Issue 02 | July 2011

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MESSER

Gases for Life

The industrial gases magazine

Soil freezing creates stability for underground construction

Low temperatures, high safety

Solar cells:

Sun, gas and energy

Dry ice blasting:

Physics leaves no traces

CoolSold process:

Dual use of cooling

Dear Readers,

As CEO and owner of an industrial gases company, I should really be used to the huge variety of gas applications that exist. Instead, it is a subject that never ceases to fascinate me.

The use of nitrogen to help safeguard the expansion of the Düsseldorf subway network is a major challenge, purely on account of the scale of the project. Specifically, one of the benefits of nitrogen, or soil freezing with nitrogen, is that it helps ensure that the buildings on the famous Königsallee are not threatened by the underground tunnelling work.

Gases also play an important role where future technologies are concerned. For example, cryogenic helium ensures that components of the "ITER" fusion reactor at Cadarache in France are adequately cooled. To achieve this, the nitrogen must be kept at a temperature of minus 193 to minus 173 degrees Celsius. Nuclear fusion is very important for our future as it represents an inexhaustible source of energy – in theory at least.

Gas mixtures from Messer are also required at the other end of the temperature scale. For example, they are used in the environmentally friendly production of thin-film solar cells. Environmentally friendly because they facilitate innovative production processes which, for example, require less silicon, whose production is very energy-intensive.

In addition to these applications, this issue of "Gases for Life" also presents a whole series of other gas applications which boost quality, increase safety and even contribute to the creation of fantastic works of art.

Fascinating, don't you think?

Best wishes

Stefan Messer

Contents

Cover photo:
Alfred Rennert, building site manager at Züblin, uses soil freezing to prevent subsidence of neighbouring buildings.

Good for you and the environment

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Hungary: Rapid freezing of ice cream

Pure indulgent pleasure

The Magnum ice creams from Unilever are given a crisp chocolate coating thanks to rapid freezing with liquid nitrogen. For this purpose, Messer Hungarogaz has installed a new gas supply with ventilation system at the production facility in Veszprem, Hungary.

On a visit to the Gases for Life editorial offices, Emily Buss tests a Magnum ice cream's crisp chocolate coating.

Anita Kötél, Messer Hungarogáz

Romania: Nitrogen for Donauchem

Ammonia for fertiliser

The Romanian chemical company Donauchem operates an ammonia and fertiliser production plant in Turnu Magurele. The nitrogen required for this comes from Messer in Romania. Ammonia is an important precursor for fertiliser. Its production involves the use of catalytic synthesis of nitrogen and hydrogen at a pressure of 150 bar.

Paula Mocanu, Messer Romania

Switzerland: Certifications

Reference gases and foodstuffs

The introduction of the new ISO Guide 34 standard (Standard Reference Material Services) means that Messer has been certified as a manufacturer of reference gases in Switzerland since July 2010. It is the second company in Switzerland and the first in the gas industry to receive this licence. In addition, Messer Schweiz has been certified in accordance with the ISO 22000:2005 standard since November 2010. It applies to the filling and distribution of all the liquid and gaseous food gases sold under Messer's "Gourmet" brand. This certification confirms that Messer meets all the requirements of the quality management system for food safety in Switzerland.

Reiner Knittel, Messer Schweiz

Hungary: Nitrogen for automotive suppliers

New CryoGAN generators

CryoGAN nitrogen generators from Messer facilitate an efficient on-site supply of gaseous nitrogen. The process requires only half as much energy as the production of liquid N_2. The gas purity settings range up to purity class 6.0 (= 99.9999 per cent by volume). This means that CryoGAN nitrogen generators are also suitable for industries in which this factor plays a significant role, such as medicine, electronics and the food industry. In Hungary, two companies from the automotive industry have now opted for nitrogen generation at their own production site. At Delphi, one of the leading manufacturers of automotive electronics, a CryoGAN generator with a capacity of 620 cubic metres per hour went into operation in Szombathely at the start of the year. In April, the Korean tyre manufacturer Hankook Tire near Dunaújváros took delivery of a generator with a capacity of 1250 cubic metres per hour.

CryoGAN facilitates the production of gaseous nitrogen at the customer's site.

Anita Kötél, Messer Hungarogáz

Monika Lammertz, Application Technology, explains the advantages of „Gourmet" gases.

Austria: Temperature-controlled wet concrete

Main station without cracks

When concrete sets, heat is generated. In larger structures, this can lead to stresses and cracks which threaten the stability and impermeability of the concrete. The temperature of the wet concrete that is delivered for the construction of Vienna's new main station must not be more than 22 degrees Celsius in order to ensure that the permitted maximum temperature of 60 degrees Celsius is not exceeded in the completed part of the building. The building contractor Cemex, which is supplying the concrete for the main station, relies on Messer's patented cement cooling process for this. The gas and the cement cooling

Construction site at Vienna's main station

unit were supplied by Messer Austria. The first concrete cooled in this way has already been used in the construction of the main station, and the collaboration has also proved very worthwhile from the customer's point of view: in future all cooling projects at Cemex are to be carried out with Messer Austria.

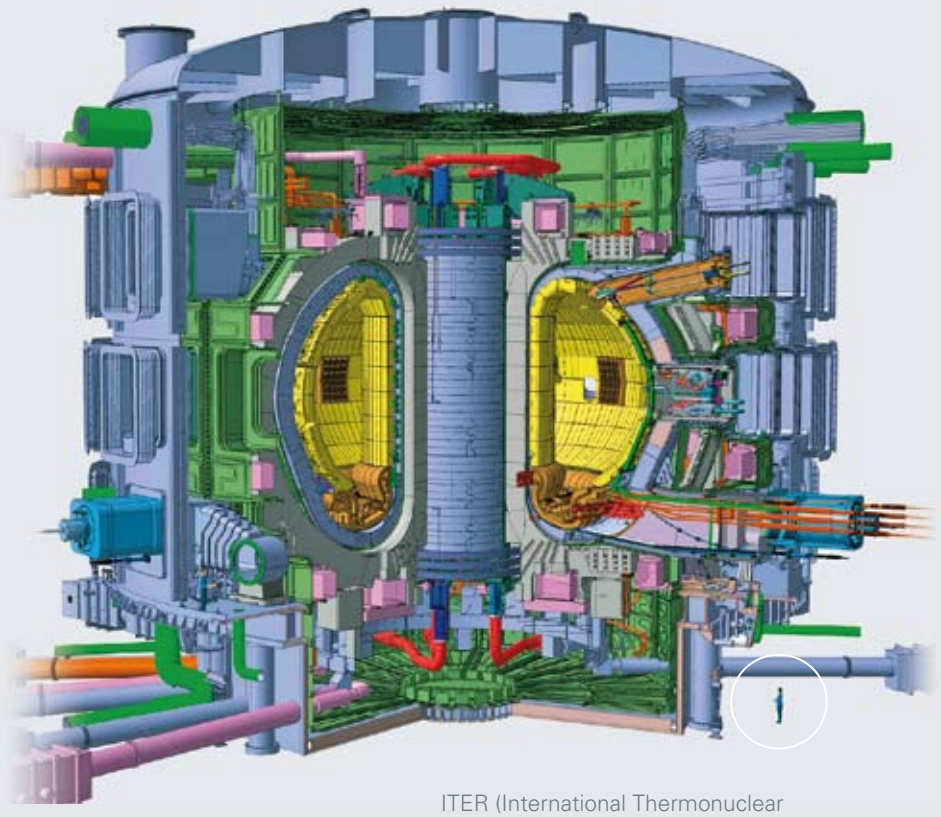
Herbert Herzog, Messer Austria

Serbia: Safety for pipelines

Pigging with nitrogen

The transportation of petrol and diesel derivates through the same pipeline can result in the formation of explosive gas mixtures in the pipes. To prevent this, the engineers from Messer Tehnogas are relying on a combination of inert gas and a pigging process at Eko Dunav in the Serbian capital Belgrade. Nitrogen is passed through the pipes before fuels are pumped through them to the storage reservoir. After pumping, the liquid residues are removed with the aid of a pig. The pig is a type of rubber plug that fits flush against the inner walls of the pipe. It is moved by means of gas pressure and pushes fuel residues ahead of it as it moves through the pipeline. At Eko Dunav, this pressure is provided with nitrogen. As well as pushing the pig forward, the gas also ensures an inert atmosphere, preventing explosive gas mixtures from forming in the first place.

Sanja Šamatić, Messer Tehnogas



ITER (International Thermonuclear Experiment Reactor) – human figure shown for scale comparison

France: Nitrogen for future technology

Nuclear fusion with precision cooling

In theory, nuclear fusion is a virtually inexhaustible source of energy. For the first time, a truly international collaboration is seeking to develop the technology for this potential energy source.

At Cadarache in the south of France, the prototype of a fusion reactor that produces more energy than it uses is being built as part of the international "ITER" project ("iter" means "the way" in Latin). At the heart of the facility is an ultra-high-vacuum chamber in which a plasma consisting of hydrogen nuclei is heated to over 100 million degrees Celsius by means of powerful magnetic fields. The vacuum pumps intended for the evacuation of the chamber are currently being developed by the Karlsruhe Institute of Technology (KIT). To test a pump, gaseous helium must be maintained precisely at a temperature between 80 and 100 Kelvin (minus 193 and minus 173 degrees Celsius). Messer supplied KIT with a special heat exchanger in which the helium is cooled with liquid nitrogen. By changing the pressure, it is possible to adjust the temperature of the gas very precisely, which in turn allows precise regulation of the cooling process. KIT will present this system at the Cryogenic Engineering Conference 2011 in the USA.

Dr. Friedhelm Herzog, Messer Group
Dipl.-Ing. Horst Haas, Karlsruhe Institute of Technology

Physics leaves no traces

Moulds and tools need to be really clean to ensure the right product quality. At the same time, however, the necessary cleaning must not hinder production – laborious cleaning processes can lead to long downtimes, reduced productivity and high costs. A much more straightforward, thorough and (cost-)effective solution is to harness simple laws of physics by using dry ice for cleaning.

Dry ice is produced from liquid carbon dioxide (CO_2). This is expanded under controlled conditions in a dry ice pelletiser. The resultant product is dry ice snow with a temperature of minus 79 degrees Celsius. A so-called extruder plate is then used to press this extremely cold material into pellets with a diameter of three millimetres. These are loaded into the ASCOJET dry ice blasting unit, conveyed to the blasting gun with compressed air and accelerated to a speed of up to 300 metres per second. The impact of the first pellets creates a thermal shock at individual points on the moulds being cleaned. Furthermore, the subsequent pellets transmit high kinetic energy. The impurities are loosened completely and simply flake off.

Since the pellets are converted to the gaseous state immediately upon impact, they leave a clean and dry surface. Furthermore, the surface remains undamaged due to the low degree of hardness of the dry ice pellets – only around two Mohs (on Friedrich Mohs' hardness scale).

Perfect surfaces are a must when it comes to design components – in this case for a Nespresso coffee machine, special New York edition. Thorough and gentle mould cleaning is essential here.

Cleaning a PU foam tool – gentle dry ice cleaning ensures reduced tool wear

In the manufacture of upholstered furniture, ASCOJET dry ice blasting technology is used to clean PU foam tools. Andrea Launer, responsible for Internal Communications at Messer, briefly swaps her desk chair for a comfortable sofa in the furniture store.

The process is used with excellent results for, among other things, cleaning moulds and tools, for example in the plastics, PU and casting industries.

New for the plastics industry

ASCO has developed a new dry ice blasting unit – the ASCOJET 908K – specifically for the plastics industry. The characteristic features of this "specialist" are easy handling and low air consumption. The blasting gun has a specially developed short plastic nozzle. This makes it possible to clean the moulds directly in the machines without damaging them or first having to remove them. The unit is primarily used in injection moulding, where it allows considerable cost savings in mould and tool cleaning.

Editorial Team

The benefits to customers:

- **Gentle:** The surfaces of the moulds and tools are not damaged.
- **No dismantling:** The ASCOJET dry ice blasting process can be used directly on fitted moulds in the production facility. Expensive stoppages in production are thus avoided.
- **No secondary contamination:** Since dry ice is converted to the gaseous state as soon as it hits the surface, there is no blast medium to be disposed of.
- **Dry:** The blasting process leaves a dry surface. There is no danger of corrosion or of electrical components being damaged.
- **Environmentally friendly:** There is no secondary contamination; no chemical substances whatsoever are used.

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ASCOJET in use:

Germany: HUKLA, based in Gengenbach, produces components for upholstered furniture for the home, such as cushions and armrests. For cleaning its PU foam tools, HUKLA was looking for a residue-free technique that can be easily integrated into the process. Moulds which in the past required laborious manual cleaning with spatulas and brushes are now cleaned – much more quickly and without mechanical damage – with the **ASCOJET 908** dry ice blasting unit.

Switzerland: Kunststoff Schwanden AG is one of Switzerland's most modern injection moulding plants. The company's products include design components for household appliances such as coffee machines. Thorough and gentle mould cleaning is particularly important for these components as otherwise the product quality would be noticeably reduced. Kunststoff Schwanden AG therefore uses the **ASCOJET 908K** dry ice blasting unit for mould cleaning.

The stem cells are stored in special tanks.

Lifesaving stem cells are stored in liquid nitrogen

Healing all-rounders

"Leukaemia" – that was the shattering diagnosis. The news reached the parents of little Zsuzsa shortly before their daughter's second birthday. The doctors in Pécs, southern Hungary, did everything, but a bone marrow transplant in December 2009 and subsequent chemotherapy were unsuccessful. Stem cells from umbilical cord blood offered the last hope for a cure. They came from Hungary's largest stem cell bank, the Krio Institute in the capital Budapest, where the cells are stored in cryogenic nitrogen.

In September 2010, the donor cells were implanted into the critically ill girl. They spread through the little girl's body via the bone marrow and the blood circulation, and soon displayed their healing effect. New, healthy blood cells were detected in the girl's blood just two weeks later. Today Zsuzsa is once again able to romp about the playground happily with other children her age because stem cells are "omnipotent", in other words they can do everything: the body is able to use them to build the most diverse cell types – such as bone marrow cells and blood cells – and thus replace diseased cells.

The cells are extracted from umbilical cord blood and subsequently frozen in stem cell banks such as those of the Krio Institute in Hungary with the aid of liquid nitrogen. The Budapest-based institution began storing stem cells in 2004 and has been sourcing the cryogenic medium from Messer in Hungary ever since. The cells from the umbilical cord blood are frozen by means of a computer-controlled freezer. They are then put into long-term storage in liquid nitrogen vapour using vapour phase technology. The nitrogen vapour ensures the optimum temperature between minus 150 and minus 196 degrees Celsius. This keeps the stem cells in a suitable condition for transplantation for at least 10 to 15 years. Based on cryobiological calculations, however, they can probably be stored for hundreds or even thousands of years without losing their special properties.

Worldwide, more than 20,000 patients have been treated with stem cells from umbilical cord blood since the late 1980s. Stem cells from umbilical cord blood are unaffected by possible harmful influences. More and more people are therefore having the umbilical cord blood of their children frozen so it is available for future emergencies.

Anita Kötél, Messer Hungarogáz

An air separation unit is being built at Eesti Energia Õ

Nitrogen for Estonian shale oil

Air separation unit in Narva

The Estonian associated company Elme Messer Gaas is investing in a new air separation unit that is due to go into operation in Narva in the summer of 2012. It will supply the Estonian energy company Eesti Energia Õlitööstus with nitrogen.

The joint venture Elme Messer Gaas will also supply oxygen, nitrogen and argon from the plant to customers in the Baltic States and North-West Russia – a total of 80 million standard cubic metres per

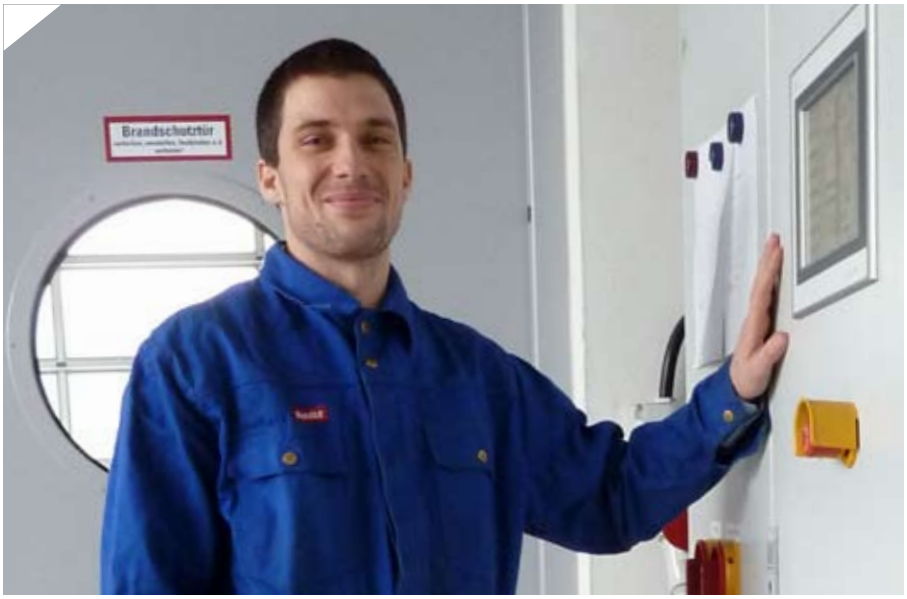
Lab assista

Õlitööstus.

year. "The contract with Elme Messer Gaas secures us the long-term nitrogen supplies we require for the production of shale oil," says Igor Kond, Chairman of Eesti Energia Õlitööstus. "It was crucial to us that our partner invests in the project and offers the service at appropriate terms." The nitrogen is needed for inerting the production processes, where it displaces reactive and explosive gases. Eesti Energia processes the oil into high-quality liquid fuels using a process developed in conjunction with the Finnish technology company Outotec. The raw material used for this is oil shale from the neighbouring opencast mine, which is delivered via conveyor belts.

Dr. Christoph Erdmann, Messer Group

nt Galina Jakovleva tests the viscosity of shale oil fuel.



Dr. Werner Höltl from Messer in Austria is specialist in combustion technology.

Storage of carbon dioxide

Unique test facility for fluidised beds

Messer is the first company to conduct tests – at its own facility – on enriching fluidised bed processes with oxygen in order to capture and process the CO_2 produced during combustion in such a way that it can be stored in layers of rock. This is designed to prevent it from getting into the atmosphere as a "greenhouse gas".

In recent years, Messer has received significant funding towards the construction of a pilot-scale fluidised bed reactor at its Austrian subsidiary's technical centre in Gumpoldskirchen. A fluidised bed reactor allows all types of gaseous, liquid and solid substances to be brought into close contact. This also applies to the latter even if they are not deemed suitable for other processes due to their low energy content or on account of their poor processability (toughness).

To begin with, tests were carried out with oxygen-enriched air and hard coal as fuel. The reactor is designed to facilitate flue gas circulation, leading to ever greater concentrations of the CO_2 that is produced. When operated with pure oxygen, the resulting CO_2 concentrations in the waste gas can reach 85 per cent – the more concentrated the CO_2 is, the easier it is to remove and store it.

The next step involves examining the burning of alternative fuels, primarily sewage sludge. One of Europe's biggest district heating companies, Fernwärme Wien, which itself operates incineration units, has agreed to be a partner in this project. The Institute for Chemical Engineering at Vienna University of Technology continues to be the scientific project partner. In tests at Messer which ran until the end of last year, fluidised bed operation with sewage sludge as fuel was tested at different oxygen concentrations. The results will now be used to simulate and then implement full-scale operation in one of Fernwärme Wien's fluidised bed incinerators.

Joachim Rohovec, Messer Group

Low temperatures, high safety

Tunnels underneath sandcastles don't last long. That didn't stop us trying again and again in the sandpit, because in the end, seeing the tunnel and castle collapse was the fun part. In a real underground construction project, collapsing soil and rocks are no laughing matter, however. If the walls of an excavation give way, this presents a danger to people as well as the building site. This is particularly the case if the work is being carried out in the middle of a city. The groundwater level is often lowered in order to stabilise the ground for such projects; so-called sheet pile walls are used and the subsoil is consolidated by introducing materials such as resin, gel or cement. Yet these techniques are not always enough. In such cases, the "ultimate" solution is to transform the ground into a solid block of ice through deep-freezing.

Icy: Freezing with nitrogen on the Königsallee in Düsseldorf

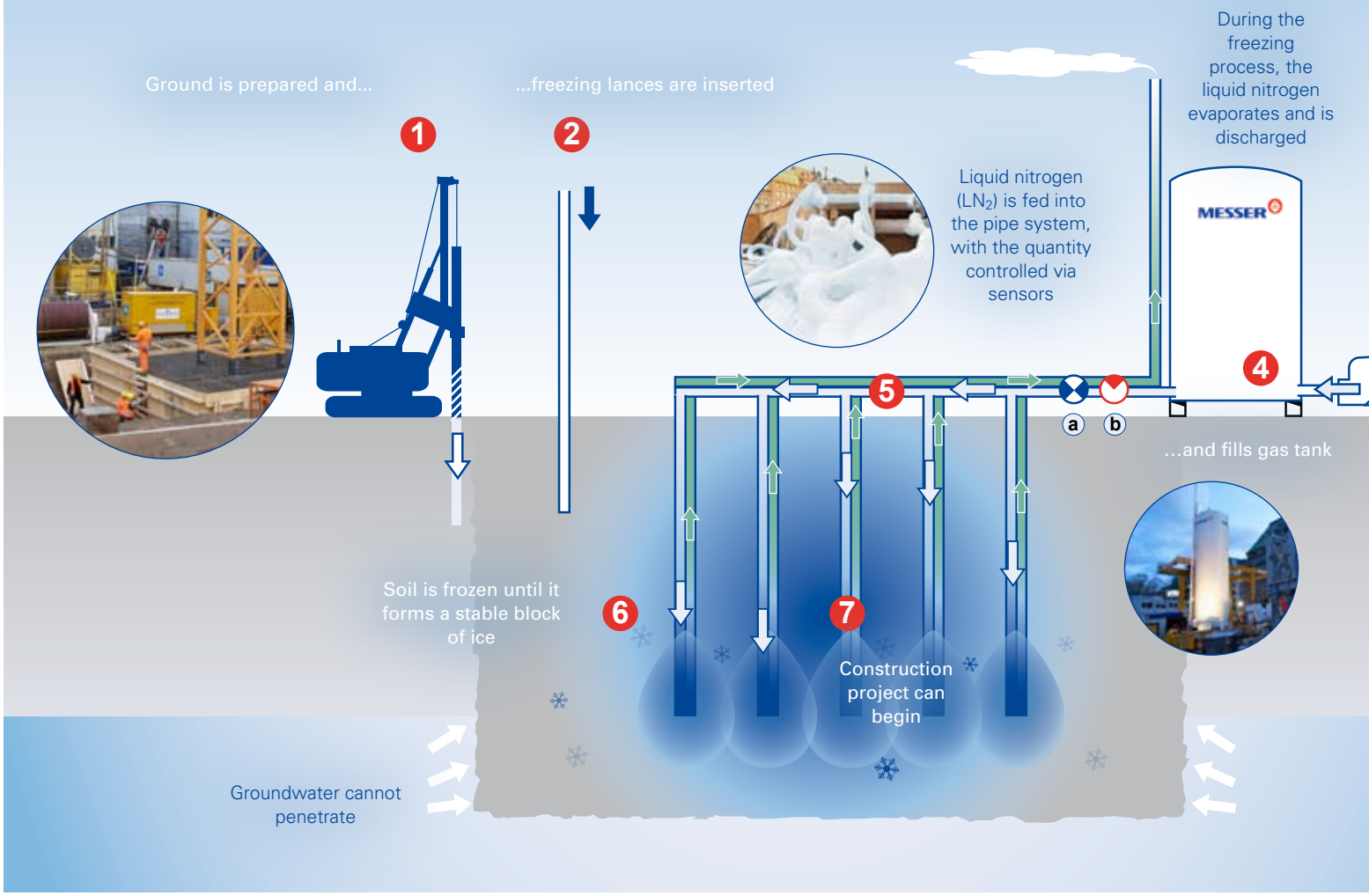
The quickest way to achieve this is with liquid nitrogen (LN_2). The medium, which has a temperature of minus 196 degrees Celsius, stabilises the ground and makes it impervious to water. This ensures that the construction site is also protected from groundwater – as is the case with the tunnel construction project under a major department store on the "Kö", Düsseldorf's famous Königsallee shopping boulevard. Work on a 3.4-kilometre section of suburban railway right across the city centre has been ongoing here since November 2007. A central underground station is to be located directly underneath the department store.

As the client, the city council attaches great importance to using state-of-the-art technology in order to minimise disruption to residents and traffic. Furthermore, they want the work to progress quickly and, above all, safely. The priority from the outset has been to prevent a repeat of the disaster in Cologne, where the municipal archive collapsed as a result of tunnelling works in March 2009. Where the use of other types of waterproofing is out of the question, soil freezing has proved itself to be a reliable method: this waterproofing process is the only one whose effectiveness can be measured objectively. Thus client and building contractor are guaranteed reliable impermeability and stability. The soil freezing order for this prestige project was awarded to Messer, one of only a handful of companies worldwide with this capability.

→ *Continued on page 12*


"Only with nitrogen could we freeze the ground quickly enough."
Alfred Rennert, Site Manager at building contractor Züblin

Soil freezing with nitrogen



The strengths of soil freezing

Soil freezing with cryogenic nitrogen is a quick and efficient stabilisation method in underground construction. It is used in tunnelling, main laying, foundation construction and the recovery of "disrupting objects" such as aerial bombs.

- Reliable stabilisation of the ground
- No penetration of groundwater
- Stability objectively measurable
- Uncomplicated installation and application
- High efficiency and cost-effectiveness
- Complete solution from a single source
- Tried and tested on a wide range of building sites
- Six times quicker than freezing with cooling brine

Continued from page 10 →

Soil freezing was used in mining as long ago as the 19th century. Where a shaft had to be driven through unstable ground, the heat was extracted from this soil with cooling brine, a saline solution with a freezing point well below zero degrees. If the ground was sufficiently moist, a thick layer of ice could form. Today, soil freezing is also increasingly used in demanding civil engineering and tunnelling projects. In approximately one third of cases, the body of ice is formed – as in underground mining in the past – with the aid of cooling brine. While this costs less, it takes at least six times as long as nitrogen freezing.

But because time is increasingly at a premium on construction sites too, the newer method is gaining ground. Nitrogen freezing is as quick as it is efficient and precise: to begin with, the volume of soil to be stabilised is determined. After that, the ground is prepared: heat-conducting pipes – so-called freezing lances that are sealed at the bottom – are inserted a certain distance apart. The lances are then supplied with precisely metered quantities of liquid nitrogen via a system of pipes fitted with sensors and controls. Beforehand, the medium is supplied to the construction site with special tankers and stored there in tank silos.

"In Düsseldorf, we are dealing with a very large freezing volume of 170 cubic metres," explains Jens Tauchmann, Manager Application Technology at Messer with responsibility for the process. The usual size is between 20 and 60 cubic metres, he says. "Yet we still

Special road tanker delivers nitrogen...

(a) Adjustment valve
(b) Safety valve
liquid nitrogen
gaseous nitrogen

Illustration: Piet Hamann, www.piethamann.de

managed to freeze the defined area of the construction site in just eight days, in spite of an unusually high starting temperature of 20 degrees Celsius at a depth of 20 to 40 metres." It could have taken up to three months with cooling brine.

The Düsseldorf block of ice is to be maintained until a lasting ground waterproofing solution is found for the duration of the construction project, which is due to go on until the summer of 2013.

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Interview with

Alfred Rennert, Site Manager at building contractor Züblin:

"The technical challenge was huge. On top of that we were under great time pressure."

Gases for Life: What is your company's role at the suburban railway construction site in Düsseldorf?

Alfred Rennert: Züblin has been tasked with the compensation work at Kaufhof on the Kö. This means that we compensate for any possible building subsidence that may occur during the construction of the tunnel.

Gases for Life: Why did you opt for soil freezing?

Alfred Rennert: I previously worked with Messer on construction work on the Lippe canal bridge. That was very constructive and characterised by a spirit of trust. So I was happy to revive this contact when we had to create a stable body of frozen ground as quickly as possible in Düsseldorf. On a Thursday evening in October, I phoned Mr Tauchmann, whom I knew from before, and just a week and a half later we were able to start boring. That was an amazing feat – after all, it was necessary to create a technical concept, plan the process and secure the funding in this timeframe.

Gases for Life: How did the work at the building site go?

Alfred Rennert: While we were still boring, we simultaneously worked together on inserting the freezing lances at other points. This is remarkable in two respects: firstly, the technical challenge was huge. We had to bore through four anchor positions at a depth of 40 metres and reach a boring target to an accuracy of 30 centimetres. On top of that, we were under great time pressure as we had to free up the construction area as quickly as possible for the set-up of the tunnel boring machine. So we worked round the clock. Whether we finished a borehole at two in the afternoon or three at night – the people from Messer were there straight away to help our workers insert the freezing lances and then carry out the pressure checks.

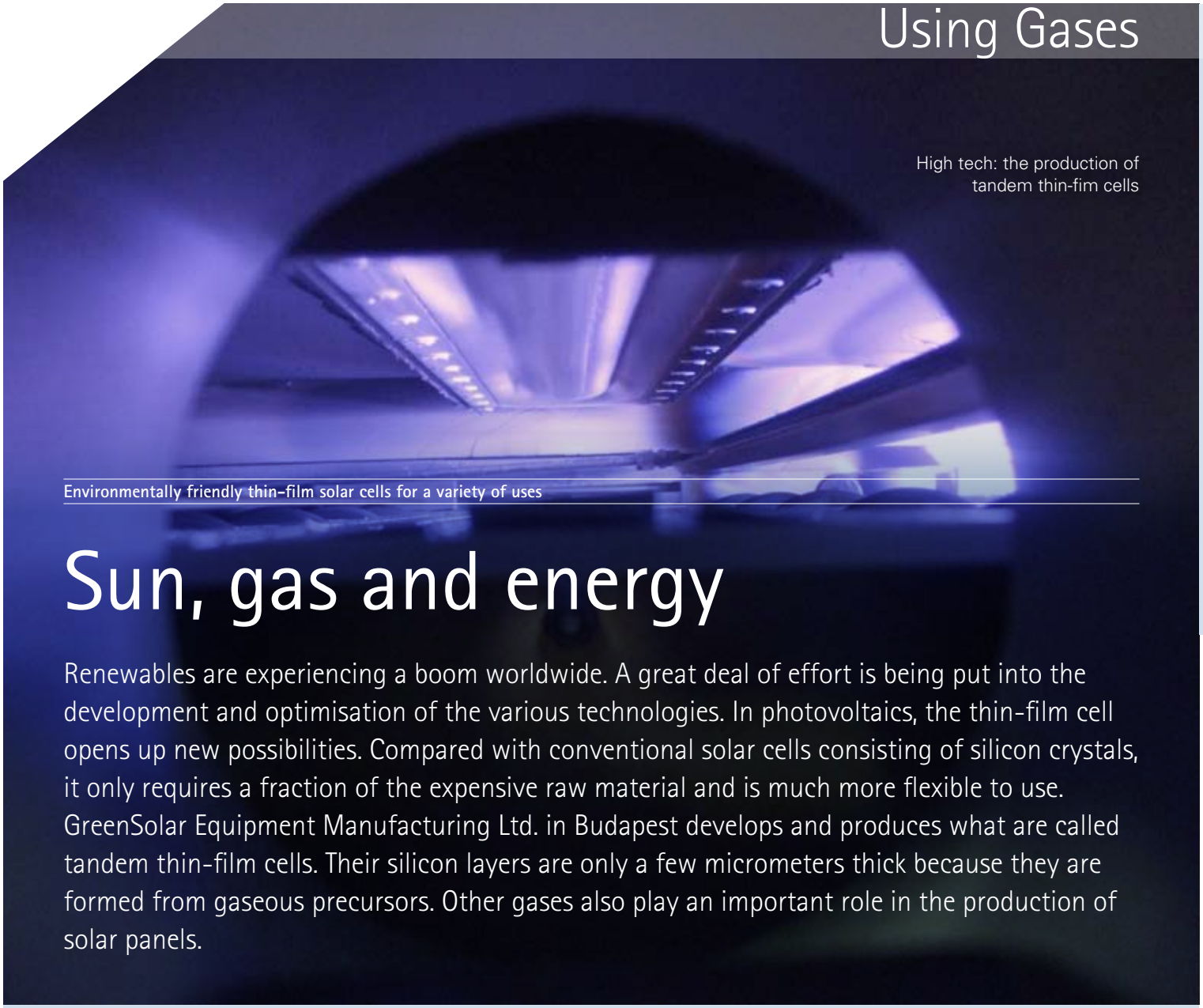
Gases for Life: Did you have any previous experience of soil freezing with nitrogen?

Alfred Rennert: This was my first involvement in nitrogen freezing, although I knew how it works from the plans at the Lippe canal bridge. My only previous experience had been with brine freezing. But it would have taken too long to create the body of frozen ground using this method. Nitrogen offers the only method of freezing the ground in a very short space of time – this flash freezing, as it is sometimes called, is made possible by the extremely low temperatures.

Editorial Team

Ed. Züblin AG

As one of the leading German building contractors, Züblin is active in every area of the building and construction industry and produces its own pipes and finished parts. It was founded in Strasbourg in 1889 by the Swiss engineer Eduard Züblin. Today the company is based in Stuttgart and has subsidiaries and associates all over the world.



High tech: the production of tandem thin-fim cells

Environmentally friendly thin-film solar cells for a variety of uses

Sun, gas and energy

Renewables are experiencing a boom worldwide. A great deal of effort is being put into the development and optimisation of the various technologies. In photovoltaics, the thin-film cell opens up new possibilities. Compared with conventional solar cells consisting of silicon crystals, it only requires a fraction of the expensive raw material and is much more flexible to use. GreenSolar Equipment Manufacturing Ltd. in Budapest develops and produces what are called tandem thin-film cells. Their silicon layers are only a few micrometers thick because they are formed from gaseous precursors. Other gases also play an important role in the production of solar panels.

The most important material for the production of solar cells is silicon. The semi-metal has the semiconductor properties that make it possible to convert sunlight into electricity. There is actually an abundance of the raw material: this element makes up around 15 per cent of our planet and about 25 per cent of the earth's crust. Sand, clay, loam and most rocks predominantly contain silicon compounds. Nevertheless, the pure and crystalline form of silicon is a fairly expensive material. And this is the form in which it is used for conventional solar cells, which can now be found on many rooftops. However, the production of pure silicon requires large amounts of energy and is associated with considerable CO_2 emissions. The crystalline form also places considerable restrictions on the possibilities of processing and forming. That is why there is growing interest in types of silicon that are suitable for photovoltaics but require the use of much less material while at the same time being easier to process.

Solar panels harness the energy of the sun.

Wafer-thin silicon

These requirements are best met by amorphous and microcrystalline silicon. Since they are only required in extremely fine layers of just a few thousandths of a millimetre, silicon consumption per square metre of solar cell can be reduced by up to 99.9 per cent. GreenSolar uses the so-called tandem process, whereby layers of amorphous and microcrystalline silicon are formed on top of each other. The two materials have different properties; in combination they form a cost-effective solar cell with a relatively high degree of efficiency.

In order to produce the thinnest possible layers, the photovoltaic materials are vapour-deposited onto a base layer. To begin with, therefore, they have to be supplied in gaseous form and fixed to

The technical coordinator at GreenSolar peers through a sight glass on the gas box to check on the solar panel surface treatment process.

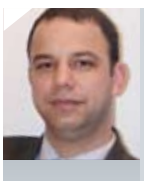
the base in a sophisticated process. This involves the use of silane – a compound of silicon and hydrogen (SiH_4) – as well as gaseous compounds of boron and phosphorus. The latter are needed to facilitate the formation of ions during exposure to sunlight. The flow of these ions generates the photovoltaic current. In addition to the three substances which ultimately remain on the base layer, the process also requires the gases argon, helium, methane, nitrogen and hydrogen. Messer supplies all seven gases to GreenSolar's plants in cylinders – and not only in Budapest, since the company sells not only the collectors but also the machines for making them. The gas supply system, which is specifically tailored to the tandem process, was developed jointly by experts from both companies.

Multiple environmental benefits

The gas cylinders are stored in a safety cabinet. From there the gases are first moved to a mixer, where the specifically tailored gas mixture is prepared. It is then piped to the panel production area. Thanks to the huge saving of material, a lot less energy is used during semiconductor production, and carbon dioxide emissions are also reduced significantly. The thin-film cells are therefore particularly environmentally friendly, both in terms of their production and, subsequently, as a non-polluting power supply.

The thin-film process makes it possible to use different base materials and allows scope for determining the transparency of the collectors. This means that areas which would not be considered for conventional solar modules can be used for energy generation. Environmental efficiency is further enhanced by multiple use: for example, the tandem cells can be used as photovoltaic coating on window glass and facade or roof elements while at the same time serving as sunshades, noise reducers and privacy screens. The panels can also be used for heat insulation or for cooling buildings. They can even function as repeater aerials, for routing mobile telephone signals for example.

Anita Kötél, Messer Hungarogáz



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6 questions for

Flor Noelanders

Flor Noelanders (56) has worked at Messer since 1981. He has been in charge of the supply chain department at Messer Benelux since 2006. He is married with three children and two grandchildren and lives in Aalst in Belgium.

1. **My biggest professional challenge at Messer so far has been...**
   ...convincing the Messer executives of the necessity of the "logistical standard".
2. **What typifies Messer for me is...**
   ...the fact that "you are in good pastures", as a Flemish expression puts it. It is a pleasant place to be. You are respected, and there are always opportunities to further your development.
3. **My strengths...**
   ...were learned from my grandfather: to be heard without causing hurt. The golden rule here is always to be prepared to extend the hand of friendship.
4. **I have a weakness for...**
   ...anything to do with the family.
5. **What fascinates you about gases and gas applications?**
   I think the gas developments in the food sector in recent years have been sensational. Who would ever have thought that you could get a juicy apple at a petrol station, peeled and cut into eight equal slices!
6. **The most important invention of the last century is...**
   ...GPS navigation, which gets me wherever I want to go quickly and reliably.

France: Partnership with "La Machine"

C'est fantastique!

The street theatre company "La Machine" is famous for its incredible machines and spectacular productions.

One of "La Machine's" "mechanical creatures"

The ensemble's engineers develop their mechanical creatures using state-of-the-art, leading-edge technology consisting of automatic, electronic and hydraulic equipment. As an official partner of "La Machine", Messer supplies welding and cutting gases for their unique projects. With workshops in Toulouse and Nantes, "La Machine" uses know-how from industry and the trades in the service of art. Steel and wood are the dominant building materials used in the ensemble's futuristic-archaic objects.

Angélique Renier, Messer France

Spain: Shielding gas for assembly work

Large installations for overseas

Ingasur, based in the Spanish town of Riudoms (Tarragona), produces plant and equipment for the petrochemical industry in the port of Tarragona. Since its formation in 1995, Ingasur has become a leading assembly company that has been involved in the construction and expansion of a large number of facilities in the Tarragona industrial complex. After assembly, the units built for overseas customers are dismantled into modules in the port prior to shipping. Large installations for Petróleos de México were welded with argon from Messer before they began their journey from Tarragona to Mexico.

Marion Riedel, Messer Ibérica

Dismantling a large installation prior to shipping

Switzerland: Interview with expert Roger Oehri

Quality matters with shielding gas

In 1973, Kurt Oehri founded orbital welding and apparatus engineering works Roger Oehri AG in Muri. Roger Oehri took over the company from his father in 2007 – it mainly specialises in aluminium processing and aluminium welding. Gases for Life interviewed him about the influence of shielding gas on quality and efficiency.

Who are your main customers?
Oehri: Our regular customers include companies such as ABB and Angst & Pfister, predominantly in the field of power engineering. Besides aluminium, we are increasingly processing high-alloy materials as well.

Why do you use the Inoxline He3 H1 shielding gas mixture from Messer?

Oehri: This mixture brings us numerous benefits. It allows a very high welding speed, plus it is superior to the commonly used shielding gases in many respects – for example in terms of heat transfer, welding safety, discoloration as well as preventing distortion and lack of fusion. Our welders have been very impressed with it from the start. This gas mixture allows them to use their technical skill to even better effect than with welding argon.

What do you think of the cost aspect?

Oehri: The welding gas costs are of secondary importance as far as we are concerned. Our customers are very demanding with regard to quality and delivery time. Inoxline He3 H1 helps us to meet these demands, which in the end also leads to greater revenue.

Kurt Schenkel, Messer Schweiz

Welding with Inoxline He3 H1

Roger Oehri (l.) in conversation with Kurt Schenkel, Messer Schweiz

Intricate technology: SMD components are soldered directly on the circuit board.

CoolSold optimises PCB production

Dual use of cooling

The trend towards miniaturisation in electronics continues unabated. The fine solder joints that are necessary for this have to be perfect, otherwise function could be impaired. That is why nitrogen is used as a shielding gas during soldering. The new CoolSold process from Messer uses the low temperatures of the gas to optimise costs and environmental impact.

PCB assemblies like the ones used in our laptops, mobile phones and MP3 players are mostly manufactured using the reflow soldering process. This process allows precise production of the electrically conducting connections without which such devices would not be possible. Under a shielding gas atmosphere, there is greater wetting action and the formation of metal oxides is prevented, thereby minimising the defect rate.

Nitrogen is best stored in the cryogenic liquid state. Before being piped to the soldering machine, it is first evaporated. This is actually wasteful because the production of liquid nitrogen uses a great deal of energy. The air vaporisers used for evaporation ice up, regardless of whether it is summer or winter. Particularly in winter, however, the nitrogen does not get warm enough because it can reach air temperature at most. Unwanted condensation forms on the pipes in the production halls.

At the "other end" of the process – the output end – the PCB assemblies need to be cooled down after soldering. The gaseous residues are also condensed at this stage. This requires cold, which in conventional systems is usually provided by electrical cooling units.

The CoolSold process uses the cold that is generated during evaporation for the soldering machine's cooling circuits. A special heat exchanger prevents the coolant from freezing upon contact with the liquid nitrogen. As well as preventing condensation, the dual use of the cryogenic nitrogen means that the heat needed for evaporation is also supplied reliably in any weather conditions. The "cooling energy" that is given off is supplied evenly over the whole year to the PCB production cooling circuits. This means that you can make considerable energy savings, cut costs and reduce CO_2 emissions.

Jens Tauchmann, Messer Group

Sarah, daughter of editor Marlen Schäfer, enjoys listening to music on her MP3 player: only possible thanks to ultra-compact PCB assemblies.

Nitrogen – Basis of life

As an essential component of amino acids, nitrogen is a building block of all life. Without the element with the symbol N, there would be no metabolism, no protein and no DNA, neither in plants, animals or humans. Nitrogen accounts for just under two kilograms of the weight of an adult weighing 70 kilograms.

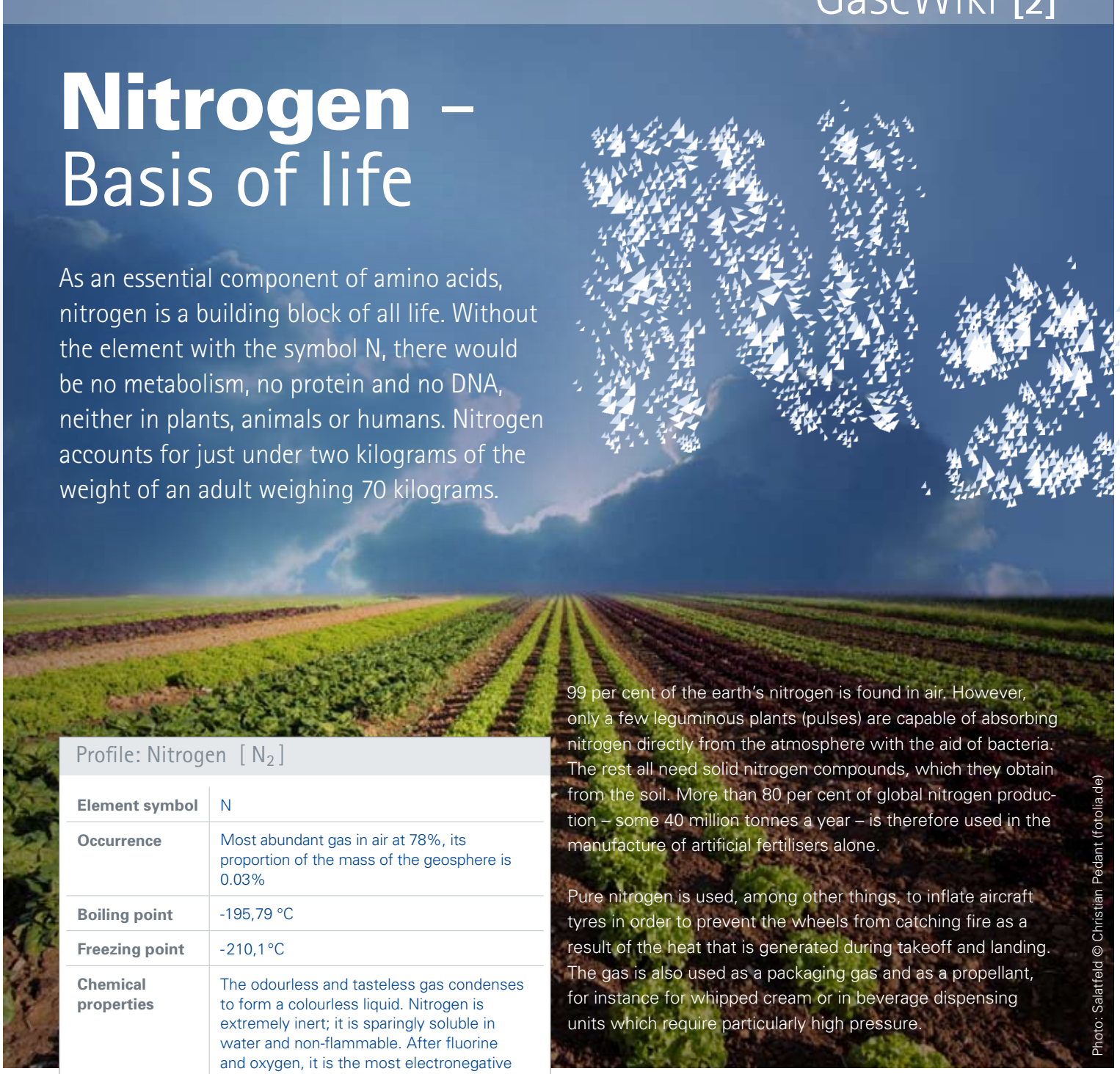

Photo: Salatfeld © Christian Pedant (fotolia.de)

99 per cent of the earth's nitrogen is found in air. However, only a few leguminous plants (pulses) are capable of absorbing nitrogen directly from the atmosphere with the aid of bacteria. The rest all need solid nitrogen compounds, which they obtain from the soil. More than 80 per cent of global nitrogen production – some 40 million tonnes a year – is therefore used in the manufacture of artificial fertilisers alone.

Pure nitrogen is used, among other things, to inflate aircraft tyres in order to prevent the wheels from catching fire as a result of the heat that is generated during takeoff and landing. The gas is also used as a packaging gas and as a propellant, for instance for whipped cream or in beverage dispensing units which require particularly high pressure.

Profile: Nitrogen [N_2]

Element symbol	N
Occurrence	Most abundant gas in air at 78%, its proportion of the mass of the geosphere is 0.03%
Boiling point	-195,79 °C
Freezing point	-210,1 °C
Chemical properties	The odourless and tasteless gas condenses to form a colourless liquid. Nitrogen is extremely inert; it is sparingly soluble in water and non-flammable. After fluorine and oxygen, it is the most electronegative element.
Production	Air separation
Uses	Shielding gas for welding and for the transportation of flammable substances; propellant; filling gas for aircraft tyres; refrigerator recycling; industrial-scale chemical synthesis of nitrogen compounds, e.g. for producing active ingredients; cold grinding of plastics

Liquid nitrogen is used as a cooling agent in cryogenics, for instance for food storage or for flash freezing. Other uses of liquid nitrogen include concrete cooling, soil freezing in construction, and cryosurgery. The best-known example of the latter is wart freezing.

The scientific name Nitrogenium is derived from "nitros", the Greek word for saltpetre, which used to be the main source of nitrogen before the invention of air separation.

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Imprint

Published by:

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Go to **www.messergroup.com** for comprehensive information about "Gases for Life".

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

The Gases for Life editorial team

We are ...

From left to right: Michael Holy, Dr. Joachim Münzel, Thomas Böckler, Monika Lammertz, Tim Evison, Marlen Schäfer, Angélique Renier, Dr. Christoph Erdmann, Diana Buss and Benjamin Auweiler.
(not pictured: Angela Bockstegers, Anita Kötél, Joachim Rohovec und Nicole Urweider)

Competition

Delicious!

In each issue of the magazine, readers have the chance to win a gourmet hamper full of specialities from the country featured in our cover story. This time there are delicacies from Germany to be won, including sauerkraut, black bread, liver sausage and apple purée.

For your chance to enjoy these special delicacies, 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 1 August 2011.

This competition is not open to employees of the Messer Group or their families. If there are multiple correct answers, the winner will be chosen at random. The result of the draw will be final and not subject to appeal.

Congratulations!

The winner of the last competition was Mr Sören Thele, Herose GmbH, Bad Oldesloe, Germany. The correct answer was "BUDAPEST".

What is the name of the fusion reactor for which Messer is supplying gaseous helium?

		4	10

What is the name of the soldering process that optimises costs and environmental impact in PCB manufacturing?

				6		8	

Which company develops innovative solar cells in Budapest?

5				3			9		

What is the name of the dry ice blasting unit that ASCO developed for the plastics industry?

7						11				1

Answer:

1		3	4	5	6	7	8	9	10	11
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Have fun and (with a bit of luck) enjoy the delicacies!
Your Gases for Life team.

Photo: Edersee © fotografci (fotolia.de)

Mummy only buys underpressure.

This is **Luo Yikai**. His father, Luo Cheng, is a sales engineer at Chenggang Messer Co. Ltd. in the Chinese province of Sichuan. Yikai was born on 8 February 2009.

Messer in Switzerland supplies a leading manufacturer of baby food with around 100,000 kilograms of carbon dioxide a year for packing baby milk powder for the Chinese market. A gas mixture consisting of carbon dioxide and nitrogen is used for China – unlike in Europe, where normally only nitrogen is used. The use of pure nitrogen leads to the development of a slight overpressure in a jar of baby food, resulting in an outward-bulging lid. This is unacceptable to Chinese consumers as a bulging lid is considered to be a sign of spoiled goods. Use of the gas mixture ensures that the lid has a slight concave depression.

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

www.Gases for Life.de