GENERATE

THE INTERNATIONAL MAGAZINE OF THE GEA GROUP ISSUE 03 AUGUST 2007



BEER
BREAD OF LIFE

BUYING POWER – INDIA GEARS UP FOR GROWTH

HOW TO DO IT – AIR COOLING

PARADISE FOUND IN DUBAI

GEA Group

GEA Group

GENERATE is published by the GEA Group Aktiengesellschaft, an international technology group with operating subsidiaries in over 50 countries.

Listed on MDAX stock index, the company focuses on specialty mechanical engineering – especially process engineering and equipment.

The principal markets in which it operates are foodstuffs, dairy, beverages, brewery systems, pharmaceuticals, biotechnology, cosmetics, petro-chemical, biofuels, energy technology as well as marine.

GEA Group companies are dedicated to innovation, helping to push back the frontiers of technological possibilities. This dedication has led to 90 per cent of its businesses achieving either market or technological leadership in their particular sectors.

The Group, headquartered in Bochum, Germany, employed approx. 17,500 people in 2006, generating Group sales of EUR 4.3 billion.

REFRIGERATION



AIR TREATMENT



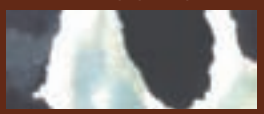
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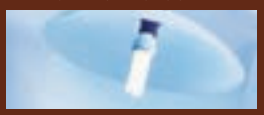
PROCESS EQUIPMENT



DAIRY FARM SYSTEMS



ENERGY TECHNOLOGY



PROCESS ENGINEERING



GAS CLEANING



Contact
GEA Group Aktiengesellschaft
Dorstener Straße 484
44809 Bochum
Tel: +49-(0)234-980-0
Fax: +49-(0)234-980-1087
www.geagroup.com



Welcome to the third issue of GENERATE, published by the GEA Group Aktiengesellschaft.

Dear Readers,

In this issue, we look at the world of beer, the most popular beverage on the planet, one of the oldest and certainly one of the most refreshing.

Beer has come a long way since the first brewmasters experimented with different grains and flavors thousands of years ago. Many countries across the world are now rightly proud of their distinctive ales and lagers, which in many instances have become part of their respective cultures. In recent years brewers have diversified their offerings with new products including fruit beers, low calorie beers and even beers with low or no alcohol. But they all have something in common: they contain essential vitamins and minerals.

In terms of absolute beer output, traditional European strongholds of beer production such as Germany and the UK are now dwarfed by the rapidly expanding markets of China and South America, as the major international brewers extend their reach across the globe.

Names such as Anheuser-Busch, Carlsberg, Heineken, InBev and SAB Miller dominate the industry. But look behind the marketing, and you're quite likely to find that GEA has played its part. We estimate that half of all the world's beer is brewed with technology that has been developed and supplied by GEA. And by doing so we're also helping to preserve countries' brewing cultures.

Besides classical brewhouse technology, GEA supplies the plants and components that allow clients to create innovative new products.

What the public sees is new, but for us this is part of a continual process: understanding the vision of our clients and then developing the technology to help them achieve their objectives – not just in the brewing industry, but in all our market sectors.

Jürg Oleas

Chairman of the Executive Board
GEA Group Aktiengesellschaft



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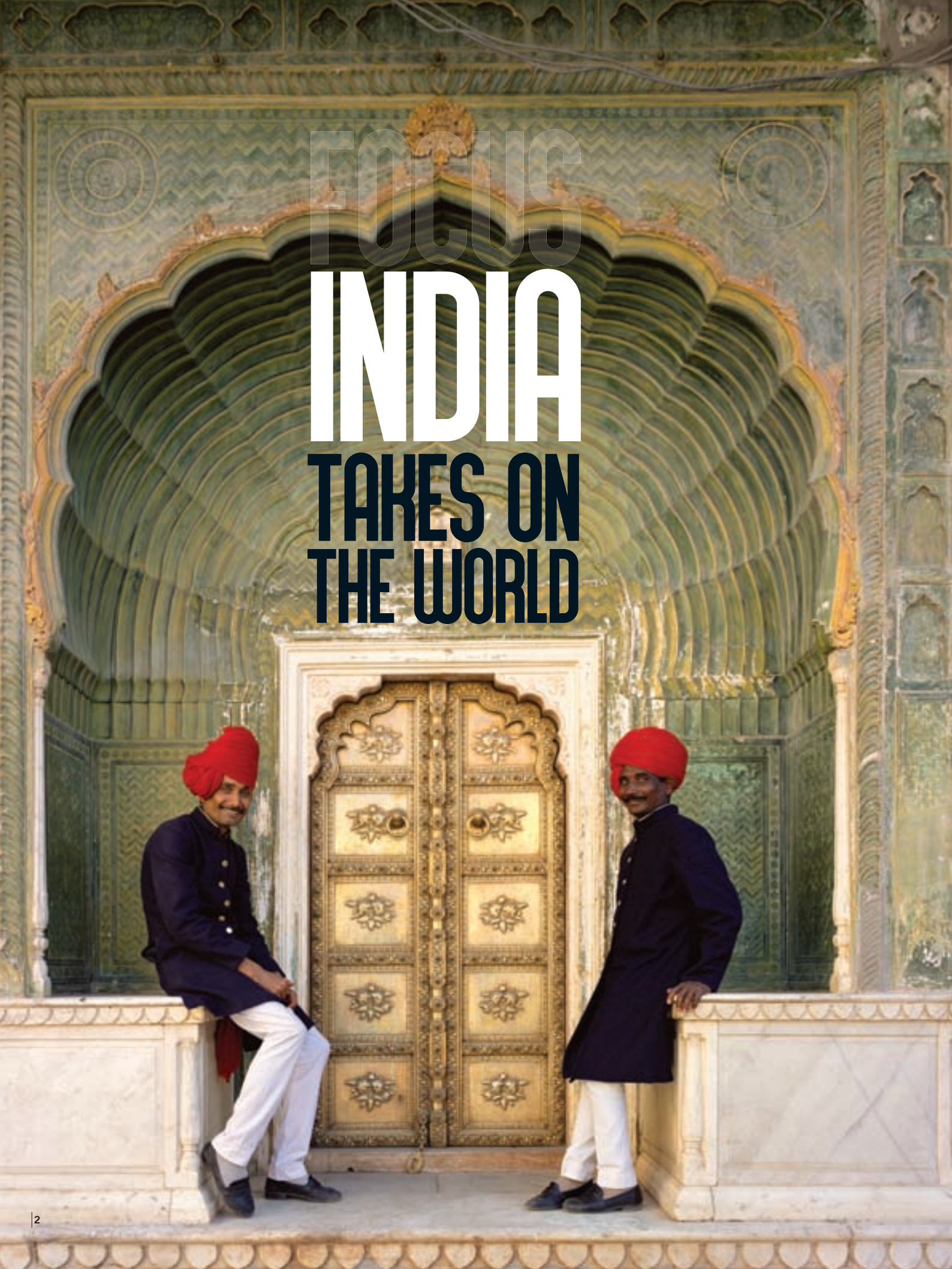
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FOCUS

INDIA TAKES ON THE WORLD

WITH AN ECONOMY SET TO OVERTAKE THAT OF THE US BY MID-CENTURY, INDIA IS A LAND OF GOLDEN OPPORTUNITY.

Since August 1,1964 devotees of the Hindu God Lord Rama have been chanting the mantra, 'Shri ram, jai ram, jai jai ram' in shifts, 24 hours a day, at the Bala Hanuman Temple, Jamnagar, in the Indian state of Gujerat.

Such amazing dedication has earned the temple a place in the 'Guinness Book of World Records' for the longest continuous chant. Also it is probably one of the few things that have stayed the same in Jamnagar over the last 40 years.

Like many other cities in India, Jamnagar is experiencing an economic boom. Reliance Industries Limited, India's leading private sector company and the only one to feature in 'Fortune' magazine's Global 500 list, has an oil refinery in Jamnagar that is the biggest in the world.

Words like 'largest', 'booming' and 'increasing' have become a regular part of the vocabulary when people talk about India. With the second fastest growing economy in the world, the country is widely regarded as the new Asian tiger.

This view is emphasized in a report published this year by investment bank Goldman Sachs. It predicts that India could overtake the US in the global economic league table by 2050, to take second place behind China.

The bank believes that India's emergence as a land of opportunity is partly due to a series of economic reforms during the 1990s, including reducing government controls on foreign trade and investment. This has opened up the country to greater competition and enabled industries to be more efficient.

So what makes India so attractive as a place to do business? Almost half of its 1.095 billion people – a sixth of the earth's population – are of working age. The workforce offers a vast pool of educated and talented young people, most of whom are fluent in English. This has encouraged overseas companies to establish customer service centers in India.

The services sector now accounts for 54 per cent of the Indian economy. Manufacturing represents 28 per cent and agriculture 18 per cent. Economic growth has brought higher living standards and people have more disposable income that they are eager to spend.

Every day in India 2,146 cars, 22,740 television sets and 4,274 washing machines are built, while 15 billion bars of soap, 19.6 million bottles of soft drinks and 0.2 million telephone handsets roll off the production line. And, as all these products, as well as many others, require polymers (or plastics), India's retail boom is extremely good news for the petrochemicals industry.

It's not just consumer goods. Plastics are used extensively in the growing infrastructure sector, for example, for pipes, water storage tanks and electrical conduits. They are also required for agricultural products and for a range of industrial applications. Polymers constitute 65 per cent of petrochemical production in India. Per capita consumption of polymers is 4.2 kg, against a world average of 24 kg.

Reliance Industries is one of the biggest players in the petrochemicals industry, with operations in 15 sites around the country, including the combined oil refinery and petrochemicals plant at Jamnagar. The oil refinery there is currently being expanded to double capacity, enabling it to refine 1.2 million barrels of crude oil per day.

Dhirubhani Ambani, one of India's most famous entrepreneurs, founded Reliance in 1966, two years after the chanting began at the Bala Hanuman Temple. His company has put Jamnagar on the world energy map, while the Lord Rama devotees have made the temple an essential part of the city's tourist trail.

As a nation, India is going places – and it's going there fast.

GEA ENERGY TECHNOLOGY

The refining process cannot function without a cooling system. GEA Energy Technology, one of the world leaders in cooling technology, is supplying a total of 541 air fin coolers for various applications at the Jamnagar oil refinery and petrochemicals site. To handle such a huge order, GEA's well-operated global manufacturing network is working together – the bundles are being made at GEA Btt in Nantes, France, GEA Ibérica in Igorre, Spain and GEA Btt in Changshu, China. The total value of the orders exceeds 40 million EUR.

Air cooling is the process of choice for modern industrial facilities. The advantages are that air is an unlimited resource, doesn't cost anything and doesn't require treatment.

GEA offers a range of different air coolers to meet the specific requirements of the process and the site location. The 'How to do it' feature on pages 6 and 7 shows how an air fin cooler works.



A POWERFUL BREW

WHEN HENRY FORD LAUNCHED HIS REVOLUTIONARY MODEL T *'TIN LIZZIE'* BACK IN 1908 HIS FUEL OF CHOICE FOR ITS 2.9 LITER 4-CYLINDER ENGINE WASN'T GASOLINE BUT ETHANOL.





MIXING ETHANOL WITH GASOLINE REDUCES THE PRESSURE ON THE WORLD'S DIMINISHING OIL SUPPLIES AND LESSENS THE RELIANCE ON OIL FROM VOLATILE COUNTRIES.

The ethanol-powered engine was however short lived and gasoline emerged as the universal fuel for powering passenger cars. In Henry's days the world was very different, the US was awash with cheap oil making gasoline far cheaper than the cleaner but costly ethanol. Climate change was not even on the agenda and carbon emissions were of little if any concern.

Almost 100 years later, ethanol is being hailed as the fuel of the future offering a renewable energy source that is both clean and sustainable. In many countries ethanol produced from sugar has been used as a substitute for gasoline, or to mix with it, for years. When lead in gasoline was outlawed in the mid 1970s methanol and ethanol became more widely used as an octane booster.

Ethanol, or bioethanol as ethanol produced from crops is known, is an alcohol fuel made from sugar crops like sugar cane and sugar beet or from starch feed stocks such as maize, wheat, barley and rye. The crops are grown specifically for use as fuel and can be selected on the basis of the most favorable variety for the location in which they are to be grown. In South America for example, sugar cane is the most commonly grown crop for ethanol production, whereas in Europe grain and sugar beet are used.

Mixed or undiluted?

Bioethanol can be used undiluted or mixed in any ratio to run a specially-adapted flex fuel engine. Another form of application (e.g. in Europe) is the use of Ethyl Tertiary Buthyl Ether (ETBE) which produces a cleaner burn in a standard unit when mixed with gasoline. Until 2010 a typical ratio in Europe will be 5.75 per cent ethanol in petrol, although larger quantities are often used in other countries, notably in the US where a ten per cent share of ethanol in petrol is the norm.

Bioethanol has a number of advantages over conventional fuels. Unlike gasoline, a fossil fuel, bioethanol comes from a renewable source, and the growing of suitable fuel crops means a substantial boost to agriculture. In addition the crops absorb CO_2, which helps reduce the emission of additional greenhouse gasses. Mixing ethanol with gasoline reduces the pressure on the world's diminishing oil supplies and lessens the reliance on oil from volatile countries. Less carbon monoxide and particulate emission are produced when bioethanol is used in engines, resulting in a significant overall improvement in air quality.

Another advantage is the biodegradability of ethanol in its undiluted condition so spillages are much less harmful to the environment than spillages of fossil fuels. There is no need to upgrade the present infrastructure as existing tankers can be used for distribution and the same garage forecourts used at the point of sale.

Farmers' true gold

Europe has a lot of ethanol crops and the crop of preference depends on the climate. In Central Europe, wheat and sugar beet are the most important crops. In Spain barley and corn are the main crops. Scandinavia has a colder climate so they use rye. Norway, Sweden and Finland are looking for ethanol from cellulose – the so called second generation of biofuels. Sugar beet and wheat are the preferred crops in South Eastern Europe.

Due to the open sugar markets, sugar factories in particular have big opportunities in the ethanol market, as sugar beet factories already have all the infrastructure in place to provide the 'sugar juice' needed for ethanol production. Investment costs are lower and existing raw material logistics can be used.

Vegetable sugar and starch crops aren't the only crops that can be used for ethanol production. GEA Tuchenhagen won a contract from a dairy company to plan the production of ethanol from whey.

Further sources for ethanol are possible and each digestion process of the raw material to sugar is different.

From sugars to ethanol

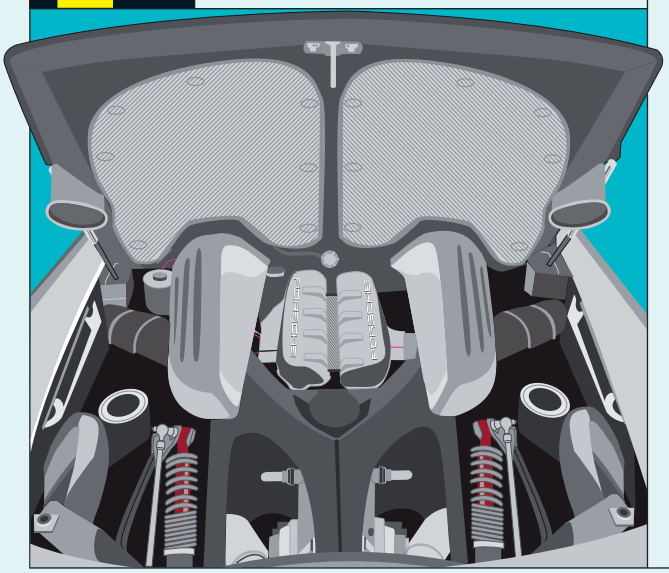
The first step to produce ethanol from sugar is the fermentation process, where yeast cells convert sugar to ethanol and carbon dioxide, just like making beer. When fermentation is complete, the alcoholic brew is distilled in the same way as a fine brandy or whisky. To increase the alcohol content, the distilled mixture of alcohol and water is rectified to a maximum of nearly 96 per cent ethanol. To blend the fuel in our cars the ethanol content has to be nearly 100 per cent. This quality is produced in a dehydration process with, for example, mole sieves.

GEA companies are involved throughout the process. Temperature control is vitally important, especially during fermentation when the ideal temperature must be maintained for optimum fermentation of the sugar into alcohol: GEA Ecoflex provides the heat exchangers. When the process is complete, valuable yeast must be recovered for re-use and the waste product, stillage, can be recovered for a nutritious animal feed: all performed in centrifugal separators and decanters from Westfalia Separator and a dryer from Barr Rosin. GEA Wiegand has the technical know-how to make complete process lines for ethanol production.

As the need to save our planet from the inexorable rise in greenhouse gas levels becomes ever more acute, it's reassuring to know that industry is now employing the latest technology to achieve viable alternatives to fossil fuels. Henry Ford, no doubt, knew he was an innovator in motorized transport but wasn't aware of the global significance of his decision to use ethanol as his fuel of choice. If in 1908 the world had been more aware of the potentially disastrous environmental effects of the burning of hydrocarbons, perhaps we would have seen the use of the 'Powerful Brew' as the primary fuel for our vehicles much earlier.

HOW TO DO IT

Air cooling



Without a radiator a car engine would overheat and then break down. In other words, keeping the engine cool is as essential as the fuel and moving parts that make the car run. The same applies for most of the major industrial processes that keep the modern world functioning.

Power plants, refineries, chemical and petrochemical sites, biomass plants and steelworks as well as a number of gas processes all need to have the heat taken out of their operations, using air, water or any other medium as a coolant. The coolant or the process medium will then be re-cooled in air cooled heat exchangers – known as air fin coolers. Here's how they work.

1 KEY COMPONENTS

An air fin cooler consists of a series of finned tube bundles with box headers at each end that run either underneath or above axial fans within a plenum chamber.

2 PIPING HOT

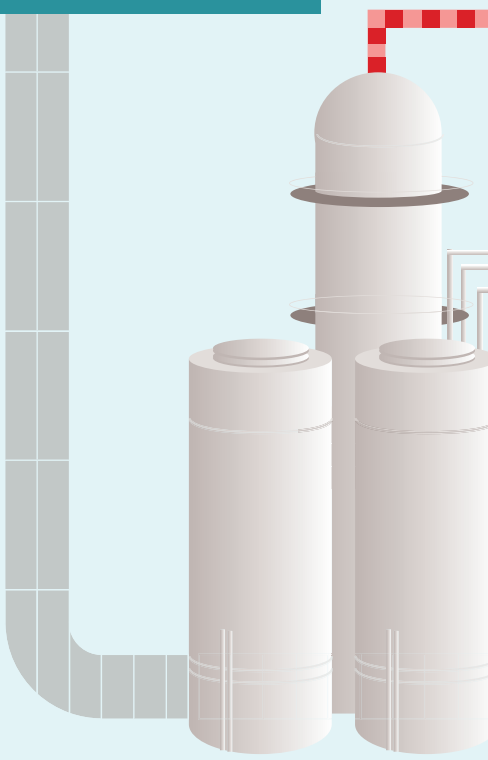
When the hot liquid or gas from the refining or chemical process is piped into the cooler bank, it is distributed through the box headers into the finned tubes.

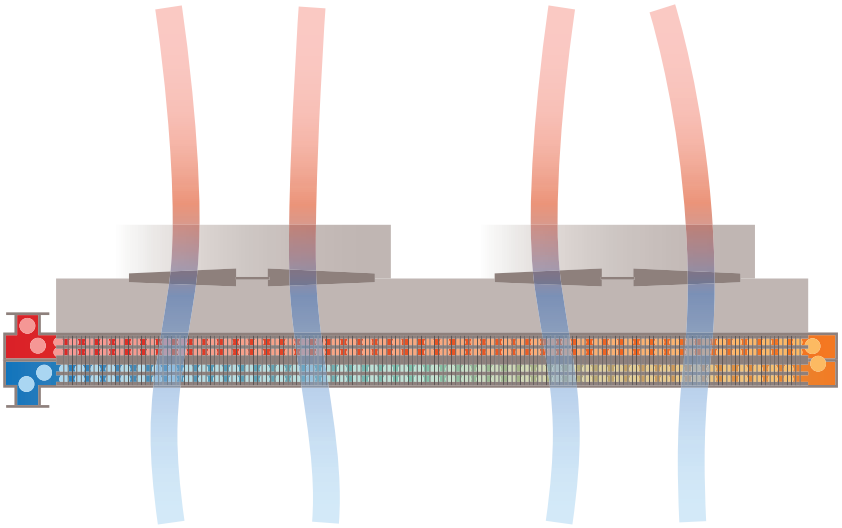
3 COOLING DOWN

The fans, which rotate at variable speeds, draw or push the air across the finned tube bundles, cooling the gas or liquid inside. The plenum chamber serves to direct the air evenly across the tube bundles.

4 JOB DONE

Finally, the heated air leaves the cooler and the cooled gas or liquid flows out of the finned tubes and is piped out of the cooler bank.





AIR COOLING PIONEERS

The Energy Technology Division of GEA has been leading the way in industrial air cooling since 1920.

In 1939 the company built its first air cooled condenser. Today GEA's state-of-the-art cooling and condensing equipment can be found in all corners of the world in a wide range of applications.

These include power plants, waste-to-energy and biomass facilities, refineries and gas to liquid plants as well as a multitude of specialized processes.

A typical single air fin cooler measures 15 x 3 meters. GEA has been and is involved in applications where hundreds of single air fin coolers are connected, equal to the size of several soccer fields.

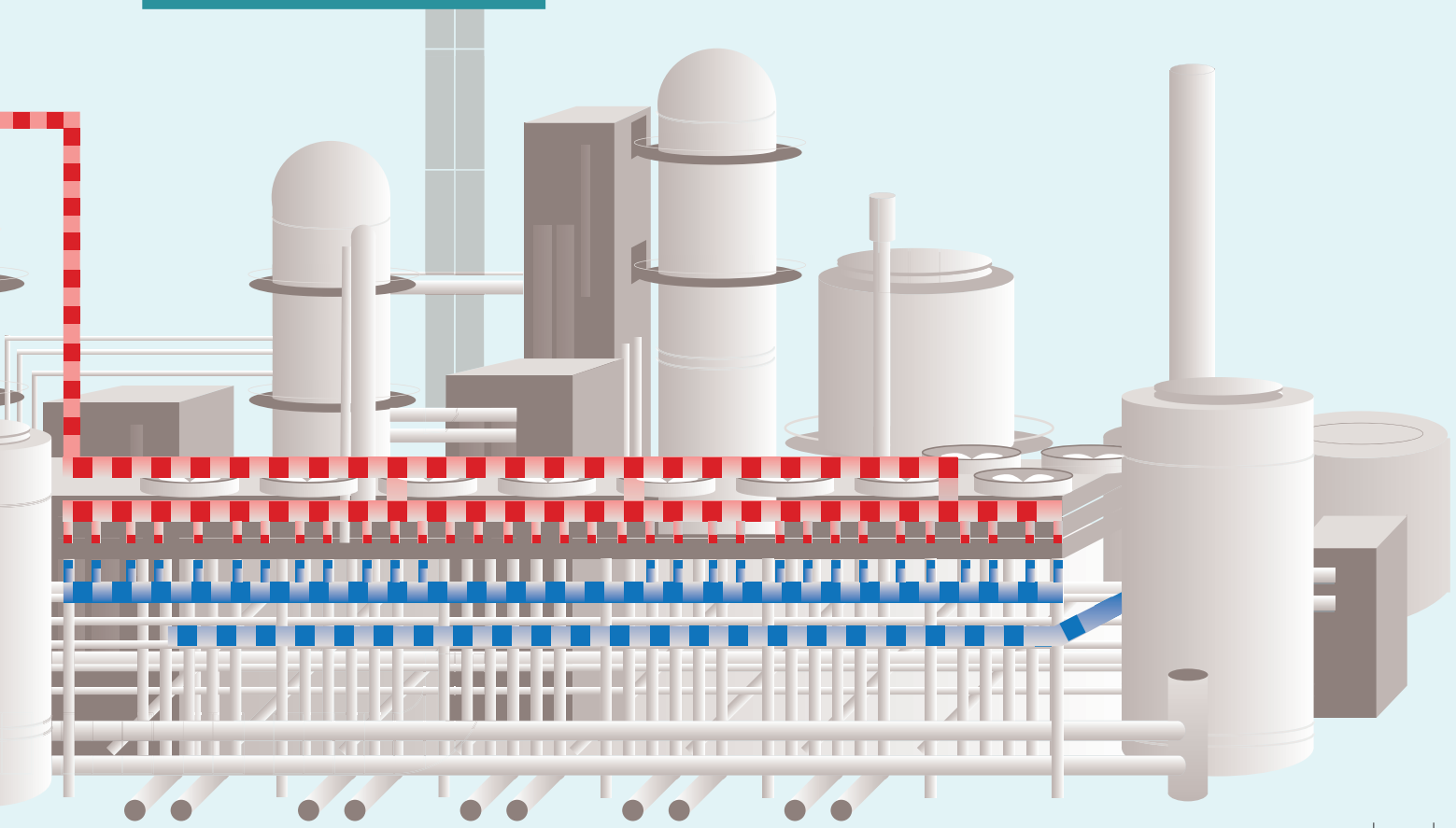
For more info: www.gea-energy.com

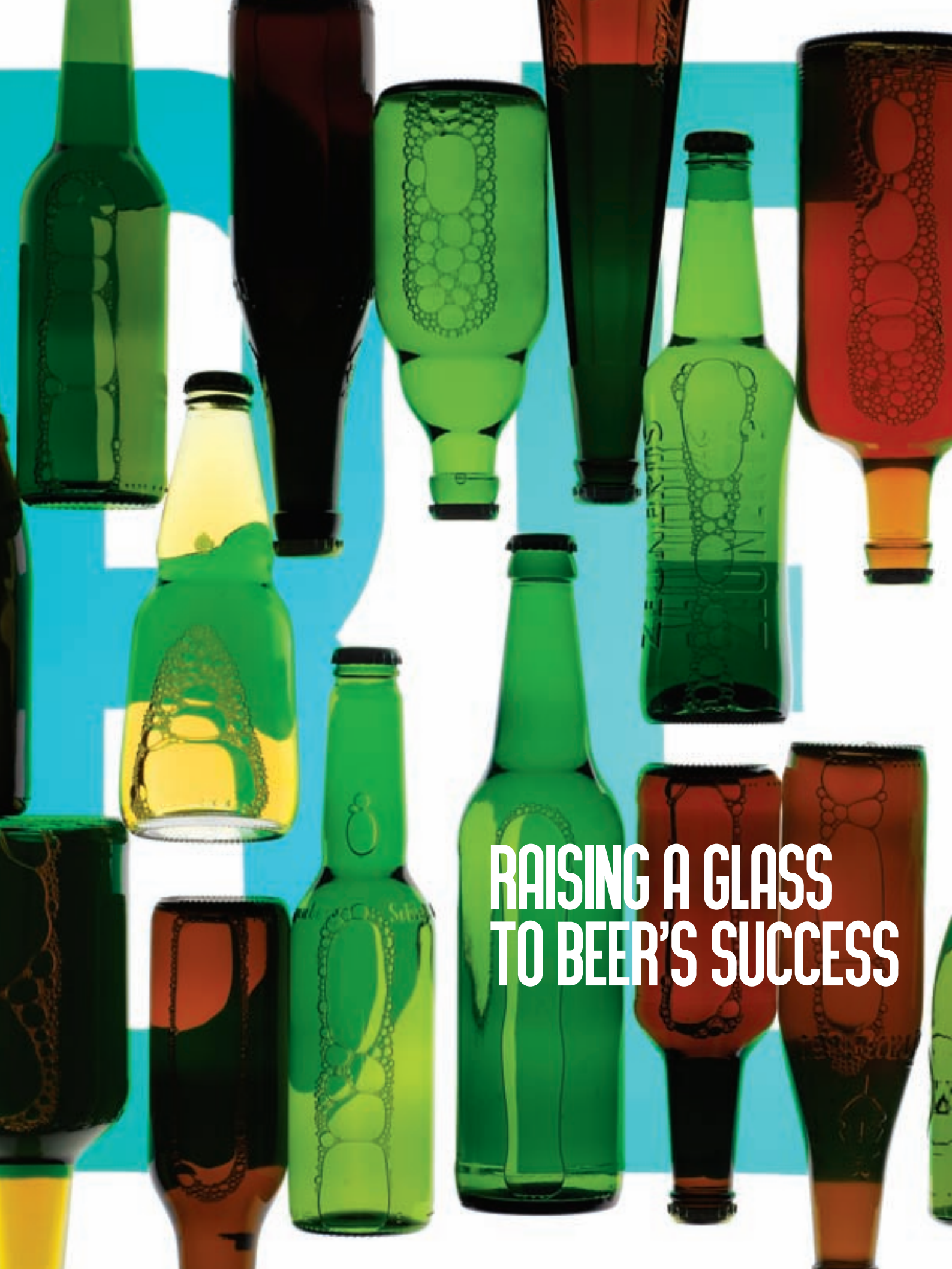
5 PURPOSE BUILT

Air fin coolers are designed, manufactured and tested in accordance with international codes and regulations. They can handle operating pressures of up to 700 bar and temperatures up to 400°C. It is therefore essential that air is allowed to enter and leave the system freely, ensuring maximum heat transfer.

6 AIR OR WATER

Air cooled heat exchangers are ideally suited to processes that require large amounts of heat to be transferred. This is because air is cost effective, non-corrosive and has unlimited availability.





RAISING A GLASS TO BEER'S SUCCESS



BEER HAS RECENTLY BEEN RECOGNIZED AS THE WORLD'S MOST POPULAR DRINK. **PAUL SYLVESTER** TAKES US THROUGH BEER'S EVENTFUL JOURNEY FROM 'LIQUID BREAD' MADE 6,000 YEARS AGO TO TODAY'S MULTI-BILLION DOLLAR INDUSTRY.

PHOTOGRAPHY: ADRIAN BURKE STYLING: WEBSTER+STOKES



SHARING A BEER WITH FRIENDS IS A COMMON THEME ACROSS THE GLOBE

GEA AND THE BREWING INDUSTRY

For today's big brewers – and smaller brewers to a lesser extent – growth in beer sales is no longer enough. Using new technology to improve the manufacturing process, reduce production costs and exploit synergies are all crucial. This is where GEA comes in. GEA's range of companies make it a big player in the brewery industry, supplying everything from brewhouses to individual components and process engineering expertise. GEA's Process Engineering Division includes Huppmann and Tuchenhagen Brewery Systems, both German-based companies and international players. Huppmann is one of the world's top three suppliers of brewhouse manufacturing equipment and technology: recent projects include supplying new systems to brewers in China, Russia and Europe. Huppmann's expertise is in brewing's hot process. Tuchenhagen is a specialist in building and supplying equipment for the cold process: recent projects include brewery plants in The Netherlands, Germany, Poland, Russia and Spain. The two companies work together to give breweries tailored solutions that match their individual needs.

As well as being specialists in brewing equipment, a number of GEA companies (GEA Diessel, GEA Ecoflex, Grasso International, Tuchenhagen and Westfalia Separator) supply component parts for the manufacturing process that include compressors, heat exchangers, valves, pumps, separators, decanters, process units and refrigeration systems.

As a result of GEA's excellent reputation and unrivalled engineering expertise, all the world's major brewers are GEA customers.

Where and when brewing began has been the subject of much discussion over the years by academics, historians and archaeologists. The truth is that no single civilization can claim to have invented beer – or 'liquid bread' as it was once known – as it was certainly being produced in many different countries across the world from about 4500BC onwards and possibly even before then. And therein lies the beverage's essential beauty: every country has mastered its own beer with its own distinctive characteristics and taste. That's still the case today, even with the world's superbrewers spreading their reach to the furthermost parts of the globe.

EARLY 'BREAD' BEERS

But let's go back to the beginning. Beer, the world's oldest man-made drink, is the product of fermentation of sugar into alcohol by yeast. Art from 4500BC showed the Sumerians (who lived in what is now Iraq, between the Tigris and Euphrates rivers) drinking beer communally through a straw, and that early spirit of people sharing a drink lives on to the present. Sharing a beer with friends is a common theme across the globe. And throughout the centuries beer makers have tested out new recipes and refined the process. The Babylonians (rulers of Mesopotamia), who derived their culture from the Sumerians, were among the first people to develop the science of brewing: there is evidence from that period of 20 different recipes using wheat, barley and honey to make cloudy and unfiltered beer.

THE BREWING PROCESS

The basic brewing process has remained relatively unchanged since the first beer was made 8000 years ago. It's just that these days – with global beer sales of 133 billion liters in 2006 (35 billion gallons) – there's rather a lot of it to make!

Beer is produced by fermenting sugar into alcohol, using four ingredients – barley, hops, water and yeast. Barley is soaked in water and allowed to germinate to form barley malt. Germination is stopped by heating the barley. It is then ground into a fine powder and mixed with hot water to produce a thick porridge called mash. Mashing results in a sweet liquid, which is separated from the mash, at which point hops are added for flavor and aroma and the liquid is brought to the boil. This liquid, called hopped wort, is chilled in fermenting vessels and yeast is added. Yeast converts the sugars into alcohol and the beer starts to come to life. The fermented beer is transferred to vessels for lagering (storage). This process can take from one to six weeks depending on the type of beer being brewed. After that, it's packaged and ready for onwards delivery for customers across the globe to enjoy.



LIQUID BREAD

It was this use of natural ingredients that earned beer its reputation as 'liquid bread', and throughout history it has often been consumed as a healthier alternative to water, which was frequently contaminated. By the Middle Ages beer was the main meal of the day in many European countries – beer for breakfast, lunch and beer soup for dinner. At this time all the brewing – and indeed bread-making as well – was carried out by women, or brewsters as they were known. Beer was brewed at most homes and they developed into the first taverns or pubs. Hops weren't included in beer until 800AD.

Beer began to be produced on a commercial scale, and in Germany modern-day brewing really began to take shape with brewers exporting products across the Baltic Sea.

All beer was ale rather than lager until about 500 years ago when Bavarian monks discovered that they could produce clearer beer by storing it in wooden casks in caves in the summer months. This process was called 'lagern' (German for 'to store'), hence the name lager. But lager as we know it today didn't appear until 1842, when the first pilsener beer was brewed in Pilsen in Bohemia (now part of the Czech Republic) and quickly became popular around the world. From this point onwards, lagers start to take on a golden look compared to the muddier color of ales. The ale market has been in decline ever since then but microbrewers, particularly in the US, have proved that there is still a market for distinctive ales in recent years.

The brewing industry really benefited from the industrial revolution of the 1800s: the steam engine, the thermometer and hydrometer all served to improve the efficiency of the brewing process. The advent of refrigeration in the 1860-70s was a key turning point for the industry as brewers were able to make lager all year round. And the discovery of yeast's role in fermentation by Louis Pasteur in 1857 enabled brewers to refine their products even further.

continues page 15

BEER THROUGH THE CENTURIES

4500 BC

Beer's history is generally assumed to begin with the Sumerians (in latter-day Iraq) as the first civilized culture to brew beer. Babylonian clay tablets included recipes for beer.

1000 BC

Brewing knowledge was passed on to the Greeks, who taught the Romans to brew. The growth of the Roman Empire helped spread the skills across Europe.

500 - 1300 AD

In the Middle Ages across Europe the most common drink of the day was ale. Hops were first added to the brewing recipe from 822AD onwards. German brewers led the way in perfecting hopped beers.



1400-1600s

A key period for the development of beer. In the 14th and 15th centuries, brewing in Europe moved from a family tradition to an industry, with breweries set up and monasteries making and selling beer. In 1516, Wilhelm II, Duke of Bavaria, declared only barley, hops and pure water could be used to make beer to guarantee consistency and quality – the Beer Purity Law.

1700-1800s

The brewing industry benefits from the industrial revolution. The discovery of yeast's role in fermentation in 1857 by Louis Pasteur further enables brewers to improve their products. Before the 1800s most beer was ale but the lager revolution kicked off with the creation of the first pale ale – pilsener – in Pilsen, Bohemia in 1842. The advent of refrigeration in the 1860-70s enabled brewers to make products all year round.

1900s

Beer continued its global spread and in the US microbreweries grew rapidly. Most US brewers didn't survive the 1920-33 prohibition. The beer can was introduced in 1935. The first 'light' beers appear.

2000s

By 2007 beer is officially the most popular beverage on the planet. Multinational brewers like InBev, Anheuser-Busch and SAB Miller buy stakes in brewers or build operations in developing markets like China and Russia. By 2010 China is expected to overtake the US as the world's biggest beer producer.



SOME BEERS AND BREWERIES OF NOTE

'Bread' beer – dates from Babylon in 600BC and used underbaked bread which was cut into small pieces and put in a jug with water – malt was produced and left to ferment. Dates, herbs and honey were sometimes added for flavoring.

Budweiser Budvar – a classic, crisp-tasting beer from the Czech Republic, per capita the world's biggest beer consumers. The brewer is still state-owned and widely exported, despite the attempts of its American namesake to buy it.

Stella Artois – one of the great Belgian beers that reflects the country's rich brewing heritage. A full-flavored quality lager beer made in Leuven. Owned by InBev.

Brooklyn Lager – a brown ale produced in Brooklyn by a microbrewery set up in 1987 that epitomizes the rise of microbreweries in the US in recent years. Brewed to a pre-prohibition recipe.

Corona – Mexico's favorite, and one of the world's top selling beers. Owned by Grupo Modelo and unlike many beers, comes in a clear bottle. The lime frequently added in Europe and the US is less common in Mexico.

Bolivia's Cervecería Boliviana Nacional – based in La Paz, uses pure Andean water from 12,000ft above sea level. They make Pacena, the country's most popular beer.

Most northerly brewery in the world: deep inside the Arctic circle, the Mack Brewery in Tromsø, Norway is the world's most northerly brewery. Established in 1877 by a German family. Mack beer tastes like a South German pale lager.

Most southerly brewery in the world: Chile's most southerly town, Punta Arenas, is also home to the Austral brewery founded in 1896 that makes Austral (which has a King Penguin logo on the bottle) and Polar pilsener beers.



OTHER APPLICATIONS FOR BEER

Over the centuries beer has been used for a variety of different applications. Cooking is probably the most widely spread of these and beer can be used in stews, pot roasts, steak and ale pie. Makes an excellent marinade for most meats. Beer is also used to make batter for that most English of traditional meals – fish and chips. Should your taste buds desire, you can even try beer cheese and beer and cheese-flavored chips.

For many years horses were used to pull drays (and they were sometimes rewarded with a bucket of ale) and although that practice has now ceased, in some countries beer is still used to clean and shine horses' coats.

In the Kobe region of Japan, farmers have traditionally raised cattle on beer and hand-massaged them to produce the succulent Kobe beef – and it sells with an extremely high price tag. Also in Japan, Kurobuta (black pig) breeds are also fed the same diet to produce the porcine equivalent of Kobe beef.

Beer is also good for getting rid of slugs and snails in the garden (they find it irresistible). Leaving no marketing stone unturned, you can now buy beer shampoo developed with natural hops – apparently it gives your hair body and shine. And if you're feeling really indulgent take a bath in beer – it's good for the skin as well!



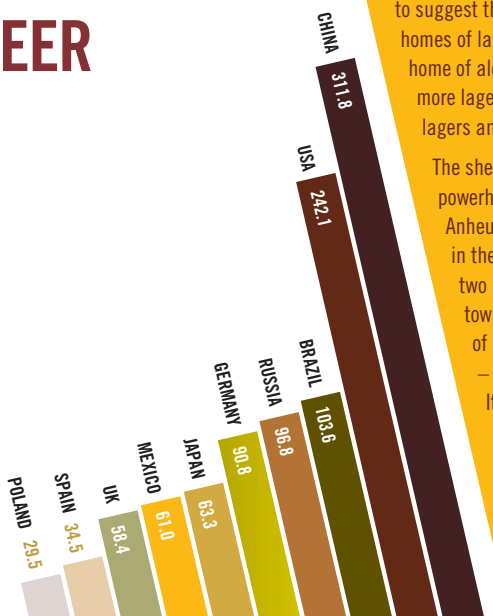
WORLD OF BEER

One of the great things about traveling is discovering new beers in different countries. And these days, thanks to the globalization of beer, the beer can come to you – we can drink global beers from the comfort of our homes whether that's San Miguel from Spain, Asahi from Japan, Sam Adams from Boston, US, or Tooheys from Australia. At the risk of causing pub arguments, it's fair to suggest that Germany and Czechoslovakia are the spiritual homes of lager in Europe. England has traditionally been the home of ales, though the trend has moved increasingly towards more lagers in the past 50 years. Belgium is famous for both lagers and ales.

The sheer volume of beer drunk in the US makes it a powerhouse player in the world beer market and Anheuser-Busch have a staggering 49 per cent share in the US through Budweiser and Bud Light, the world's two biggest selling beers. Interestingly the trend towards light beers in the US started after the end of prohibition (some brewers watered down beers – a crime punishable by death in Babylonian times). It has continued to this day, which is why many US weak lagers are disparaged by some beer aficionados.

TOP TEN BEER MARKETS IN 2006

(in million hectoliters)



continued from page 11

FUTURE TRENDS IN BEER

Today's beer market is dominated by global players like Anheuser-Busch, InBev, Heineken, SAB Miller and Scottish & Newcastle. The world's top 40 breweries produce approximately 85 per cent of the world's beer and they are involved in a constant battle for what brewers call 'share of throat'.

Currently they are flexing their muscles in the developing markets, particularly China and Russia, where beer sales are now surging after decades of consumer restrictions. And they are doing this in various ways: firstly, by acquiring stakes in brewery companies in these countries, for example Anheuser-Busch owns a 30 per cent stake in China's best-known brewer Tsingtao. Secondly by opening new brewhouses in the developing markets. In addition the brewers are consolidating some of their operations and entering into alliances with each other, for example Scottish & Newcastle and Carlsberg have an Eastern European joint venture.

But it's not all over for the little brewers who can co-exist alongside these multinationals in local markets with a more regional character. For example, in Germany beer drinkers are fiercely loyal towards regional brands. In recent years there has been a revolution in the US microbrewery industry to offer customers more hoppy and flavor-rich beers. Just like the bigger companies, these smaller brewers are investing in modern technology and innovation with a continuing focus on efficiencies and new products and marketing.

On the products side, brewers are concentrating on expanding their offerings across the world – for example, InBev has introduced Brahma, one of Brazil's leading beers, to Europe, as one of its three world beers alongside Stella Artois and Beck's.

Marketing these beers is an incredibly sophisticated – and expensive – business and is backed up by global advertising themes that promote certain beers as being cool, better tasting or just plain trendy.

Wheat beers, flavored beers and even diet beers (in the US, naturally) have all come on to the market in recent years. Wheat beers originated from Belgium (witbier) and Germany (weissbier), and the Belgian brand Hoegaarden is probably the world's most famous wheat beer. Wheat beer is also produced in the US, Canada, Australia and Brazil.

Flavored beers are nothing new to the market as bark, berries, fruits, herbs and spices have been used to add flavor to ales for centuries. Belgium produces the most traditional fruit beers – peach, banana and blackcurrant beers are common but cherry (kriek) and raspberry (framboise, or frambozen) are probably the two best-known products. These days brewers are increasingly pushing the envelope, with chestnut and chocolate flavored beers, beers made with lemon and dragon fruit and even cola-flavored beers. Quite what Wilhelm II, Duke of Bavaria, who passed the German Beer Purity Law in 1516 decreeing that German brewers could only use barley, hops and water to make beer, would make of these products is anybody's guess.

The beer market and the technology involved have become increasingly sophisticated over the years but the process and essential ingredients have not changed. So let's raise a glass to the early brewers in Sumer and Babylon who set us on the way to being able to enjoy a nice cold beer.



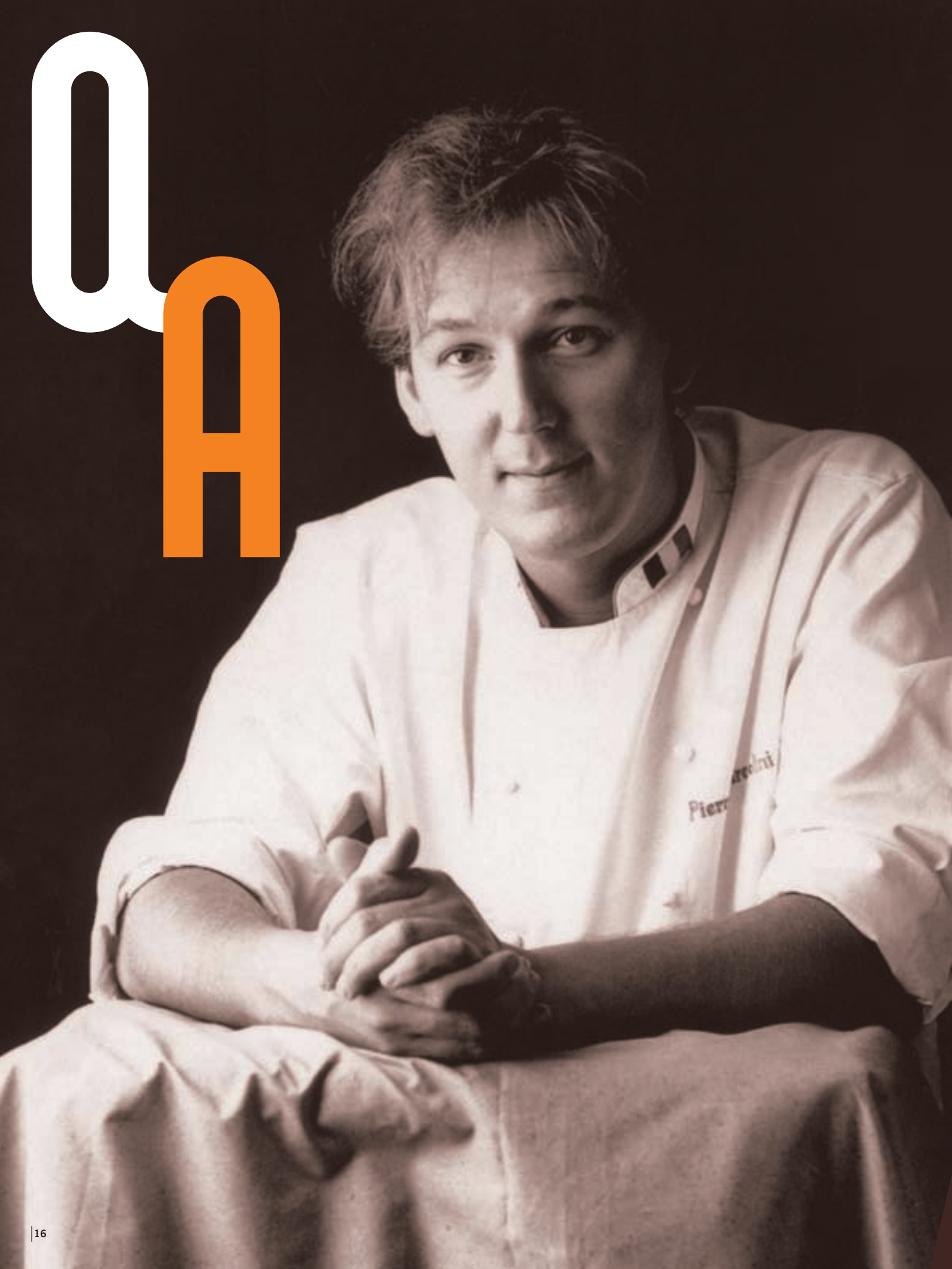
ALES VERSUS LAGERS

Ales and lagers are opposite sides of the same coin. The process used to make them is exactly the same apart from the yeast and fermentation process.

Ales were the earliest beers – fermented at warm temperatures by yeasts that float on top of the wort. Top fermenting yeasts add fruity, distinctive flavors and the other ingredients also add flavors during the fermentation process. As a result ales have more fruity flavors and aromas than lagers.

Lagers are fermented at much lower temperatures and for longer than ales and the yeast falls to the bottom of the fermenting vessel. Bottom fermenting yeasts add little flavor to the beer. Lagers also undergo secondary fermentation when the liquid clears and mellows. Consequently, most lagers are clean flavored and refreshing.

Q A



Chocolate is one of the most popular and recognizable flavors in the world. Alternatively described as food of the gods or food of the devil, chocolate is the ultimate sensual fix. The global chocolate market – which all starts with raw cacao being harvested, mainly in Africa – is worth a staggering $75 billion annually and it's growing.

The demand for quality chocolate has seen stratospheric growth over recent years as customers worldwide have realized that fine chocolate products with an astonishing range of flavors offer a luxurious experience which is both available and affordable. Pierre Marcolini, one of the world's leading chocolatiers, is one of the pioneers taking hand-made quality chocolates to a whole new level. GENERATE talked to him about the joy of chocolate.



> FOR ME IT'S ALWAYS BEEN ABOUT CREATING NEW FLAVORS, A QUEST FOR PERFECTION AND MAKING INNOVATIVE CHOCOLATES AND SMALLER PRODUCTS

Q. Why does chocolate taste so good?

A. That's a really interesting question. There's no doubt eating chocolate is a very social experience and can make you feel happy. It melts slowly in your mouth at a temperature just below your own and as it passes through your system chemicals are released in your brain that make you feel good. For me as a chocolatier, it's all about different flavors and how they are blended together. It's about the cacao beans and the aromas they produce. Beans from different countries produce different flavors – when the beans are fermented and dried by the farmers they start to give off flavors and this continues throughout the manufacturing process.

Q. Where do you source your cacao beans?

A. I've been called 'the chocolate gringo' by the cacao producers. I travel the world to work with small cacao co-operatives in Madagascar, Mexico and Brazil. I know the people who grow the beans and they are like extended members of the Marcolini family. We treat them as valued partners and work closely with them to produce the right beans with the right flavors and give them a fair price – that's what fair trade is all about. When we have made the chocolates we send them the products so they can see what we have done with their cacao beans – having this personal relationship is an important part of the process.

For the cacao manufacturers that supply the big chocolate manufacturers, mainly based in the Ivory Coast and Ghana, the sheer quantity of cacao beans they are contracted to supply means it is a different type of working relationship. The big companies treat their suppliers fairly and give them a good price for their products but it is, I think, a less personal relationship than I have with my cacao farmers. And the cacao beans that are used for mass produced chocolates tend to be blander than those used for quality hand-made chocolates.

Q. How long have you been making chocolate? And how did you get started?

A. I've always liked to eat chocolate – maybe a bit too much – so I decided I would be better off making chocolate for a living. I started as an apprentice at the age of 17 and learned the trade at all the famous chocolate houses in Brussels. Later I worked in Paris and that experience really taught me a lot about chocolate as an international business. In 1995 I decided I wanted to open my own business and set up the Marcolini business when I was 30 – quite late for a chocolatier to set up his own business. For me it's always been about creating new flavors, a quest for perfection and making innovative chocolates and smaller products.

Q. Can you tell us about your business?

A. I started in a garage that was 30 meters square, moved to one that was double that size and things grew from there. We now employ more than 300 people, in 15 shops, in Belgium, the US (New York), France, Kuwait and Japan. Even though the business has grown I've tried to keep the friendly, family atmosphere. I still make chocolates every day and I never have to ask myself why I am doing this when I wake up every morning. I am one of a handful of chocolatiers who still create their own coating (blending the beans from different regions) to make the chocolate and it creates wonderful flavors.

We produce a winter and summer range of chocolates and these days we make a lot more than just chocolates. Our shops also stock desserts like cheesecakes, marshmallows, biscuits, ice cream and sorbets.

Q. What's the secret of making great chocolate?

A. Working with good beans, trying out new flavors and developing innovative new products. For example we have just started working with a new cacao producer in Brazil: that will enable us to add new flavors to our cru, which is an exciting development. Size and merchandising are also important – small products with amazing flavors presented in beautiful boxes all add to the chocolate's appeal.



Today's chocolatiers are producing more innovative products that are beautifully presented.

Q. Which country is the spiritual home of chocolate?

A. Belgium is the capital of Europe in many regards and we certainly produce some of Europe's best chocolates. Belgian people can be quite shy by nature and don't shout about the things that we are good at. At some point in the future we might well lose our title as Europe's chocolate capital to Paris, which would represent something of a crisis in Belgium.

Q. Why does mass-produced American chocolate taste so bad compared to its European equivalent?

A. I certainly don't want to comment on the quality of chocolate produced by the big American companies but I would say that customers' tastes are changing in the US. We have a shop in New York that does really well so there is probably a market for quality chocolate in the bigger, more cosmopolitan US cities.

Q. How is the market changing?

A. As well as their tastes, customers' eating habits have changed over the years. For example, businessmen used to have three-course business lunches and chocolate desserts were a popular part of them. Now that those long lunches are generally a thing of the past, we have adapted our products, making smaller chocolates that can be eaten at any time and not just with a meal. As chocolate makers we have learned to react quickly to such changes.

In recent years people have realized that they can get better quality versions of basic goods like tea, coffee and chocolate alongside the everyday kind. Luxury chocolate represents five per cent of the global market but it's the fastest growing segment. We have four stores in Japan where there is a real demand for quality products of any description. The Middle East also represents an opportunity for chocolatiers. One day I would like to open a shop in London. But for me it will always be about actually making the chocolate and the joy of producing new chocolate products.

Biographical details

Pierre Marcolini is a world-class chocolatier who has won numerous awards, including Premier Belgian Ice Cream Confectioner in 1991, Pastry World Champion in 1995 and European Pastry Champion in 2000. He set up his own business in 1995 and now has 15 shops across the world. All products are handmade in the company's factory outside Brussels and shipped to the shops. Exports now account for 50 per cent of the company's turnover. The Marcolini flagship store in Brussels is a chocolate dream, displaying some of the world's most innovative chocolate products.

www.marcolinichocolatier.com

GEA AND THE CHOCOLATE BUSINESS

GEA's main connection to the chocolate industry is through Westfalia Separator, a company in GEA's Mechanical Separation Division, which supplies clarifying decanters and separators used during cocoa butter's production process.

Denmark-based Niro A/S, part of GEA's Process Engineering Division, is also involved in the chocolate industry, supplying various agglomeration systems that make chocolate powder (cocoa/milk solids/sugar mixtures). The powder is used to make hot chocolate for vending machines and homes across the world.

BIG IS BEAUTIFUL IN THE US DAIRY BUSINESS







EVERYTHING IS BIGGER IN THE US – THE COUNTRY, THE CARS, THE LANDSCAPES, THE SERVINGS OF FOOD. THE SAME CAN CERTAINLY BE SAID OF THE COUNTRY'S DAIRY INDUSTRY, EASILY THE WORLD'S BIGGEST, WHOSE LEVELS OF PRODUCTION AND AVERAGE HERD SIZE DWARF THE REST OF THE WORLD'S TOP MILK PRODUCING COUNTRIES.

The word California evokes many things – sunshine, the Pacific coast, Hollywood, Silicon Valley, Napa Valley, Disneyland, maybe even Baywatch. But probably not the dairy industry. And that would be an oversight as California produces more milk than any other state in the US and is home to some of the world's biggest herds.

All told the US produced 181.8 billion pounds of milk in 2006 – nearly as much milk in a year as its three closest rivals – India, Russia and Germany – put together. And California was responsible for just under a fifth of total production in the US.

Some farms in California keep between 10,000-20,000 cows and on these and many other big farms in the US, milking really is a 24/7 operation. The cows know exactly when it's their turn to be milked and getting these enormous herds through the milking parlors – and it takes on average 3-5 minutes to milk each cow – is an incredible feat of logistics each and every day. The average herd size in New Mexico is a mammoth 2,088 with Arizona's herds averaging out at 1,331 and California's 908. Globally, only New Zealand and Australia come close with average herd sizes of 291 and 204 respectively.

Technological revolution

Of course it wasn't always like that. Far from it. Milking cows was traditionally a labor-intensive operation with small herds – and that's still the case in less developed countries. Before mechanization revolutionized the industry in the 1950s keeping a dozen or so cows was a family business – the original family farm – and families could make a good living from it. Technological advances changed all that and having more cows enabled farmers to build more profitable businesses and be better able to weather price changes.

In today's dairy industry, certainly in the developed world, the focus is on milking the herd as efficiently as possible using state-of-the art equipment, increasing the milk output per cow and improving the quality of the milk.

But if you thought that as in many other areas of life the bigger corporate companies had taken over the family businesses and built up huge milking operations, generally speaking you'd be wrong. Many small family farms have successfully expanded over the years to take advantages of economies of scale, taking over other businesses. One of GEA's biggest customers in the US certainly proves this.

David Sumrall's family has owned a farm in his home state Mississippi since the 1800s. Over the years it's grown into the Dairy Production Systems (DPS) business that now includes two farms in Florida, one in Georgia and the original farm. All told the business has 10,000 cows.

Sumrall originally studied animal science at Mississippi State University but later switched to dairy science. That's when a lifetime's passion for the business started

> "MANY PEOPLE THINK THAT SUPERIOR MILK QUALITY IS UNACHIEVABLE IN OUR BIG HERD ENVIRONMENT"

to take shape. While working at a dairy farm during a vacation, he first came across the GEA Group's WestfaliaSurge products in the form of the Surge breaker cups. Nearly 30 years on, WestfaliaSurge are now the products of choice at his own farms.

"Many people think that superior milk quality is unachievable in our big herd environment," Sumrall says. "We disagree. I am blessed to have a strong team of dedicated people within our company, and they are complemented by an equally strong team at WestfaliaSurge. I am very proud of the reputation we have achieved, especially with regard to milk."

"We work well together," Sumrall points out. "Our DPS team, allied with the WestfaliaSurge products and the constant help and oversight of our WestfaliaSurge representative Mack Reeves, has been able to accomplish some great things." Westfalia's Mack Reeves is a classic example of one man making a real difference to the business, as Sumrall recalls.

"He stopped in the farm I was managing at the time 17 years ago," Sumrall says, "and after talking a while about our milk quality, he was certain he could improve it. My response was that he could evaluate things closely and get back to me with his thoughts. The next afternoon, I went into the tank room to check temperatures, and I heard noises coming from the empty bulk tank. Sure enough, Mack was in there hand-scrubbing the milk tank! I knew right then that he was not the average salesman," Sumrall said, "and 17 years later, he is still just as devoted to our milk quality success."

Better quality milk

In 2006, US dairy producers set new records for total milk production and milk produced per cow. A recent industry study predicted that in the long term the number of cows would decrease but milk production per cow would increase. The market is being driven by better quality milk at better prices. With dedicated representatives like Mack Reeves and a reputation as one of the world's best suppliers of dairy equipment, WestfaliaSurge looks like being with the dairy farms every step of the way.



The US is home to some of the world's biggest herds.

GEA AND THE DAIRY INDUSTRY

The dairy industry represents 40 per cent of GEA's global business. Westfalia has always been one of the major global players in dairy production equipment but the business took a big leap forward in 1999, when it acquired US business Babson Bros Co., the manufacturer of Surge dairy farm equipment and related supplies.

The acquisition created WestfaliaSurge, bringing together two of the world's most recognized brands of dairy equipment, providing dairy producers with the most complete line of milking systems, herd management systems, milk tanks, milk hygiene products and dairy supply product lines available within the industry.

TAKING THE HEAT OFF

HIGH-TECH EQUIPMENT DOESN'T LIKE CHANGES IN TEMPERATURE – WHICH IS WHY IT IS ESSENTIAL TO STAY COOL.

In the classic movie 'It's a Wonderful Life' the main character George Bailey, played by James Stewart, is given a unique chance by his Guardian Angel to find out what the world would have been like if he'd never been born.

As anyone who has seen the movie will know, George Bailey is shown a nightmarish, alternative reality, where his town, family and friends are considerably worse off without him.

Of course this is only fiction but, by applying this scenario to something that is generally taken for granted, you can better appreciate its value. Air-conditioning is a perfect example. Over the years it has developed from being a luxury to a must-have. For some time it's been a feature of many American homes and is standard in most modern offices, shops and cars. But, more importantly, it is essential for maintaining precise temperatures in computer rooms, laboratories and other areas containing sensitive technology.

So, what would the world be like without air-conditioning? At the very least individuals would feel uncomfortable and lethargic in hot weather. However, for temperature-critical environments, the lack of air-conditioning could be catastrophic.

"COMPUTERS HAVE A LOW TOLERANCE TO CHANGES IN TEMPERATURE OR HUMIDITY"

"Computers have a low tolerance to changes in temperature or humidity," explains Mark Shutler, Managing Director of Denco, a company of the GEA Air Treatment Division. "If the air is too dry computer chip boards can crack and if it's too wet there is a risk of bacteria, which has the same effect."

A computer room is generally kept at 21°C, plus or minus one. If the temperature went up to, say, 31°C it would have a negative effect within an hour, with computers crashing and possibly losing data.

If this were to happen in a bank's data center customers would not be able to use their cash and credit cards to pay for purchases or even withdraw money from ATMs. A global catastrophe would soon ensue.

In the case of weather centers, computer data failure could have disastrous consequences for airlines that rely on the information they supply. Similarly, if the computers were to crash at any central airline ticket center, passengers would be unable to buy tickets or check-in at any airport.



HEAT SENSITIVE
The Denco HS range has been specially developed to meet the strict requirements of specialist air-conditioning applications, such as clean rooms, which involve extremely high standards of air cleanliness, together with very close control of temperature and relative humidity.

It would be even worse for hospitals where accuracy of equipment is vital. Also drug manufacturers require strict temperature and humidity control to ensure that medicines are made to the same standards.

The good news is that the worst case scenarios are unlikely to occur. "We ensure that systems are reliable, properly designed and maintained," says Shutler. "It's usual to have at least one extra unit to act as stand-by and to allow for maintenance."

Denco is arguably the UK king of cool, with more than 50 years' experience in the design, manufacture, installation and maintenance of air-conditioning solutions across all market sectors. You will find Denco equipment in major banks, telecommunications centers, industrial facilities, weather centers, government buildings, offices and shops around the UK. Currently, its biggest contract is at the new Terminal 5 at London's Heathrow Airport, set to open in 2008.

Denco has seen its business double over the last seven years, as the demand for taking the heat out of day-to-day living and ever more sophisticated technology increases.

But is all this artificial cooling good for the environment? "Air-conditioning works on a refrigeration cycle and it is commonly believed that refrigeration gas is harmful to the environment," says Shutler. "But in fact modern refrigerants have zero ozone depletion potential. The negative is the energy it uses, so the key is to ensure effective use of electricity with efficient compressor technology."

FANTASY ISLAND

IN A PLACE LIKE DUBAI, THE LAND OF SAND, WHO WOULD HAVE THOUGHT THERE WOULD BE SUCH A DEMAND FOR A LITTLE BIT MORE?



The Palm Jumeirah, billed as the 'eighth wonder of the world' and looking like a fantasy from a sci-fi movie, is real. What's more, its big brothers, The Palm Jabel Ali and The Palm Deira, are being built, too.

It was the brainchild of the Dubai Prime Minister, His Highness Sheikh Mohammed Bin Rashid Al Maktoum. The intention: to increase the beachfront accommodation to meet demand of the country's blossoming tourist trade.

The Palm, as its name suggests, is a man-made island shaped like a palm tree with 17 fronds projecting into the sea protected by an eleven-kilometer crescent island breakwater. The Palm is just five kilometers diameter but has added 78 kilometers to the Dubai coastline and provided space for 4000 luxury beach-front residences. The project started in 2001 and people began moving into their 'eighth-wonder' homes at the end of last year.

The project is an engineering triumph. The first task was to build the rock breakwater to protect the sand fronds from the ravages of the sea.The breakwater is built in water up to eleven meters deep and projects from the Arabian Gulf to a height four meters above the water level at low tide. This level is sufficient to protect The Palm against the highest predicted seas, the violent storms caused by the Shamal winds howling in from the northwest, and the possible effects of global warming.

The building of the fronds themselves began with a foundation of rock followed by the precise placing of over 92 million cubic meters of sand.The sand was positioned with the aid of DGPS (Differential Global Positioning System) which gave engineers the ability to place every grain within one centimeter of its target to achieve the perfect palm shape.

But the building of the fronds and the protecting breakwater was only part of the engineering problem. The Palm is not an ornament, it's a real, living island with homes, shops, restaurants and, of course, people. The engineers realized, well into the building project, that left alone, encased in its protective breakwater, the salinity of the stagnant water around the fronds would soon increase to unacceptable levels. To solve the problem, the engineers redesigned The Crescent to include two



100-meter openings on either side, to allow the water to flow naturally around the island. Tidal flow now ensures that the entire volume of water inside The Crescent is refreshed every 13 days.

Flushing the fronds was not, however, the complete answer to the pollution problem. People create waste and pumping large quantities of untreated sewage into the sea, even beyond The Crescent, was environmentally unacceptable. The solution: the installation of a waste water treatment plant, underground so that it could not be seen by the residents. At the heart of the plant is a CDForce decanter centrifuge (affectionately called a 'crocodile' because it looks a bit like one) from Westfalia Separator. The Westfalia Separator 'croc' has the ability to dewater sludge creating a liquid stream of 'clean' water that can be safely discharged from the treatment plant to the sea and a dry 'cake' of solid matter for easy disposal by incineration.

It would have been easier to build The Palm out of steel and concrete but the builders decided to use only natural materials, sand and rock, which are more seismically stable and environmentally friendly. A technique known as vibro-compaction was used to settle the sand artificially; the builders expect further natural settlement to be less than 2.5cm during the next 50 years.

Planners were keen to protect the area's natural marine life and delicate ecological balance. Almost 2000 fish and other marine creatures were moved from the sea around the construction site to open waters nearby.

Buildings on the island will incorporate the latest technology to limit waste generation, conserve water and reduce energy consumption. Double-glazing is used extensively to minimize energy loss, while solar panels provide emission-free power for applications such as water heating and lighting.

There is little doubt that Palm Jumeirah will provide another boost to Dubai's already flourishing tourist industry, with all year round sunshine and impressive luxury. For those fortunate enough to visit this seaside desert paradise, it will indeed feel like visiting the 'eighth wonder of the world'.



EASTERN PR

AT 33, EDYTA REKAS IS THE YOUNGEST EVER MANAGING DIRECTOR IN GEA'S PROCESS EQUIPMENT DIVISION. GENERATE SPOKE TO HER TO FIND OUT MORE ABOUT THE CHALLENGES AND OPPORTUNITIES OF RUNNING GEA'S GROWING BUSINESS IN POLAND

PHOTOGRAPHY: MARCUS GINNS



OMISE

"THE WORST THING FOR ME WOULD BE A BORING, EVERYDAY JOB"

Hi, Mr Andruszko, how are you?" That's how Edyta Rekas greets the morning shift foreman and his approximately 60-man team while making her daily rounds through the factory. "Whenever I'm in the company, I always visit the shop floor," explains the 33-year-old managing director of GEA Polska Sp. z.o.o. She enjoys rubbing shoulders with the staff. "I like knowing what they're doing without actually checking up on them."

Rekas values independence and a sense of responsibility, characteristics that she also cultivates in her employees."I am certainly not the kind of manager who tells people exactly how to do things," she says. "I give my people clear targets but how they attain them is entirely up to them."

Her first experience with GEA was while studying business administration at the University of Applied Sciences in Zittau, Germany. Rekas completed a six-month internship at GEA Technika Cieplna in Opole, Poland, in 1997. "After my studies, I got an offer from GEA Polska to write my thesis there. They also wanted me to set up and run the Financial Control Department. I was a 26-year-old graduate and they made me an offer I couldn't refuse," she laughs.

She's been at the helm of GEA Polska for six years now. Following a challenging start due to tough trading conditions in Poland, the company has evolved into an international standard manufacturer of heat exchangers, thanks to the dedication of staff and division heads.

GEA Polska supplies every major Polish manufacturer of air conditioners with a broad range of dry coolers, intercoolers, radiators for generators and electrical motors, recuperators, Cu/Al heat exchangers and small axialflow fans. The latter see use in industrial cooling applications but also in air conditioning systems for shopping centers or office buildings. From its plant in Świebodzice, the company delivers to both GEA affiliates and end customers.

"No two days are alike. That's good because the worst thing for me would be a boring, everyday job." There is some routine, of course. Mail needs to be read, emails need to be answered. Sometimes, though, there's enough time for her favorite task: "Once in a while, if I have a few spare minutes, I do detailed what if analyses for projects. I try to find solutions that can be used in other projects for better results," she explains.

Rekas is always on the lookout for new projects and challenges. Currently, GEA Polska is transferring production of intercoolers for MTU from affiliate company GEA Maschinenkühltechnik in Germany to Poland. She is also planning and coordinating the market launch in the Ukraine. The launch is starting to bear fruit – affiliate GEA Ukraina Kiev has already booked its first orders. "I see a big market in the Ukraine, especially for dry coolers and radiators for generators. I want to see this launch succeed."

At the weekends Rekas tanks up energy for her ambitious goals. Whenever time permits, she goes on extended bicycle tours through the woods near her home with her husband and four-year-old son.

NOW & THEN

MILKING COWS HAS COME ON A LONG WAY FROM THE DAYS OF THE FARMER SITTING ON A STOOL BESIDE THE ANIMAL WITH A BUCKET.



MILKING ADVANCES

Cow's milk has featured in the human diet for thousands of years. The ancient Egyptians included it in their religious rituals and Cleopatra famously bathed in it as part of her beauty regime.

As the world's population has grown, so has the demand for dairy products. And it's not just milk, cream, butter, cheese and yogurt. Look on any supermarket shelf and the chances are you will find milk derivatives, such as whey powder, listed in the ingredients for a wide range of foods.

In 2005, according to the United Nations Food & Agriculture Organization, the top ten milk producing countries alone provided nearly 400 million tonnes of the stuff. Given that it takes, on average, three to five minutes to milk a cow, producing milk on this scale is only possible thanks to modern milking technology that enables farms to keep massive herds.

Cows were milked by hand up until the mid 19th century when the introduction of electricity allowed the development of automatic milking machines. Inventors came up with a variety of mechanical pressure devices to emulate hand milking and also vacuum devices that were designed to copy the action of a calf sucking.

But it took around 50 years of trial and error to get it right. New developments were hampered by farmers' obvious reluctance for machines to be tested on their herds because the cows often got hurt in the process. For example, subjecting the cow's udder to a constant vacuum damaged the mammary glands.

Then in 1895 the pulsator was introduced in the "Thistle" vacuum milker. Despite some sanitation problems, the machine proved to be effective and led to the development of the modern pulsator machines. The next phase in automatic milking innovation was the milk pipeline. This saved farmers the effort of carrying pails of milk to collection tanks and also meant that the milking device could be made small enough to hang beneath the cow.

Finally, the development of the milking parlor enabled milking to be carried out on an industrial scale. The first rotary milking parlor, called the 'Rotolactor', was installed on the Walker-Gordon dairy farm in Plainsboro, New Jersey in the US.

The Rotolactor, which enabled 50 cows to be milked at once, remained in operation well into the 1960s. GEA company WesfaliaSurge installed its first rotary parlor in 1969. This offered better positioning of the animals and was more convenient for the operators.

During the late 60s and early 70s rotary parlors fell out of favor in Europe and North America because they were not robust enough to milk for long hours and were considered to be too high maintenance. But, by the mid 80s, they were the parlor system of choice in Australia and New Zealand, particularly for larger herds.

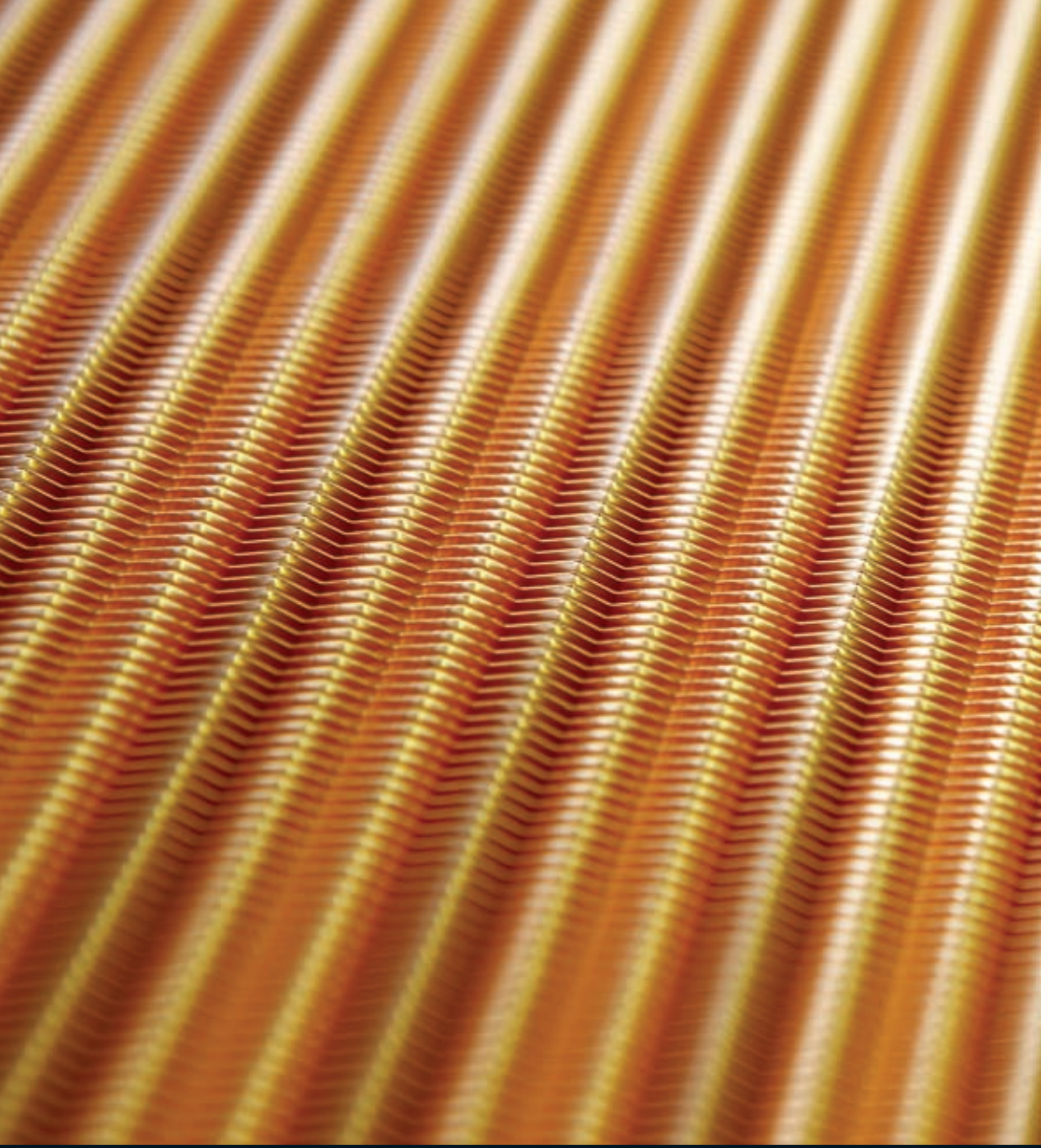
The WestfaliaSurge AutoRotor is now the market leader in AutoRotor milking carousels which can milk more than 100 cows an hour. For that reason they can be found on some of the biggest farms in the world. In addition to established markets in the US, Canada, Mexico, Europe and South America, the AutoRotor is in demand in new markets such as China, Iran and Turkey.



The first rotary milking parlor was installed 1929 in New Jersey in the US.

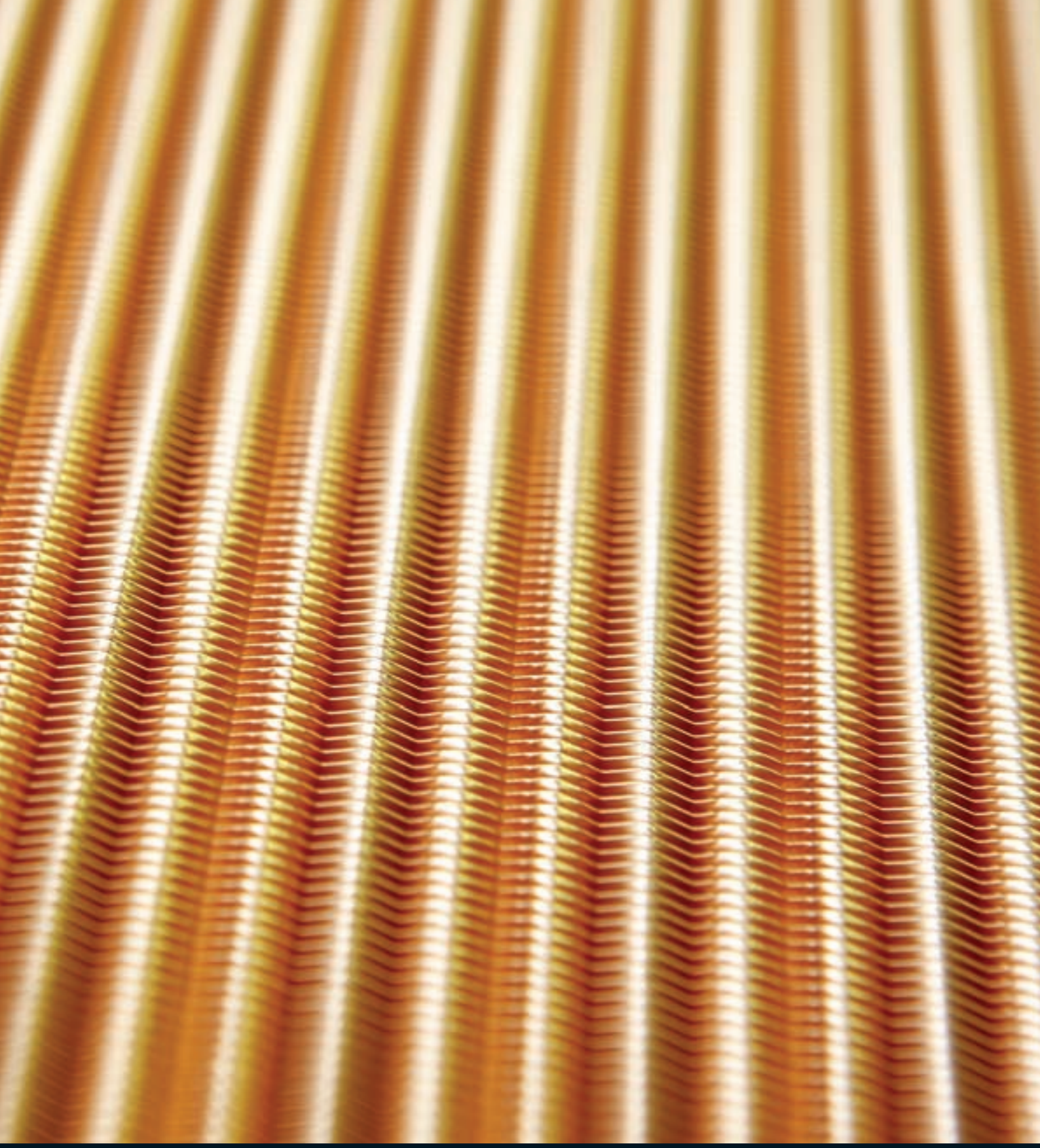


The modern-day AutoRotor, seen here in action in the Netherlands.



ART IN ENGINEERING

All that glitters is not necessarily gold but there's no doubting the value of these visually appealing copper tubes to the cooling industry. This picture, taken at a GEA factory in Poland, shows a fin block – a single fin made up from numerous copper tubes. Quick to manufacture and extremely efficient, fin blocks are used in many different types of cooler and one of their most important roles is heat exchange.



AERO ACQUISITION BOOSTS REFRIGERATION BUSINESS

GEA Group has strengthened its Refrigeration Division by acquiring Aero Heat Exchanger Inc. of Richmond in British Columbia, Canada. Aero is a leading manufacturer of industrial food freezing equipment in North America and employs 154 people.

"The excellent freezing technology of Aero will further improve the competitive position of our refrigeration business," says GEA executive board member Peter Schenk.

"It is an important strategic acquisition that significantly extends the refrigeration business' scope of products and services and gives us the ability to deliver attractive solutions with professional industrial freezing equipment to end customers."

www.geagroup.com

NEW INSTALLATION WILL KEEP THE ENERGY FLOWING IN RIYADH

Westfalia Separator Mineraloil Systems is supplying a crude oil processing installation for the PP9 power station in Riyadh, Saudi Arabia. This power station, with a capacity of 2100 MW in the final design stage, is responsible for assuring the city's energy supplies.

The new installation will clean the crude oil and dewater and desalinate the fuel, ensuring the continuous and trouble-free operation of the gas turbine power station. In addition to the fuel processing facility with 32 OSD 60 separators, various feeder pump stations for crude oil, and feeder installations, the order includes a complete monitoring installation with redundant control and motor starters.

www.westfalia-separator.com

GEA GROUP ACHIEVES IMPRESSIVE START TO 2007

Strong performances across all its businesses contributed to an excellent start to 2007 for GEA Group, with earnings before interest and tax (EBIT) of EUR 64.3 million in the first quarter, up 82.8 per cent on the EUR 35.2 million reported for the first quarter of 2006.

"Although the first quarter of the year is traditionally our weakest, we have almost doubled our EBIT," announced GEA Group chief executive officer Jürg Oleas. "The GEA Group is therefore well on its way to increasing its EBIT margin by roughly two percentage points by 2009."

The volume of new orders received in the first quarter of 2007 grew by 12.9 per cent to more than EUR 1.38 billion (Q1 2006: approximately EUR 1.22 billion). Sales in the first three months of 2007 rose by 26.1 per cent to roughly EUR 1.06 billion (2006: EUR 0.84 billion).

Earnings before tax (EBT) doubled to EUR 51.8 million, as did earnings per share on continuing operations, which advanced from EUR 0.08 to EUR 0.17.

Based on 2006 sales of EUR 4.3 billion, the Executive Board is forecasting sales growth of between five per cent and ten per cent in each of the next few years.

www.geagroup.com

ART IN THE ROUND

Art lovers have been enjoying a series of regular exhibitions at the GEA Center in Bochum, Germany.

Since August 2000 a variety of photographs, paintings and sculptures have been displayed in the glass-domed rotunda of the company's headquarters. The "Kunst in der Rotunde" (Art in the Rotunda) series of exhibitions show the works of selected artists to GEA staff and visitors as well as to the general public.

www.geagroup.com

OPEN HOUSE FOR PHARMA TEST STATION

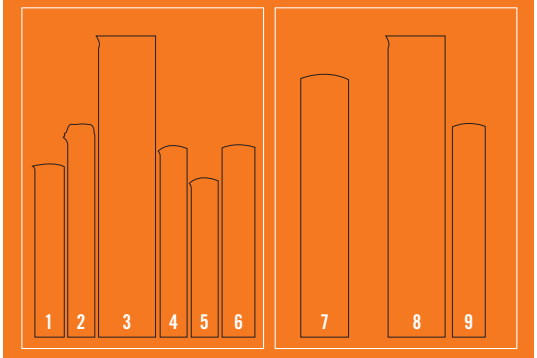
Delegates attending the Spray Drying – Solutions for the Pharmaceutical Industry conference in October will have the chance to visit Niro's unique Pharma Test Station in Søborg, Denmark.

The station enables customers to test the spray drying process for manufacturing new drugs without the need for early investment in plant or expertise. During the tour visitors will be shown various methods of spray drying and how to scale-up and handle highly potent compounds.

The two-day conference is aimed at specialists and executives working in the fields of pharmaceutical manufacture, research and development, quality control and assurance as well as technicians, planners and plant designers, especially those involved in the manufacture of powders and granules.

www.niroinc.com

DO YOU KNOW YOUR BEER?



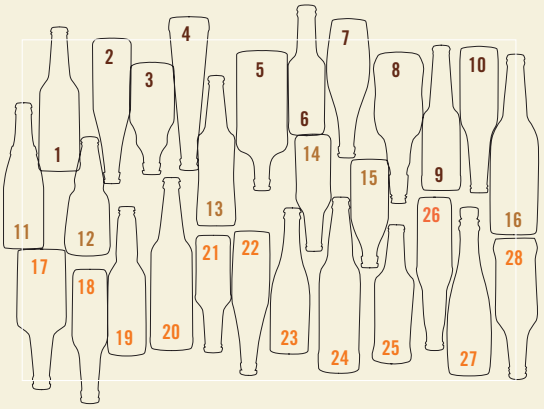
FRONT COVER

1. Fuller's Organic Honey Dew Ale – England
2. Chimay Peres Trappistes Blue Ale – France
3. Coopers Best Extra Stout – Australia
4. Coniston Bluebird Bitter – England
5. Wychwood Hobgoblin Dark Ale – England
6. Lindemans Cassis – Belgium

BACK COVER

7. Krombacher Pils – Germany
8. Hoegaarden – Belgium
9. Guinness – Ireland

Beer supplied by UTOBEER (www.utobeer.co.uk)



FROM PAGE 8

1. Windhoek – South Africa
2. La Trappe Quadrupel – Holland
3. Duvel – Belgium
4. A. Le Coq – Estonia
5. St. Peter's – England
6. Corona – Mexico
7. Meantime – England
8. Grolsch – Holland
9. Jever – Germany
10. Freedom Brewery – England
11. Westmalle – Belgium
12. Negra Modelo – Mexico
13. Zeunerts – Sweden
14. Tsingtao – China
15. Coopers Green Label – Australia
16. Meteor Biere de Noel – France
17. Sierra Nevada – America
18. La Cuvée des Trolls – Belgium
19. Schloss Eggenberg Libero – Austria
20. Etoile du Nord – Belgium
21. Big Rock – Canada
22. La Trappe Blonde – Holland
23. Alhambra Reserva 1925 – Spain
24. Ochakovo Blonde – Russia
24. Innis & Gunn – Scotland
25. Titanic Iceberg – England
27. Belle Vue Kriek – Belgium
28. Jenlain Dark – France

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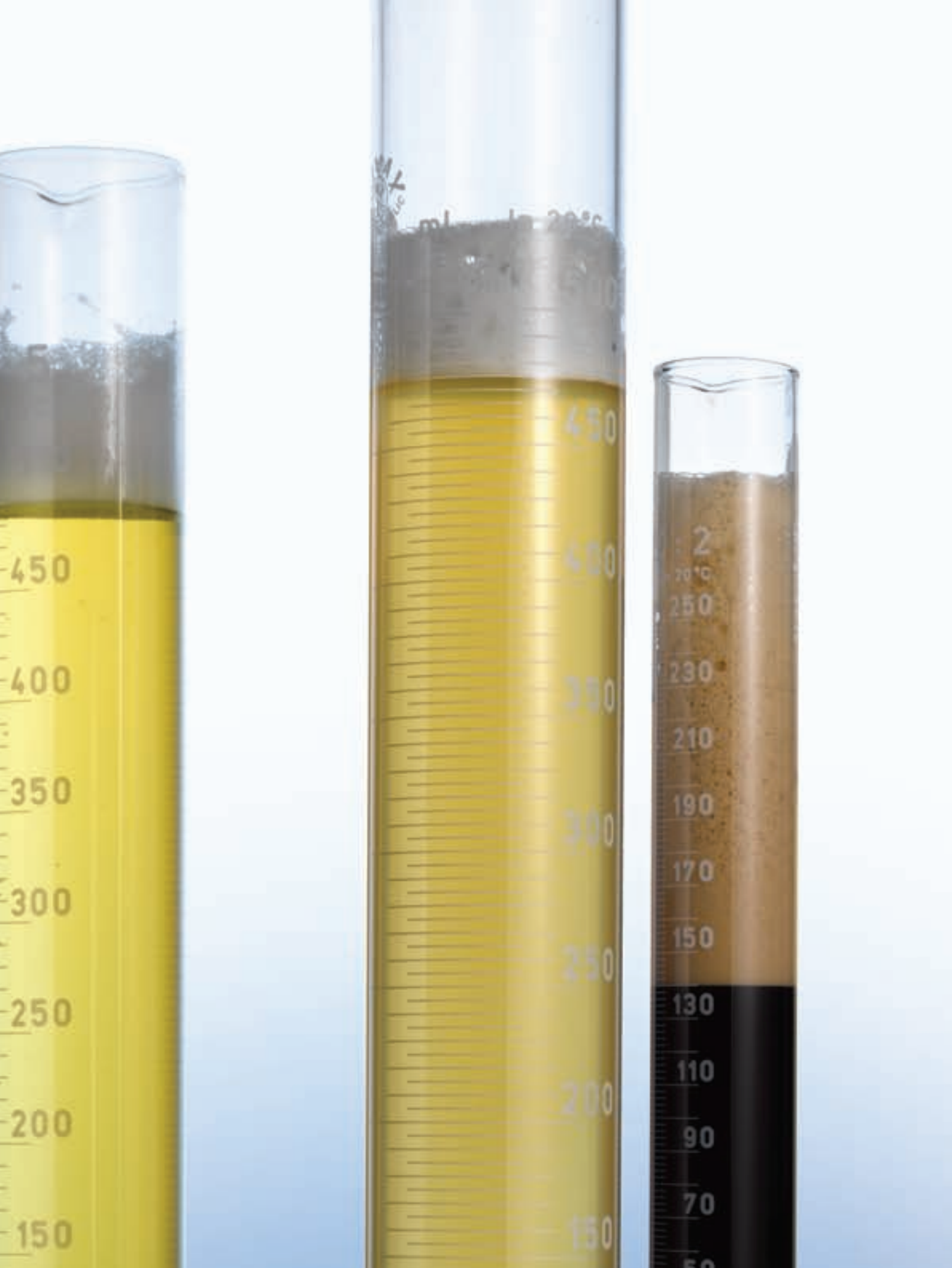
EDITORIAL BOARD
Peter Caspar Hamel (V.i.S.d.P)
Nina Remmer
Katrin Lamprecht
generate@geagroup.com

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