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**“Modernity is something we seek every day as a means of securing lasting sustainability for our business. It’s Alfa Laval that gives us access to modernity, to the latest technology.”**

Roberto Kist, *industrial director,*  
Brazilian agribusiness company *Camera*

## REFINED WINE

New method will rid wine of smoke taint

## BIOREFINERIES

Pulp and paper mills are becoming multi-product factories

## SOLAR POWER

Alfa Laval technology increases power output

# BRAZIL

*on top of its game*

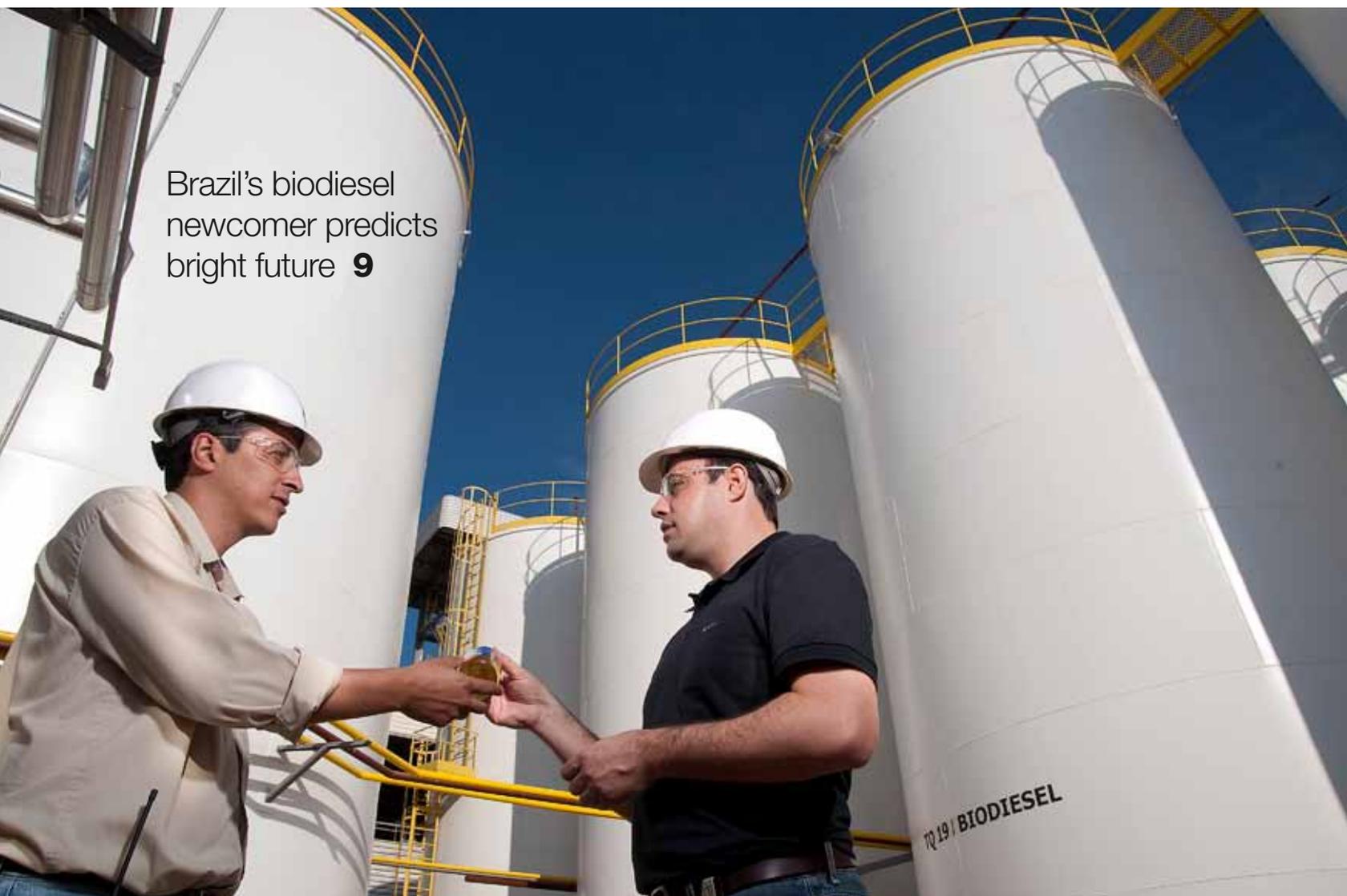
Brazil is on a roll. The world’s eighth-biggest economy is booming, and the country is heading for world leadership in biofuels.

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# Brazil grabs the reins



**editorial** Brazil has always been a dynamic country, but this could be the decade when it really bursts onto the global economic stage. Brazil recovered quickly from the economic crisis of 2008–2009, growing 7.5 percent in 2010. Employment is up, and there's an increase in domestic consumption and wages. Additionally, the country is gearing up to host both football's World Cup in 2014 and the Olympics in 2016, two events certain to generate even more growth in the economy.

Alfa Laval has been a part of Brazilian development for more than 50 years, providing solutions, equipment and services for a variety of sectors. Today Latin America accounts for 6.5 percent of Alfa Laval's orders, and half of these come from Brazil. During 2010, orders in Brazil grew by almost 18 percent.

**I WORKED IN BRAZIL** in the early 1980s, when we sold the first of many heat exchangers to national oil company Petrobras (Petroleo Brasileiro SA) for use on offshore platforms. Petrobras is still using our heat exchangers, along with diesel purifiers and desalination equipment for oil field applications. Today we are working together developing technology that will enable the drilling of oil more than 7,000 metres deep in Brazil's Tupi offshore field, among other areas.

In addition to being a major player in the oil industry, Brazil is the second biggest ethanol producer in the world (after the United States). The International Energy Agency

estimates that Brazil will produce 520,000 barrels of ethanol per day this year. In addition to supplying yeast separators to the Brazilian ethanol industry, Alfa Laval is the Brazilian ethanol industry's main supplier of plate heat exchangers for process as well as energy recovery applications.

**WE ALSO HAVE A STRONG** position in the Brazilian food market, especially for vegetable oil, breweries and fruit juices, which rely on our food processing solutions. Today we supply equipment to the growing soya market that is used for refining soya oil prior to turning it into food oil or biodiesel. Alfa Laval has developed an innovative new cleaning process, enzymatic degumming, that uses enzymes instead of water to wash impurities out, greatly increasing the amount of oil extracted.

This technology is being used by agribusiness Camera, which recently invested in a pretreatment plant in the state of Rio Grande do Sul. Read more about this on pages 9–12.

This issue of *here* also focuses on solutions to many other technology challenges, from harnessing solar power to adapting pulp mills to meet changing needs.

Energy, environment and food – this is what Alfa Laval is about.

**LARS HENRIKSSON**  
EXECUTIVE VICE PRESIDENT AT ALFA LAVAL,  
HEAD OF REGION LATIN AMERICA

## Panamanian hub

**Alfa Laval has opened** a new office in Panama. This transport hub for Caribbean and Central American countries will serve as a base for a highly mobile team, bringing Alfa Laval's sales and service support closer to customers in the countries surrounding the Caribbean Sea.

Executive Vice President Lars Henriksson opened the office, saying: "It's not every day we open a sales office in a new country. That we've chosen to locate here is a sign of the region's growing importance for us."

**DID YOU KNOW THAT...**  
 ...India overtook Germany and became Alfa Laval's third largest market during 2010? Half of Alfa Laval's large orders (orders valued above EUR 5 million) came from India that year.

## Exclusive Stock – a cost-saving service

**Alfa Laval has developed** a new service called Exclusive Stock that meets a growing customer demand for consignment and/or local stock. The service will minimize customers' downtime by offering short and accurate delivery of parts.

To ensure fast and direct access to the right parts, Alfa Laval keeps an agreed number of parts reserved under each company's name. Whenever a customer has need for a part, it is available for same-day shipment from the chosen Alfa Laval distribution centre.



## Order of size

**Decanter centrifuges** from Alfa Laval will be used in the world's largest wastewater treatment plant. The plant is located in Chicago, in the midwestern United States, and serves about 2.5 million people.

When the order – worth a total of SEK 250 million – was placed in June 2010, it was the largest ever received by Alfa Laval. "The increasing environmental awareness is driving interest in our efficient wastewater treatment solutions," says Lars Renström, President and CEO of the Alfa Laval Group.

The Alfa Laval decanter centrifuges will be used for thickening the sludge generated in the biological treatment process in the Chicago plant. Delivery should be finalized in 2013.



## Breaking new ground

**Solutions from Alfa Laval** will be part of the world's first full-scale IGCC (Integrated Gasification Combined Cycle) process for power generation with carbon capture. The plant is being built in the United States and will use Alfa Laval Packinox heat exchangers in the gas treatment process.

The order value is about SEK 80 million (EUR 9.1 million), and delivery is scheduled for 2012.

"We are very proud to be part of such a pioneering project," says Lars Renström, President and CEO of the Alfa Laval Group. "We see this order as a confirmation that our strategy of being involved in pilot projects for carbon capture techniques is paying off. By proving our products and solutions in the testing phase we will be well positioned when the process is scaled up."

When finalized, the project will include a state-of-the-art gasification facility with a capacity of more than 500 megawatts and an integrated carbon capture facility.

The IGCC process is a clean technology solution. Instead of burning coal directly to produce electricity, a gasification process breaks down the coal into synthesis gas. The gas is then purified and used to fuel the power plant. The process generates a very low level of emissions: 99 percent of the sulphur dioxide is removed, and as much as 65 percent of the carbon dioxide is captured.

**Green award**

Alfa Laval China was selected as one of China's 50 greenest companies by the Chinese publication *Business Watch Magazine*, in a ranking determined by evaluations of a panel of judges, readers and online voting. The prize is awarded to companies, Chinese and multinational, that have achieved particular success in combining growth and sustainability.

## Heat recovery key in Russia

**The refinery industry** in Russia is increasingly investing in equipment that optimizes energy consumption through heat recovery. By using compact heat exchangers from Alfa Laval, the refineries can recover up to 95 percent of the heat that would otherwise be wasted. This represents a 35 percent increase in efficiency

compared with competing shell-and-tube technology.

Alfa Laval's equipment can be found in nine out of 10 of the Russian refineries, and in 2011, Alfa Laval will deliver yet another set of compact heat exchangers to a refinery in Russia. The order is worth SEK 70 million (EUR 8 million).

Alfa Laval's solution will be

used in the distillation process of the refinery, where the crude oil is preheated for further refining into high-value products such as petrol. By using Alfa Laval's compact heat exchangers the refinery will be able to preheat the oil using heat recovered from other parts of the process, thereby achieving a highly energy-efficient solution.

# Aalborg acquisition will benefit marine sector – and beyond

**Alfa Laval is acquiring** Aalborg Industries. The SEK 5 billion acquisition will mean a wider range of products and improved service for customers in the marine and offshore sector. It will also strengthen Alfa Laval's offering in green technologies and benefit customers within the oil and gas industry.

"Aalborg Industries is an excellent fit," says Lars Renström, President and CEO of the Alfa Laval Group. "Aalborg Industries complements our offering of energy-efficient and environmental solutions. It not only supports the development of our product offering to customers in the marine and offshore markets, but it also means we can introduce Aalborg's product offering to new industrial end markets and customers."

**Aalborg Industries**, with 2,600 employees and headquarters in Aalborg, Denmark, is a leading provider of critical products, systems and service solutions, mainly to the marine and offshore markets. The company also has an increasing exposure to the power industry as well as other industrial markets and has a strong manufacturing and engineering presence in rapidly growing markets such as China, Vietnam and Brazil.

After integration, the marine sector will account for about a

quarter of Alfa Laval's total business. Joakim Thölin, manager for Alfa Laval's Marine & Diesel segment, says that both companies' customers will see benefits from the acquisition. "We will be able to meet their expectations and product needs with a broader offering and by optimizing integrated solutions in the environmental area," he says. "We will also significantly strengthen our teams, which will improve the service level as well as building stronger key customer management."

Thölin says the fact that Alfa Laval's and Aalborg's product portfolios are so complementary will contribute to more technology development in key areas. "For example Aalborg's boilers and heat recovery systems are related to our heat transfer offering," he says, "and we have been working together on exhaust gas cleaning systems."

Such systems reduce sulphur oxides emissions from ships, enabling ship owners to meet future environmental legislation without going over to more expensive fuels.

Aalborg provides the scrubber technology while Alfa Laval provides the water treatment solution based on its separation technology.



**Jan Vestergaard Olsen, President and CEO of Aalborg Industries, and Lars Renström, President and CEO of the Alfa Laval Group.**

The coming together of the two companies also has potential for customers outside the marine sector. Alfa Laval has been a supplier of plate heat exchangers and separators to the Brazilian ethanol industry since the 1970s, while Aalborg produces biomass boilers for the sugar plants. Together the boilers, separators and heat exchangers form a broad offering for the ethanol industry. Similarly, there are potential synergies

within the power sector and process industry.

**The deal**, which is Alfa Laval's largest so far, is in keeping with the company's acquisition strategy, which aims to strengthen existing key technologies by adding new solutions as well as complementary products and distribution channels.

Over the past five years Alfa Laval has acquired 28 companies.



**Shipping of an Olmi shell-and-tube heat exchanger.**

## Stronger offering to high-pressure market

**Through its recent** acquisition of Italian family business Olmi, Alfa Laval has stepped up its offering to customers within the high-pressure, high-temperature heat exchanger market.

Olmi is a leading company specialized in the designing and manufacturing of shell-and-tube heat exchangers and air coolers for niche applications in the

petrochemical, power and oil and gas industries.

"In line with Alfa Laval's overall acquisition strategy, we aim to become the leading process heat exchanger supplier," says Svante Karlsson, Alfa Laval Executive Vice President and Head of Process Technology Division. "Olmi matches this strategy perfectly."

Alfa Laval's customers can now select from a broader product

range for more applications. Olmi's customers benefit from Alfa Laval's worldwide presence, with its own sales companies and organization, and not least its service organization.

Olmi's headquarters in Suisio, near Bergamo in northern Italy, will become Alfa Laval's competence centre for process shell-and-tube heat exchangers and process air coolers.



# Brazil's **FUTURE** within its grasp

As Brazil's economy booms, the Latin powerhouse is heading for world leadership in biofuels. TEXT: JONATHAN WHEATLEY ILLUSTRATION: ANNIKA SKÖLD

**BRAZIL, IT HAS OFTEN BEEN SAID**, is the country of the future – and always will be. The tired old joke, based on an ill-informed perception that the country is inherently incapable of realizing its enormous potential, is wearing decidedly thin. Last year, after shaking off a shallow recession caused by the global economic crisis of 2008–2009, Brazil's economy grew by about 7.5 percent, leaving the developed world in the dust, and the country looks on course to settle into a sustainable growth rate of about 5 percent a year, more than double its average for much of the past two decades. Brazil really is the country of the future, it seems. And its future has – almost – arrived.

Almost, because Brazil still has much to do. The foundations of stability and growth were laid by the inflation-busting Real Plan of 1994. Its architects drew up a blueprint for prosperity that included structural reforms – especially deep cuts to a bloated public sector – that have yet to be completed.

But stability alone has allowed the Brazilian people and Brazilian business to plan for the future in a way they never could under high inflation. While savings and investment remain low, Brazil has embarked on a virtuous circle in which rising employment and incomes have delivered a boom in domestic consumption, creating more jobs and higher wages and even more consumption.

With the United States and Europe facing stagnation, Brazil is on a roll. Brazil's trade balance with the US, for example, has gone from annual surpluses of about USD 15 billion in Brazil's favour to a deficit of about USD 6 billion last year, as Brazilian consumers buy goods that those in developed countries are increasingly having to go without.

**CAN BRAZIL TAKE UP THE SLACK** in the global economy as the developed world slows? That may be asking a lot. But many economists believe its economy, currently the world's eighth biggest, will be its fifth biggest by as early as 2015.

A big question is what kind of economy and society will

it become? At first, Brazil's recent period of growth was driven by exports. It quickly began to exploit its vast mineral wealth – much of it still untouched – and is already the world's biggest exporter of iron ore. Its farmers and ranchers have transformed it from a middling agricultural country just two decades ago into a global powerhouse, the world's biggest exporter of beef, chicken, orange juice, green coffee, sugar, ethanol, tobacco and the “soya complex” of beans, meal and oil, as well as its fourth biggest exporter of maize and pork.

**“We expect Brazil to overtake Germany and become the world leader in biodiesel this year.”**

JOÃO ARTUR MANJABOSCO, CAMERA AGROALIMENTOS

But as the shift in trade with the US suggests, Brazilian manufacturers are losing out to cheap imports. Many businesses are still struggling under the burden of a public sector that taxes heavily and spends badly, delivering poor infrastructure and other services, often cancelling out productivity gains. A surge of cheap but increasingly high-quality imports from China is hitting manufacturing even harder.

“Brazil has to decide what it wants to be,” says Charles Tang, head of the Rio de Janeiro-based Brazil-China chamber of commerce and industry. “Either it can be a high-cost, non-competitive country, in which case it can still be successful as a commodities exporter. Or it can lower the *custo Brasil* [the local term for the extra costs of doing business in the country] to stimulate industrial production based on lower costs.”

Nevertheless, to argue that Brazil faces the risk of “deindustrialization” is probably to overstate the case. The Brazilian people, as well as being open and welcoming, are adaptive and agile. Businesses have survived greater difficulties in the past, and Brazilians – if such

- ▶ generalizations can be allowed – are natural entrepreneurs.

Innovation, to be sure, is often held back by poor standards of public education. But it has flourished regardless, often when the public and private sectors come together (Embrapa, a government agricultural research centre, has been especially successful at developing new crop strains suited to Brazil's tropical climate).

**ONE AREA WHERE BRAZIL** can claim world leadership is in biofuels. It first experimented with ethanol-fuelled cars after the oil shock of the 1970s, but this ground to a halt when rising sugar prices led producers (who can switch easily between sugar and fuel alcohol) to cut ethanol production, leaving drivers stranded. The recent development of flex fuel cars – which run on petrol, ethanol or any mixture of the two, allowing drivers to choose on price at the pump – has delivered a renaissance. The government likes to point out that in Brazil petrol is now an alternative fuel, as it is outsold by ethanol.

Now it is also investing heavily in biodiesel. Again, the public and private sectors have worked together. Under a government programme introduced in 2004, production has centred on family farms, initially using tropical crops such as *dendê* (the African oil palm) and *mamona* (the castor oil plant). But as the programme expanded, soya quickly took over as the main source of oil for processing

into diesel and by 2009 accounted for more than 95 percent of all biodiesel produced in Brazil.

In 2010, Brazil produced 2.4 billion litres of biodiesel, or about 22 percent of the world total. That puts it just behind Germany, with about 23 percent, and ahead



of the US, with about 18.5 percent, according to figures from the US National Biodiesel Board, the Union zur Förderung von Oel und Proteinpflanzen of Germany, the Argentinean ministry of agriculture and Brazil's national petroleum agency.

"We expect Brazil to overtake Germany and become the world leader in biodiesel this year," says João Artur Manjabosco, sales manager for biodiesel at agribusiness company Camera Agroalimentos.

**BIODIESEL IS USED** by mixing it with fossil-based diesel, much as fuel ethanol is often mixed with petrol. Under the Brazilian government programme, a mixture of 2 percent was authorized between 2005 and 2007 and became mandatory from 2008. The original plan was to increase this to 5 percent from 2013 but instead the proportion was raised to 3 percent in July 2008, 4 percent in July 2009 and 5 percent from January 2010.

"If the mixture remains unchanged, we expect economic growth will take consumption of biodiesel in Brazil to 4.2 billion litres by 2019," says Manjabosco. "But we believe that by 2019 the mixture will have increased to 10 percent. That's a monstrous amount of biodiesel, and Brazil has the capacity to meet it." ■



## ALFA LAVAL BRINGS SET OF NEW SOLUTIONS

**Alfa Laval** has been present in Brazil since 1959, delivering solutions, equipment and services mainly to the food, biofuel and oil and gas industries. It is, for example, the biggest supplier of plate heat exchangers and separators to Brazil's ethanol industry.

Lucas Klettenhofer, food technology manager at Alfa Laval's process division in São Paulo, says Brazil's biodiesel industry is on the verge of its next big transformation.

"Our view of the future is certainly that volumes will increase," he says. "Today most biodiesel is produced by local players. We imagine that the big international players [the world's big commodity traders] are preparing to take a bigger role."

Even though the amount of biodiesel

produced in Brazil has grown quickly, Klettenhofer says, the industry is still in its early stages compared with the potential for future demand.

"Around the world, there are three issues affecting biodiesel," he says. "One is dependence on oil and the related issue of fixing carbon in the environment. Another is the imperative for diversification of the energy matrix. And the third is political – how to involve issues of land reform in food and fuel policies."

**The rapid growth** of Brazil's soya industry has given Alfa Laval the opportunity to develop a new set of solutions. Its equipment is used to clean soya oil before it is refined into cooking oil or biodiesel. In 2009 it signed

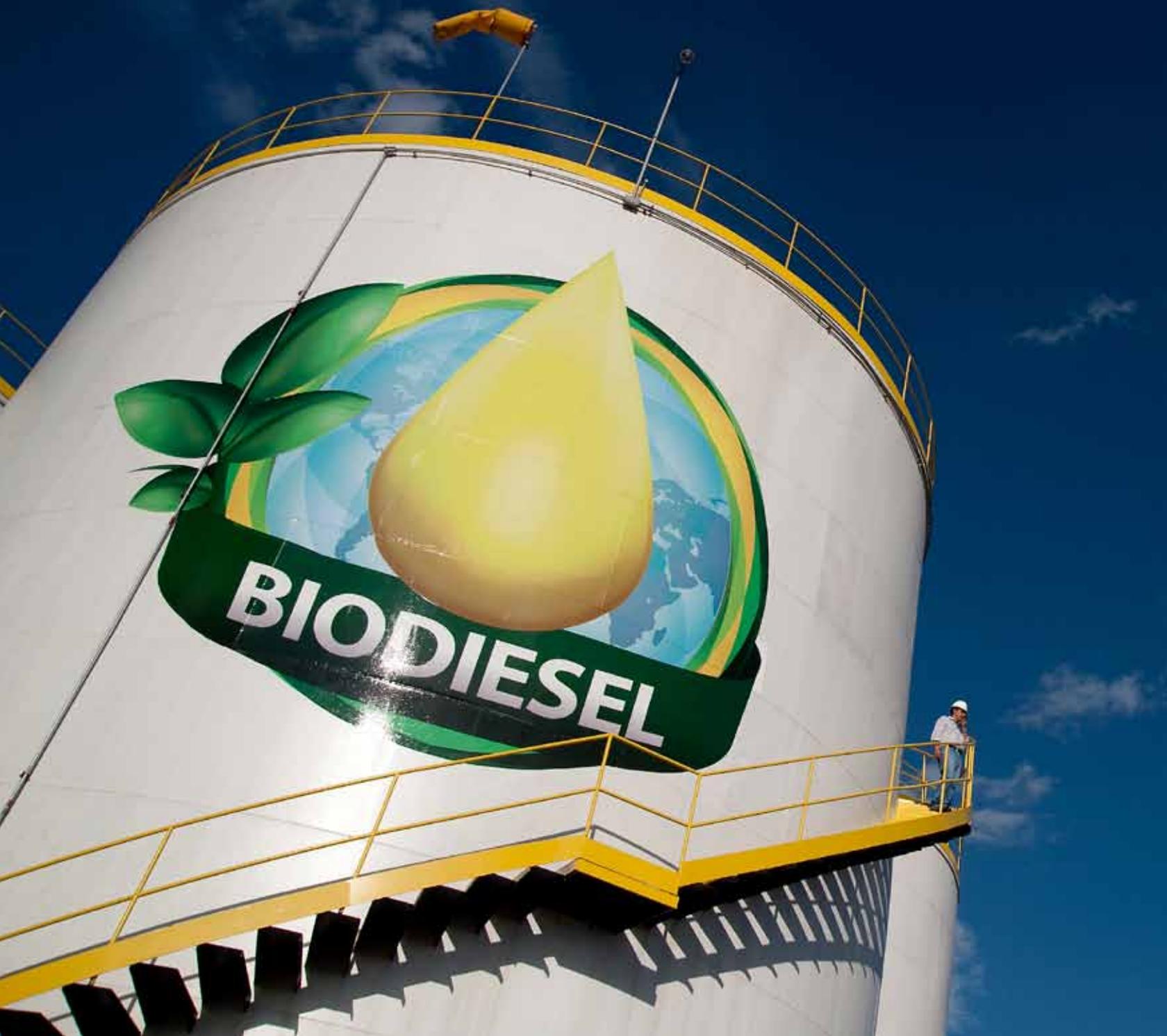
an agreement with biotechnology company Verenium to jointly market enzymatic degumming of vegetable oils using enzymes produced by Verenium and Alfa Laval's engineering services and equipment.

"This is a new concept that is still not 100 percent consolidated," Klettenhofer says. "This is a process of technological change that we are right now involved in driving in the market. We have worked with other processes in the biodiesel industry in the past, but they were always based on chemical-based refining methods. As we have developed the know-how needed to use enzymes we have introduced concepts that aggregate other Alfa Laval products and deliver better results for our partners."

# BIODIESEL UPSTART

Thanks to an innovative solution from Alfa Laval, a traditional Brazilian agribusiness company is setting the pace in the country's fast-growing biodiesel industry. ▶

TEXT: JONATHAN WHEATLEY PHOTO: PAULO FRIDMAN



## CAMERA BRAZIL



Roberto Kist, industrial director of Camera, welcomes novel technology. In 2009, the company moved into biodiesel production and invested in a pretreatment plant using enzymatic degumming.

**THE SMALL TOWN** of Ijuí in Brazil's southernmost state of Rio Grande do Sul, home to brand new installations built by agribusiness company Camera, is surrounded by some of the world's most fertile farmland.

The gently rolling hills are carpeted with the deep, almost luminous green of young soya, interspersed with stretches of subtropical forest. This is a landscape steeped in farming traditions, worked by descendants of German and Italian 19th-century immigrants for the most part, together with a mix of African and European and indigenous people typical for Brazil.

It's a friendly place too. At Camera's facilities outside Ijuí there's a warm welcome in the local singsong accent. But what strikes the visitor first is the scale and modernity of the new plant, at the cutting edge of one of Brazil's most modern and fastest-growing industries, biodiesel.

This is a new departure for Camera. The company was founded in 1971 as a soya trader, buying the grain from farmers and supplying them with seed, fertilizer and

agrochemicals. Soya farming in Brazil was in its infancy then, but it has grown quickly over the years, and the country is now the world's second biggest producer after the United States.

Camera's business has grown in tandem. Today, with an annual sales outlook of 1.6 billion Brazilian reais (about EUR 710 million) and 1,000 employees, it deals with 25,000 farmers who produce some 15 percent of all the soya in Rio Grande do Sul.

"At the heart of Camera's core values are tradition and modernity," says Roberto Kist, industrial director and a member of Camera's controlling family.

**THE COMPANY HAS** always maintained close relationships with its farmers, through a network of *casas*, or houses, that cover about 60 percent of the soya-growing areas in the state. The term reflects the personal ties between Camera and its farmers. Each of the 42 houses operating today has silos for receiving soya and other grains (Camera also deals in wheat, rice and sweet corn) and storage

### CAMERA AGROALIMENTOS S/A

**Headquarters:** Santa Rosa, Rio Grande do Sul, Brazil

**Founded:** 1971, family-owned

**Business:** Deals with 25,000 farmers in the state of Rio Grande do Sul, of which at least 60 percent work on small family farms

**Employees:** 1,000

**Annual sales:** 1.6 billion Brazilian reais.

**Main products:**

- Refined vegetable oils such as soya, canola, sunflower and olive oil
- Fertilizers and agrochemicals
- Soya, sunflower and wheat seeds
- Soya meal
- Lecithin
- Animal feed
- Biodiesel

**“It’s Alfa Laval that gives us access to modernity, to the latest technology, and we want that to come in a traditional relationship, covering more than one business area.”**

ROBERTO KIST, CAMERA AGROALIMENTOS

for the materials, such as fertilizer, pesticides and herbicides, it supplies to growers.

In 1998, following almost three decades of close cooperation with the family and other farmers, Camera decided to take the business of adding value a stage further by buying its first soya crushing plant in Santa Rosa, where it has its headquarters. From 300 tonnes per day of beans in 1998, the plant is now expected to crush 1,500 tonnes per day during the harvest.

**THE COMPANY** took another big step in 2007 with the building of a refinery, also in Santa Rosa, making possible Camera’s debut as a retail brand of soya oil, which grew quickly to 35 percent of the market share in Rio Grande do Sul. This also marked the beginning of Camera’s relationship with Alfa Laval – a relationship that has grown quickly, partly because Alfa Laval’s innovative techniques have contributed to Camera’s vision of combining tradition and modernity.

“We have always sought to preserve traditional values in our relationships with our farmers and to extend those values to our dealings with other suppliers and customers,” Kist explains. “And modernity is something we seek every day as a means of securing lasting sustainability for our business.

“It’s Alfa Laval that gives us access to modernity, to the latest technology,” he says, “and we want that to come in a traditional relationship, covering more than one business area, as something that is always present. We don’t have our own strong base of engineers, so Alfa Laval has become our auxiliary in this respect. We put a lot of value on Alfa Laval’s support, and we are very open with them. We give them a lot of access to our business, because if we didn’t they wouldn’t be able to help so much. It’s a relationship of openness and trust.”

With access to Alfa Laval’s expertise, in 2009 Camera took the decision to diversify further by moving into biodiesel, one of the most dynamic areas of Brazil’s fast-growing biofuels industry. After consultation with Alfa Laval, it decided to invest in a pre-treatment plant using enzymatic degumming – a recent development with significant advantages over the more common method, known as neutralization.

“With neutralization you lose a lot of product, and you produce a lot of residues with very little value,” says Marcelo Cardoso,

Camera’s industrial manager at Ijuí. While neutralization uses chemical reactions and a lot of water, the new method uses enzymes to remove impurities in a largely physical process, separating out fatty acids and phosphorous as high-value by-products. Although more expensive than neutralization, enzymatic degumming delivers better results because of the high demand for the by-products that result.

Enzymatic degumming is a new process in Brazil’s biodiesel industry, but it is beginning to take hold. Camera’s plant entered production at the end of 2010 as one of four or five such installations in the country, all developed at about the same time.

“Our view is that we have entered the biodiesel business in its third wave,” Kist says. The first, he explains, was driven by government efforts to support poor farmers in remote parts of Brazil, especially in the Amazon. It focused on alternative fuel sources such as *manona* (the castor oil plant).

The second phase focused on soya, which quickly came to dominate and now provides 80 percent of all biodiesel in Brazil. ▶



Camera belongs to the third wave of Brazilian biodiesel producers that cover the whole business chain from origination to refining.



Camera is surrounded by soya fields and maintains a close relationship with about 25,000 farmers in the state of Rio Grande do Sul.

## CAMERA BRAZIL



Marcelo Cardoso, industrial manager of Camera, says the enzymatic degumming process is innovative and efficient.

Camera is part of the third wave. “Our entry into the business is significant because it marks the arrival of verticalized companies, which cover the whole business chain from origination to refining,” Kist says.

This vertical business model has attracted considerable attention. Late last year, to raise investment capital, Camera sold 17 percent of the company to a consortium of some of Brazil’s biggest pension funds: Petros (run by Petrobras, the national oil company), Funcef (of Caixa Econômica Federal, a government-controlled savings bank), Valia (of Vale, the private sector mining giant) and Fapes (of BNDES, the government development bank), plus the BNDES’s investment arm, BNDESPAR.

**HOW MUCH THE** consortium paid was not disclosed, but the deal will provide Camera with BRL 200 million for investment over the next two to three years. Camera has committed itself to developing new levels of corporate governance in preparation for a stock market flotation in about three years.

Camera’s biodiesel business, though still in its infancy, is already growing quickly. At Ijuí, it has the capacity to produce 400 cubic metres of biodiesel a day. It recently applied for permission from the ANP, Brazil’s oil and gas industry regulator, to increase capacity to 650 cubic metres a day.

“We are still newcomers to this business, but we have already identified the need to add capacity,” Kist says. “The company has this vision that we must add value. It’s in our DNA.” ■

### ENZYMATIC DEGUMMING ADDS VALUE

**When soya oil** is refined, whether for use as a cooking oil or as biodiesel, it must first be degummed to remove impurities such as phosphorous and fatty acids. The traditional method of degumming, known as neutralization, uses a lot of water to wash out the impurities. This process is helped along by adding chemicals. Along with the desired end product, the degummed soya oil, a sludge of oil, water, phosphorous and fatty acids is also produced, which is of little value.

The one advantage of neutralization is that it is relatively cheap, with an industrial cost of about 6.6 euros per tonne. That

is about half the cost of using enzymatic degumming, which is a new method that is gaining considerable attention.

In addition to being cleaner and more efficient and producing much less waste, enzymatic degumming delivers by-products of a much higher value. Distilled fatty acids, rich in vitamin E, can be sold to the food, pharmaceutical and cosmetics industries for about EUR 1,500 a tonne. Phosphorous, distilled separately, is sold for use in fertilizer. In comparison, the sludge produced by neutralization sells for about 150 Brazilian reais (EUR 66) a tonne, says Marcelo Cardoso, industrial manager.

Enzymatic degumming is primarily a physical rather than a chemical process. The enzyme is mixed with crude oil to help separate its phosphorous, which is removed in a centrifuge. The remaining oil is washed with water to remove its soaps and then dried in a vacuum tower. The residual water is recycled in the system until it becomes saturated, when it is turned into vapour and used in heat transfer. The oil then goes to a double scrubber distillation column to remove fatty acids in concentrated form.

“We chose this process because it’s innovative and efficient,” says Cardoso. “We are in the renewable fuels business,

and we want to produce fewer residues.”

After a year of setting up its enzymatic degumming system, the plant began operations in the fourth quarter of 2010.

Camera is so pleased with the results that it is running tests with Alfa Laval with a view to introducing the system at its edible oil plant in Santa Rosa. This would be the first time the process has been used for refining edible oil in Brazil and one of very few instances of this in the world. When *here* visited Ijuí in January, Cardoso reported that the tests were coming out within the desired specifications. A decision is expected soon.

Visit the  
showroom at  
[alfalaval.com/  
showroom](http://alfalaval.com/showroom)



Alfa Laval's virtual showroom is available both online and on smart phones.

# VIRTUAL SHOWROOM features best of the best

Visitors to Alfa Laval's new Virtual Showroom are greeted with clear and relevant information about the company's top products.

TEXT: ÅSA LOVELL PHOTO: CHRISTER JANSSON

**Alfa Laval has** a new digital venue to give visitors a tour of its latest innovations. Available on the Internet as well as through a new smart phone application, the Alfa Laval Virtual Showroom features only products with an outstanding degree of innovation. "In this new showroom, we have chosen to focus more on quality than quantity," says Anja Simonsson, project manager for the Virtual Showroom.

To qualify for the showroom, the Alfa Laval products must be new and lead to clear benefits for the user in terms of, for example, lower energy consumption, reduced life-cycle costs and improved product output.

"Our aim has been to compress

and quantify the customer benefits as much as possible," says Simonsson. "When doable, we have quantified the benefits in terms of money – what the products will do for the customer's bottom line."

Showroom visitors can access information on how the Alfa Laval innovations compare with competing technologies on the market. "We try to explain why each product is an innovation and what makes it stand out in the competition," says Simonsson.

**The products** featured in the showroom will differ depending on who the visitor is and from which part of the world the visitor

logs on to the service. In reality, Alfa Laval has created 50 different showrooms in 22 languages targeting different markets. Each sales company within Alfa Laval has chosen the products that it believes should be displayed to the local customer base to ensure that the products are relevant and available for order. Each local showroom also contains contact information for local sales managers.

Stanley Miller, technical purchasing supervisor at US-based Carnival Cruise Lines, is one customer who has tried the new service. "The showroom displays the Alfa Laval products we use and describes the applications," he says. "There are

## VIRTUAL SHOWROOM GUIDE

### What's in it for me?

- Clear and quantified customer benefits in terms of what the product will do for the user's bottom line.

### How it works

- Explanation of what makes the Alfa Laval product stand out compared with similar technologies on the market.

### Downloads and links

- Leaflets and brochures in .pdf format about the product as well as links to campaign and other relevant websites.

### Invite

- Opportunity to invite others to visit the showroom.

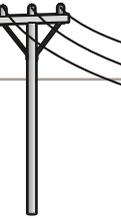
### Contact

- Contact information for Alfa Laval's local sales managers to allow visitors further information and customized quotations.

downloads for product information, which I'm sure reduces further emails. I believe it was well conceived."

**When launched** in December 2010, the global Virtual Showroom had seven products on display, but the list will be updated with new products quarterly. Although the front page will only feature seven products at a time, no products will be removed from the showroom. Instead they will be moved into a searchable archive function.

In May 2011, Alfa Laval also launched a showroom for smart phones, making it possible to access the Virtual Showroom on the go. ■



# THE SUN'S ADVOCATE

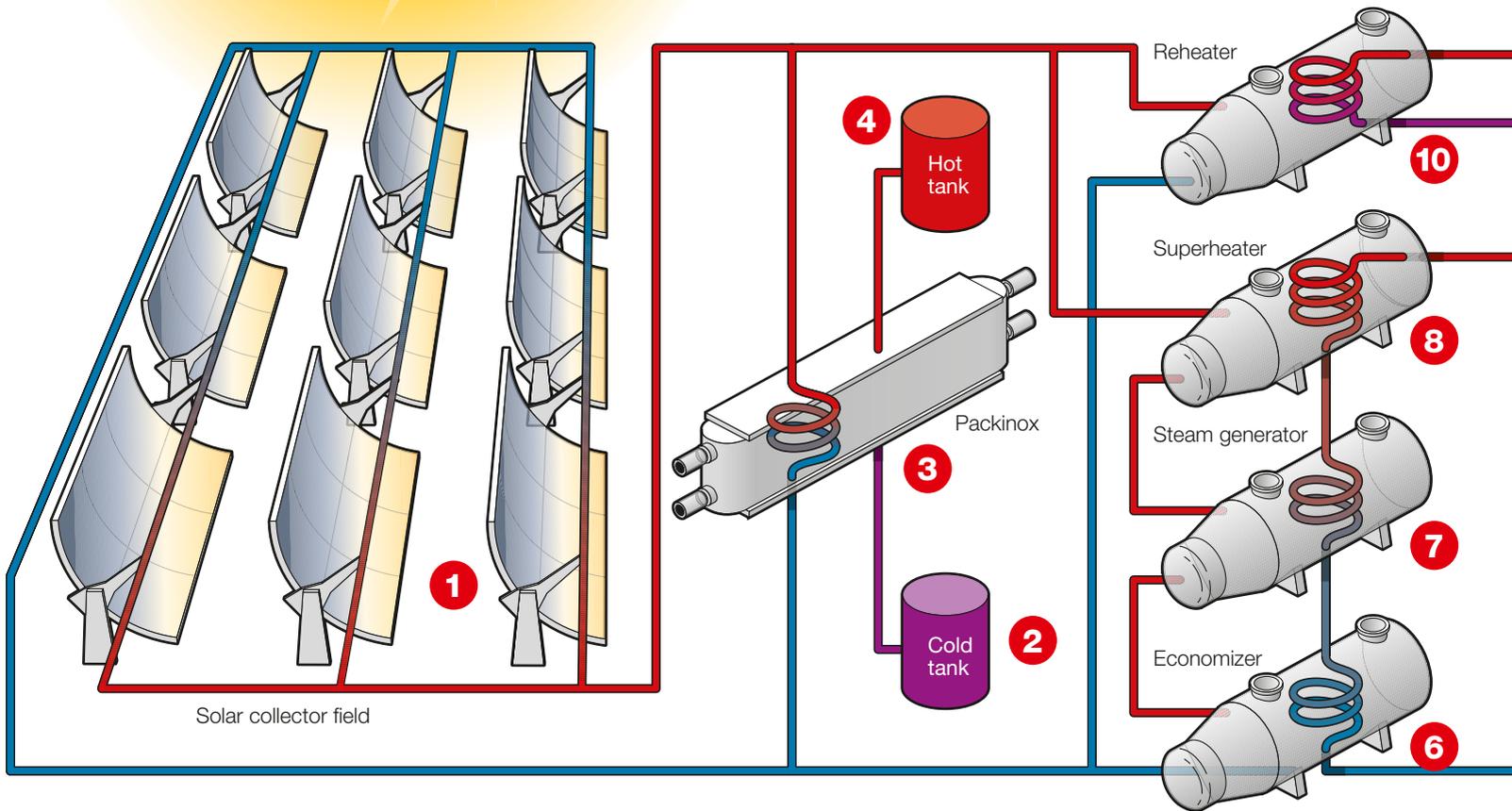
A solution from Alfa Laval increases the electrical generation time in concentrated solar power plants by 50 percent, making the sun a power source to be reckoned with. TEXT: ÅSA LOVELL ILLUSTRATION: ANDERS HUMLEBO

**CONCENTRATED SOLAR POWER**, or CSP, is one of the two main technologies to produce electricity from the sun's energy. Until recently, CSP has been used to produce electricity only when the sun was up. This has been a problem, since the production does not fully match the typical demand curve for electricity. A solution to the problem is to add

a thermal storage system based on molten salt, which allows the plant to generate electricity even when the sky is overcast and after the sun goes down without using a backup system powered by fossil fuels. This means the plant can operate for 18 hours straight instead of 12 hours – an increase of six hours or 50 percent. At the heart of

the thermal storage system is an Alfa Laval Packinox heat exchanger specifically developed for this application.

Thanks to recent acquisitions, Alfa Laval can also supply other vital equipment to CSP plants, including a variety of heat exchangers, condensers and dry coolers. ■



## This is how a CSP plant with thermal storage operates

**When the sun** shines, the solar concentrator field (1) heats up a circulating loop of thermal oil. Some of the heated oil is sent directly to the steam generator at the power island for immediate production of electricity. Excess heat is sent in parallel to thermal storage for later use.

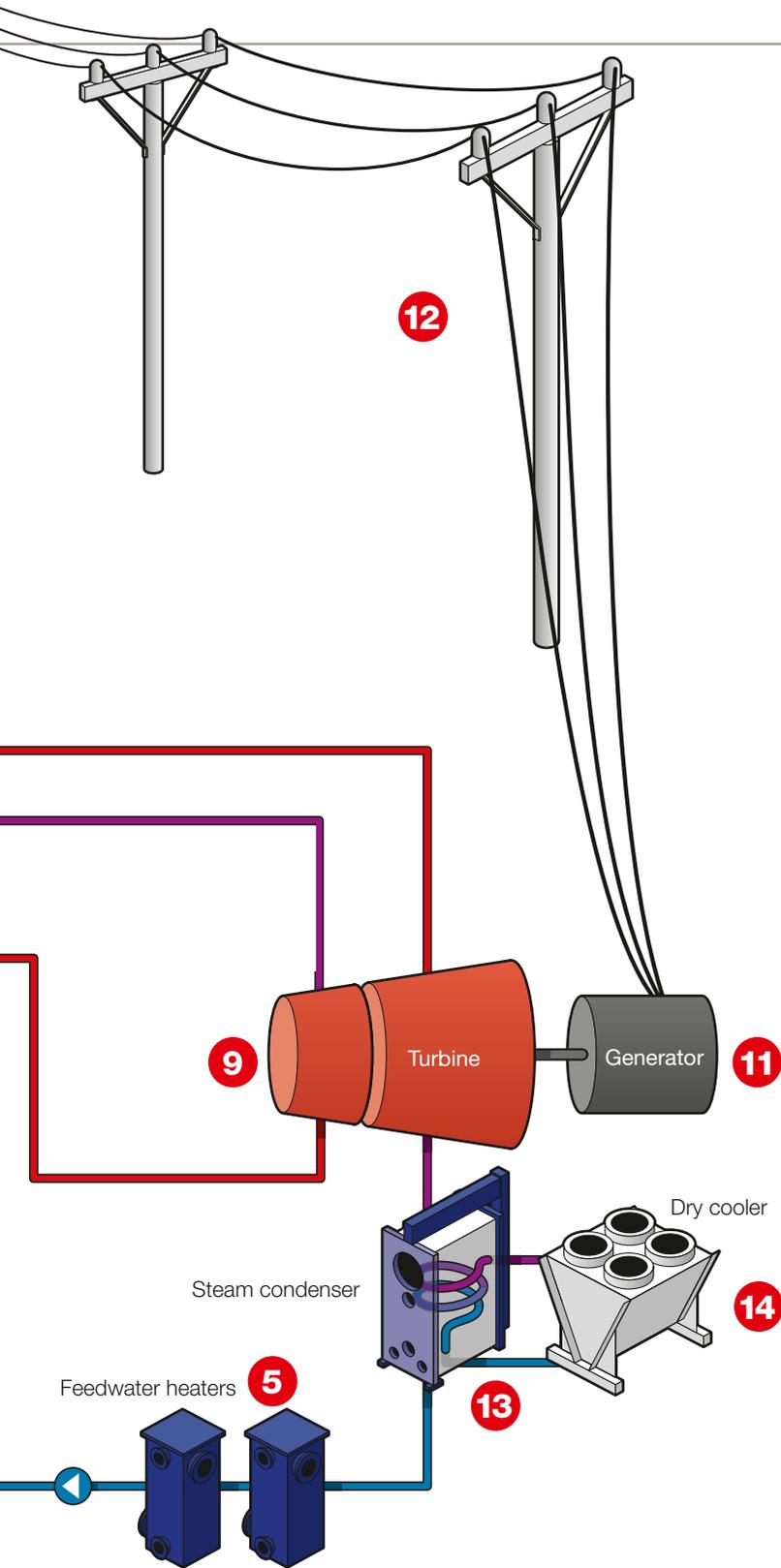
During the storage mode, salt is

pumped out of the cold storage tank (2), heated by the hot oil in an Alfa Laval Packinox heat exchanger (3), and then stored in the hot salt tank (4). On cloudy days and after sunset, the fluid circulation is reversed: Salt is pumped out of the hot tank, cooled in the oil-to-salt Packinox heat exchanger, then

stored in the cold tank. The heat energy contained in the hot salt tank is thereby transferred to the hot oil circuit, which in turn allows the generation of steam and the production of electricity.

In the steam process, water is heated into pressurized steam using a four-step process: First the

feedwater heaters (5), then the economizer (6) and the steam generator (7), and finally the superheater (8). After going through the first stage of the turbine (9), the steam is reheated in the reheater (10) before powering the second stage of the turbine, which in turn drives the generator (11) that



produces electricity. The transformer feeds the electricity into the transmission grid (12).

Steam that comes out of the turbine is condensed back into water. Since many CSP plants will be located in desert environments, Alfa Laval offers a solution that minimizes the use of water in this

process. It combines an Alfa Laval AlfaCond steam condenser (13) and an Alfa Laval dry cooler (14), which uses air instead of water as cooling medium, to handle the vacuum condensing requirement. The only water used circulates in a closed loop running back and forth between the AlfaCond and the dry cooler.

THE ALFA LAVAL TECHNOLOGIES



**The Alfa Laval Packinox** weighs up to 350 tonnes, and one is usually produced to handle the required length of the thermal storage system.

The Packinox offers better thermal efficiency than shell-and-tube technology, which means more energy can be stored in the same mass of salt, and the steam produced at night will have a lower moisture content, which translates into better-quality steam for producing electricity. The Packinox can also readily accommodate the internal 4 percent volume changes associated with salt freezing and melting. Moreover, the Packinox offers a single pass design that is self-draining. (3)

**The Alfa Laval Compabloc** is a compact plate heat exchanger that combines a range of technological advantages. Its corrugated plate pattern creates an exceptionally high degree of turbulence, which results in outstanding heat transfer efficiency. (5)



**The Alfa Laval Olmi** shell-and-tube heat exchanger is built to withstand high operating temperatures and pressures.

Designed to specific customer requirements, this type of heat exchanger is used in a wide range of power plants for heating, evaporating and condensing duties. (6,7,8,10)

**The Alfa Laval AlfaCond 800** is the world's first plate condenser specifically designed for condensing vapours into liquids at low pressure. (13)



**The Alfa Laval Fincoil Solar Max G** range of dry coolers is especially suitable

when high capacities relative to available space, low energy consumption and/or low sound pressures are required. (14)

# Equipped to handle pressure

The cooling solution for one of Singapore's latest iconic buildings – the Marina Bay Sands Hotel – called for one of the highest-pressure systems ever installed in the country. TEXT **ÅSA LOVELL** PHOTO **TIMOTHY HURSLEY**

**THE MARINA BAY SANDS HOTEL** in Singapore is no ordinary hotel. Besides being the largest hotel ever built in Singapore, with more than 2,500 rooms and suites, it is an architectural masterpiece, inspired by a deck of cards.

Three unique sloping towers hold a gigantic cantilever that is longer than the Eiffel Tower laid flat. The gigantic platform is home to the Sands Sky Park, comprising landscaped gardens with 250 trees and 650 plants, as well as exclusive restaurants and a public observation deck that can host hundreds of people. Moreover, on top of the platform hotel guests have the luxury of swimming in a 150-metre-long infinity pool, 200 metres above ground and with a stunning view over the Singapore skyline and the South China Sea, also called Marina Bay.

The hotel also includes a casino, theatres and the new ArtScience Museum.

Through Voltas Limited, a subsidiary of Tata Group, Alfa Laval has delivered heat exchangers and other equipment for the

cooling solution in the upper and lower hotel towers, the casino and theatres, the museum and the MICE (meetings, incentives, conferences and exhibitions) facilities. Alfa Laval has also provided a heat-recovery system for heating the water in the restaurant kitchen and the infinity pool.

In total, Alfa Laval delivered heat-exchange capacity of 115,600 kilowatts. "It has been impeccably installed and tested to the stringent conditions," says Kaustubh Tambe, Project Manager at Voltas Limited.

**TAMBE EXPLAINS** that it was Alfa Laval's long experience in heat exchanger technology, coupled with its local presence in Singapore and its large installed base that led Voltas to choose Alfa Laval's solutions.

A challenge was the very tight time schedule of delivery and installation, following a delay in the construction of the building. "Alfa Laval helped us from day one and acted as a partner in the complete, and

complex, project," says Tambe. "Alfa Laval helped during testing and commissioning with different practical things, such as verifying the actual parameters with software simulations, and it helped with the physical installation when the first seven units arrived at the hotel. It was a challenge to get all the units in place."

Another major challenge was to get the pressure right for the cooling solution, as the district-cooling provider for the hotel requested a single-loop cooling system to minimize the area needed for cooling equipment. This meant the design pressure had to be 25 bars. "This is one of the highest-pressure systems in use in Singapore," says SiewKien Chua, Equipment Division Manager at Alfa Laval in Singapore. "Before delivery the customer came to our factory to see for themselves that it really worked."

It did, and still does. At a prestigious hotel like the Marina Sands Bay there is no room for failure. ■



The luxurious Marina Bay Sands hotel has one of the highest-pressure cooling systems in use in Singapore.

# Groundbreaking decanter

Alfa Laval's new decanter cuts power consumption by 40 percent while improving performance.

**THE ALDEC G3 DECANTER**, Alfa Laval's third-generation decanter, is nothing less than a revolution in the world of wastewater treatment, cutting power consumption by up to 40 percent while improving performance on cake dryness. It targets municipal wastewater treatment plants primarily but is also aimed at industrial wastewater treatment plants.

"For the first time in history, it might actually be worth replacing an old decanter with a new one before the old one is completely worn out," says Bent Madsen, manager, Process & Technology, Product Centre Decanters at Alfa Laval. Madsen has worked on the development of the Alfa Laval Aldec G3. "It is quite unique that the investment in a new decanter pays off before the lifetime of the old decanter is up."

**TWO NEW FEATURES** make this possible – the Alfa Laval Power Plates and the Alfa Laval Slimline design. The Power Plates reduce the loss of kinetic energy when the liquid leaves the bowl, reducing flow-related power consumption by up to 20 percent. The Slimline design features a smaller conveyor diameter, which means there is room for more liquid in the pond, and the pressure on the bowl wall can be higher. This paves the way to either a drier cake or less use of polymer. The smaller discharge radius can save an additional 20 percent in power costs, and a drier cake helps solids handling and saves on transport costs.

"This is a product for customers who focus on their operational costs," says Brian Munch, business manager, Environment Technology at Alfa Laval. "Sometimes it's just a matter of making a simple calculation to know the actual impact on the operational costs."

The development of the Aldec G3 began some years back. Alfa Laval determined to develop an extraordinary product that would really make a difference, focusing on both

reducing power consumption and improving performance. "The large power consumption of decanters actually disturbs the separation process, so we figured if we could reduce power consumption we would improve the result as well," explains Madsen.

The final solution featuring the Power Plates and the Slimline design is actually quite simple – so simple in fact that the Alfa Laval Aldec G3 is often met with initial scepticism. When it was launched at a municipal wastewater exhibition in Munich, Germany, in September 2010, the customers invited to the launch couldn't believe that such a simple solution could make such a difference. "They first wondered 'Can that really be true?'" says Munch. "We have been facing a challenge of how slim we could make the conveyor design without losing its stiffness. But we have found a new way of doing this."

## Customer's voice



"We have recently tested the Alfa Laval ALDEC G3 decanter in our wastewater treatment plants in Klingnau, Killwangen and Neuenburg. The results from the first evaluations are good, although they are still to be verified. We could see a clear improvement in energy efficiency, while cake dryness is slightly higher and the decanter reliability is on par with the previous model. It is, however, too early to conclude anything regarding the use of polymer. "Overall it can be established that Alfa Laval, with its new generation of decanters, has taken yet another step into the future of wastewater treatment."

### Josef Brem

Owner, Brem ARA Dienstleistungen AG

The results speak for themselves. The Alfa Laval Aldec G3 has been tested in full scale at a wastewater treatment plant in Chicago, in the United States, with great results. And the first customers to buy and install the Aldec G3 have already seen the promised results. ■



## BENEFITS OF THE ALFA LAVAL ALDEC G3 DECANTER

- Reduces power consumption by up to 40 percent
- Increases capacity by 10 percent
- Bowl speed, conveyor speed, pond depth and feed rate can be combined to meet changing needs and conditions.
- Comes equipped with the Alfa Laval 2Touch controls package as standard. In addition, with the inclusion of Alfa Laval's Octopus autopilot system it is possible to monitor operations 24/7, maintaining peak efficiency and the lowest possible operating costs at all times.



Lee Yong-hee is senior vice president of operations at S-Oil, the third largest refinery in South Korea.



# A SOUTH KOREAN REFINING TIGER GROWS UP

S-Oil Corporation started out in the 1970s to deliver stable petroleum exports to a shaken market. Now it has matured into a global powerhouse that places a priority on product innovation and environmental accountability. ▶

TEXT: JOEL LEVIN PHOTO: JAE-HYUN KIM



S-Oil is gradually upgrading its plant in Ulsan to produce the type of products in demand by today's market.

In South Korea, a small, energy-poor nation of 49 million people, energy conservation has attracted a near-religious fervour. Sleek electric buses ply broad city streets. Towering wind turbines spin away on mountain passes. Automakers churn out high-tech electric and hybrid models, and authorities in the capital, Seoul, enforce office-building temperatures that can get downright steamy in summer.

Although Korea is a voracious consumer of energy, ranked 11th worldwide, the 2000 Kyoto climate change agreement ushered in a renewed emphasis on energy conservation and emissions reduction policies. This was followed by Korean President Lee Myung-bak's highly touted "low carbon, green growth" policy directive, which he put through after taking office in 2008. This emphasis on clean and green has had huge ramifications for the nation's oil refiners.

For its part, No. 3 refiner S-Oil takes pride in tightly controlling impurities in oil to achieve a very high-quality end product. It has earned praise from the government for its numerous greenhouse-gas reduction projects (reputed to make up 5.7 percent of all projects nationwide), which cut CO<sub>2</sub> emissions by 160,000 tonnes a year as of July 2010. It has also set up a dedicated energy management department and committee to focus on mid- and long-term energy-cutting plans and activities. As a result, in 2009 alone S-Oil saved 14,467 tonnes of oil equivalent (TOE). S-Oil is continually seeking ways to

improve energy efficiency and environmentally friendly manufacturing, techniques and equipment, says Lee Yong-hee, senior vice president of operations, from his office in the company's Onsan plant on the edge of Ulsan City, the hub of Korea's industrial southeast.

**S-OIL WAS FOUNDED** in the depths of the 1970s oil shocks as a way to help stabilize the nation's petroleum supply and by 1980 had achieved commercial production of 60,000 barrels a day.

As was – and still is – the norm in Korea's *ppalli-ppalli* ("hurry, hurry") society, the little oil firm had no time to waste. It started up lube base oil and petrol plants, then entered the local lubricants market, and soon began producing high-octane gasoline. On the strength of its lube base oil business, S-Oil went on to produce an array of high-end lubricant products that made it internationally competitive.

A joint venture with a subsidiary of Saudi state oil firm Aramco in 1991 assured S-Oil a stable oil supply for decades to come. It embarked on a second growth phase, building a large-scale bunker C oil cracking plant. A xylene plant capable of producing 650,000 tonnes of paraxylene opened in 1997, serving to ramp up its xylene (BTX) product line.

To stay competitive, S-Oil, like most South Korean refineries, is upgrading its plant to produce the types of light, clean products demanded by today's market. In 2010, it

broke ground on a 1.4 billion won (EUR 894 million) benzene, toluene and BTX plant addition, which went online in April. Located at the Onsan complex, the upgrade will allow S-Oil to turn out 900,000 tonnes a year of paraxylene and 280,000 tonnes a year of benzene when running at full capacity, boosting the company's total production capacity to 670,000 barrels per day (bpd), up from 585,000.

In tandem with its production growth, S-Oil's distribution network has mushroomed to include more than 1,860 service

Cont. page 22 ►

## S-OIL CORPORATION

**Location:** Ulsan, South Korea

**Core products:** Petrol and premium petrol, bunker oil, kerosene, naphtha, lubricants, lube base oil, benzene, toluene and xylene

**Number of employees:** more than 2,500

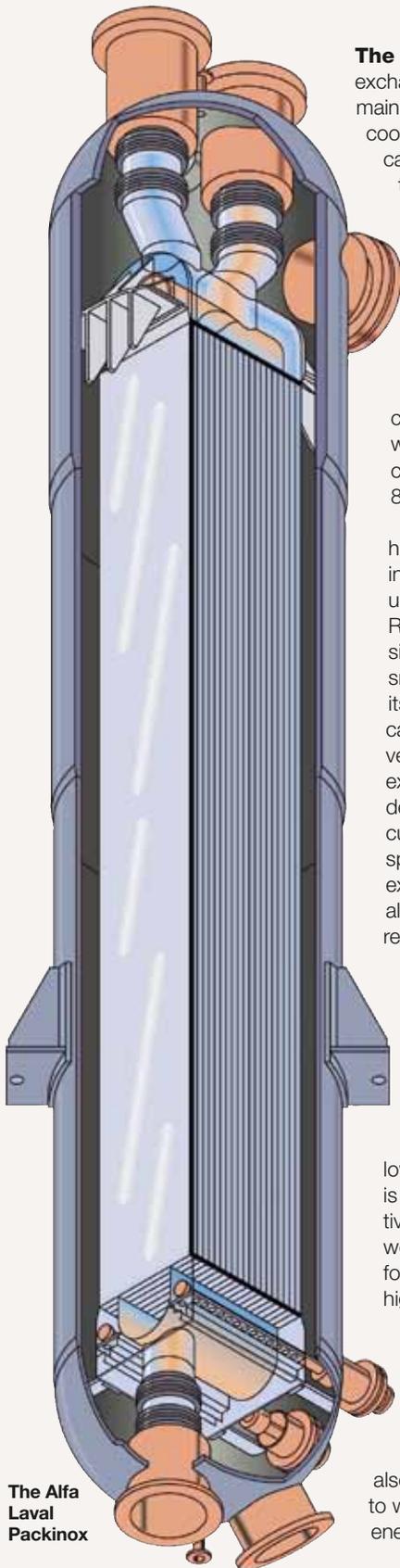
**Crude distillation capacity:**

580,000 barrels per day (which will increase to 630,000 bpd when a new BTX plant opens in mid-2011)

**More:** S-Oil has an affiliation with Total of France (S-Oil Total Lubricants) and a fully owned overseas subsidiary, S-International Ltd.

# Tailor-made giants

Alfa Laval's huge Packinox heat exchangers offer customers a purpose-built solution created especially to their requirements.



The Alfa Laval Packinox

**The Alfa Laval** Packinox heat exchanger is one of a kind. Used mainly for preheating and after-cooling of substances for different catalytic processes, this gigantic piece of equipment can be more than 25 metres long and more than 5 metres in diameter.

In 2011, Alfa Laval will deliver the largest Packinox heat exchanger built so far to an Indian refinery. When completed the heat exchanger will weigh 450 tonnes, which corresponds to the weight of 83 Indian elephants.

Each Packinox unit includes hundreds of plates, amounting to a heat exchange area of up to 16,000 square metres. Regardless of its enormous size, the Packinox has a very small footprint in relation to its performance. One unit can replace four of the largest vertical shell-and-tube heat exchangers, which results in decreased capital costs for the customer. It also reduces the space needed: A Packinox heat exchanger can typically fit into already existing plants, and by replacing several bulky shell-and-tube heat exchangers with one Packinox it is actually possible to expand the capacity within the current production facility.

**Moreover,** transport and installation costs are lower, and no piping duplication is required. The Packinox's relative compactness and lighter weight limit project costs for the foundation structure, and its high thermal efficiency allows downsizing of process heaters, coolers and compressors.

The Packinox offers excellent heat recovery with very low pressure drop. It also enables other equipment to work less, resulting in fuel and energy savings. In addition, it is a

safe solution: Its double containment design and low number of flanges cut the risk of leakage, thereby reducing any fire hazard and promoting safer working conditions.

**Every Packinox** heat exchanger is unique, built according to specific customer requirements. Size, plate pattern and other parameters vary from one unit to the other.

"Since each customer's needs are different, every project is a new challenge," says Perre-Xavier Bussonnet, Technical Manager at

Alfa Laval Packinox in Chalon sur Saone, France. "We have developed sophisticated and powerful software for calculating the optimal design and predicting the effects of different operating conditions."

Since Alfa Laval acquired Packinox in 2005, more than 150 Packinox heat exchangers have been delivered to customers within the refinery, petrochemical, oil and gas industries. The most common application is catalytic reforming, a process that produces a high-octane gasoline from naphtha (low-octane gasoline). ■

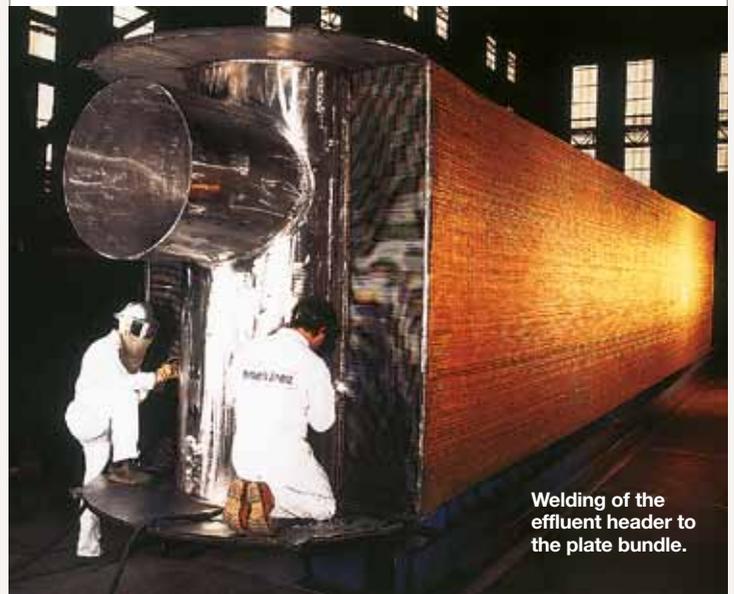
## AN EXPLOSIVE PRODUCTION

**Producing** a Packinox heat exchanger requires purpose-built facilities and specialized techniques. Because of its size, there are no machines large enough to make the plate patterns. Instead, the patterns are formed by a unique process that involves blasting according to a mould.

The plate is placed on a rig above the pattern mould used for that plate. A fuse is carefully placed over the plate to give the plate the exact pattern in the

explosion. The whole package is then lowered into a pool of water, where the fuse is detonated.

After forming, the plates are sent for automatic welding in the world's largest bundle welding press. In the assembly workshop the plates are then welded together into huge units. After passing a series of inspections, the plate bundle is inserted into a pressure vessel. Additional checks are carried out, and the heat exchanger is prepared for transport.



Welding of the effluent header to the plate bundle.



Lee Yong-hee, senior vice president of operations at S-Oil, says his company is continually seeking ways to improve energy efficiency.



S-Oil uses Alfa Laval Packinox heat exchangers in critical areas of the refining process.

▶ stations across South Korea, holding some 14.5 percent of the local market. But a sizable 60 percent of its business now takes place overseas, in markets stretching from Japan and China to Australia, India and the United States.

Senior VP Lee explains that, in response to rising energy prices and tough regulations, the BTX plant addition will use environmentally efficient equipment to the greatest extent possible, including three Alfa Laval Packinox heat exchangers, which have arrived after a nearly three-month-long journey from Europe by land and sea.

Construction of the BTX plant was streamlined by applying some existing schematics that called for using certain equipment and designs similar to those in existing facilities.

**THE EXPANSION SUPPORTS** CEO Ahmed Subaey's vision of achieving "sustainable, profitable growth" by developing new growth sectors, including new and renewable energies, and working more closely with the petrochemical sector.

It's an attainable vision, but it won't be easy. According to the Korea Energy Economics Institute, local refiners must cope with myriad challenges, including oil's shrinking slice of the energy pie due to a growing reliance on natural gas and nuclear power, the government's heightened focus on alternative energies such as solar power and wind power, and a fast-ageing population that will shrink starting in 2019.

**“The Packinox unit has very high heat efficiency, so we gain a lot on energy savings.”**

HK KIM, S-OIL

Through such expansions, however, the fixed costs associated with new facilities can be sidestepped and economies of scale realized. The latest addition comes only two years after S-Oil opened a new alkylation plant yielding 9,200 bpd of alkylate, a clean-burning petrol feedstock.

The application of Packinox heat exchangers is part of S-Oil's energy-savings efforts. By recycling the thermal waste heat generated during refinery operations as process heat, these units help to reduce the need to burn fuel, which in turn reduces harmful emissions.

Once the new BTX plant goes online, the Onsan plant will contain seven of these heat-exchange units, including three at the new plant addition and two replacements of older units that had fulfilled their effective operating lifespan.

**WHILE SHELL-AND-TUBE** heat exchangers still have a place at S-Oil as a traditional solution, Lee Jin-woo, an Alfa Laval representative in Korea, explains that Packinox is used "in critical areas where there are heavy pressure requirements and large-surface heat exchangers" of more than 300 psi and 60,000 square metres, respectively. The design configuration of large metal plates welded into a plate pack and fitted into a larger plate vessel results in

very efficient heat recovery in a compact size that can handle large throughputs.

S-Oil and Alfa Laval's ties date back to 1989, when the refiner bought its first two Packinox units, models E-40101 and E7201 A/B.

"Alfa Laval is the only one that has the [Packinox] unit," says HK Kim, an S-Oil engineering manager. "It has very high heat efficiency, so we gain a lot on energy savings."

Although the Packinox units are nearly maintenance-free, Alfa Laval fields a local Korean agent, Lee Jin-woo, who is dedicated to servicing Packinox customers. Senior VP Lee Yong-hee describes him as "the communication door."

"There's a sense of words [between us] that Western people cannot sometimes understand," he says, indicating his preference for doing business in his own language – something that Alfa Laval readily provides. In addition, a full complement of support staff is on hand in the country to respond to and service most requests.

Although some of business in Korea still gets done in smoke-filled taverns over barbecued pork belly and shots of fiery rice wine, there's little secret to this long-standing relationship. As Kim puts it, "Alfa Laval's technical service is very good. When we have a question, they provide help right away." ■



“We value the Alfa Laval team’s solution-oriented methods. They are proactive and come forward with thoughtful proposals and ideas.”

GEOFF CONRAD, CUMMINS

Many gigantic mining haul trucks are equipped with Cummins’ diesel engines, including the Alfa Laval Eliminator filter.

# ELIMINATOR PARTNERS

In late 2010 global power leader Cummins installed the 5,000th Alfa Laval Eliminator filter on one of its engines. What started as a collaborative effort between the two companies has turned into a rewarding partnership and a true success story.

TEXT: NOREEN COMERFORD, ÅSA LOVELL PHOTO: GETTY IMAGES

**US DIESEL ENGINE** manufacturer Cummins provides engines for nearly every type of on- and off-highway application – ranging from fire engines to 360-tonne mining haul trucks and continuous power generation plants to sophisticated offshore support vessels.

Adding value for the customer is basic to the Cummins business philosophy. “We don’t look at Cummins’ critical success factors,” says Geoff Conrad, General



Geoff Conrad

Manager of Commercial Marine Globally at Cummins. “We look at our customers’ critical success factors.”

A Cummins engine must be well engineered and thought-out, with validated quality and proven durability, he says. But most importantly, the engine has to add value to the customer by lasting longer and being more reliable than competing products.

The Alfa Laval Eliminator filter meets all these requirements. Developed in the 1990s in a collaborative effort between

Cummins and Alfa Laval, the Eliminator was the first full-flow automatic backflush and combined centrifuge-lube oil filter for the high-speed engine industry. The high-efficiency centrifuge reduces particles to below two microns. The Eliminator may be bolted to the engine or fitted as an upgrade, and it is used in the treatment of lube oil in many applications, including the railroad, mining and marine industries.

The estimated return on investment for the Eliminator is on average 18 months to two years.

“The Eliminator adds clear value,” says Conrad. “It eliminates the customers having to dispose of cartridge filters, eliminates man-hours, greatly increases uptime, eliminates the risk of contaminants entering the lube oil system and optimizes both the cost and the process overall. These added values are the main reason for the success of this innovation.”

And the success is evident. In December 2010, Cummins and Alfa Laval celebrated the production of the 5,000th Eliminator filter used with Cummins’ engines.

“We value the Alfa Laval team’s solution-oriented methods,” says Conrad. “They are

**CUMMINS INC.**

**Founded:** 1919  
**Headquarters:** Columbus, Indiana, USA  
**Business:** Designs, manufactures, sells and services diesel engines and related technology  
**Markets:** About 190 countries worldwide  
**Net income:** 428 million US dollars (2009)  
**Employees:** 40,000 worldwide.

proactive and come forward with thoughtful proposals and ideas. They listen, respond and take the time to understand our challenges, and then they work on a solution to these challenges.”

The Eliminator is an excellent example of how the partnership works. The filter was originally created for Cummins’ larger engines, but on request Alfa Laval developed the same solution for the company’s smaller engines, the Eliminator T160 – a “baby” Eliminator based on the original design premise. “This is now available on our 19L engine,” says Conrad.

Cummins also uses other products from Alfa Laval as critical systems, such as Alfa Laval heat exchangers for cooling for its marine engines.

The partnership between Alfa Laval and Cummins continues. “We are encouraging Alfa Laval to grow with Cummins as we evolve into new products, locations and regions of world,” Conrad says. “Cummins’ customer base is changing, and as long as Alfa Laval strives to find customer solutions with us, there is no reason why the partnership should not be successful.” ■



# No more WINE up in SMOKE

Each year smoke taint ruins vast quantities of wine worldwide, causing huge financial losses. Until now, there has been no satisfactory solution, but a new method by Alfa Laval may prove to be a breakthrough.

TEXT: ULF WIMAN PHOTO: GETTY IMAGES ILLUSTRATION: ANDERS HUMLEBO

**TASTE IN WINE**, as in other things, is highly subjective. However, it is a safe bet that bouquets of burnt bacon, sweaty socks and ashtrays have little mass appeal. These are some of the flavours associated with smoke taint in wine.

Each year around the world, smoke taint from wildfires adjacent to vineyards renders huge quantities of grapes and wine useless, causing severe financial damage. For example, it is estimated that bush fires in the King and Alpine valleys in Australia in 2007 caused the local wine industry to lose as much as 90 million Australian dollars.

Similar smoke taint in wine may be caused by contamination by wild yeasts of the *Brettanomyces bruxellensis* type. And this problem has spread markedly during the

past few years, according to Rolf Zimmermann, leader of the wine analytics team, and Katharina Schneider, technical assistant with the Agroscope Changins-Wädenswil Research Station (ACW), which is one of five Swiss Federal agricultural research stations. It has carried out *Brettanomyces* research for more than 10 years.

Unfortunately, the warming climate is set to aggravate the smoke taint problem, both as it contributes to the risk of wildfire and as it encourages the propagation of yeast. "This type of yeast is mostly found in warmer viticulture regions, so climate change could further propagate the problem," says Schneider.

This makes the future look rather bleak for wineries left with large quantities of smoke-

tainted grapes or wine, especially as there is currently no satisfactory solution on the market.

Says Zimmermann: "Today there are no real solutions for the treatment and rectification of smoke-tainted wine. The use of clarifying media such as activated charcoal, bentonite or similar products has not brought the desired success. The best choice has been to filter the wine and subsequently mix it with a taint-free wine to bring the smell and taste below threshold values."

Reverse osmosis filtration has been used, but not only is this costly and energy-consuming, but the process may also remove desired flavour and texture along with the smoke taint. The winery might end up with



Smoke taint from wildfires around the world renders huge quantities of grapes and wine useless.



**“The results look promising. The filtered wine contains practically no undesirable substances.”**

KATHARINA SCHNEIDER, ACW

lower-quality wine that could be sold but would likely damage the wine’s brand reputation.

Another solution has been to filter the wine and then distil it, but apart from being energy-consuming, this subsequently causes problems with tax regulations.

Now, at last, the wine industry’s search may be over. In cooperation with ACW, Alfa Laval has developed a solution that promises to be a breakthrough in treating smoke-tainted wine, whatever the cause. “This approach uses a nanofiltration membrane and a natural absorbent to remove only the flavour components causing the smoke taint,” explains Bruno Klaus, Portfolio Manager Membranes Alfa Laval. “The benefits include significantly reduced power consumption compared with reverse osmosis and distilling plants. Not having to distil inferior wine, the winery can also avoid any implications with customs and excise. And importantly, it is a lot easier on the wine.”

What originally set the ball rolling was an enquiry received by Alfa Laval’s Australian

sales company about a membrane suitable for removing smoke taint. “We started screening our membrane portfolio,” Klaus says, “but to develop the right one for this application we had to bring in outside help for the testing.”

Based on ACW’s know-how in this particular area, Klaus set up a partnership with the institute. ACW has since conducted thorough tests to find the right membrane type, and now it looks as if it is getting there.

“We’ve found a membrane that is practical for filtering out the smoke taint,” Schneider says. “The results look promising. The filtered wine contains practically no undesirable substances and can be restored into the residual wine. There are still some points where further clarification is necessary, but so far, we’re excited about the results.”

The initial tests of Alfa Laval’s membrane technology should certainly instil hope in the wine industry. While flawed wine can never be turned into top-quality wine, Zimmermann says, “just being able

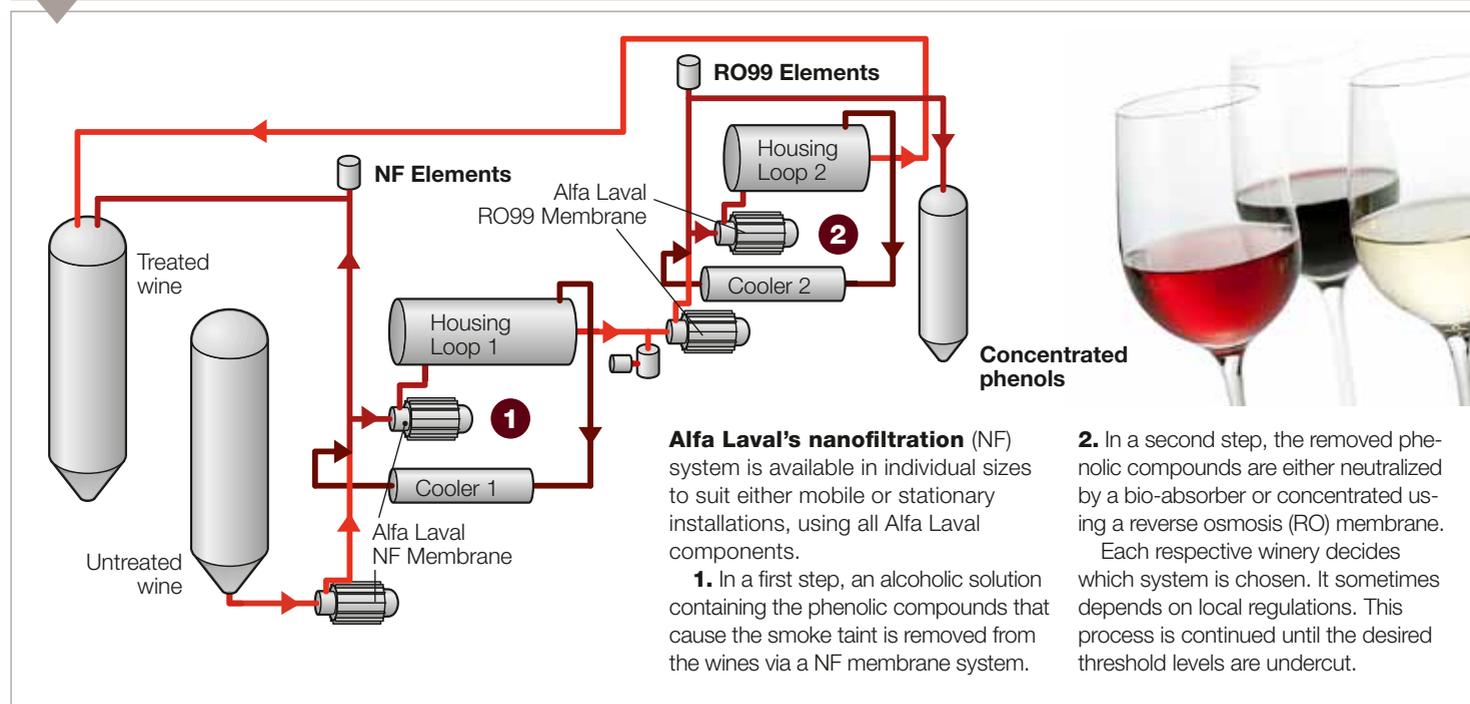


Rolf Zimmermann of the Swiss research institute ACW says the Alfa Laval solution shows great promise for wine makers.

to turn it into sellable wine would be extremely valuable for the wine industry.”

With the newly developed nanofiltration membrane at the core, Alfa Laval is preparing to go to market with its solution for smoke-tainted wine. “There are still some endurance tests,” Klaus says, “but once they’re finished, we can provide all the necessary components. I have already started discussions with interested system builders targeting the wine industry.” ■

**ALFA LAVAL’S SOLUTION FOR REMOVING SMOKE TAINT IN WINE**





## Hygienic design

# Improves safety and reduces costs

Product safety and cost-effective production are major issues for the pharmaceutical industry. Hygienic equipment design addresses both issues simultaneously.

TEXT: DAVID WILES PHOTO: ALFA LAVAL

**CONTAMINATION OF MEDICINES** by bacteria, cleaning chemicals or other products can lead to illness and even death amongst patients. Such avoidable tragedies can also lead to high compensation costs and reduced consumer confidence in the companies involved.

At the same time, pharmaceutical companies are facing continuous pressure to reduce their use of and thereby their costs for raw materials, energy and water, and there is a drive to get the most out of raw materials. Cleaning in particular is a major expense for these companies, consuming water, electrical energy and time.

Companies in the pharmaceutical industry are starting to wake up to the possibilities of

tackling the issues of contamination and cost at the same time through the use of equipment designed and built with hygiene in mind. "Many of our end users are beginning to understand that it is the small details in hygienic design that are important," says Per-Åke Ohlsson, Global Manager market unit Pharma & Personal Care at Alfa Laval. "It is not just the equipment itself but its cleanability, the quality of raw materials, its surfaces, how it is manufactured and how it matches the other stages of the production process that affect product safety. This applies not only to the pharmaceutical industry but also to the food industry."

Centrifugal pumps, as an example, are

potential sources of contamination because of the presence of small crevices where bacteria or contaminants from previous manufacturing cycles can accumulate.

"Normally you clean your system in place without disassembling it," says Ohlsson. "The cleaning liquid circulated in the system cannot always reach to the bottom of a crevice to clean it. When you introduce your next medicine, the residue left in the crevice will contaminate it."

Industry regulations demand that equipment be designed so that it can be easily and thoroughly cleaned. Improved product safety through hygienic design will also reduce manufacturing costs. "A component that is



“We are both increasing safety through better coverage and cleaning of the tank and reducing consumption of cleaning liquids and water.”

PER-ÅKE OHLSSON, ALFA LAVAL

accumulate on the heat exchanger's surface.” And because the Pharma-X does not need to have bacteria flushed out at regular intervals, large savings in water use are achieved.

Another unique product that helps minimize product contamination is the MM UltraPure magnetic mixer, which has a levitated design where the impeller is floating and has no contact with the male bearing. On traditional magnetic mixers the impeller is supported and in contact with the male bearing.

“This makes it difficult to drain and clean and also generates wear particles,” says Ohlsson. “The levitated design solves this problem with a magnetic coupling that lifts the impeller from the surfaces of the bearing to make it easier to clean and drain.” The design also minimizes wear particles and makes it possible to operate the mixer at a very low velocity. This gives a very gentle product treatment and improves the yield from the raw material.

**ALFA LAVAL'S TANK-CLEANING** products contribute to improved hygiene in the pharmaceutical industries while having a considerable impact on water and energy costs. By using SaniJet rotary jet heads, one drug manufacturer reduced cleaning time by 70 percent, while using just a tenth of the water and heating energy compared with its previous solution, which consists of static spray balls. “These nozzles give a very high impact on the surface and operate in a three-dimensional and very precise pattern,” says Ohlsson. “So we are both increasing safety through better coverage and cleaning of the tank and reducing consumption of cleaning liquids and water.”

The tubes and fittings that link the various components together are often neglected by the pharmaceutical industry, but these can be a major source of contamination. In many systems these parts can account for some 90 percent of the total product wetted surface.

“A tube is not just a tube or a piece of metal with a hole through it,” says Ohlsson. “What is important is how the tubes are polished and cleaned, how they are manufactured and the quality procedures that secure high-quality raw materials and manufacturing

procedures.” Alfa Laval's tubes and fittings are backed up by a rigorous quality system with 100 percent inspection and well-proven and validated standard operating procedures.

**STRICT REGULATIONS** have made the pharmaceutical industry somewhat slow in moving over to new technologies. The European pharmaceutical industry is at the forefront in adopting new technologies for improved product safety and cost-efficiency, such as improved hygienic design and continuous manufacturing instead of batch manufacturing. Also, the pharmaceutical authorities are now trying to change the conservatism in the industry in order to improve both safety and efficiency. New regulatory initiatives are being presented, such as the US Food and Drug Administration's “PAT [Process Analytical Technology] – A Framework for

*Cont. page 30* ▶

difficult to clean requires more cleaning liquid and water as well as more time, and so it costs more,” says Ohlsson.

One example of a hygienically designed plate heat exchanger is Alfa Laval's unique Pharma-X, a point-of-use cooler, specially designed for pharmaceutical water systems. It boasts a number of features that eliminate the risk of contamination, such as the sub-loop design, where water flows continuously in the heat exchanger, even when on standby, and because of this the water temperature is always more than 65 degrees Celsius. This means the typical bacteria found in pharmaceutical water systems cannot grow.

“Standard shell-and-tube heat exchangers don't have much turbulence, and therefore bacteria can accumulate in the form of a biofilm,” says Ohlsson. “With the Pharma-X, we have also increased the turbulence in the heat exchanger, minimizing bacteria that





# Unique design adds value

Alfa Laval's Unique Diaphragm Valve UltraPure helps German pharmaceuticals giant Bayer HealthCare keep its processes free from contamination.

TEXT: DAVID WILES PHOTO: GETTY IMAGES

After 20 years of using Alfa Laval's Unique UltraPure valves, Bayer HealthCare knows they are highly reliable.

**AT BAYER HEALTHCARE'S** state-of-the-art fermentation plant in Wuppertal, Germany, quality and hygiene are paramount. As part of its efforts to ensure that its highly advanced lab-to-large-scale fermentation equipment is free from contamination, Bayer HealthCare relies on Alfa Laval's Unique Diaphragm Valve UltraPure. It has done so for 20 years.

"We have used Unique DV-ST UltraPure valves for a long time, so we know that they are highly reliable and that the membranes are long-lasting," says Horst Neuland, chief plant engineer in Wuppertal. "We appreciate the simplicity of the valve design and the

flexibility of operation afforded by the valve actuators."

The plant uses Alfa Laval valves in its product lines, WFI water systems, demi water systems and steam systems for all its fermentation processes. The design, reliability, versatility and ease of maintenance make the Unique DV-ST UltraPure valve ideal for Bayer HealthCare's high-purity fermentation applications.

The Unique Diaphragm Valve UltraPure range, with its forged and welded valve bodies, meets the requirements of most sterile and ultra-hygienic processes used in the biotechnology industry. These compact, lightweight valves are modular in design, enabling a wide range of purpose-built configurations. The range delivers documented, reliable and contaminant-free performance.

**A KEY CHARACTERISTIC** of the range is its compact, lightweight design, which enables Bayer HealthCare to cut material and installation costs. Weighing 62 percent less than conventional welded T or block valve bodies, the diaphragm valves do not add material stress to the installation. "This is by far the smallest and lightest product on the market," says Neuland. "It makes installation and service easy and prevents unnecessary stress on the piping system."

Because the forged body of the Unique

DV-ST UltraPure is machined from a single piece of metal, the risk of bacterial contamination is eliminated.

The range's compactness also reduces the cost of sterilization, as less energy is required to heat and cool valves with lower mass and lower weight. And because less energy is required to heat the valves to the required temperature, less time is required to sterilize them. For a standard process line, sterilization is quick – generally about 20 to 40 minutes – depending on the application, temperature, media and other factors.

**THANKS TO THE UNIQUE** design that offers easy access, the valves' membranes are easy to service, requiring about five to 10 minutes per valve for replacement. This reduces downtime and cuts maintenance costs.

An adjustable spring, standard on all diaphragm valve actuator types, drastically reduces wear, downtime and maintenance costs for the Unique DV-ST UltraPure. The spring relieves process pressure on the diaphragm and protects it against overstress. "We don't have to stop fermentation processes as often to change the membranes on these valves, and the valves themselves last longer," says Neuland. "This translates to minimal downtime, lower overall costs, increased productivity and higher profitability." ■

## BAYER HEALTHCARE

A subsidiary of Bayer AG. Maintains facilities on five continents.

**Headquarters:** Leverkusen, Germany

**Divisions:** Animal Health, Bayer Schering Pharma, Consumer Care, Diabetes Care

**Number of employees:** 53,400 in more than 100 countries

**Turnover:** EUR 15,988 million in 2009

**Top-selling products:** Yasmin/YAZ/ Yasminelle (women's health care), Betaferon/Betaseron (speciality medicine), Kogenate (speciality medicine).

## HYGIENIC DESIGN

**“We have a very detailed and thorough documentation on our products, called Alfa Laval Q-doc.”**

PER-ÅKE OHLSSON

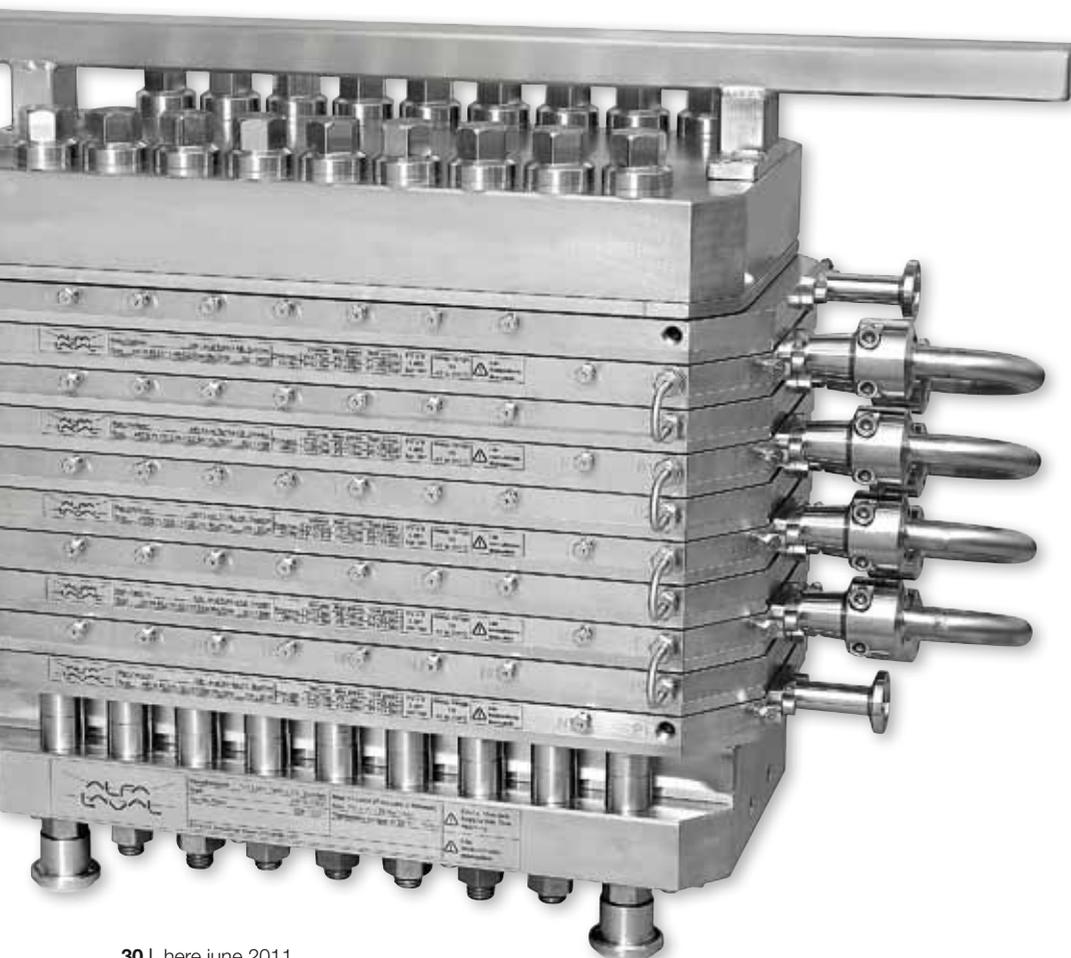
Innovative Pharmaceutical Development, Manufacturing and Quality Assurance” and ICH Q8-Q11, which covers a risk-based approach to development and manufacturing of drugs.

**SURVEYS SHOW THAT** companies are not expecting any revolutionary changes in the kind of equipment they use in the near future, but rather small incremental improvements. Probably these improvements will be seen in equipment designs that facilitate the new regulatory initiatives, such as Alfa Laval’s new ART Plate reactors for continuous-flow chemistry, which contribute to improved efficiency, safety and product quality. By adopting a risk-based approach on equipment design to prevent contamination, both equipment supplier and the pharmaceutical industry will focus more on hygienic equipment designs.

Another area that will come more into focus is documentation of equipment. It is only with correct documentation that it is possible to perform an accurate risk-based analysis on contamination risks from equipment. “We have a very detailed and thorough documentation on our products, called Alfa Laval Q-doc,” says Ohlsson. “We explain, for example, which materials we use, how we manufacture our components and how we control the quality of incoming and outgoing goods. By having this information it is possible to evaluate if there are risks for contamination.”

Contamination could come from the material itself or from additives that have been used during manufacturing. “The documentation certifies that the equipment

has been fully controlled and manufactured in accordance with validated standard operating procedures,” says Ohlsson. “This gives full transparency and long-term peace of mind and further contributes to product safety.” ■



### RANGE OF PRODUCTS

**Alfa Laval’s range** of hygienic design products for pharmaceutical industry includes:

- **Tank equipment**, including tank cleaning devices, agitators and mixers, access covers, instrumentation and other tank accessories
- **Pumps** in all categories, such as centrifugal, liquid ring and positive displacement pumps
- **Heat exchangers**, such as shell-and-tube, gasket and welded plate, spirals, and brazed and fusion-bonded heat exchangers
- **Valves** with related automation, including diaphragm, seat, sampling, regulating, ball and butterfly valves
- **Separation and filtration systems**, from laboratory scale to full scale.
- **ART Plate reactors** for continuous-flow chemistry reactions.



# Mixer improves output

Since introducing Alfa Laval's UltraPure magnetic mixer to its vaccine production process, Colorado Serum has seen its output increase beyond all expectations.

Microbiologist Annie Ewing says the Alfa Laval magnetic mixer has increased cell count by up to 50 percent.

TEXT: DAVID WILES PHOTO: RALPH OZZIE OSWALD

**WHEN COLORADO SERUM**, a US biotechnology company that produces veterinary vaccines and medical instruments, was looking to replace its bioreactor mixing system, it chose Alfa Laval's UltraPure Magnetic Mixer. The result is that the company is achieving a 30 to 50 percent increase in dosage levels.

"It's amazing because we are now greatly improving our output, attributed solely to the mixer," says microbiologist Annie Ewing.

The mixer, which features a unique levitating impeller design, is part of a bioreactor used to produce a vaccine against leptospirosis, a bacterial disease transmitted through the urine of wildlife animals such as skunks and raccoons. The disease infects cattle and swine, causing kidney and liver failure and ultimately death.

Colorado Serum is a fourth generation, family-owned company based in Denver.

In 2009, the company management was looking to replace its existing bioreactor mixing system, and while researching options it came across Alfa Laval's magnetic mixing technology and determined that it was the perfect fit.

The bioreactor's mixing process always starts at very low revolutions per minute (r/min), which allows the organisms to acclimatize to their new controlled environment. By eliminating friction, the UltraPure's

levitating impeller design makes it possible to mix at velocities ranging from an extremely slow 10 r/min right up to 600 r/min. Via a series of gradual aeration additions and r/min increases, the biological growth can be accelerated.

**SINCE INSTALLING ULTRAPURE**, Colorado Serum has been mixing with greater levels of return.

"My organisms are highly aerobic and require the correct amount of oxygen at the right time to grow," says Ewing. "We've found that the mixer and proper introduction of air over increments of time provide the perfect combination to increase growth to levels never seen before at Colorado Serum. Specifically, the Alfa Laval mixer has allowed us to generate a greater cell count, which equates to more doses and vaccines that we can sell. We consistently see a 30 to 50 percent increase in cell count."

Colorado Serum, which produces a full range of large animal biologicals, large animal veterinary instruments, veterinary diagnostics, speciality products and laboratory reagents, has reported other benefits through using Alfa Laval's UltraPure Magnetic Mixer. Its levitating design provides better scale-up capabilities by allowing cultures to freely flow and prosper, while the

eight-wing impeller, and in particular its wing shape, eliminates cell shearing while allowing cultures to move and reproduce faster. As there are no entrapment areas or crevices, the mixer can be completely drained of product and cleaning solutions, while the open design ensures full coverage by the cleaning solution and aids the removal of product residues.

The company's next improvement will be to install a CIP bioreactor process. "We've achieved 50 percent yield improvements and know that by working with our process this can be improved further," says Ewing. "Maybe 75 percent is next." ■

## COLORADO SERUM

**Founded:** 1923, family-owned for four generations

**Number of employees:** 100

**Markets:** Worldwide

**Products:** 80 to 90 products, from serums to toxoids. The company is the exclusive US producer of anthrax spore vaccine, RB51, Case-Bac, Caseous D-T, bluetongue, ram epididymitis bacterin and West Nile virus antiserum.



# Biorefineries: DELIVERING THE GOODS

Goodbye pulp and paper, hello bioplastics, biofuel and fabrics. In the face of slumping prices and increased competition, and with consumers demanding more sustainable products, pulp and paper mills are being converted into biorefineries.

TEXT: DAVID WILES ILLUSTRATION: ROBERT HILMERSSON

**THE SPRAWLING, STEAMING MILL** at the mouth of the Mörrum River in southeast Sweden has been producing paper pulp for the European market for more than 50 years. But with the move towards reading online rather than in a paper format, the future of the plant, with its 420 employees, is under threat. So in December 2010 the mill's owner, Södra Cell, announced a seemingly minor conversion to the plant, with one of its lines switching from producing paper pulp to dissolving pulp for the production of textiles.

With its low-key announcement that it is entering the textiles business, the Mörrum mill is in effect becoming a biorefinery and thus part of a shift towards producing fuel, chemicals and materials from biomass rather than from petroleum.

Exactly what a biorefinery is is open to interpretation. For some it is a single facility, such as the Mörrum mill, where biomass – be it wood or sugar beet or maize – is processed into a wide spectrum of bio-based products. These can be high-value, low-volume products such as chemicals or materials, or low-value, high-volume products such as advanced biofuels. Niklas von Weymarn, of the VTT Technical Research Centre of Finland, takes the broad view. “I see the biorefinery as a concept,” he says. “It can be something on a drawing board or already in operation where many companies and factories are cooperating to refine biomass into high-value products.”

The pulp and paper industry has long looked into ways to maximize its turnover

with side streams such as the production of heat and power.

“These efforts have been going on for 100 years or more,” says von Weymarn. “But today the world looks different, and that opens up the demand for new solutions and more sustainability. The changing world now has a need for the kind of solutions biorefineries can provide.”

**BIOREFINERIES BASED** on various renewable raw materials are in operation or in the planning stages around the world, although some would argue that the true biorefinery has still to be fully realized. In the US, Cargill Dow is producing polymer of lactic acid (PLA) for making carpets, T-shirts, cups and other products from cornstarch. DuPont is



behind a similar polymer, called Sorona, from the same raw material. In the Nordic region, pilot-scale biorefineries are producing advanced biofuels, often with by-products of the pulp and paper industry as the feedstock.

While no one expects that the alternative fuels produced by some biorefineries – such as dimethyl ether (DME), methanol and Fischer-Tropsch diesel – will ever replace fossil fuels for energy, these facilities could replace today's oil-based chemicals and materials.

“Of the fossil-based raw materials – coal, oil and gas – 96 percent becomes energy and 4 percent chemicals and materials,” says Peter Axegård, Director of Business Area Biorefining at Innventia in Sweden. “That 4 percent could be completely green. Is that more important than producing 4 percent more green energy? Maybe it doesn't matter from a holistic perspective, but if you can make more money making interesting products, that of course is attractive.”

Von Weymarn adds that biorefineries can help the world meet the needs of its ever-growing population. “We need more energy, more food and more of these products that are made from oil. On the other hand we

## PRODUCTS AND EXPERIENCE FOR A GROWING SECTOR

**Alfa Laval's** involvement with biorefineries grows out of its long association with both the pulp and paper and the biofuels industry. Today Alfa Laval in the Nordic region supplies a range of technologies to pilot-scale facilities producing renewable fuels such as second-generation bioethanol and biodiesel.

“Our membranes, separators, heat exchangers and decanters are very important to biorefineries for two reasons,” says Thomas Svensson, Alfa Laval sales engineer for the Nordic region. “Firstly they help the process work reliably. But they also save energy, and this is so important because sustainability of these plants is key. There is no point having a bioethanol plant if you use more energy than you get out of it. By contributing to low energy costs we can help biorefineries become financially viable.”

Among Alfa Laval's customers is Denmark's Dong Energy, which has a pilot plant producing second-generation ethanol from hay, which uses decanters, spiral

heat exchangers, pumps, agitators and tank-cleaning equipment from Alfa Laval. In Piteå, in northern Sweden, Alfa Laval supplies spiral heat exchangers, Compabloc welded heat exchangers and AlfaNova plate heat exchangers to SunPine, which has pioneered a renewable diesel process technology using crude tall oil, a by-product of the pulp and paper industry, as feedstock. The main product of the process is crude tall diesel, which can then be converted into a renewable diesel fuel with a very low carbon footprint.

Alfa Laval's strength as a supplier to biorefineries comes from its broad and continually expanding product portfolio and its deep expertise in the area. The recent acquisition of an Italian tube heat exchanger manufacturer means Alfa Laval will be able to supply the full range of heat exchanger equipment for gasification processes to producers of biofuels such as DME (dimethyl ether) or methanol, with their particularly high-pressure and high-temperature conditions.



#### PRODUCTS FROM BIOREFINERIES

**Fuels**, including biodiesel, bio-DME (dimethyl ether) and bioethanol

**Fabrics**, including viscose

**Materials**, including carbon fibre and bioplastics

**Energy**, such as electricity and process heat

**Chemicals**, including levulinic acid, formic acid and diphenolic acid.

“Today the world looks different, and that opens up the demand for new solutions and more sustainability. The changing world now has a need for the kind of solutions biorefineries can provide.”

NIKLAS VON WEYMARN, VTT TECHNICAL RESEARCH CENTRE OF FINLAND

► know that the supply of oil has peaked or will peak soon, and so while we won't run out of oil, the price will go up. And I think this is the role of these biorefineries: to lower the pressure on oil with respect to these products that the planet's population needs.”

Biorefineries have proved themselves to be economically viable. Some, like the facility in Lenzing, Austria, which is the world's largest integrated pulp and viscose-fibre plant making textiles from wood, have high profit margins. The Lenzing Group announced in December 2010 plans to invest some 285 million euros in new production capacity worldwide to help it meet rapidly growing demand for man-made cellulosic fibres.

While those biorefineries in operation today making high-value products are doing

so without the need for government support, von Weymarn says that subsidies would help the expansion of the sector.

“Governments can help by supporting R&D and building the first factories, but I don't believe anybody thinks biorefineries will need support in the long run,” he says.

**UNLIKE THE RECENT** controversy over production of first-generation biofuels competing with food production, access to raw material is not an issue for biorefineries because of the relatively small size of the markets for the chemicals and material they produce. The market for carbon fibre for cars, for example, is overshadowed by the market for the fuel on which those cars run.

“There is a lot of raw material; the question

is what is the cost of the raw material and what is the economic situation,” says Axegård. “For instance it is impossible economically to make ethanol from wood in Sweden without subsidies. So you need something that is higher value. The trick is to find the right products and in some cases to develop the market, and that takes time.”

Von Weymarn says that most of the technology that will allow biorefineries to live up to their potential is already in place. “If you build a complete set of factories you are applying a lot of existing technology, and you might need a few new improved technologies. If you take the gasification route to diesel, the only technology you need to develop is for cleanup of one of the intermediate products.”

The big challenge, he says, is finding the right combination of players. “You need partnerships, and then you have a concept where the economics are feasible. It becomes easier when you go to higher-value products, but these do not turn up overnight. You need to make strategic alliances, and you need to understand the market. This is long-term development work.” ■

# Hooked on quality

When the time came for Tricom Agrochem to double its capacity, there was no doubt that Alfa Laval would get the order.

**FOUR QUESTIONS FOR CHETAN KOTHARI**, owner of Tricom Agrochem, a food processing company based in India.

**Why was Alfa Laval's fruit-processing line the best option for your new plant in Andori?**

"We selected Alfa Laval in February 2008 from amongst six vendors because our managing director had worked with the company for 25 years and was confident there would be no quality or technical problems. We definitely had a good comfort level with Alfa Laval, which was very important for our team. We also felt that because Alfa Laval is the local vendor, the responses and after-sales service would be better compared with the other vendors, who were from outside the country. The local presence of Alfa Laval as a reputable company made all the difference."

**What did you want to achieve with the processing equipment at the new plant?**

"We wanted a plant that could process mangoes, pomegranates, papaya, guava and tomatoes into pulps and juice and their concentrates. The final product from the plant had to meet the specifications of the international market requirements in terms of colour, aroma, taste and appearance. Assuming that the raw material was up to the required standard, the final product quality had to be ensured by designing the plant to have the right processing parameters such as surface areas, temperatures, pressure drops, flows and holding times."

**How well has Alfa Laval's solution lived up to your expectations?**

"We have been 100 percent satisfied with Alfa Laval's solution. That is why now, when we are doubling our capacity, we have decided not to involve other vendors and instead have given the order straight to Alfa Laval."

"Alfa Laval is very professional and committed to us, and Tricom's team is very satisfied working with that company."

**Can you foresee using Alfa Laval's processing equipment and solutions for other plants?**

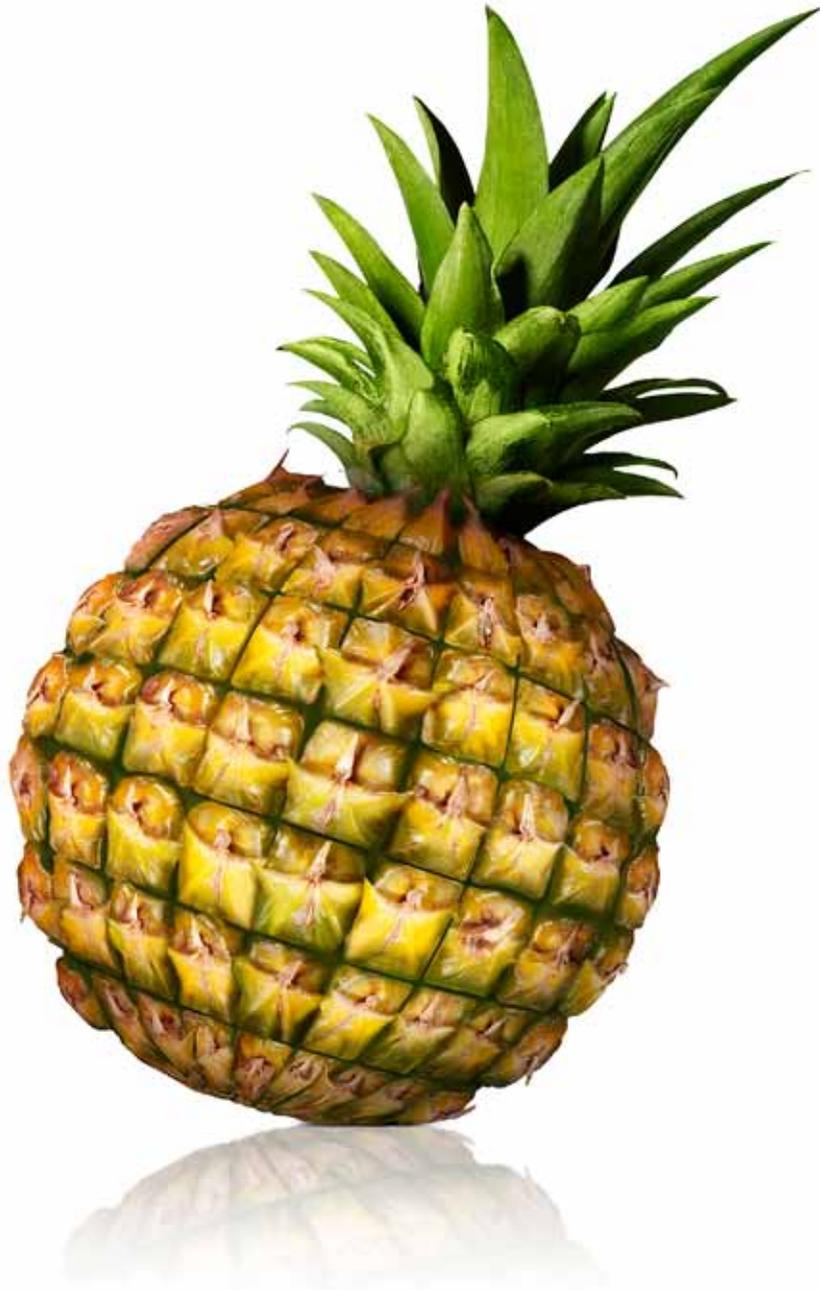
"Alfa Laval will definitely be our processing, design and engineering partner in the future."

"At our main plant we process pomegranates and mangoes, and we are evaluating processing other fruits and vegetables as well. In a couple of years we may also get into dairy. Alfa Laval is a leading name in the dairy industry, so if we do expand into this area we will use the company there too."

**CARI SIMMONS**



# Fruitful growth



By the middle of this century, the population of our planet will have increased by 50%, from more than 6 billion to nearly 10 billion people. A growing challenge is to provide nutritious food for everyone. Take India, for example – a fertile area larger than the entire Nordic region. Here, fruit and vegetables have traditionally been processed by hand. Now change is taking place on a huge scale. Modern plants are being built that will treat raw materials more efficiently. It's about heating, cooling, sterilising, extracting, transporting, separating and concentrating food products. These processes represent the very heart of Alfa Laval's know-how. Today only 2% of India's produce is treated in this way. In less than ten years, this figure will exceed 15%. Talk about growth.



[www.alfalaval.com](http://www.alfalaval.com)