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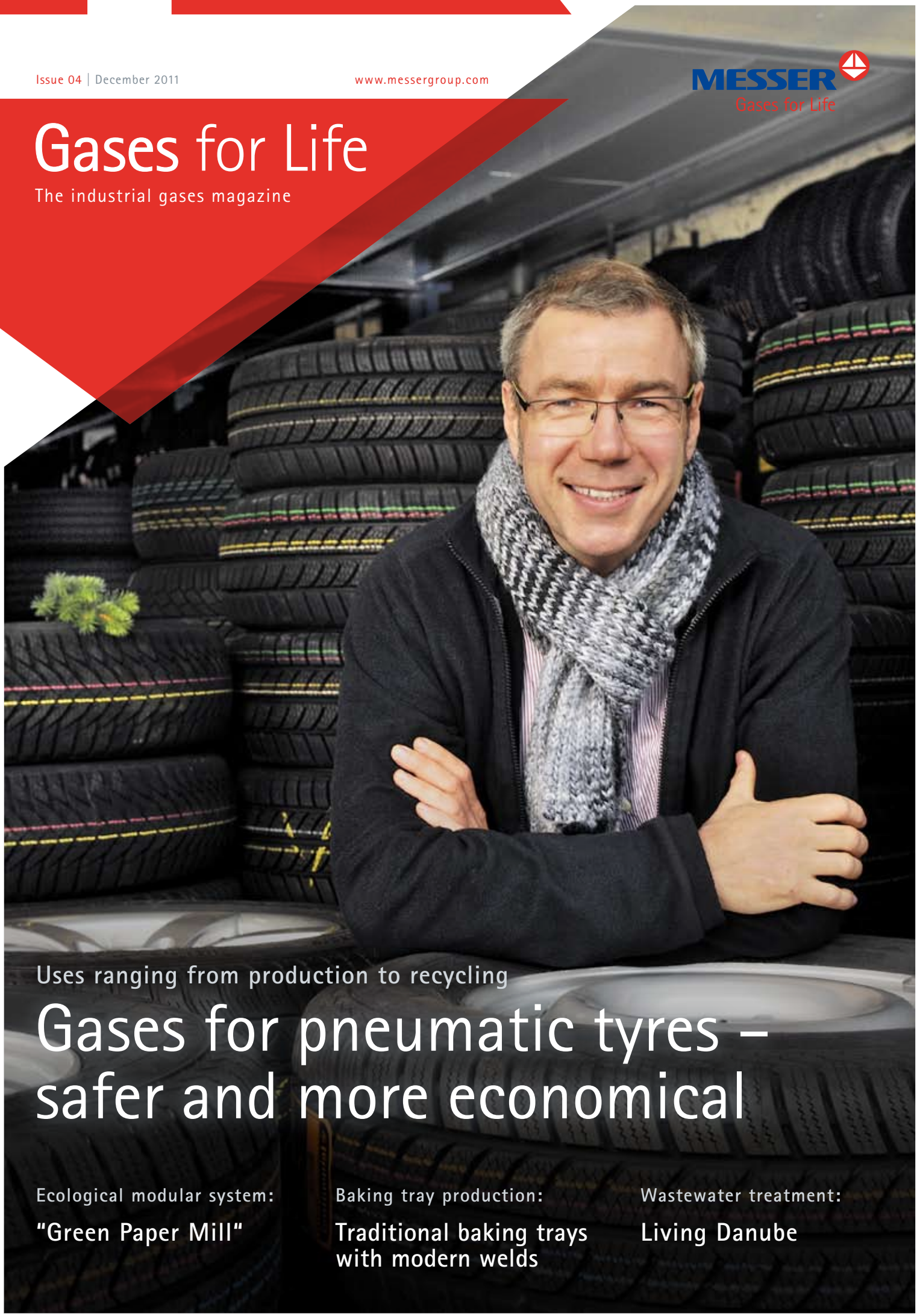
MESSER
Gases for Life

Gases for Life

The industrial gases magazine



Uses ranging from production to recycling

Gases for pneumatic tyres – safer and more economical

Ecological modular system:
"Green Paper Mill"

Baking tray production:
Traditional baking trays with modern welds

Wastewater treatment:
Living Danube

Dear Readers,

Stefan Messer (front row, centre) with executives from all over Europe at Messer Square in Bad Soden in front of a group of sculptures from the "Implosions" series by Ewerdt Hilgemann.

The world is on the move – and not just figuratively speaking. We use cars and buses for our daily journeys or when we go on holiday; foodstuffs and other goods are delivered to consumers by trucks. All these vehicles have one thing in common: they are fitted with modern tyres.

The fact that these highly developed tyres can make a substantial contribution to road safety is partly due to gases. Nitrogen, carbon dioxide and dry ice are used in the manufacture of car tyres. Nitrogen/argon mixtures are the modern alternative to classic tyre air pressure, and nitrogen helps to recycle worn tyres more easily and efficiently.

But tyres are not the only mobility-related field in which gases are used. The tanks on Ducati motorbikes are reliably sealed by welding with shielding gases from Messer; the engines of Formula 1 racing cars do not overheat in the pits thanks to our dry ice; and calibration gases are indispensable for the precise determination of exhaust emissions.

Furthermore, if you would like to find out how gases are used in the production of herbal candles and baking trays, when flying fighter planes or producing drinking water from sea water, or in environmentally friendly papermaking, I can certainly recommend this issue of "Gases for Life".

I wish you all the best for Christmas and the festive season and a healthy and happy 2012.

Best wishes

Stefan Messer

Art in construction – "Airsmith makes stainless steel implode"
In his studio in the Dutch town of Hardinxveld-Giessendam near Rotterdam, Ewerdt Hilgemann used a vacuum pump to slowly extract the air from the three hermetically welded stainless steel structures. This process causes the cubes to contract, giving rise to pronounced kinks which look as though they have been caused by external forces and which therefore contrast markedly with the still-gleaming stainless steel surface. Hilgemann explains his work as follows: "I deform geometric shapes. People plan, we plan everything, and that is what I do with my cubes, pyramids and columns. Then the air is sucked out of them and the air on the outside presses against them. This air is my chisel, my hammer, my tool. I am an airsmith." The cubes were welded with Messer welding gases.

Cover photo:
Oliver Dietrich, head of Messer's cold grinding centre, which among other things carries out type-specific separation of used tyre components before returning them to the production cycle.

Good for you and the environment

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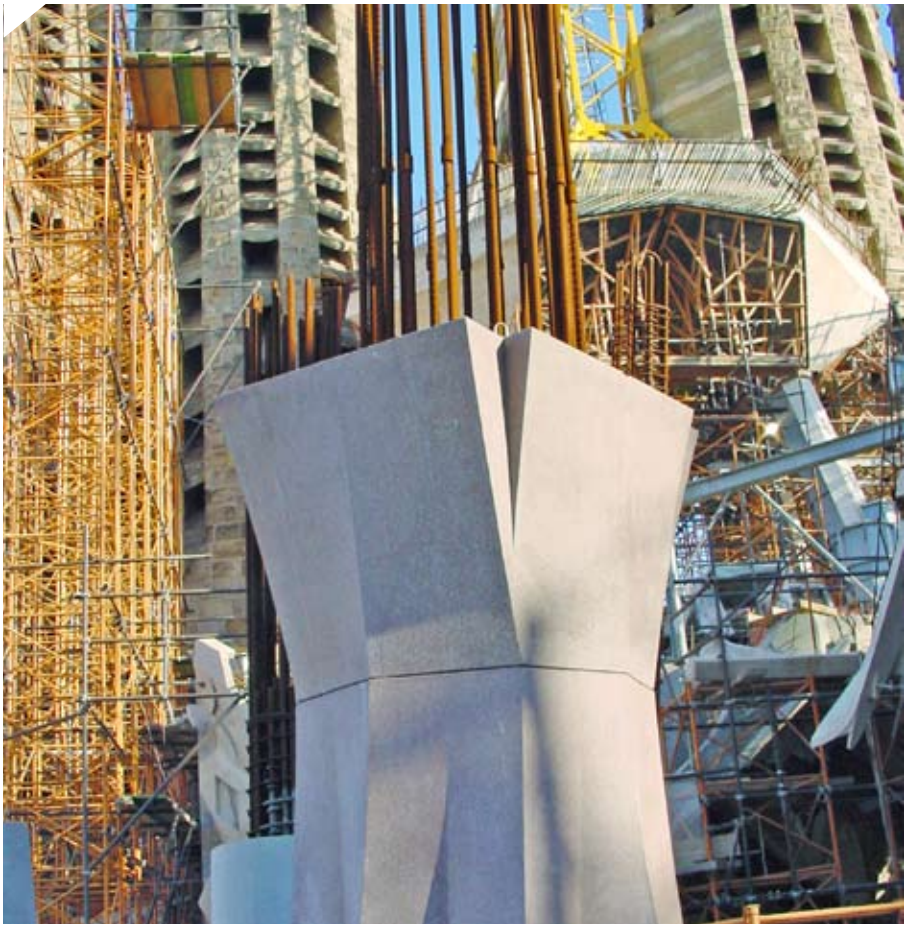
Spain: Avant-garde urban design

The art of welding

Ever since the work of the great architect Antoni Gaudí, if not even before then, Barcelona has been regarded as a centre of imaginative urban design. Escofet has a strong sense of obligation to continue this creative tradition. The company produces street furniture in the Catalan capital, combining materials such as architectural concrete, aluminium, stainless steel, wood, glass and plastic to create a unique blend of avant-garde industrial design and contemporary architecture. The steel structures and the moulds of the concrete components used are welded with Ferroline mixtures from Messer. Escofet has also been involved in the completion of Gaudí's masterpiece, the Sagrada Família church, since 1996. State-of-the-art moulding technology is being used here to create structures that would not be possible with traditional construction methods.

Marion Riedel, Messer Ibérica



Amongst other things Escofet is welding artistic concrete-steel structures at the "Sagrada Família".

Hungary: Oxygen for altitude sickness

Fighter pilots with clear heads

Altitude sickness is triggered by a lack of oxygen. It causes headaches, coordination difficulties, loss of judgement and unconsciousness. For fighter pilots, the condition would put their lives in danger. The air they breathe is therefore enriched with oxygen, depending on flight altitude. For example, at 8,000 metres, they are given 100 per cent oxygen to breathe. Above 8,000 metres, it has to be fed into the pilots' helmets with overpressure so that they can breathe it at all. The Hungarian air force gets the liquid oxygen needed for this from Messer. The gas is filled into spherical tanks, from where it is fed into the cockpits of the Gripen fighter planes.

Krisztina Lovas, Messer Hungarogáz

Pilot in pressure suit and oxygen mask, with Gripen fighter jets in the background

Slovenia: Liquid oxygen for URSA

Growth with heat

URSA is one of Europe's leading manufacturers of insulating material for the building and construction trade. Its Slovenian subsidiary, URSA Slovenija, is one of the country's top exporters, generating most of its turnover in foreign markets. It has concluded a long-term contract with Messer for the supply of liquid oxygen. The gas is used to increase the temperature in smelting furnaces, where glass and stone are disintegrated to produce insulating mineral wool. Some 2,800 tonnes will be supplied this year, rising to 8,500 tonnes in 2012. A planned replacement of the furnaces in 2013 is expected to lead to a further increase in demand.

Marija Čurič and Alenka Mekiš, Messer Slovenija

Slovenia: Flame treatment of natural stone

Safety every step of the way

A touch of hoarfrost is enough to transform stone-paved paths into skating rinks if their surfaces are too smooth. The surfaces of paving stones are therefore roughened to make sure that soles get enough grip even in sub-zero temperatures. The Kamen Jerič stone-working factory in Kranj, Slovenia, has carried out tests with Messer which involved the stones being flame-treated with gas burners. The flame causes the crystals on the surface of the natural stone to expand to varying degrees and partially flake off. This creates a rough, non-slip layer. Since completing the tests, the company has been getting the burner equipment and necessary gases from Messer.

Stanko Jamnikar and Alenka Mekiš, Messer Slovenija

Slovakia: Synthetic corundum

Diamond-like

One of the remarkable features of synthetic monocrystalline corundum gems is their close resemblance to diamonds – particularly if they are

Only experts can recognise corundum.

flawless. In order for synthetic corundum to not only be almost as hard as diamonds but also have great optical qualities, the raw materials used in its production need to be of high purity.

Czech company Radsworth has been producing monocrystalline corundum from aluminium oxide (Al_2O_3) in the Slovakian town of Nováky since 2011. Aluminium oxide in powder form is exposed to a 2,150 degree Celsius oxygen/hydrogen flame in so-called Verneuil furnaces. The high-purity oxygen required for this comes from an on-site oxygen supply system at Radsworth which was installed by Messer.

Michael Holy, Messer Tatragas

Romania: Using CO_2 as a fertiliser

Healthier ripening

Enriching the air in greenhouses with pure carbon dioxide (CO_2) ensures higher yield and quicker growth. Messer has gained two greenhouse operators – Sere Rovina and Toia Duo in the Romanian city of Deva – as new customers who want to benefit from these advantages. Both companies cultivate tomatoes. Sere Rovina operates a 10,000 square metre greenhouse with an annual CO_2 requirement of about 325 tonnes. Toia Duo will be supplied with approximately 144 tonnes of CO_2 a year in the future. The use of CO_2 as a fertiliser in combination with water, nutrients and light leads to the formation of new plant biomass through photosynthesis.

Paula Mocanu, Messer Romania Gaz

Liviu Serban, Messer Romania Gaz: "The tomatoes in our customers' greenhouses are really thriving thanks to CO_2."

France: Study on geological CO_2 storage

Storing of carbon dioxide

Messer in France is working with French energy institute "IFP Energies nouvelles", the CNRS national research centre and the Douai mining academy to explore the possibilities of geological storage of carbon dioxide (CO_2). The joint project is focusing on the materials required for the construction of safe return shafts. The research project is examining the physical-chemical mechanisms that can affect the stability of underground shafts.

Messer is supplying the gas mixtures as well as the know-how for the gas-specific processes. Separating CO_2 from waste gases and subsequently storing it underground is seen as a promising way of slowing down the warming of the earth's atmosphere.

Angélique Renier and James Hennequin, Messer France

Underground CO_2 storage tests in Lacq, France

Traditional baking trays with modern welds

The French word for pan is "poêle". It is therefore not that difficult to guess what the main line of business has been in Villedieu-les-Poêles over the past centuries: even in medieval times, copper pots and pans from the Norman town were widely known and in demand. And the town's tradition of making high-quality kitchen utensils remains as vibrant today as ever. Batista Mécanique Générale de Précision de Villedieu specialises in baking trays for industrial bakery products. The quality of the company's products and the efficiency of its production depend in no small part on the welding process. A shielding gas mixture consisting of three components has helped the company optimise this important stage of production.

The welding processes at Batista are 15 to 20 per cent quicker than before

The actual baking trays – like their domestic counterparts – are made from compression-moulded sheet steel. The dough for several dozen loaves or cakes would be too heavy for just a tray on its own. The moulded sheets used in large bakeries therefore require a frame to stabilise them and facilitate mechanical handling. The sheets and frames are welded together.

The time required for welding affects the productivity of the entire manufacturing process. The quality of the welds is much more than just a question of appearance. The better the quality, the less reworking has to be done. Furthermore, smooth surfaces and neat connections are particularly important for the baking sheets in order to provide a good base for the non-stick coating that is subsequently applied.

The steel, which is liquefied during welding, is sensitive to the ambient air, and its material properties can be adversely affected, particularly if it reacts with atmospheric oxygen. That is why shielding gas is used, which flows around the arc and the molten pool, shielding it from the ambient air. As a rule, the gas mixture consists mainly of argon and a smaller proportion of carbon dioxide (CO_2), which together form an active protective layer over the melt. The shielding gas also has a major effect on important welding parameters, and therefore on the quality of the weld. The gas mixture that is used most widely in industry has a CO_2 content of 18 per cent.

The customer

Batista-MGPV
(Mécanique Générale de Précision de Villedieu)
In 1997, Monsieur Besnard and his son took over the Batista toolmaking business and started specialising in baking trays for industrial bakery products. Today, the company is France's leading supplier in this area, and is also expanding abroad.

Perfect spot welds – thanks in part to the Ferroline C12X2 gas mixture

Batista used to use such a standard gas as well. However, the welding results were not satisfactory. Too great a proportion of the liquid metal was spattered over the surfaces and had to be removed again in what was a time-consuming process. The managing director of Batista, Etienne Besnard, therefore decided to try out a new shielding gas.

This gas mixture, Ferroline C12X2, was specially developed by Messer for plain and low-alloy steels. In addition to its main component, argon (86%), it also contains CO_2 (12%) and oxygen (2%). Batista, too, has found this mixture to be superior to the standard gas it had been using. One area in which this manifests itself is the equipment. For example, the welding torch does not heat up as much with the new shielding gas, which in turn means lower maintenance costs for the automatic welding machines. Moreover, smaller amounts of harmful gases are generated during welding. However, the main difference is the improvement in process and product quality: the welds are much smoother with Ferroline C12X2, and the extent of welding spatter has been significantly reduced. Expenditure on clean-up work has been cut by 30 per cent. In addition, the new gas has allowed Batista to increase the speed of the welding process by 10 to 15 per cent while at the same time improving its reproducibility. This has also resulted in much less waste.

These advantages carry a lot of weight for Etienne Besnard since, in addition to quality, Batista's customers often expect deliveries at very short notice: "Messer has helped us expand our know-how, reduce our response times and increase our productivity. This, in turn, helps us achieve sustained business growth in a competitive global environment."

Angélique Renier, Messer France

Etienne Besnard, CEO at Batista, is pleased about shorter response times and more productivity.

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Belgium: Gases for chemical production

Raw material for numerous products

Alkylamines are a diverse class of substances that are produced through reaction of alcohols with ammonia. They are used as the raw material for numerous chemical products, ranging from paints to medicines, and from body care products to agricultural chemicals. Taminco, the Belgian chemicals company, is a global market leader in this field. It has specialised in the production of alkylamines as well as their derivative products, which are produced in further reaction steps. Nitrogen is needed for inerting, both in the chemical processes and in the tank farm for intermediate and finished products. Oxygen is used for controlling oxidation reactions. These gases are now supplied to the company's headquarters in Ghent, Belgium, by Messer.

With Taminco, Messer counts the Belgian "Company of the Year 2010" among its customers. This award is given to companies that have been extraordinarily successful in terms of growth and results.

New collaboration in the chemical industry: Steven Segers (left), Technical Purchasing Manager at Taminco, with Dirk De Keulenaer of Messer in Belgium.

Taminco employs some 800 staff at eight production sites in Belgium, Germany, the United States, Brazil and China, as well as at 18 distribution agencies worldwide. In 2010, the company had a turnover of 715 million euros.

Dirk De Keulenaer, Messer Belgium

Slovenia: Cooled herbal candles

Clear advantage

In candle manufacture, the process of cooling the wax is very time-consuming. For this reason, the Silvester Wolf herbal candle manufacturing plant in Slovenia had been experiencing delays in its production chain. In order to reduce the cooling time, the plant now uses cryogenic nitrogen from Messer. Thanks to a cooling bridge installed at Silvester Wolf by Messer, the company can now rapidly cool up to 7,000 candles per hour.

Alenka Mekiš, Messer Slovenija

Candles before and after cooling with nitrogen

Clean drinking water is something to be savoured – as demonstrated by Angela Bockstegers, Press Officer at Messer.

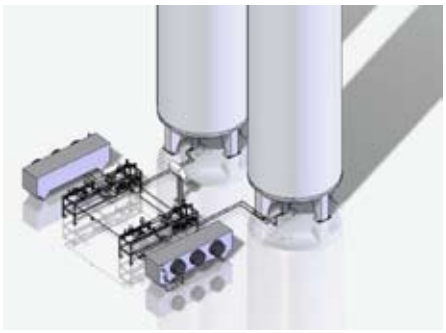
Switzerland: CO_2 dosing systems for water neutralisation

Getting drinking water from the sea

As a natural component of clean drinking water, carbon dioxide (CO_2) facilitates environmentally friendly and economical improvement of water quality without any unwanted by-products or impurities.

For example, the addition of precise doses of CO_2 allows the pH of desalinated sea water to be kept neutral. Precise dosing of the gas, together with the addition of small quantities of mineral salts, is an important factor in obtaining palatable drinking water from the desalinated sea water. CO_2 dosing systems from ASCO ensure that exactly the required amount of gas is added to the water. ASCO also takes care of the entire CO_2 dosing process. The complete CO_2 solutions include storage tanks, the atmospheric CO_2 vaporiser, the dosing and injection system as well as an interface for easy connection to the main control system of a sea water desalination plant. CO_2 dosing systems from ASCO are available for different quantities of CO_2 to be injected. All models can be supplied with a single or dual line. The dual line – two CO_2 dosing systems with a tank and vaporiser each – ensures 100% redundancy.

Nicole Urweider, ASCO Carbon Dioxide



The complete solution: CO_2 dosing systems with tanks and atmospheric CO_2 vaporisers. The double line ensures a fully redundant system.

CO_2 dosing system from ASCO

People Focus

6 questions for

Helmut Gutenberger

Helmut Gutenberger (48) is a paper engineer who has been working in application technology at Messer since 2005, where he is responsible for "Pulp and Paper". He is a single parent with a 17-year-old daughter and lives in Austria.

1. **My biggest professional challenge at Messer so far has been …**
   … the introduction of the "Green Paper Mill" – this is the implementation of an EU-funded project in Spain.
2. **What typifies Messer for me is …**
   … the fact that "We are family" is not just a phrase written down on paper, but something that is actually lived out in practice. That is my experience.
3. **My strengths …**
   … are the ability to cope with pressure and my extensive knowledge of the subject based on 25 years' experience in the paper sector.
4. **I have a weakness for …**
   … the finer things in life.
5. **What fascinates you about gases and gas applications?**
   The work I am involved in at the moment, because you can use gases to optimise a wide range of parameters in the papermaking process.
6. **The most important invention of the last century is …**
   … penicillin.

Gases for pneumatic tyres – safer and more economical

Ever since the Michelin brothers first fitted a car with air-filled rubber tyres in 1895, it is hard to imagine everyday motoring without the pneumatic tyre. It offers us comfort and safety when driving. In motor racing it can make the difference between winning and losing. Improvements to the aerodynamics can shave several tenths of a second off lap times in Formula 1; the right tyre can make all the difference. Pilots and Formula 1 drivers, as well as demanding car drivers, get their tyres filled with a special gas instead of air. Gases also play an important role in the manufacture of tyres.

Various mixtures of up to 30 types of rubber are used in making a tyre, depending on whether summer or winter tyres, treads or sidewalls are being produced. The individual layers of rubber are combined – layer by layer – with the other components, such as textile fabric or steel belt, and provisionally joined together by means of powerful rolling.

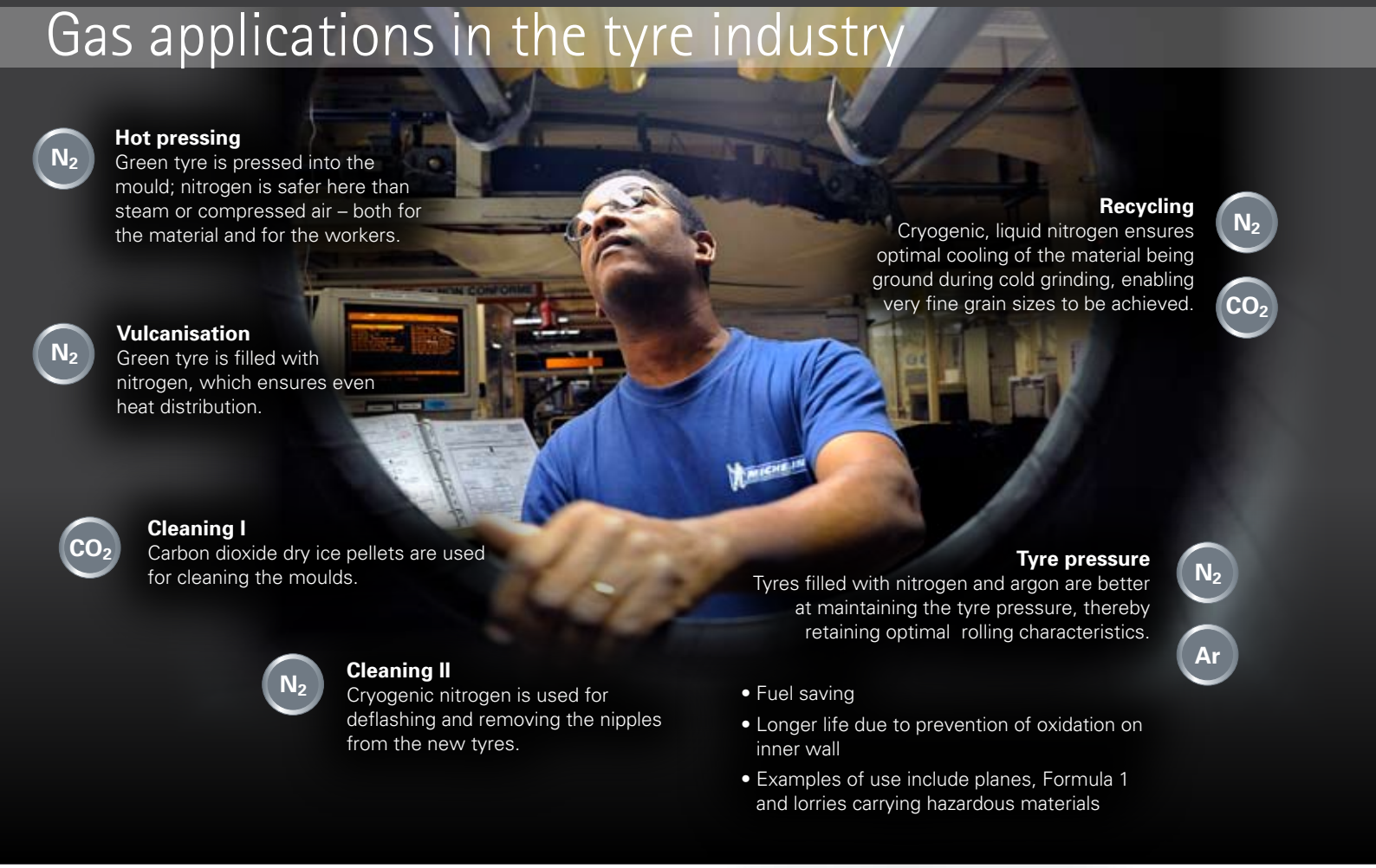
The layers only finally become an inseparable unit during vulcanisation in the hot press. This is where the tyre also gets its tread, and where the hitherto malleable rubber mass is transformed into the sturdy yet elastic material we are familiar with from the tyres on our cars and bikes.

Nitrogen (N_2) plays an important role in this crucial step, as exemplified by tyre manufacturer Hankook. The Korean company operates its European production facility, with an annual capacity of 12 million tyres, in Rácalmás, Hungary. Hankook uses the nitrogen for two process steps in the hot press. The first one involves inflating the so-called bladder with nitrogen. Located at the centre of the hot press, the bladder presses the green tyre into the mould with a pressure of about 1 bar. In the past, this step involved the use of steam. But it is safer with nitrogen, as the press is still open during this phase. While the bladder is regularly replaced as a wear part, any premature damage could result in the uncontrolled release of hot steam, which would endanger the workers.

Continued on page 12 →

The inspection team of Hankook in Rácalmás, Hungary, where the Korean company operates its European production facility.

Gas applications in the tyre industry



Hot pressing
Green tyre is pressed into the mould; nitrogen is safer here than steam or compressed air – both for the material and for the workers.

Vulcanisation
Green tyre is filled with nitrogen, which ensures even heat distribution.

Cleaning I
Carbon dioxide dry ice pellets are used for cleaning the moulds.

Cleaning II
Cryogenic nitrogen is used for deflashing and removing the nipples from the new tyres.

Recycling
Cryogenic, liquid nitrogen ensures optimal cooling of the material being ground during cold grinding, enabling very fine grain sizes to be achieved.

Tyre pressure
Tyres filled with nitrogen and argon are better at maintaining the tyre pressure, thereby retaining optimal rolling characteristics.

- Fuel saving
- Longer life due to prevention of oxidation on inner wall
- Examples of use include planes, Formula 1 and lorries carrying hazardous materials

→ *Continued from page 10*

Use of compressed air is out of the question due to the risk of ignition. Inert nitrogen offers the greatest protection.

In the second step, the press is closed and the bladder filled with hot steam at 15 to 20 bar. It provides the heat and pressure needed for vulcanisation, but is replaced by nitrogen after a short time. "The steam would continue to heat up too much under pressure. However, heat and pressure must remain in an optimal range during vulcanisation so that the required quality is achieved," explains Roland Gucsi, who is responsible for vulcanisation in Rácalmási. The bigger the tyre, the longer the process takes. For ordinary car tyres, it takes about ten minutes; for heavy-load vehicle tyres measuring up to four metres, it can take a whole day. "Nitrogen ensures even heat distribution over the entire period."

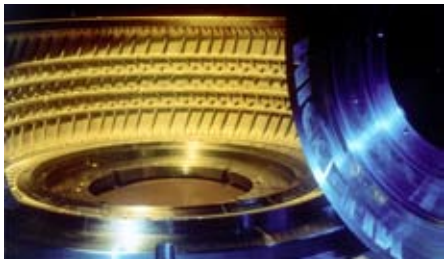
After the hot N_2, cryogenic CO_2 is used to remove surplus rubber from the moulds. Carbon dioxide dry ice enables the moulds to be cleaned without disassembly and with minimal loss of time: cryogenic dry ice pellets are "shot" at the moulds at up to 300 metres per second from a blasting unit such as the ASCOJET. Thermal shock and impact energy remove the dirt completely. The pellets transform to the gaseous state, leaving behind a clean and dry surface. The tyre mould has small ventilation holes, into which rubber is pressed during vulcanisation. This is how the little nipples are formed which are typically found on new tyres. When the first set of tyres are fitted on new cars, the tyres are not only deflashed, but they also have their nipples removed. The method of choice for both is to use cryogenic nitrogen to make the protruding rubber residues brittle and then simply brush them off.

Whether with or without nipples, the tyre will only perform optimally if the tyre pressure is right. Here, too, nitrogen – or a nitrogen/argon mixture – is far superior to simple compressed air.

Tyres filled with nitrogen are better at maintaining the tyre pressure and therefore retain the optimum rolling

characteristics for longer. This allows fuel to be saved. Moreover, oxidation of the inner wall is prevented, which gives the tyre a longer life.

Filling tyres with nitrogen is an essential safety requirement in Formula 1, as well as for lorries carrying dangerous materials, vehicles that are used in tunnels or mines, and commercial aircraft. When a jet lands, its tyres experience a sudden acceleration from zero to about 260 kilometres per hour, in the process of



Mould for hot pressing

which they become very hot. They are filled with nitrogen in order to prevent the possibility of their igniting from the inside.

Gases also ensure optimum results when it comes to recycling tyres. In order to recover the valuable raw materials, the tyres must first be crushed. The best quality can be achieved with cold grinding. The material to be ground is cooled and embrittled with liquid nitrogen. This allows a very fine grain size to be achieved in the grinding process. The raw materials – rubber, metal and synthetic fibres – can be separated out and partly reused for tyre production.

Anthony Grandpierre, Messer France, Editorial Team

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Interview with

Sylvia Chiaramonte, Purchasing Manager for Industrial Gases at Michelin Group:

"We value the excellent customer care."

Sylvia Chiaramonte with Anthony Grandpierre, Sales Manager Chemistry, Messer France

Gases for Life: Which gases does Michelin use?

Sylvia Chiaramonte: We mainly use nitrogen for membrane pressing during vulcanisation of the tyres and dry ice for cleaning the moulds by means of cryotechnology.

Gases for Life: Are there seasonal fluctuations?

Sylvia Chiaramonte: Nitrogen consumption in France rises sharply before the summer. The international peaks in demand vary however. This means that production is evenly spread throughout the year with correspondingly steady gas consumption.

Gases for Life: Is gas quality important for your processes?

Sylvia Chiaramonte: Quality drives progress. Michelin has been applying quality standards consistently for a long time and also expects its suppliers to make continuous improvements in quality, because active supplier participation in quality assurance is crucial. The quality of Messer gases fully meets Michelin's high standards.
Messer is currently supporting Michelin in a project on recycling nitrogen that has already been used.

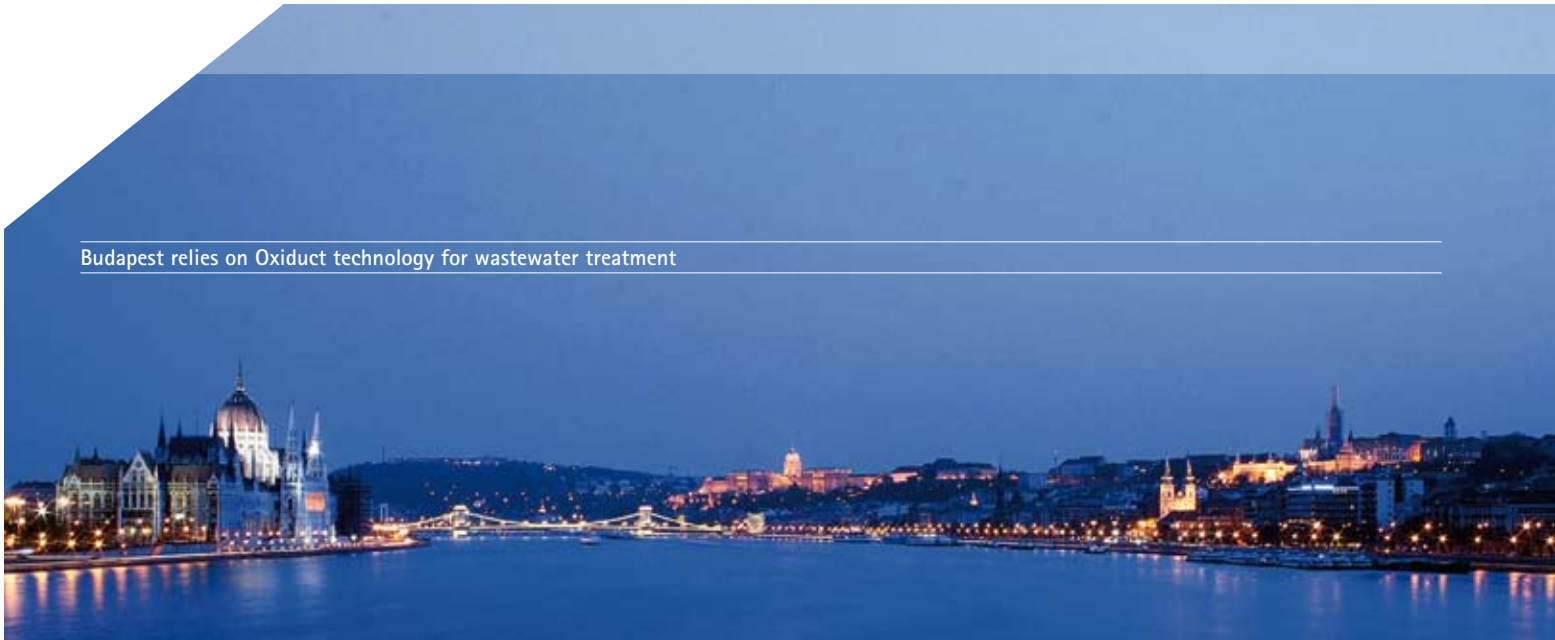
Gases for Life: Why did you choose Messer as a supplier?

Sylvia Chiaramonte: Messer has the right balance of quality and price, and we value the excellent customer care that is provided. We have a central contact person for all general matters, as well as regional Messer experts who help us with rapid implementation. This is in line with the Michelin Group's approach of combining quality and responsiveness.

Anthony Grandpierre, Messer France

Manufacture Française des Pneumatiques Michelin

Over the course of nearly 120 years, the Michelin Group has grown to become one of the world's biggest suppliers of vehicle tyres. It employs 111,000 people at 70 production facilities and has a sales presence in over 170 countries. In 2010, Michelin produced some 176 million tyres and 10 million road maps. In addition to the Michelin brand, the BFGoodrich, Kleber, Uniroyal, Riken, Taurus, Kormoran, Warrior, Pneu Laurent, Recamic and Michelin Remix brands are also part of the Michelin Group.



Living Danube

The Danube stretches for 2,800 kilometres from its source in the Black Forest to its delta on the Black Sea. Flowing through ten countries, it is a transport route and an ecosystem of continental importance – a European lifeline. That is why the European Union has been committed to keeping its longest river clean and has supported Budapest, the largest city on the Danube, in modernising its wastewater system. The extensive clean-up and reconstruction work has also involved the use of Messer technology. Thanks to this technology and regular deliveries of pure oxygen, the Danube has become much cleaner downstream from the Hungarian capital.

Up until a few years ago, following decades of neglect of the wastewater treatment system under socialism, almost half of Budapest's wastewater flowed into the Danube without biological treatment. It was only when Hungary joined the European Union in 2004 that the financial conditions were created for comprehensive modernisation of the system. That same year saw the launch of the "Élö Duna" (Living Danube) project with the aim of bringing the city's effluent disposal system up to the latest standards and providing lasting relief for the Danube. 65 per cent of the total investment of 428.7 million euros came from the EU Cohesion Fund, with the Hungarian state and capital providing the rest of the funding between them. The new wastewater treatment system went into operation in 2010.

Its centrepiece is Budapest's newly constructed central wastewater treatment plant on Csepel, an island in the Danube in the south of the city. It is designed for a daily capacity of 350,000 cubic metres of wastewater, but can handle up to 525,000 cubic metres during peak periods. This ensures that 95 per cent of Budapest's wastewater now undergoes biological treatment before it enters the Danube. It is conveyed south along main sewers on either side of the river, collected in basins and pumped under the river to the island. This process involves the wastewater from both sides having to overcome a height difference of 30 metres in closed pressure sewers.

The wastewater has only little contact with atmospheric air in the collecting basins, and none at all in the pressure sewers. Here the oxygen is quickly used up by microbiological and chemical processes.

If no measures are taken against this, then putrefaction processes will be set in motion by anaerobic microorganisms, which do not require oxygen. This involves the formation of hydrogen sulphide, among other things, with its characteristic smell of rotten eggs. This gas not only causes an odour nuisance, it is also highly toxic and explosive, and it disrupts the biological processes in the wastewater treatment plant. It can also damage the sewer system: after passing through the pressure sewer, the wastewater continues its journey along ordinary sewers and comes into contact with air again.

Here bacteria on the damp inner walls convert this and other sulphur compounds into sulphuric acid, which can even corrode the concrete of the pipes. The wastewater treatment plant's inlet structures are also exposed to this risk of corrosion.

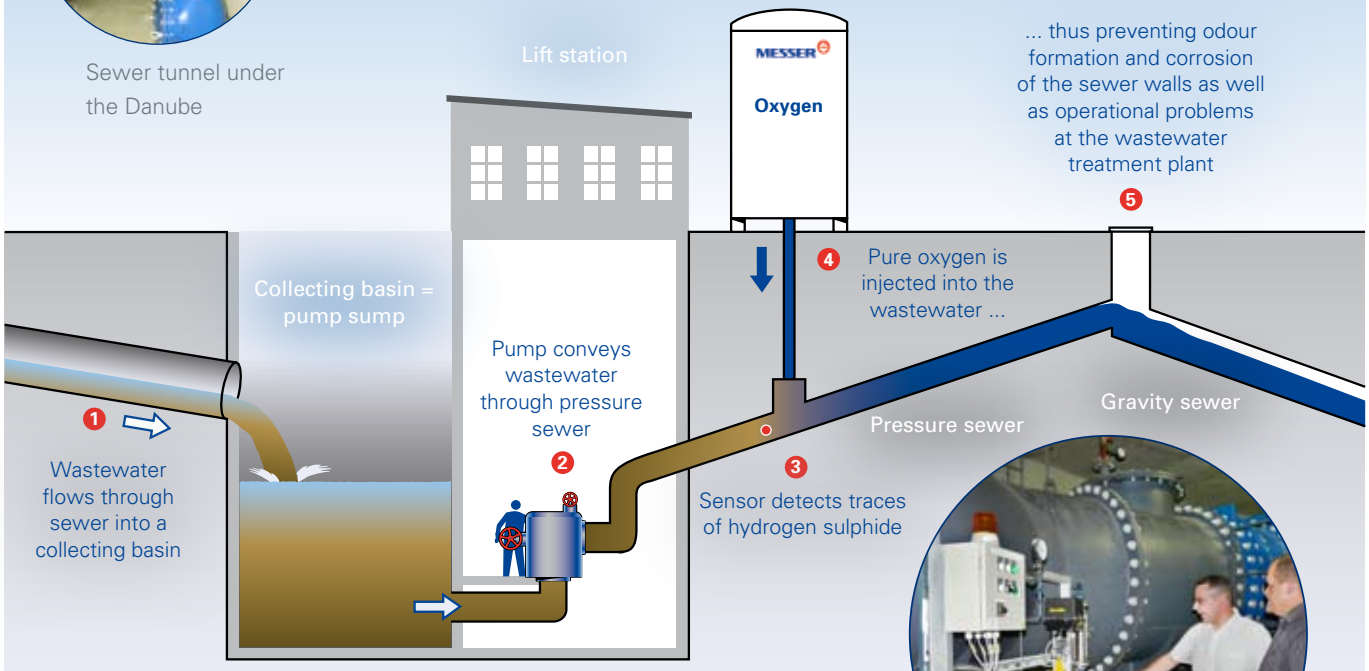
Messer has developed the Oxiduct process for such situations: as soon as a sensor detects traces of hydrogen sulphide, gaseous oxygen is added to the wastewater. It prevents the wastewater from becoming anaerobic and ensures that there are always sufficiently aerated conditions. This means that the anaerobic putrefactive microbes cannot survive.

"First we tried to solve the problem with the controlled addition of nitrate," Csaba Fejes recalls. As hydraulic engineer at the capital's wastewater treatment plant (FCSM), he is responsible for the supply of wastewater from the Budapest district of Ferencváros to Csepel. "However, we would have had to remove this nitrate from the wastewater again in the treatment plant. By comparison, the addition of oxygen is simpler as well as more environmentally friendly and economical. And the team from Messer has done a great deal to tailor the automation precisely to the requirements of our wastewater system."

Krisztina Lovas, Messer Hungarogáz

Sewer tunnel under the Danube

Oxiduct prevents odour nuisance and corrosion in sewers



András Paszera from Messer in Hungary (left) and Csaba Fejes from the Budapest wastewater treatment plant check the Oxiduct system's control unit.

The advantages of the Oxiduct process

- Reliable prevention of anaerobic putrefaction processes
- No odour pollution or pipe corrosion
- High efficiency
- Automated control in line with requirements
- Minimal energy demand
- Low investment costs
- Low operating costs
- Low maintenance

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Hungary: Dry ice refreshes engines and drivers

Cooling for Formula 1

Eight engines may be used per car in a Formula 1 season, with at least five weeks between two changes. Any violation of this rule is punishable with a severe grid penalty. A real risk to the engines arises when they are idling, for example before the start, during pit stops or between qualifying laps. Without the cooling effect of the air stream that is generated when the cars are racing, the engines can quickly overheat. In such situations, the teams like to use dry ice to control the engine temperature: the frozen CO_2 is filled into containers that are connected to a fan. The cryogenic gas that is released from the dry ice is blown into the racing cars' cooling vents by a powerful stream of air, ensuring that the idling engines are adequately cooled. On hot training and race days, the drivers too are glad about a quick cool-down in the pit lane. The cars do not have air conditioning, and it can become uncomfortably hot in the highly sealed protective suits worn by the drivers. Some of the teams have experimented with refreshing the drivers by filling their suits, helmets, shoes and gloves with dry ice – even if it is just temporary relief. At the Formula 1 race at the Hungaroring in August, Messer supplied nine teams with dry ice.

Krisztina Lovas, Messer Hungarogáz

Pit stop fix: Ferrari's Formula 1 team

Italy: Letting bikers open up

Sealed tanks at Ducati

ILAS, a company based in Bruino near Turin, specialises in the production of tanks for motorbikes. It makes around a thousand fuel tanks a day – from steel, titanium and other metals – for motorcycle manufacturers such as Ducati. ILAS uses fully automatic TIG welding in the production process, which ensures high mechanical quality and reliably sealed tanks. Messer supplies the shielding gases for the welding process, primarily Argon 5.0 in bundles as well as Ferroline C18. Use of the gases plays an important role in terms of the quality of the welds.

Lorena Vaschetto, Messer Italia

The Ducati Multistrada – one of the make's bestselling models

Hungary: Calibration gases in engine development

Emissions down

Calibration gases are indispensable for the precise determination of exhaust emissions. They are used for checking the measurement processes and for calibrating the measuring instruments. The gases must have a precisely defined composition for this purpose. The measurement of exhaust gases is used to determine their chemical composition as well as their optical effect. Calibration gases from Messer fulfil the relevant requirements and have been certified for this exacting application in numerous countries.

One of the main priorities of development work today is, of course, to reduce exhaust emissions. The EURO 6 standard, which comes into force in 2014, requires vehicle manufacturers to make a significant reduction in the emission of nitric oxides and fine dust compared with presently permissible values. AVL in Hungary has been using calibration gases from Messer for the precise determination of exhaust components for many years. These include Topline gas mixtures, nitrogen and synthetic air. AVL is the word's largest independent specialist in engine development as well as simulation and test systems.

Krisztina Lovas, Messer Hungarogáz

Ecological modular system facilitates environmentally friendly paper production

"Green Paper Mill"

The basic method of making paper has remained unchanged for more than 2,000 years: plant fibres are soaked in water and then dried on a screen, where they coalesce to form a web. Over time, this process has been constantly refined for the production of countless varieties of paper.

Today, paper is produced in huge machines in a process that typically involves massive energy and water consumption. More often than not, large quantities of chemicals are also used to make the paper lighter, smoother and more durable. But environmentally friendly alternatives do exist. Significant environmental effects can be achieved through the use of gases in the various process steps. Messer has developed a modular system for this purpose which, if used consistently, makes the "Green Paper Mill" a possibility, but which also lends itself to the use of parts of the system.

Reducing the consumption of energy and resources begins with the treatment of the raw material. Pulp washing with carbon dioxide (CO_2) and pulp bleaching with oxygen or ozone render the use of large quantities of chemicals superfluous. When treating waste paper for reuse, the paper/water mixture is enriched with CO_2 in order to prevent microbial growth and the formation of unwanted deposits.

Sticky build-up is removed from the machines with dry ice instead of solvents. Lime scale in the tubes and pipes of the machines can also be prevented with CO_2. This in turn makes it possible to use the abundant wastewater in paper mills for certain processes, thereby saving huge quantities of fresh water. Messer was nominated for the TRIGOS Österreich business award in 2011 for its "Green Paper Mill" concept. In addition, Helmut Gutenberger of Messer Austria has been nominated for the Austrian State Prize for Innovation as the developer of the concept for the "Production of absolutely chlorine-free paper".

Editorial Team

The large-scale production of paper is made more efficient and environmentally friendly in many places thanks to the use of CO_2, ozone and oxygen.

Hydrogen – Basic element of the universe

In the periodic table, hydrogen is in pole position – period 1, group 1, atomic number 1 – and that is where it belongs: it was the first element to be formed during the big bang and remains the most abundant element in the universe to this day.

Profile: Hydrogen [H]

Element symbol	H
Occurrence	On earth, it occurs predominantly in water molecules; in certain chemical reactions, it briefly occurs in atomic form, and then it is highly reactive.
Boiling point	-253 °C
Freezing point	-259 °C
Chemical properties	Colourless and odourless, element with the lowest density, lighter than air, highly reactive. Hydrogen burns with a slightly bluish flame in air to form water. In mixtures with gaseous oxygen, H_2 reacts highly explosively when ignited (hydrogen-oxygen reaction).
Production	Partial oxidation: natural gas reacts with oxygen to form H_2 and carbon monoxide. Steam reformation: hydrogen is produced from methane at high temperature and under high pressure. Chlorine-alkali electrolysis: an electric current is applied to sodium chloride solution to produce sodium hydroxide, chlorine and H_2.
Uses	Fuel and welding gas, production of ammonia and numerous other chemical compounds, reduction of iron ores, coolant, fuel, propellant and packaging gas, annealing of high-alloy steels, oxide reduction in molten metal, glass melting.

The hydrogen atom only has one proton and one electron, making it the lightest and simplest atom. This explains why it accounts for up to 93 per cent of all the atoms in our solar system but makes up "only" 75 per cent of the mass. By contrast, hydrogen is downright rare on earth. It accounts for all of 0.12 per cent of the earth's mass. But that is enough to cover two thirds of the earth's surface with the most important hydrogen compound, water (H_2O).

Hydrogen was first detected in 1766; in 1787, Antoine Laurent de Lavoisier discovered that water can be produced from it and gave the gas its scientific name Hydrogenium (from Greek hydor = water). Hydrogen for industrial use is largely produced as a by-product of chemical industry processes, and more often than not that is also where it is used again. The main method of targeted production of the gas is by breaking down light hydrocarbons such as natural gas as well as through chlorine-alkali electrolysis using simple sodium chloride solution.

Hydrogen is used for oxyacetylene welding of lead and aluminium as well as for flame cutting.It is used as a raw material in countless chemical processes, including fertiliser production, for the reduction of iron ores and as a coolant for generators in power stations and industrial plants. The gas has been approved as food additive E949 and is used as a propellant as well as a packaging gas.

A kilogram of hydrogen contains as much energy as 2.8 kilograms of petrol. It can be obtained from water using renewable energy and subsequently burned to form water again in a carbon-neutral process. When the necessary technology has been fully developed, hydrogen could become the energy source of the future.

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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: Dr. Joachim Münzel, Marlen Schäfer, Diana Buss, Angela Bockstegers, Johannes Hirning (Trainee), Krisztina Lovas, Benjamin Auweiler, Dr. Christoph Erdmann, Monika Lammertz and Michael Holy

(not pictured: Angélique Renier, Thomas Böckler, Tim Evison, Dr. Bernd Hildebrandt and 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 France to be won, including soft cheese, sausage and wine.

For your chance to win 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 31 January 2012.

The 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 Fritz Reuker, Sinn-Fleisbach, Germany. The correct answer was "BIERGARTEN".

Which substances can be produced by reaction of alcohols with ammonia?

				5		1					

Technology and oxygen from Messer are helping to keep which river clean?

	8	3			

Which Italian motorcycle marque uses welding gases from Messer?

			4		6

For which Austrian business award was the "Green Paper Mill" concept nominated in 2011?

				2	7

Answer:

1	2	3	4	5	6	7	8

Have fun and (with a bit of luck) enjoy the delicacies!
Your Gases for Life team

Good riddance to woodworm!

The baroque coronation carriage of the Habsburg imperial family is one of the most magnificent items on display at the "Wagenburg" coach museum in Schönbrunn near Vienna. The worst enemy of this unique collection is woodworm, the larva of the common furniture beetle, which is only a few millimetres in size. The experienced team of restorers are tackling this pest with nitrogen: a gas-tight tent is erected over the carriage and filled with nitrogen. The treatment time depends on the size and type of object. This makes it possible to rid valuable cultural assets of pests, without using any toxic substances and without any side effects.

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

www.Gases for Life.de