage production today is unthinkable without gases. But what is it we like about a drink – a liquid – that also contains a gas? It's quite simple: most people find the tingling sparkle of the tiny bubbles refreshing. It stimulates salivation and increases circulation of the blood to the tongue and palate. This makes them more receptive to flavours – coke and lemonade simply have a much stronger taste with CO_2. Furthermore, researchers in Los Angeles recently discovered that carbon dioxide stimulates the same pain receptors in the mouth that also react to strong mustard, horseradish or chilli. And this small pain, which we don't even register as such, also has a pleasant and invigorating effect.

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Interview with

Miroslav Urica, Strategic Procurement Manager at Coca-Cola Hellenic Procurement GmbH:

"Messer has proved to be a flexible and reliable partner in every respect."

Gase im Leben: Which gases do you get from Messer?

Miroslav Urica: In 2010, Messer supplied us with some 38,000 tonnes of carbon dioxide and 4,500 tonnes of liquid nitrogen. The latter is used in filling thin-walled PET bottles or cans. A slight overpressure develops when the nitrogen evaporates, giving the containers the necessary stability.

Gase im Leben: What is the most important factor in relation to the gases?

Miroslav Urica: Quality is our prime consideration. The Coca-Cola Company has defined its own very strict specifications for this. The supplier must carry out regular checks and be able to demonstrate that these specifications are being complied with. We also need an international player who can preferably partner us in all our sales areas. And of course the price has to be right too.

Gase im Leben: What do you expect from the supplier?

Miroslav Urica: It is important to us that they are flexible, and that their service adheres to the agreed standard. There is always the possibility of an unplanned spike in demand, for instance during unexpectedly hot weather. The supplier then has to be able to deliver a sufficient quantity of gases at very short notice. We also expect any technical problems that may occur with the tanks and pipelines to be resolved very quickly. Since 2000, Messer has proved to be a flexible and reliable partner in every respect. That is why we want to further strengthen our cooperation.

Editorial Team

Image: The Coca-Cola Company

The Coca-Cola Hellenic Procurement GmbH

Coca-Cola Hellenic is the world's second-largest and Europe's largest bottler of Coca-Cola Company products. The company operates 80 bottling plants and sold more than 13 billion litres of soft drinks in 2010. Its area of operation covers 28 countries, predominantly in central and eastern Europe, covering a total population of over 560 million people. Besides Coca-Cola Hellenic, Messer also supplies Coca-Cola Enterprise in France as well as Coca-Cola China.

Protective gas with cleaning effect during annealing of heating elements

Perfect appearance for hidden helpers

Normally we don't see them, but we would certainly miss them if they didn't do their unseen work: heating elements are ubiquitous and indispensable. Whether they get the oven to the right temperature or heat the water in the washing machine, melt plastic for film or get rid of the ice on railway points, they always generate the required heat when and where it is needed. Backer ELC AG in Aarau, Switzerland, has been producing flat and round heating elements for different applications for over eighty years. The company relies on high-purity protective gases from Messer.

The centrepiece of any heating element is the heating coil, which converts electricity into heat. It is embedded in an insulating layer consisting of magnesium oxide powder, which in turn is encased in a steel sheath. At Backer ELC, these tubular casings are made from corrosion-resistant steel alloys. The rods, which are straight to begin with, are bent into different and sometimes quite exotic shapes, depending on what they are going to be used for. In order to improve the steel's workability, the rods are annealed at around 1,050 degrees Celsius. This also sinters the magnesium oxide powder to a solid ceramic mass.

Any oxidation of the metals in the annealing furnace is of course unwelcome as it would affect the quality and appearance of the tubular casings. Chromium oxide, for example, turns the surfaces green. In order to avoid such effects, a protective controlled atmosphere is created inside the annealing furnace. First, the air is displaced from the furnace by adding nitrogen, and then a mixture consisting of 75 per cent hydrogen and 25 per cent nitrogen is introduced. Since the continuous furnace – the material to be annealed is moved through the furnace chamber on a conveyor belt – is open on two sides, the gas has to be topped up continuously to ensure that the atmosphere remains virtually free of oxygen. Apart from providing protection against oxidation, the hydrogen also has a cleaning effect: if there are oil residues on the metal, these are evaporated in the heat; the gas reacts with the carbon contained in the oil, thereby preventing possible condensation of the vapours and keeping the surfaces smooth and clean. The hydrogen also helps to make the annealing process more efficient and save energy. In comparison with all other gases, it is much better at absorbing heat (heat capacity) and conducting it (thermal conductivity). It speeds up the transfer of thermal energy and causes the heating elements to be heated more evenly. Disposing of the hydrogen is easy as well as environmentally friendly: once it has served its purpose, it is burned off at various points in the furnace system, with an easily visible flame. This produces harmless steam as waste gas. The purity of the gases that are added is crucial in terms of ensuring that the surfaces are of the required quality. Messer guarantees both the required purity of the gases as well as their constant availability. During the design and installation of the gas supply, Messer supported the customer with special know-how in applications, gases and safety technology.

Lorenz Thalmann checks the heating elements after annealing in the continuous furnace

Annealing is a crucial stage of production, but the heating elements only acquire their diverse forms once they have cooled. After leaving the furnace,

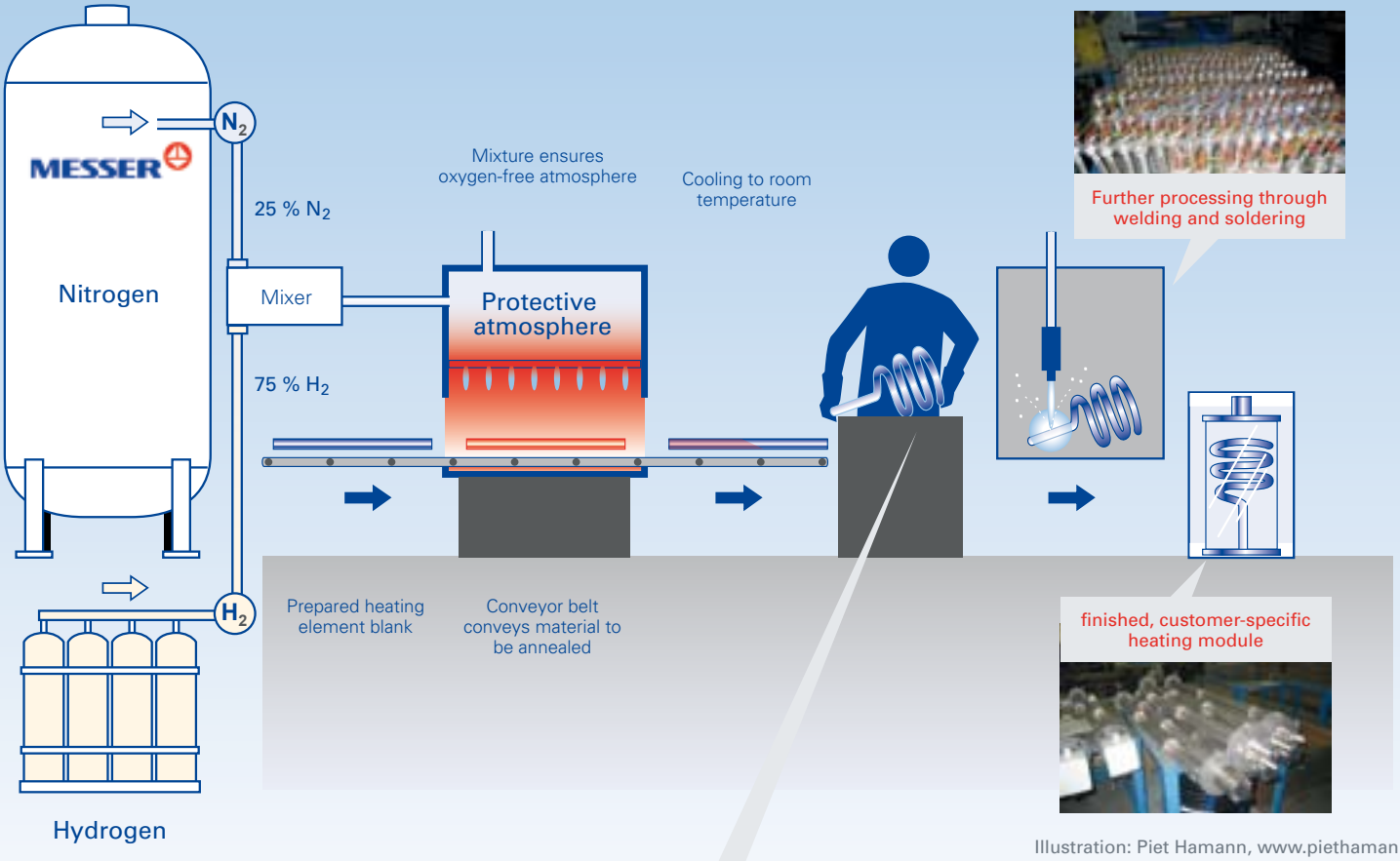

Illustration: Piet Hamann, www.piethamann.de

Stefan Cuturic screws together the cooled, manually bent heating elements.

The advantages of hydrogen/nitrogen mixtures from Messer

- High degree of purity of industrial gases
- Dosage and concentration as required
- Reliable quality thanks to reproducible gas atmosphere
- Constant availability of gases as safety purge gas
- Reliable and secure storage of gases
- Low consumption of protective gas
- Low investment costs
- No direct CO_2 emissions

they undergo a visual inspection. The surfaces of the protecting tubes already have their final appearance and should have a metallic sheen without any oxidation.

The secret of producing high-quality heating elements lies in the optimal determination of the final length as well as in the bending, which is done by hand. At the end, the electrical connections must be correctly positioned with millimetre precision so that the finished heating elements can be easily fitted. Any tears in the tubes during bending would inevitably result in rejects. It takes the skilled workers up to six years of practice to learn how to make complex three-dimensional forms with loops.

Gases are also required for other operations besides annealing. The manufacture of welded tubes involves the use of argon/hydrogen mixtures during welding and homogenizing annealing. Fuel gases and oxygen are needed for soldering of the electrical connections on the finished module.

Hans-Peter Schmidt, Messer Group
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Hungary: Oxygen for veterinary medicine

Animal operations under general anaesthetic

Vaccinations, the treatment of minor injuries and the implantation of "Backhome Chips", as they are called, make up the bulk of the day-to-day work of the Rex clinic for small animals in the centre of the Hungarian capital Budapest. If necessary, however, the clinic also performs operations under general anaesthetic. During inhalation anaesthesia, the animal patient is given medical oxygen from Messer in addition to the anaesthetic. The supply of oxygen during anaesthesia is vital and prevents organ damage.

Anita Kötél, Messer Hungarogáz

Bitang, who belongs to Messer employees Laura and Ferenc András, has not needed to go to the clinic yet as he is fit and healthy.

Poland/Benelux: Cryotherapy with nitrogen

Cold benefits

Extreme cold has astonishingly positive effects on the human body. After spending a short period exposed to a very cold environment, the body recovers much more quickly from strenuous physical exertion or a shock. Sensitivity to pain is reduced, physical and mental vigour is enhanced. One to three minutes in a cryosauna, as it is called, at a temperature of minus 140 degrees Celsius is enough to experience this beneficial effect.

Whole-body cryotherapy – in contrast to specifically targeted cryotherapy – goes back to Toshiro Yamauchi, the Japanese doctor who developed the first cryochamber in 1978. Zdzislaw Zagrobelny, Chair of Rehabilitation at the Academy of Physical Culture in Wroclaw, continued the research in the 1980s and established a scientific tradition in Poland in the field of cryotherapy. This ultimately led to the development of an inexpensive and compact chamber which is also simple to operate. Messer in Poland has been involved in this from the beginning. The Polish company PPH JUKA sells the chambers under the name "Cryosauna".

The low temperatures are generated by evaporating liquid nitrogen. The Cryosauna's main features are its small dimensions, particularly low operating costs and high efficiency: up to 20 patients an hour can be treated in the single-person chamber. Evaporation of the liquid gas allows the target temperature to be reached in under five minutes while at the same time complying with all the safety criteria that are absolutely essential when performing cryotherapy. In February 2010, the first chamber from Poland was installed at CryoWell in Ohain-Lasnes, Belgium. Another two chambers have been installed since then. Each chamber requires 3,000 litres of liquid nitrogen a year. CryoWell imports and sells the PPH JUKA chambers in the Benelux countries.

Frédéric Dohet/Marina De Ridder, Messer Benelux

Cryosauna: Therapy at minus 140 degrees Celsius

Hungary: CO_2 for cryotherapy

Shock for pain relief

A local cold shock can help with pain, sports injuries and other symptoms. The Cryofos thermal shock therapy device, which is sold in Hungary by Rentac Trade Kft., builds upon this effect. It uses the cold temperatures that are generated when liquid carbon dioxide expands, directing a fine spray of dry ice at the patient's skin with a pressure of 1-2 bar. The temperature of the treated area is lowered to around 2-4 degrees Celsius within just 30 seconds. The thermal shock causes the vessels to expand, thus facilitating much quicker removal of so-called inflammation mediators, substances produced in the body which trigger or maintain an inflammatory response in the body. This allows oedemas, haematomas and local inflammations to be removed much more quickly than with other forms of therapy. In 2010, Rentac donated one of these cryotherapy devices to the Hungarian Olympic Committee to support the treatment of top athletes as well as their preparation for future sporting challenges.

Anita Kötél, Messer Hungarogáz

Enjoying the optimum insulation properties of insulated glass: Messer employees Ute Schaad, Marlen Schäfer and Anita Kötél.

Krypton optimises insulation performance of insulated glass windows

Benefits of gas in glass

Heat insulation is one of the most important "alternative energy sources" with the potential to make a major contribution to climate protection. Windows are the main culprits when it comes to energy leakage from buildings. The use of noble gases such as krypton can significantly improve the insulation performance of insulated glass.

It is a basic law of physics that where different temperatures meet, they seek to balance each other out. Ever more sophisticated insulation techniques are being used in buildings to prevent this 'balancing out' in order to save heat energy. Of course, the quality of the glass and the finishing is crucial in determining the insulation properties of double or triple-glazed windows. But what you put in the space between the panes also plays an important role in this regard: the lower the thermal conductivity of the filling gas between the panes, the better the insulation.

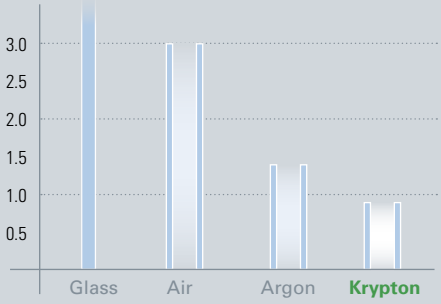
The simplest filling gas is air, but it has relatively high thermal conductivity. The noble gases argon and, in particular, krypton, which is rarer and therefore more expensive, have lower thermal conductivity.

The superior insulation properties of krypton allow the gap between the individual panes to be reduced compared with conventional insulated glass windows. Thus for argon, the optimal gap between panes is 16 mm, while for krypton it is only 8 to 12 mm. This enables the U-value to be reduced by between 0.3 and 0.5, depending on the filling gas and filling level. Double-glazed windows filled with krypton can thus achieve insulation values that are comparable with those of much heavier, argon-filled triple-glazed windows. Furthermore, windows filled with noble gases have the welcome side effect of also offering improved sound insulation.

Jens Tauchmann, Messer Group

The U-Value

Insulation efficiency is expressed with the U-value, which indicates how much heat a building material allows to pass through. The lower the U-value, the greater the insulation. For example, a single pane of glass has a U-value of 5.8, while insulated glass filled with air has a U-value of 3.0. If argon is used as a filling gas, U-values of under 1.5 are achievable, while the use of krypton allows this figure to be reduced even further to below 1.0.



Argon – Inactivity welcome

Each of us breathes in (and out again) a good 120 litres of argon every day. At just under one per cent, the noble gas is the third most abundant gas in the atmosphere after oxygen and nitrogen. One litre of air contains around 9.3 millilitres of argon. It is the third most abundant element in the universe besides helium and neon, and is the most prevalent of the seven noble gases on earth.

By far the largest proportion of argon on earth is found in the atmosphere. Since argon is also produced by the decay of the potassium isotope 40K in the earth's crust, small amounts of it are present in rocks. Volcanoes and hot springs also leak the noble gas into sea water and ground water.

After helium, argon was the second noble gas to be described scientifically. The British chemists William Ramsay and William Rayleigh discovered it in 1894 when they were investigating the composition of air. Since the gas – like all noble gases – turned out to be extremely inert, the scientists named it argon, after the Ancient Greek word "aergon", meaning "inactive". To this day, only one chemical compound involving argon is known of – argon fluorohydride HArF, which Finnish scientists demonstrated in 2000; however, it is only stable at extremely low temperatures.

Argon is non-flammable, it is heavier than air and displays virtually no chemical reactivity. The bulk of industrially produced argon is used as a shielding gas for welding and in metallurgy, for example in the production of steel, pure silicon or titanium. It is used as an extinguishing agent in automatic fire-extinguishing systems and, mixed with helium, it ensures that airbags inflate in a flash in an emergency. Its low thermal conductivity makes the noble gas a good filling gas for the space between the panes of glass in double-glazed windows. It is also used in winemaking for transfer-pumping and as a gas filling in casks in order to protect the wine against oxidation. Argon is also used as a filling gas for light bulbs and as an illuminating gas for gas discharge lamps, where it produces its typical purple hue.

Editorial Team

Profile: Argon [Ar]

Element symbol	Ar
Occurrence	Most abundant noble gas on earth, making up approximately 0.93% of the atmosphere
Boiling point	-186 °C
Freezing point	-189 °C
Chemical properties	Colourless, odourless noble gas, monatomic and extremely inert, heavier than air, non-flammable
Production	Air separation
Uses	Shielding gas for welding, degassing of metal melts, filling gas in light bulbs, illuminating gas for gas discharge lamps, laser medium in argon-ion lasers, filling gas in insulated glass windows, protection against oxidation in the food industry, gaseous extinguishing agent

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"Gases for Life" is published four times a year in German, English and Hungarian

The Gases for Life editorial team

We are ...

From top to bottom: Angélique Renier, Dr. Bernd Hildebrandt, Tim Lieser, Krisztina Lovas, Monika Lammertz, Marlen Schäfer, Dr. Joachim Münzel, Diana Buss and Michael Holy

(not pictured: Benjamin Auweiler, Angela Bockstegers, Thomas Böckler, Dr. Christoph Erdmann, Tim Evison and Nicole Urweider)

Competition

Cheers!

In this issue of the magazine, readers have the chance to win a selection of special beverages, in keeping with the subject of our cover story. These include beers, wines, spirits and soft drinks, all of which have been produced by our customers.

Which gas has the best insulation properties for insulated glass windows?

	4					10

Which coffee capsules are produced with the help of Messer gases?

		2			6	
				9		

What is the name given to the "ovens" in which carbon fibres are "baked"?

		8						3	

What is the brand name of a range of Messer gas mixtures used in the beverage industry?

5			7			

For your chance to enjoy these special beverages, all you need to do is answer our questions relating to this issue of "Gases for Life". The letters in the coloured boxes will give you the answer. Please send it by email with the subject line "Gases for Life competition" to: diana.buss@messergroup.com. The deadline is 31 October 2011.

This competition is not open to employees of the Messer Group or their families. In the event of multiple correct answers, the winner will be picked randomly. The result of the draw will be final and not subject to appeal.

Congratulations!

The winner of the last competition was Werner Dittmann, Voestalpine Rotec GmbH, Krieglach, Austria. The correct answer was "KÖNIGSALLEE".

Answer:

	2	3	4	5	6	7	8	9	10
B									

Have fun and (with a bit of luck) enjoy some sparklingly refreshing beverages!

Oxygen makes "Miami" nicer

The **„Miami"** vase was made for a new luxury cruise liner sailing out of Miami. 15 craftsmen at Ajka Kristály worked on it for over 16 hours.

The Hungarian Ajka Kristály glassworks has been crafting glasses, vases and bowls from the finest crystal glass since 1878. After decoration, the surfaces of the glass products are made smooth with the help of oxy-fuel burners. Messer supplies Ajka Kristály with 120,000 cubic metres of oxygen a year for this purpose.

For more on this and many other gas applications, go to:

www.Gases for Life.de