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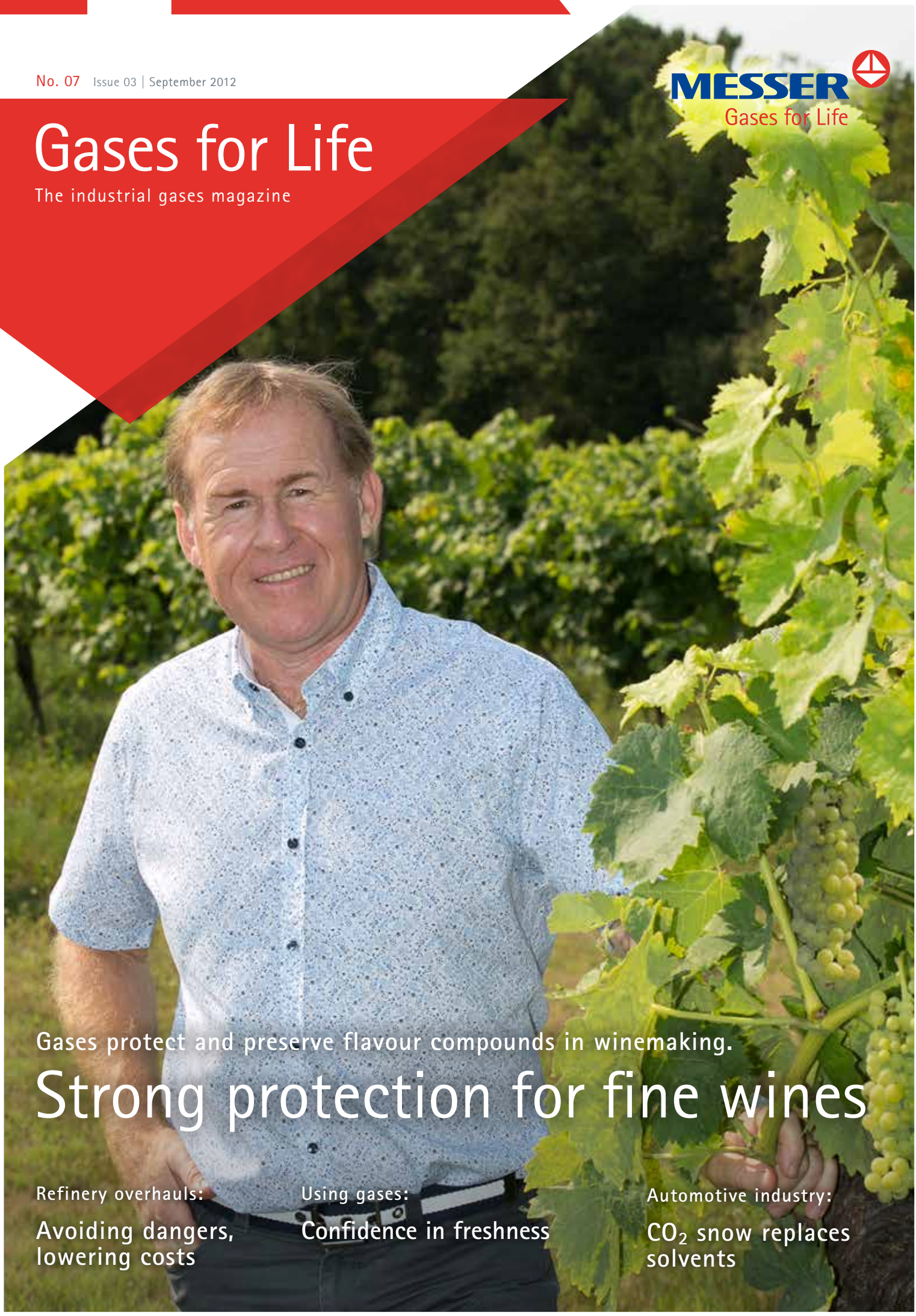
MESSER
Gases for Life

Gases for Life

The industrial gases magazine



Gases protect and preserve flavour compounds in winemaking.

Strong protection for fine wines

Refinery overhauls:
Avoiding dangers, lowering costs

Using gases:
Confidence in freshness

Automotive industry:
CO_2 snow replaces solvents

Dear Readers,

Changeable weather can be a problem for wine growers: they are particularly affected by weather conditions such as rain, sun, wet and cold spells and drought. The challenge lies in maintaining the high quality levels of the vintages in spite of the changing conditions. This is by no means a simple task.

I am all the more delighted that our "Gases for Life" are supporting the work of the wine growers. Examples of this include dry ice, which cools the freshly harvested grapes, or inert gases such as nitrogen and argon, which prevent unwanted contact with oxygen during processing of the grapes.

"Gases for Life" also play an important role in a host of other food- and drink-related processes. This is the case with cryogenic cooking, the preparation of fresh minced meat or the production of low-fat foodstuffs.

I hope you enjoy reading this issue of "Gases for Life" and manage to savour what will hopefully be a lovely late summer – perhaps with a glass of wine.

Best wishes

Stefan Messer

Contents

Cover photo:
Jean-Yves Berlie, salesman and consultant at Messer in France, visiting a vineyard run by wine grower Florent Lys in Saint-Sulpice-de-Royan.

Good for you and the environment

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The runway lights are cleaned automatically and without stopping.

Switzerland: Dry ice blasting at the airport

Orientation for pilots

Airport runways are marked with thousands of lights that serve as an orientation aid for pilots. These lights need to be cleaned on a regular basis in order to ensure that they shine brightly at all times. In the past, this was done manually in what was a rather laborious process. Today, it can be done using time-saving and efficient technology. Zurich Airport uses an ASCOJET dry ice blasting unit to clean the majority of its approximately 8,000 runway lights. This unit sits on a mobile structure on the vehicle, with the compressor towed behind as a trailer. In front of the vehicle is a front-mounted hydraulic structure fitted with a sensor and a jet nozzle. The sensor detects each light and triggers the dry ice jet as well as the movement of the front-mounted hydraulic structure, so the driver can simply keep on driving during the cleaning process. Thanks to the automatic system, the driver can perform the cleaning job on his own.

Nicole Urweider, ASCO Carbon Dioxide

Hungary: Gases for Bosch Group

One for all

The Bosch Group operates its largest car electronics production facility worldwide in the northern Hungarian town of Hatvan. It is supplied with nitrogen from two permanently installed Messer nitrogen generators. Among other things, the nitrogen is used in reflow, selective and wave soldering, at the manual repair stations and for the storage of oxygen- and moisture-sensitive spare parts.

This year, Messer in Hungary has begun supplying gases to two further Bosch subsidiaries, both based in Miskolc: Robert Bosch Power Tool Elektromos Szerszámgyártó Kft. develops and produces the well-known Bosch power tools; Robert Bosch Energy and Body Systems Kft. specialises in car accessories such as starters, electric drives and relays.

All of the Group's Hungarian manufacturing companies thus get their gases from a single source. In addition to nitrogen, they also require argon, acetylene, forming gases, sulphur dioxide and oxygen for their manufacturing and maintenance processes. Messer supplies these as liquid gases in tanks or cylinders.

Krisztina Lovas, Messer Hungarogáz


Ferenc András, a regional sales manager at Messer in Hungary, swears by Bosch.

Serbia: Liquid nitrogen for gourmet cooking

An experience: the art of cryogenic cooking

A feast for the eyes and taste buds

Pumpkin soup over frozen dumplings, caramelised goose liver and unusual ice creations are just some of the dishes that are prepared in the cryo-kitchen of "Mala fabrika ukusa" ("The Little Taste Factory"), a restaurant in Belgrade. Using cryogenic nitrogen, chef Mihajlo Subotic and his team "cook" in front of and for the pleasure of their guests. When, for example, the hot pumpkin soup is poured over the icy-cold cream, pork crackling and grilled aubergine dumplings, the hissing and the steam generated are quite spectacular. The taste manufacturers use liquid nitrogen at minus 196 degrees Celsius for their temperature game. The gas for these highly imaginative dishes is supplied by Messer in Serbia.

Sanja Šamatić, Messer Tehnogas

Italy: Pizza baking with CO_2

Cooled kneading

Twenty years ago, resourceful pizza chefs in San Donà di Piave near Venice decided to offer their products on a larger scale and founded the company Prodal. Since then, the company, which specialises in the production of frozen pizzas, has established itself in the small to medium-sized sector of the market. Prodal produces some 25,000 pizzas per shift. In order to be able to supply the best quality, the pizza specialists try to maximise the use of natural raising agents and traditional ingredients for the dough. Messer in Italy is also contributing to the quality of Prodal's products by supplying the liquid CO_2 that is used to cool the dough during the kneading process.

Lorena Vaschetto, Messer Italia

Czech Republic: Fire polishing with oxygen

Perfect polish for glass

Fire polishing glass involves melting the surface of the material with the aid of hot flames, thereby creating an extremely smooth surface after cooling. A high and precise energy input is vital to ensure that the material becomes viscous

Fire polishing at Crystalite Bohemia

on the outside whilst remaining solid on the inside. Crystalite Bohemia, the long-established Czech glass maker and number three in the European market, uses oxygen to ensure that the desired flame temperature is achieved. Messer supplies liquid oxygen to Světlá nad Sázavou for this purpose.

Josef Filip, Messer Technogas

Germany: N_2 for assembly production

Filigree top quality

Mobile communication devices such as smartphones, tablet computers, navigation and hands-free systems are becoming ever more compact and powerful. The insides of these devices consist of high-quality electronic assemblies that are produced to the highest quality standards. Such assemblies are also produced by Friedrichsdorf-based Peiker Acustic, one of the leading providers of communication solutions in the automotive market. The company uses liquid nitrogen for lead-free soldering. The inert gas atmosphere that is produced with the nitrogen leads to reduced surface tension and improved wetting behaviour when the filigree elements are applied.

Uwe Angenendt, Messer Industriegase

Hungary: Oxygen bleaching for cellulose

Fibres instead of fat

Dunacell is the only manufacturer in Europe to produce cellulose from wheat straw. In the past, the product was used exclusively for paper production. Now the straw cellulose is also used in the food industry, including as an emulsifier, carrier and filler, as well as a separating, coating and foaming agent. It can help to reduce the fat content and increase the fibre content of food. Since 2010, Messer in Hungary has been supplying Dunacell with carbon dioxide for the purpose of dewatering the cellulose during washing and pressing. This year, moreover, the bleaching process in Dunaújváros has been converted to oxygen bleaching. As well as being much more environmentally friendly and economical, this process also achieves better quality than other conventional bleaching processes.

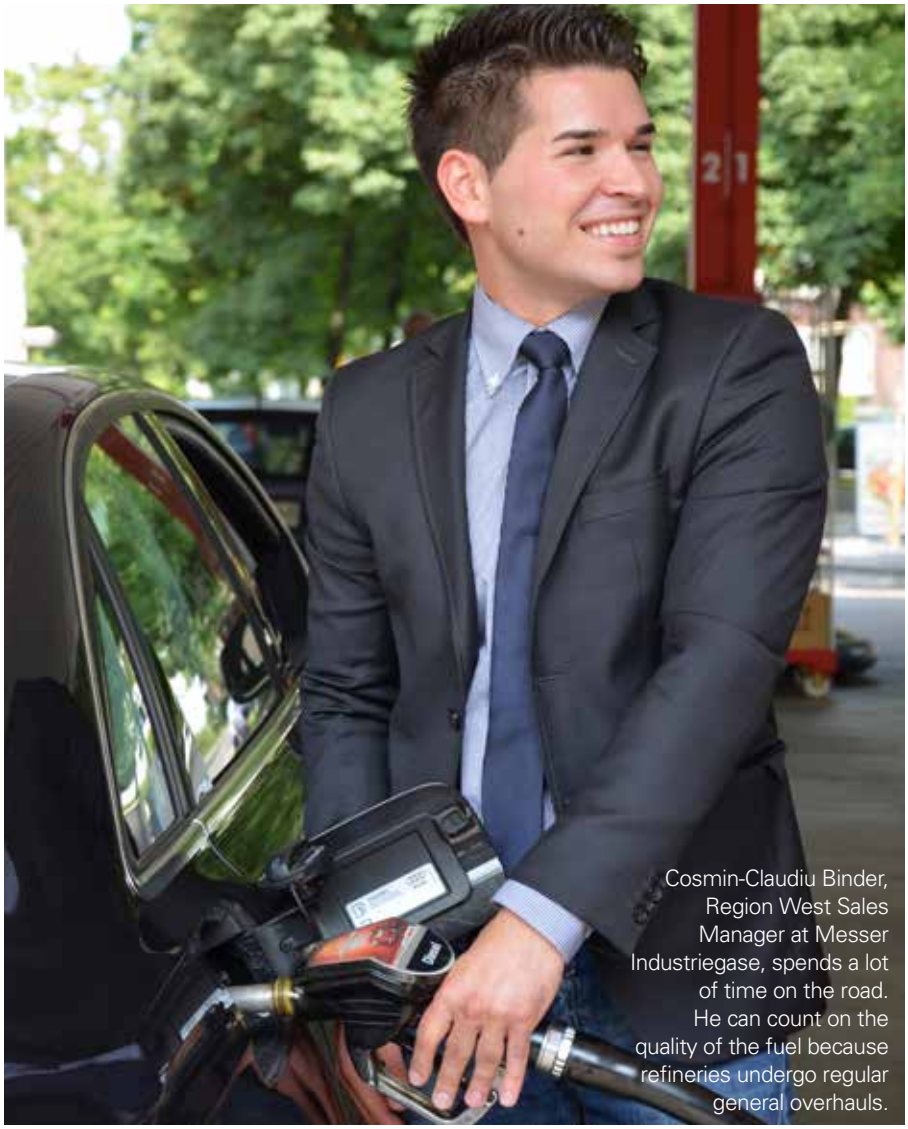
Krisztina Lovas, Messer Hungarogáz

Andrea Simony, a buyer at Messer in Hungary, likes low-fat cereal bars.

Nitrogen ensures safe and quick plant overhauls.

Avoiding dangers, lowering costs

Things can really hot up in oil refineries – in more ways than one. In some parts of a refinery, temperatures can reach up to 800 degrees Celsius. Naturally, the substances that are exposed to this heat are flammable, and the heat results in vapour formation. Reliable prevention of fires and explosions is only possible under strict exclusion of air. However, the plants have to be opened when they undergo an overhaul. In such cases, large quantities of nitrogen ensure that the vapours do not mix with oxygen. This reduces the refinery's maintenance downtime and brings down costs.



Cosmin-Claudiu Binder, Region West Sales Manager at Messer Industriegase, spends a lot of time on the road. He can count on the quality of the fuel because refineries undergo regular general overhauls.

In order to produce petrol, diesel or high-quality intermediate products for the plastics industry from crude oil, it is distilled in huge plants, broken down into its constituent parts and reformulated. To ensure that the plants operate reliably and efficiently, they are shut down and emptied at regular intervals, followed by cleaning, inspection, repair, further technical improvements and, finally, a TÜV audit. Mineralölraffinerie Oberrhein (MiRO) in Karlsruhe is the largest oil refinery in Germany. When the last overhaul took place there, 295 tanks, 40 rectification columns – the tall pipe bundles in which the crude oil as well as products and intermediate products are distilled –, 316 heat exchangers and hundreds of fittings, regulators and control devices had to be checked.

This mammoth task was scheduled to last four full weeks and involved the deployment of up to 2,800 staff in addition to the MiRO team. Human safety as well as the safety of the plant and equipment has top priority during each overhaul. "When the process is shut down, the equipment and pipes are filled with a mixture of hydrocarbon vapours," says Messer application specialist Thomas Berger, describing the starting situation.

The Mineralölraffinerie Oberrhein (MiRO) in Karlsruhe

"If you just opened up the plant, these vapours would combine with atmospheric oxygen to form a highly explosive mixture. That is why nitrogen is first piped into the closed plant components. The gas pushes the vapours to the flare, where they are burned in a controlled manner."

Cooling, pigging, blasting

Plant components or catalyst fillings which are operated under great heat need to cool down before they can be overhauled or replaced. Since one hour of downtime can mean a six-figure loss in revenue, you can't simply wait for something to happen by itself. "In a reactor, the cooling process can be reduced from about four to two days through the precisely dosed addition of liquid nitrogen," explains Thomas Berger. The gas is also used to push so-called pigs – plug-shaped cleaning devices – through the pipes or to dry the pipes from the inside by means of gas purging. When sand blasting plant components that are subject to coke deposits, the gas is used as an inert gas propellant for the blasting material. Final pressure tests carried out for the purpose of leak testing the pipes involve the use of helium as a detector gas. Nitrogen is once again required at the end of the overhaul. "Now the air has to be pushed out of the pipes before oil products can be allowed to flow into them again," explains the application technology specialist. This means that the hydrocarbon vapours that are generated during the start-up process will encounter an oxygen-free atmosphere.

Crude oil is piped through hot stainless steel pipes as part of the refining process.

Meticulous process

A meticulous approach to logistics is crucial in ensuring that an overhaul goes smoothly and the associated costs are kept to a minimum. The gas supplier has to supply very large quantities of nitrogen within a very short space of time and ensure punctual delivery. This is mostly done by truck, but sometimes pipeline systems are used, as is the case at the chemical complex near Tarragona in Spain. "We supply numerous customers at the site via our 90-kilometre pipeline system, including the refinery operated by the Spanish oil company Repsol," reports Dr. Walter Bachleitner, application engineer at Messer in Spain. "However, the quantities that are required for such a large-scale operation have to be produced by us in good time in advance. If required, we also provide customers with the necessary mobile vaporisers which allow them to turn the liquid nitrogen into gaseous nitrogen." Additional services of this kind are usually provided by companies that specialise entirely in overhaul. "We always make sure that the gas is available on time and in the required quantity, whatever the weather or traffic conditions."

Information provided by:
Peter Laux, Messer Industriegase
Dr. Walter Bachleitner, Messer Group

Further information:
Thomas Berger
Manager Application Technology
Chemistry/Environment
Messer Group GmbH
+49 2151 7811-229
thomas.berger@messergroup.com

Serbia: Turbine cleaning with dry ice

Clean for the next decades

The Serbian-Romanian Djerdap 1 power station at the Iron Gate on the Danube was commissioned in 1970. At the time, it was the largest hydroelectric power station in the world, and even today it remains one of the largest in Europe. Its twelve generators can generate a total output of 1,026 megawatts from the flow of 4,800 cubic metres of water per second.

The border between the two countries runs through the middle of the power station, also bisecting it from an organisational perspective. The Serbian part of the plant is currently undergoing a thorough overhaul designed to make it fit for the next 40 years.

The overhaul of the giant turbines – they have a diameter of 9.5 metres and weigh 650 tonnes – requires the rotors to be cleaned thoroughly. At Djerdap 1, this is being done with a combination of sand and dry ice blasting. The thermal effect of the cryogenic CO_2 pellets boosts the cleaning performance without causing any damage to the material. It is also a particularly economical solution as it reduces the cleaning time compared with conventional methods.

Dragan Radiš and Sanja Šamatić, Messer Tehnogas

The Djerdap 1 power station on the Danube has twelve generators for energy production.

Winding of a power plant generator before and after cleaning with dry ice pellets.

Found (almost) everywhere

The eye-catching product display in the foyer of the Messer headquarters

In September 2011, the new company headquarters of Messer was opened in Bad Soden. As well as uniting all the companies of the Messer Group under one roof for the first time, it also houses an extensive exhibition on the people, brands, technology, products and history of the Group.

The great variety of ways in which gases are used is showcased in a floor-to-ceiling display featuring 114 models of different end products made by Messer customers. These products range from the AIDA cruise ship to ice-cream wafers, and from Coca-Cola and Chio Chips to a cylinder head. They clearly document the fact that gases can be found – at least indirectly – in practically every sphere of life. The exhibits have been provided by Messer customers around the world. The number of exhibits represents the company's 114-year history, with another product being added each year.

Angela Bockstegers, Messer Group

6 questions for

Marisa García

Marisa García (39), responsible for safety, environmental protection and quality at Messer Ibérica de Gases S.A. in Spain, has been working for Messer since February 2003. She lives in Tarragona with her husband and two children.

1. **My biggest professional challenge at Messer so far has been …**
   … implementing the «Quality, Environment and Safety Management System» at Messer Ibérica de Gases. In May, we received the silver EIGA safety award from the European Industrial Gases Association for ten accident-free years.
2. **What typifies Messer for me is …**
   … the fact that employees are given the freedom to develop their areas of expertise.
3. **My strengths …**
   … are my personal commitment, perseverance and sincerity.
4. **I have a weakness for …**
   … walks along the beach, good films and, of course, playing with my children.
5. **What fascinates you about gases and gas applications?**
   The fact that you frequently encounter them in everyday life. Gases are hidden in many products such as consumer goods or commodities.
6. **The most important invention of the last century is …**
   … it is hard to name just one invention today. The last century has seen so much progress that benefits humankind. In my view, medical advances, such as penicillin and vaccines, have been the most important ones.

Gases protect and preserve flavour compounds in winemaking.

Strong protection for fine wines

Wine growers and wine connoisseurs know that the quality of a wine is created "on the vine". It is only the grapes and what has accumulated inside them during the ripening process that can subsequently tickle the taste buds of wine lovers. This includes around a thousand volatile compounds that have so far been identified by oenology – the science and study of wine. The foremost task of vintners is to bottle as many of these flavour-giving substances as possible. In doing so, they have to contend with some strong adversaries though: bacteria, fungi, heat and oxygen all pose a threat to the sensitive flavour compounds. In modern winemaking, gases are one of the methods of choice for keeping these adversaries in check.

Every wine grower is glad of dry and sunny weather at harvest time. The grapes get one last ripening boost and the harvest stays healthy – only in this way can truly great vintages be created. However, a warm autumn also encourages premature fermentation. As soon as the grapes are pulled from the panicles and get slightly squashed in the process, the ubiquitous microorganisms start to attack the must. They multiply particularly quickly in warm temperatures. If the wine grower does not intervene, they will immediately start to convert the fructose into alcohol.

Golden October spells danger

While this conversion – the fermentation process – is what turns the juice of the grapes into wine, it would be premature at this stage, because the must needs some time to allow important constituents to be released from the grape skin. This includes some of the flavour compounds that help give the wine its fruity taste. The tannins, which are essential to the "body" of the wine, and the colour compounds, which give it its shimmering lustre, are also predominantly derived from the grape skin and extracted prior to fermentation.

Colouring bath of skins

To ensure that this subtle process is not interrupted by premature activity on the part of the alcohol-forming yeast cells, many vintners rely on so-called cold maceration. The process was originally developed in Burgundy to help give the not so intensely coloured Pinot Noir a darker density. In most cases, a temperature of approximately five degrees Celsius is aimed for. This is achieved by adding dry ice with a temperature of minus 78 degrees. The cryogenic carbon dioxide cools the must to the desired temperature and also keeps the ambient air away from it:

Wine grower Florent Lys and Jean-Yves Berlie from Messer in France discuss technical aspects of winemaking in the vineyard.

It changes from the solid state to the gaseous state (sublimation) and rises above the must, remaining just above it as a blanketing CO_2 cloud since it is heavier than air. After a while, fermentation can finally begin. With good red wine, it takes place "on the skins" – the must and grape skins stay together. In the case of white wine, the two are first separated. The must is pressed, and this juice is then clarified, i.e. trub such as leftover particles of grape skin is removed.

Nowadays, with larger batch sizes, the flotation process is predominantly used for this step. Many wineries use nitrogen for this as it does not react with the sensitive contents. Nitrogen is fed into the grape juice inside a pressure tank. At a pressure of five to six bar, it remains absorbed in the liquid, but is then released again as soon as the pressure is reduced. Gas bubbles rise to the surface, taking with them the particles to which they are still adhering. This leaves clear must at the bottom, which can simply be drawn off.

Continued on page 12 →

Stainless steel wine tanks

Gases in winemaking

There are a variety of ways in which gases can help to make wine production processes more efficient and – above all – to improve quality. They are used in different phases of winemaking.

- Grape harvest – dry ice prevents premature fermentation
- Destemming and mashing – CO_2 ensures oxidation protection
- Soaking (maceration) – cooling, e.g. with cryogenic gas, delays fermentation and allows enhanced extraction of fruit flavours and colour compounds
- Must clarification – nitrogen removes trub during the flotation process
- Storage – inert gas pushes air out of the tanks and fills the headspace
- Freshening up – carbon dioxide lends the wine a sparkle
- Bottling and catering – wine in containers that have been opened is protected against oxidation by various mixtures of nitrogen, CO_2 and argon

→ *Continued from page 10*

The process also works with compressed air, but the oxygen it contains can cause undesirable reactions, oxidation and a loss of flavour.

Tank flooded with gas

During fermentation, the microorganisms themselves produce plenty of carbon dioxide, thus preventing air from getting into the fermentation tanks during this phase. However, before these are filled, as well as a few weeks later when transferring the fermented young wine into the storage tank, the question of how to avoid contact with oxygen arises again. The best way to prevent changes in the flavour and colour of the wine is to use inert gases – nitrogen or argon for red wine and carbon dioxide for white wine. These gases displace the air during the storage, transfer or bottling of wine and thus prevent oxidation by atmospheric oxygen. They are stored in gas tanks or gas cylinders and dosed via pipes and hoses as required. There is another very simple method of tank inerting. This involves manually adding a measured quantity of dry ice to the empty tank. Inside the tank, it turns into gaseous carbon dioxide and pushes the air out through the opening at the top of the tank.

The same inert gas processes are used when different wines are blended to make a cuvée, as is the case with the majority of the fine Bordeaux wines for example. These expensive wines are made from the wines of different grape varieties, which are made separately before being mixed at a later stage. Here too, of course, it is desirable to avoid contact with oxygen, and this can be achieved by using inert gases. When

Jean-Yves Berlie inspects the container in which the grapes are stored after harvesting. The grapes are cooled and inerted before being transferred to the press.

the vintner bottles the wine later on, it is often done in several stages. This leaves a number of half-full tanks, quite often over a longer period of time. Inside these tanks, a layer of the relatively heavy noble gas argon offers the most efficient protection against flavour-destroying oxidation. It is generally used in a nitrogen-argon mixture and can also preserve a wine's freshness and flavours in bottles that have been opened.

Editorial Team

Further information:
Walter Laimer
Technology Manager
Food & Pharma
Messer Austria GmbH
Phone: +43 50603-260
walter.laimer@messergroup.com

Interview with

Mr Florent Lys from the cooperative winery CAVE COOPERATIVE DE ST SULPICE DE ROYAN

"Messer offers innovative vinification processes"

Gases for Life: Mr Lys, which wines do you produce?

Florent Lys: We produce vins de pays, i.e. local wines, as well as pineaux – liqueur wines with cognac added – and the Jules Gautret and Prince de Didonne cognacs.

Gases for Life: Which Messer food gases do you use and what do you use them for?

Florent Lys: We use Messer gases for the various stages of vinification, from arrival of the grapes through to storage of the wines. Dry ice, which is produced from a liquid CO_2 tank, is used to prevent oxidation of the grapes immediately after harvesting. Liquid CO_2 is also sprayed into the container in which the grapes are collected. This serves to cool the grapes and inert the presses, which are the next step in the process. Here we use a Messer process with feed injectors that are installed directly in this unit and which the operator controls from his cabin to produce vins de pays from the early and red grape varieties. We also use liquid CO_2 to cool and inert the maceration tank. There are further applications for which we use cylinder gases from Messer's Gourmet gas line.

Gases for Life: You have been a Messer customer for six years – what is the decisive factor for you?

Florent Lys: We receive regular and helpful on-site support from the Messer team, including from technicians and engineers when required. Messer offers innovative vinification processes and excellent service with resources to match. And last but by no means least, we use the 300-bar gas cylinder bundles, which enable a large quantity of gas to be stored in a limited number of cylinders.

La Cave Cooperative de Saint-Sulpice-de-Royan winery, France

The La Cave Cooperative de Saint-Sulpice-de-Royan winery in southwest France belongs to the Charentes Alliance Group. Formed in 2010 from two cooperatives, it employs 600 staff in cereals, popcorn production and the winery. La Cave Cooperative de Saint-Sulpice-de-Royan has been in existence for almost 50 years and is the most significant cooperative winery in the region. Its cellars, which house wooden, stainless steel and concrete tanks, produce 50,000 hectolitres of quality wine (grape juice), which is processed and refined by a team of professional oenologists.

Friedrich Moser, Manager Application Technology Food at Messer Group in Krefeld, enjoys a home-made burger.

Italy: Mixer cooling and packaging with gases

Confidence in freshness

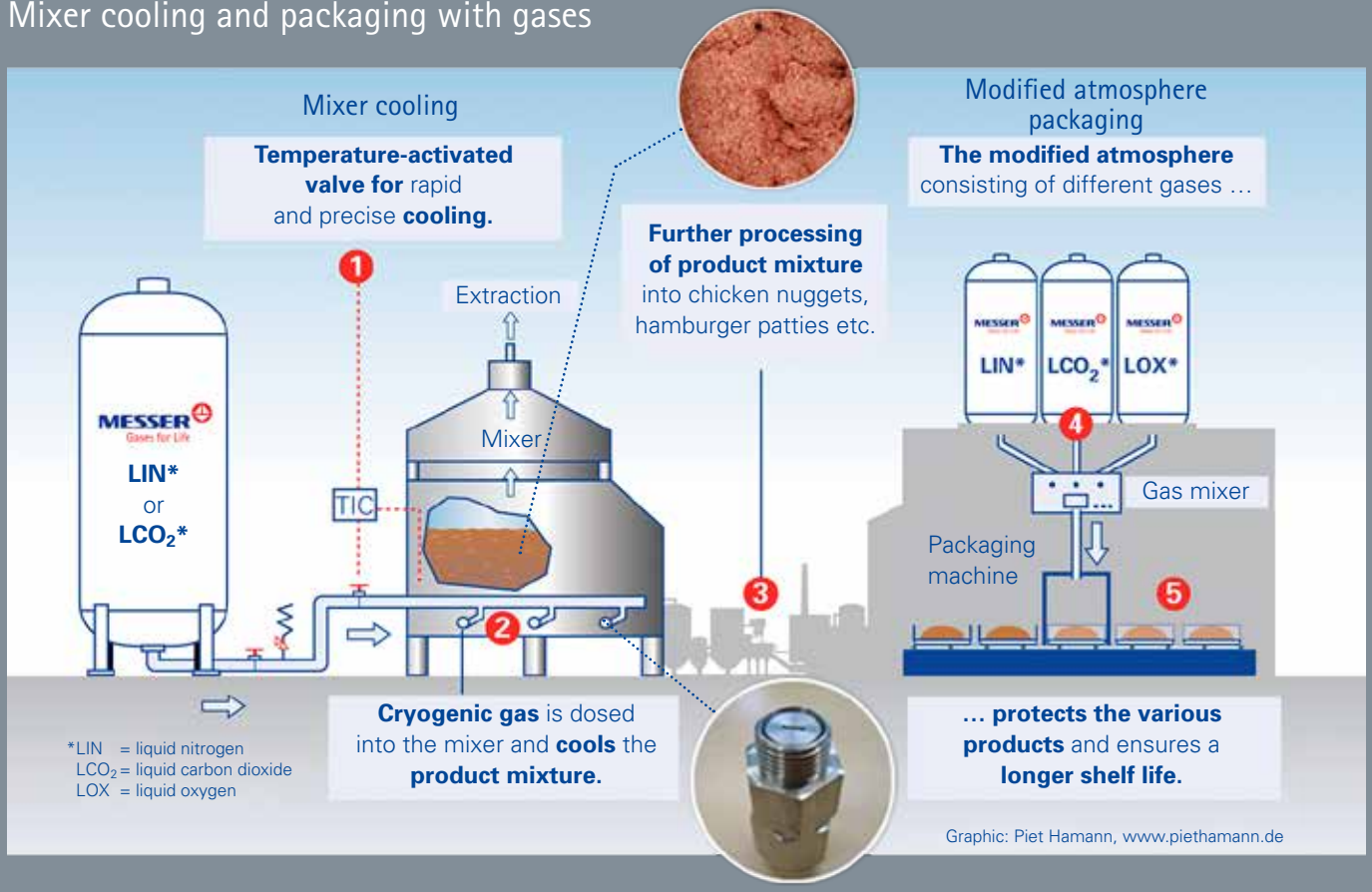
The Unicoop Firenze cooperative has 103 sales outlets, making it one of the largest food suppliers in the Italian province of Tuscany. It operates a logistics centre for chilled meat and dairy products in Pontedera, not far from Pisa. A new production facility for the processing and packaging of fresh meat forms an important part of this "Centro Freschi". Featuring a high degree of automation, it is one of the most modern plants of its kind in Europe. The company attaches great importance to maximising energy efficiency, but its top priority is product quality. The use of gases has a crucial role to play in both areas.

Unicoop Firenze had already consulted Messer engineers at the planning stage for the Centro Freschi in order to optimise the production and packaging processes. At the same time they cooperated closely with RISCO, the manufacturer of the meat processing machines. The mixers supplied by RISCO were fitted with a gas cooling system (Variomix) from Messer. This system allows the optimal processing temperature to be achieved particularly quickly.

When mixing meat, a cryogenic coolant – liquid nitrogen or, as in Pontedera, liquid carbon dioxide – is injected in precisely metered quantities. The cryogenic gas offsets the heat that is generated by the mixing and ensures that the required temperatures are maintained throughout the mixing process.

The Clapet nozzle developed by Messer (after the French clapet = non-return valve) represents one possibility for injecting the gas when using the Variomix process.

Mixer cooling and packaging with gases



It is opened by the pressure of the gas and requires neither additional power nor heating. It is designed to prevent any product residue or cleaning water from getting in. The gas flows through the Clapet nozzle and into the mixer, where it cools the product mix directly. As it is installed at the bottom of the mixer, it is possible to use almost all of the enthalpy of the gas – its "cold content". The cooling energy is thus used extremely efficiently.

The "Centro Freschi" (=fresh centre) is one of the most modern plants of its kind in Europe.

Dough is cooled too

Mixer cooling with cryogenic gases is not only used in meat processing. When it comes to the production of bakery products, you can use the same process to cool the dough in the kneader in order to achieve complete dough development, sometimes with shorter kneading times. Cooling with gas instead of cold water or flake ice is simpler and, above all, more hygienic. The Variomix process is also used in the production of food in powder form, such as packet soups or instant products. Another application is the encapsulation of powders. This involves adding a molten substance such as fat or lecithin so that the product does not absorb any more moisture and remains pourable. This only works if the fat particles crystallise very rapidly, something that can be achieved with cryogenic gases.

The finished meat products are packaged under a modified atmosphere in the Centro Freschi. This is to ensure that they retain their quality all the way to the consumer's fridge.

Unicoop uses a finely balanced blend of carbon dioxide, oxygen and nitrogen for this. All three gases occur naturally in the ambient air, but in a modified combination they help to protect the products and prolong their shelf life. Messer in Italy has been certified in accordance with the provisions of the international Food Safety System Certification FSSC 22000:2010. Its equipment and gases therefore meet the strictest statutory regulations governing food standards.

Lorena Vaschetto and Dr. Leonardo Galli, Messer Italia

Further information:
Leonardo Galli
Head of Application Technology
Messer Italia
Phone: +39 55 2373718
leonardo.galli@messergroup.com

Hungary: Gases for nuclear research

Non-destructive measuring methods

The Centre for Energy Research is the leading centre in Hungary for scientists working in the field of neutron physics. The institute, which is part of the Hungarian Academy of Sciences, operates a research reactor with numerous associated laboratories amid the green hills on the western fringes of the capital Budapest. Among other things, the reactor is used as a source of so-called cold neutrons, which play an important role in neutron research. Hydrogen with a temperature of minus 253 degrees Celsius is used to produce them. This temperature is maintained in the reactor by means of a helium cooling system. This year, a new laboratory has been opened next to the reactor, in which materials science research is being conducted with the aid of the Mossbauer Effect. This effect is created by a nuclear process – the emission and resonance absorption of gamma radiation by atomic nuclei. It facilitates new, non-destructive measuring methods in solid state physics, materials research and chemistry. The lower the temperature, the stronger the effect becomes. The Mossbauer machine's sample chamber is therefore cooled to minus 269 degrees Celsius, just four degrees above absolute zero. Again, helium is used to achieve this. Besides hydrogen and helium, the research centre also uses nitrogen and other gases, which have been supplied by Messer in Hungary for many years.

Krisztina Lovas, Messer Hungarogáz

Slovakia: Weather balloon filled with gas

On its way into the stratosphere: a weather balloon filled with balloon gas

Bursting for science

Students from the University of Žilina in Slovakia sent a weather balloon filled with Messer balloon gas into the stratosphere on the first nice May weekend of the year. At an altitude of almost 30 kilometres and at around minus 60 degrees Celsius, the balloon burst, as planned, after expanding to twice its original size due to the low atmospheric pressure. Its remains and the weather data recorder were parachuted gently back to Earth. The flight lasted about two and a half hours.

Erika Hergottová, Messer Tatragas

France: Experiment with liquid oxygen

Even diamonds are not forever

Diamonds are regarded as indestructible. This has made them a symbol of constancy and eternal love. They even owe their name to their supposed immortality (ancient Greek adamas = indomitable). But do these precious stones merit this name? An experiment carried out in April on the French science programme "On n'est pas que des Cobayes" ("We are not just guinea pigs") clearly answers this question in the negative. In a studio of TV station France 5, a pre-heated diamond was immersed in liquid oxygen supplied by Messer. The mineral, which consists entirely of carbon, disappeared into thin air: it reacted with the liquid gas to form gaseous carbon dioxide – and vanished. So, as often happens with love, even diamonds are not forever.

Angélique Renier, Messer France

The French TV series "We are not just guinea pigs" is a science programme that likes to put on a show.

CO_2 snow is a solvent-free alternative for degreasing components prior to paint application.

CO_2 snow blasting system deoils complex surfaces.

CO_2 snow replaces solvents

"Remove any oil and grease residues before applying paint!" This advice is provided on any paint tin, and one would be well-advised to heed it if one wants the paint job to last. While this may be a fairly straightforward task when dealing with a smooth wing, it can demand a considerable amount of time and effort – quite apart from the use of not very environmentally friendly solvents – when it comes to complex surfaces.

At its plant in Dautphetal in the state of Hesse, automotive supplier Johnson Controls manufactures adjustment systems, height adjusters and rails for car seats. These metal parts are first lubricated to prevent rusting. They are later painted in their entirety or in part. Of course, the film of oil has to be removed completely from those areas that are to be painted. The rear seat system of the successful BMW X1 model was previously cleaned manually with solvents: the areas to be painted were deoiled using a cloth soaked in thinner. This was a time-consuming process which yielded an uneven cleaning result at the numerous corners and edges. This, in turn, necessitated reworking and resulted in an increased cycle time. A new CO_2 snow blasting system does the job much more quickly today, achieving consistently good results while dispensing with solvents altogether. Following a series of impressive tests, Johnson Controls decided to use this technology, which is still relatively young, for pre-treating the rear seat system. The snow blasting operation is similar to that of a fire extinguisher in that the carbon dioxide is expanded in a nozzle and formed into a fine jet with compressed air. This jet removes the film of oil thoroughly and evenly. It has therefore also been possible to turn deoiling into an automated process. As well as saving time, it reduces annual solvent use by around 80 per cent, which benefits the environment. The carbon dioxide is obtained from industrial waste gas, so snow blasting represents a useful and ecologically neutral application of this gas.

Stefan Kosock, Messer Industriegase

Acetylene – from illuminating gas to nanotubes

Acetylene was one of the first industrially produced and widely used gases. Around the turn of the last century, it was in great demand as a light source as well as for heating and cooking. "The beauty and brightness of acetylene light was striking compared with petroleum and gas lighting, as was the simplicity and safety of my acetylene generator," commented Adolf Messer, who had founded his first company for the production of acetylene and the associated application technology back in 1898.

Photo: an acetylene flame pre-heats a workpiece

Profile: Acetylene [C_2H_2]

Empirical formula	C_2H_2
Occurrence	Does not occur naturally on Earth, but present in the atmosphere of Jupiter as well as in interstellar matter
Boiling point / Sublimation point	- 83.8 °C
Ignition temperature	in air: 305 °C in oxygen: 300 °C
Explosion limits	in air: 2.3 – 78 % vol.
Chemical properties	Colourless, flammable gas, odourless in its pure form; in practice, it smells of garlic because of impurity due to technical reasons
Production	High-temperature pyrolysis of petrol (at 1,500 °C) or natural gas (at 2,000 °C) or reaction of calcium carbide with water
Uses	Organic synthesis processes, including for the production of plastic semiconductors, PVC, fragrance and flavouring substances and Vitamin A; autogenous welding and cutting; separation/precipitation of diamond, graphite or polyacetylene layers as well as the production of nanotubes

But only a few years later, the advance of electricity meant that acetylene was no longer needed for lighting. The founder of the company was quick to react and switched his focus to welding and cutting technology.

Acetylene is the fuel gas with the highest flame temperature and the lowest oxygen requirement. This makes it particularly suitable for autogenous welding and cutting. However, under certain conditions, the gas has a tendency to break down explosively into its constituent elements of carbon and hydrogen – also referred to as spontaneous decomposition. Steel cylinders for acetylene are therefore filled with a highly porous mass that absorbs a solvent such as acetone, in which the gas is safely dissolved.

The word acetylene is actually an obsolete term, but one which remains stubbornly persistent in metal technology. The scientifically correct name is ethyne. Under this name, the gas is used in synthesis processes for plastics production in the chemical industry, for example.

Whether ethyne or acetylene – the history of C_2H_2 is a classic example of the continuous process of technological change in the application of gases. Today, it plays an important role in, among other things, the manufacture of plastic semiconductors for microelectronics and in nanotechnology.

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Messer Group GmbH
Corporate Communications
Gahlingspfad 31
47803 Krefeld, Germany

Editorial Team:

Diana Buss – Editor-in-chief
Phone: +49 2151 7811-251
diana.buss@messergroup.com

Benjamin Auweiler, Corporate Office
benjamin.auweiler@messergroup.com

Angela Bockstegers, Corporate Office
angela.bockstegers@messergroup.com

Thomas Böckler, Application Technology
thomas.boeckler@messergroup.com

Mónika Csere, Southeast Europe Region
monika.csere@messer.hu

Dr. Christoph Erdmann,
Production & Engineering
christoph.erdmann@messergroup.com

Tim Evison, Corporate Office
tim.evison@messergroup.com

Dr. Bernd Hildebrandt, Application Technology
bernd.hildebrandt@messergroup.com

Michael Holy, Central Europe Region
michael.holy@messergroup.com

Monika Lammertz, Application Technology
monika.lammertz@messergroup.com

Dr. Joachim Münzel, Patents & Trademarks
joachim.muenzel@messergroup.com

Angélique Renier, Western Europe Region
arenier@messer.fr

Marlen Schäfer, Corporate Office
marlen.schaefer@messergroup.com

Nicole Urweider, ASCO Carbon Dioxide LTD
urweider@ascoco2.com

Concept and Realisation:

Agentur Brinkmann GmbH
Mevissenstraße 64a
47803 Krefeld, Germany

Text and Editing:

klartext: von pekker!
Römerstraße 15
79423 Heitersheim, Germany

Cover photo:

Media Photo France

Translation:

Context GmbH
Elisenstraße 4–10
50667 Köln, Germany

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The Gases for Life editorial team

We are ...

From left to right: Sonja Zellmann, Benjamin Auweiler, Tim Evison, Thomas Böckler, Marlen Schäfer, Mónika Csere, Michael Holy, Diana Buss, Nicole Urweider, Monika Lammertz, Michael Wolters
(Not pictured: Dr. Joachim Münzel, Angela Bockstegers, Angélique Renier, Dr. Bernd Hildebrandt and Dr. Christoph Erdmann)

Competition

Delicious!

In this issue of the magazine, readers have the chance to win a gourmet hamper with wines from France, the country featured in our cover story.

For your chance to win this special prize, 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 2 October 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 Magda Decouter from Zeebrugge in Belgium. The correct answer was "SUMMER".

What is the name of the dry ice blasting unit that is used to clean the runway lights at Zurich Airport?

3			5			

What is the name of a logistics centre for chilled meat and dairy products in Tuscany?

1		6		4		
					2	

Which fuel gas has the highest flame temperature?

8				9			7	

Answer:

1	2	3	4		5	6	7	8	9
				D					

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

Eco-friendly motorisation

The BeKane®H_2 motorised scooter was ridden through the streets of Paris for 19 hours on its way to setting a new efficiency world record. While the two riders were allowed to take turns, the little scooter had to keep going all day and half the night to cover a distance of 365 kilometres in April. It used up a whole 1.2 kilograms of hydrogen for this journey. In addition to the gas, the combustion of which releases pure steam, Messer also supplied the pressure relief material for this eco-friendly motorisation.

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

www.Gases for Life.de