

# CHEMManager

## EUROPE



### Chemicals

Pharmaceutical  
Outsourcing  
in New Markets.

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THE NEWSPAPER FOR THE  
CHEMICAL AND  
LIFE SCIENCE MARKETS

### Production

Water and Energy –  
Two Things to Save for  
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### NEWSFLOW

#### Country Focus

The **United Kingdom** is our featured country in this issue. After several years of turmoil due in part to the global financial crisis, the UK chemical industry is on its way back. The challenge is trying to find the right recipe for continuous steady growth in a highly competitive market.

More on **Pages 8, 9, 16**

#### M&A News

**BayerCropScience** is paying \$425 million to take over California-based pesticides producer **AgraQuest**. CropScience chief Sandra Peterson said the deal would help expand the Bayer sub-group's position in the growing fruit- and vegetable pesticides market, which already accounts for some 25% of its business.

**Eastman Chemical Company** has completed its \$4.8 billion acquisition of compatriot **Solutia**, announced in January of this year. Solutia was delisted from the New York stock exchange with effect from July 2.

US chemical carbon chemicals specialist **Cabot** will pay \$1.1 billion to acquire Dutch activated carbon producer **Norit**. The buy is designed to move Cabot's focus to higher-margin specialty products.

More on **Pages 2, 7, 9**

#### Collaborations

**Sartorius Stedim Biotech** (SSB) and **Bosch Packaging Technology** (Bosch) announced a long-term global partnership agreement. The agreement covers the mutual design and development of single-use filling solutions to be used on Bosch's aseptic filling equipment for final fill-and-finish operations of drug products.

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#### Pharma

In an out-of-court settlement, **Bayer Healthcare** has tentatively agreed to pay \$15 million (€12.3 million) to end a four-year battle over two enhanced Aspirin products that were sold in the U.S. market without prior approval by the Food and Drug Administration. At dispute was whether or not the Bayer products required prior approval.

## Ready, Set, Go!

Dow, the Official Chemistry Company of the Olympic Movement, gets Excited about London 2012



© Getty Images



Keith Wiggins, Managing Director, Dow UK, Ireland & Nordic

**Let the Games Begin** – In July 2010, Dow became the official Chemistry Company of the Olympic Movement through 2020. Being an official Worldwide Olympic Partner alongside corporations such as Coca-Cola, GE, Panasonic and Samsung would present Dow with new business opportunities, making the partnership a growth catalyst for the world's second-largest chemical manufacturer. However, there has been a lot of negative publicity in the UK and India from falsely associating Dow with the 1984 Bhopal chemical disaster. But despite the negative coverage, the U.S. company is committed to the 10-year deal. In the run-up to the London 2012 Olympic Games, Dr. Michael Reubold asked Keith Wiggins, Managing Director for Dow in the UK, Ireland and Nordic, about Dow's association with the Olympics and the somewhat rocky road to London 2012.

**CHEManager Europe: For how long has Dow been associated with the Olympic Movement?**

**K. Wiggins:** Dow's relationship with the Olympic Games dates back more than 30 years to the Lake Placid 1980 Winter Games, where Dow made significant donations of Styrofoam insulation used in ice skating rinks and bobsled runs. In 2010, Dow became a Worldwide Olympic Partner joining the TOP – short for The Olympic Partners – program and the "Official Chemistry Company" of the Olympic Movement through 2020.

**What has led Dow to become an official Worldwide Olympic Partner?**

**K. Wiggins:** The Worldwide Olympic Partnership is an investment in the Olympic Movement and allows Dow to explore exciting new business opportunities that highlight the depth and breadth of our specialty products from infrastructure needs to solutions that directly impact athletic performance. Hundreds of Dow products are necessary for Olympic-related infrastructure and equipment, helping ensure the success of the Games and also contribute to the growth of our Company.

**What is Dow contributing to the Olympic ideal?**

**K. Wiggins:** Fundamentally, the Olympic Games are about peace, progress, sustainability and the world coming together to celebrate our common humanity. We share that vision and are committed to achieving it.

As the "Official Chemistry Company" of the Olympic Games, Dow provides science-based solutions that improve the Olympic experience for host cities, athletes and fans everywhere. Dow has the innovation, commitment and capabilities to provide solutions that will meet London's

**Sponsorship of the Olympic Games makes Dow distinctive.**

and other host cities infrastructure goals and needs for the Games and beyond. In fact, hundreds of solutions from Dow improve the Olympic experience and help make the Games safer, more sustainable and higher-performing. Beyond London, Dow is actively involved in helping improve the Olympic experience in

Sochi 2014, Rio de Janeiro 2016 and Pyeong Chang 2018.

**The connection between chemistry and sports is obvious, not only when it comes to sporting equipment. How did Dow support the construction of Olympic venues in the past and which contributions has Dow been making for the London 2012 Olympic Games?**

**K. Wiggins:** Solutions from Dow help make the Games safer, more sustainable and higher-performing. Dow's contribution to London 2012 includes the icon of the Olympics: London's Olympic Stadium is "wrapped" with fabric panels produced by Dow and made with Dow resins. The wrap textile is a scientific innovation based on the latest generation of elastomers. The Dow technology inside the wrap made it possible for the first time to achieve a unique combination of durability, flexibility and fire performance, all while meeting the other performance requirements for the wrap like printability, mechanical properties and abrasion resistance. The coating contains materials supplied by Dow's Performance Plastics Division. Roofing insulation materials from Dow offer moisture resistance and structural strength.

Dow's polyurethane binder will be used in 5,000 meters of the track at the Olympic Stadium. Dow solutions can also be found in the Olympic Village, the Copper Box arena, the Field Hockey Centre, the Eton Manor Sports Complex, the International Broadcast Centre and Main Press Centre and in Olympic Banners.

**How did Dow's 50,000 global staff react to the involvement with the Olympics?**

**K. Wiggins:** The Olympic Games is the world's most respected and revered sporting event. Dow employees are excited to help improve the Olympic experience for athletes and fans around the world. We hope that Dow's Olympic partnership will give employees a deep sense of pride about the company.

The Dow team will have a significant presence in London during the Games. Ten Dow Torchbearers will carry the Olympic Flame during the Torch Relay across the UK and seven will serve as Paralympic

**Olympic infrastructure contracts offer major business opportunities.**

pic Torchbearers. Dow will provide Olympic-related incentives to employees to inspire and engage employees through the Olympic Movement.

**There had been controversy in the UK and India surrounding the 1984 Bhopal accident in a Union Carbide pesticide plant in India. Dow, however, merged with Union Carbide in 1999, only 15 years after that incident. What was this controversy about and how did Dow respond to it?**

**K. Wiggins:** It is unfortunate that the misrepresentation of facts about Bhopal by some groups is leading others to make misdirected comments about our sponsorship. Misrepresenting facts is not consistent with the goals and spirit of the Olympic Games. Dow remains committed to our partnership with the London Organizing Committee.

This relationship is an important extension of our Worldwide Olympic partnership with the International Olympic Committee IOC.

**What is Dow's involvement with the 1984 Bhopal gas tragedy?**

**K. Wiggins:** Dow never owned nor operated the Bhopal plant nor has the company acquired any part of the Bhopal plant or issues related to it. The settlement of the incident between the Government of India, Union Carbide and Union Carbide India occurred in 1989, long before Dow acquired the shares of Union Carbide in 2001. Dow, along with the rest of the industry, has

learned from this tragic event, and has helped to drive global industry performance improvements to ensure that such incidents never happen again.

**Both, Dow and the IOC are committed to sustainability and social responsibility. The IOC welcomed Dow as "an important partner in making our vision for sustainability and global cooperation a reality". Can you name a few projects?**

**K. Wiggins:** Through our partnership with the IOC, Dow remains committed to helping London and future host cities achieve a positive legacy through the Olympic Games. In its "Sustainable Sourcing Code", LOCOG sets out its desire to make the games 'a benchmark for sustainability, which other organizations around the world will seek to follow'. Dow is central to achieving this goal, providing a wide range of sustainability solutions. For instance, the Olympic Stadium wrap meets London 2012's strict sustainability standards and no significant emissions occurred in its production. After the games, it will be used in underprivileged African communities to provide shading and improved living conditions.


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## Analysts Read Tea Leaves for Huntsman Takeover Signs

As the chemical merger and acquisition market cools amid economic uncertainty, analysts are searching the tea leaves for signs as to whether U.S. chemical producer Huntsman could be up for sale. In late June, Bank of America Merrill Lynch said it had contacted several private equity players to gauge their interest in a potential takeover of Huntsman. The company itself has not

commented on the current discussion, although CEO Peter Huntsman said in March that management was "open to all options to create shareholder value."

As recent market corrections have reduced share prices, observers say more investors could be likely to play ball; however, Huntsman is unlikely to want to sell under such conditions.

## Cabot to Buy Activated Carbon Producer Norit for \$1.1 Billion

US chemical carbon chemicals specialist Cabot will pay \$1.1 billion to acquire Dutch activated carbon producer Norit from British private equity fund Doughty Hanson & Co Managers and Dutch private equity firm Euroland Investments. The buy is designed to move Cabot's focus to higher-margin specialty products.

Norit, which operates 10 plants in the Americas and Europe, reported sales of \$360m in 2011. Cabot expects the deal to add 20-25 US cents per share to its earnings, excluding one-off costs, in 2013. Activated carbon is used primarily in purification and filtration processes.

## Sartorius Stedim Biotech and Bosch Announce Global Collaboration

Sartorius Stedim Biotech (SSB) and Bosch Packaging Technology (Bosch) announced a long-term global partnership agreement. The agreement covers the mutual design and development of single-use filling solutions to be used on Bosch's aseptic filling equipment for final fill-and-finish operations of drug products. SSB will provide Bosch

with pre-configured single-use filling transfer sets, consisting of bags, filters, tubing and connectors. Bosch will combine them with its aseptic filling and barrier isolation technology into new, innovative systems for aseptic filling, and exclusively market, distribute and service these new filling systems under its own brand name.

## BASF Sells Marine Biopolymers Business to Seagarden

BASF and the Norwegian company Seagarden signed a contract to transfer the Chitosan marine biopolymers business. Chitosan marine biopolymers are used in personal care products and as pharmaceutical ingredients. The transaction is

expected to be completed by August 2012. The divestment of the Chitosan business from former Cognis results from the portfolio optimization following the acquisition of Cognis by BASF in 2010.

## Evonik Owner Scraps Latest IPO Plans Amid Market Uncertainty

Citing market uncertainties, the RAG coal mining foundation, majority owner of German chemical producer Evonik, has scrapped plans for a stock market launch that, depending on the number of shares offered – some reports said as much as 30% of equity – could have been Europe's largest initial public offering (ipo) in more than a year.

The state-owned trust that will bear the liabilities of Germany's drawdown of coal mining, had hoped to float the shares at a ratio of 2:1 on the prime standard Frankfurt stock exchange by the end of June; however, uncertainty about mid-month elections in Greece and the disappointing results of other public offerings are believed to have triggered the cancellation.

RAG, which holds €74.9% of Evonik (private equity investor CVC Capital Partners has 25.1%) is said to have seen an enterprise value of €15 billion for the chemical producer, an earnings multiple of 6.5, while leading fund managers reportedly thought €12-13 billion more acceptable for a company with 2012 sales of €214.5 billion and EBITDA of €2.8

billion. Even with the ipo discount of 10% there was apparently insufficient interest.

The latest cancellation was the third of three attempts and market observers see little prospect of a fourth attempt in the near future. Nevertheless, both RAG and CVC will need to find a near-term solution. Without an ipo, the German government would have to raise taxes to fund the upkeep of disused mines. The private equity group needs money, too, especially as another planned flotation recently had to be ditched.

In a reverse of how it was created Evonik (once stock market-listed as Degussa), could enter the stock market through the back door through a merger with another company, observers say. The German state of North Rhine-Westphalia is rumored to be once again flirting with the idea of merging Evonik with compatriot Lanxess – a trial balloon launched several years ago by Lanxess CEO Axel Heitmann. This would create a further global chemical player in the state, alongside Bayer and Henkel.

## Poland Snubs Acron Hint of Higher Tarnow Bid

Poland is still opposed to Acron's bid for the country's No.1 chemicals maker Azoty Tarnow, despite the Russian group's readiness to raise its 1.5 billion zloty (\$434 million) offer.

"Acron's readiness to talk about the price for Azoty Tarnow does not change our negative view of the bid," Pawel Tamborski told Reuters. "The price in this respect is not the most important. The other, more vi-

tal conditions from our point of view are still decisive."

Tarnow and Poland's treasury, which holds 32% stake of the company, are against the bid, as the sale to a Russian group would be a sensitive issue given historic tensions between the two countries.

While Poland is seeking to raise 15 billion zlotys through asset sales by the end of 2013, it continues to hold out against Acron.

## Brenntag Private Equity Owners Exit Through Stock Market

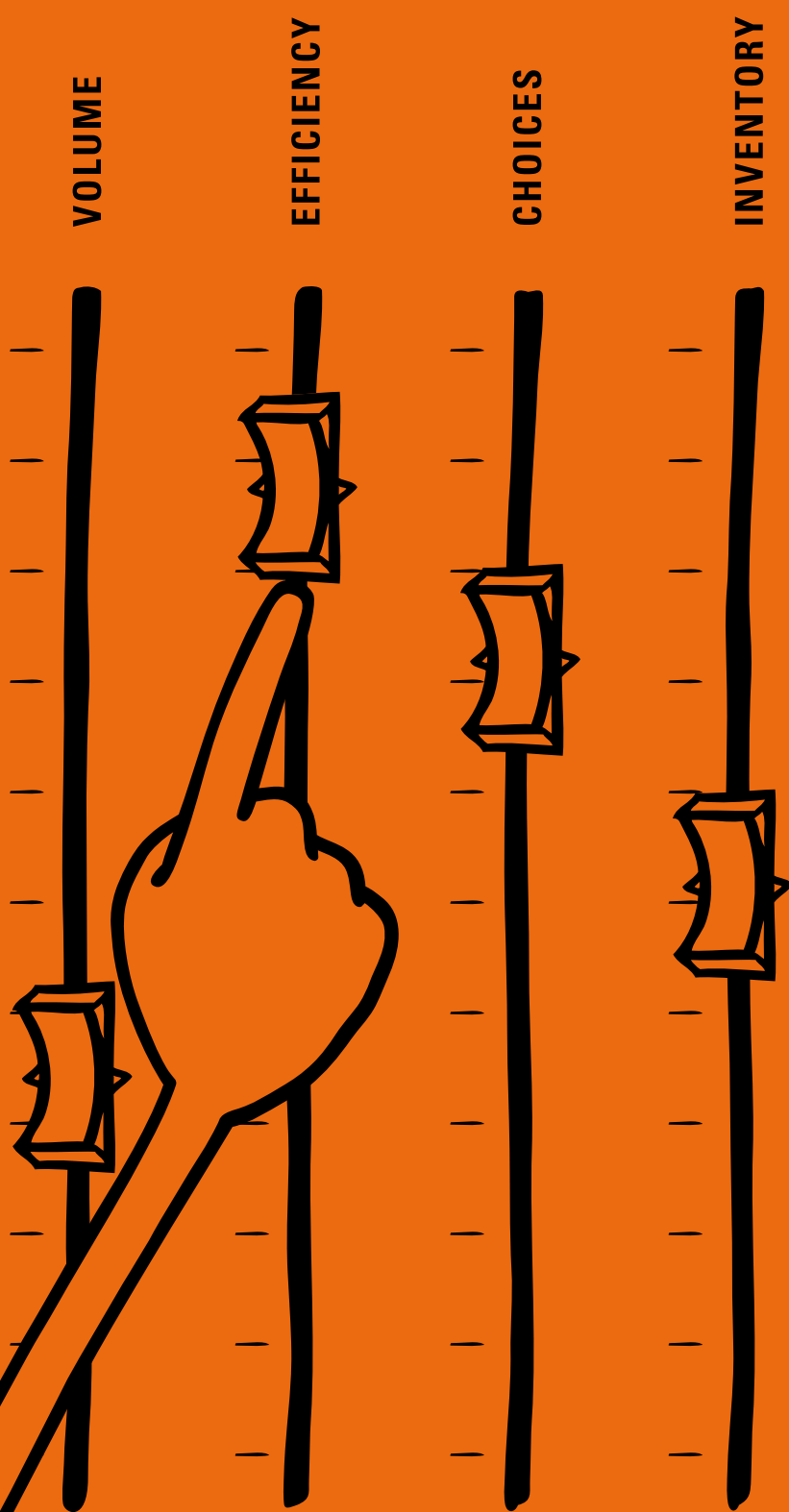
Brachem Acquisition, the investment vehicle of private equity companies BC Capital Partners, Bain Capital and Goldman Sachs, has successfully exited distributor German chemical distributor Brenntag by placing its remaining 6.9% stake (13% of equity) with institutional investors via the stock exchange. The company with sales of €8.7 billion in 2011 is now in free float.

In the latest offering, the shares changed hands at €89 each for a total of €611m. Financial sources said Brenntag top managers acquired shares worth altogether €15 million in late June. Brachem sold an initial 29% stake through an ipo in March 2010, netting the stakeholders

€747.5 million at €50 per share. The private equity companies first bought into the world's largest chemical distributor in September 2006.

Brenntag said recently that it was cutting 4% of its European staff to streamline operations in response to challenging macro-economic conditions. Savings of around €12m/year from the second half of 2012 reportedly are being targeted.





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# Changing Demographics

Chemical Industry Employees in Europe are already the Best Paid, soon they may be the Most Flexible

**Silver Generation** – European chemical industry employees are among the world's best paid and additionally enjoy social benefits their counterparts on the other side of the Atlantic can only dream of. What's more, says the European Industrial Relations Institute EIRO, they also command higher pay than workers in almost all other branches of industry.

The best place to be employed by a chemical producer appears to be Belgium, the worst Poland. Calculated at euro exchange rates prevailing in 2010, statistics published by the German chemical employers association BAVC, Belgian chemical workers were by far the most expensive that year, as they have been for many years. Chemical producers in one of Europe's smallest countries shelled out an average of €56.96 per hour, about 7% more than in 2008. Those working for large companies in large production centers such as Antwerp undoubtedly earned more.

Dutch chemical companies had the second highest hourly wage bill in 2010, averaging €45.83, some 3.7% above the 2008 benchmark. Pooling figures for west and east, Germany was the third most expensive place to do chemical business. The figures are not entirely comparable, however, as wages and benefits for employees in the old Federal Republic in the west and the former German Democratic Republic in the east diverge, and a larger share of production facilities are located in the west.

Chemical workers in western Germany cost their employers €46.49 per hour in 2010, some 3.5% more than in 2008. The pay envelope in eastern Germany was nearly 6% fatter than in 2008 but the hourly tally was only €31.36. French workers cost €44.66, some 4% more than two years earlier.

By comparison, the 2010 wage total for chemical workers in the United States was the dollar equivalent of €34.99, only slightly more than in eastern Germany and lower than the bill in 10 European countries. In Japan, where hourly wage costs averaged €37.31, pay lagged Sweden, Denmark, Austria and Ireland. Japanese workers nevertheless cost employers less than in Finland, Italy, Spain, the Czech Republic, Hungary, Slovakia and Poland, where chemi-

cal company workforces cost only €8.63.

While European statistics show that in most countries chemical industry wages increased over the two-year period, this was not true for the UK (where pay levels sank 2.3%), Hungary (6%) and 5.7% in Poland. The decline in UK hourly wages to €26.05 from €26.65 a year earlier may be chalked up to exchange rate fluctuations but clearly in this country in which chemical production – as well as manufacturing in general – has been pointing downward for some time industry did see any wage growth.

Of course, the bare numbers reveal neither how much cash employees actually take home nor do they take into account what non-monetary benefits they may enjoy. EIRO says the wage totals in Belgium are inflated by social benefits more generous than those received by employees in other European countries and certainly the U.S.

## Shrinking Labor Pool Demands a New Approach

Shifting demographics could make the European chemical industry an even more favorable place to work. As the population ages, chemical employers will find their labor pool shrinking. But despite the laws of supply and demand, with economic crises looming at every turn, putting more money into workers' pockets may not always be possible so flexible solutions will have to be found.

Another matter that will have to be considered is that older workers will require more attention. As early retirement soon will no longer be an option, they will have to remain healthy enough to continue on the job until retirement age – which in some countries has been raised to 67 – and their employers will be called on the help make this possible.

A new contract on wage and working conditions recently signed by Germany's chemical trade union IG BCE and the employers' association BAVC could help pave the way for changes that would secure the future for companies throughout Europe. This especially as it provides for lifelong work accounts that combine phases of normal activity with periods of inactivity such as sabbaticals.

The 2011 collective agreement for the 30,000 chemical workers in eastern Germany was novel in that it married a linear wage increase of 15% up to 2015 with improved work flexibility for older employees and those with expanded family responsibilities such as caring for small children or elderly parents. Under the terms, shift workers over 60 were given the right to work four-day weeks at 95% of previous pay and under certain circumstances to halve working hours for pay equivalent to 80% of full-time.

## Germany Improves Flexibility

The union-employers contract agreed in late May for western Germany builds on many of the demographic components agreed last year for the east. In addition to this, workers in the west received a linear pay increase of 4.5% covering a period of 19 months. This will be implemented in all geographical regions up to September. Also under the new contract, the length of the work week has been officially established at 37.5 hours. It will be left to individual businesses to determine how this should be organized. Instead of overtime pay for work exceeding 37.5 hours, employees generally will be given time off but in some cases will be eligible for monetary compensation.

The new contract provisions undoubtedly will help sweeten the pill for those who would prefer to retire

early as German chemical workers have been doing for decades (in such great numbers that the proportion of workers over 60 still on the job is currently negligible). Under the current rules, that the new terms will simply complement for now, shift workers over 55 and others over 57 could reduce their working hours.

To help pay for the new conditions, German chemical companies have pledged to annually invest a further €200 per employee in an existing demographics fund, topping up the €312 already being spent under a 2009 scheme. A long with making it easier to retain a qualified force of older workers, the companies have pledged to uphold the already high level of qualification for young people entering the workforce.

In Germany, both union and employers, are pleased with their latest joint effort. IG BCE's chief negotiator, Peter Hausmann, called the agreement "a new milestone on the path toward a working world suitable for older employees." Terming the revamped rules for life employment accounts an "intelligent" move, his counterpart at BAVC, Hans-Carsten Hansen, said the improved flexibility also will benefit employers as their workers will stay on the job longer.

It remains to be seen whether the new German rules could serve as a model for other countries or whether labor and capital would so willingly cooperate. In Germany the two sides have traditionally enjoyed amicable relations – there has been no strike in the industry since 1971.

Author: Dede Williams, freelance journalist, Frankfurt, Germany

[chemanager-online.com/en/tags/demographics](http://www.chemanager-online.com/en/tags/demographics)

# Production Falls as Prices Climb

EU Chemicals Sector Output Drops 1.9% Through First Four Months of 2012

## Dwindling Confidence in the Industry

EU chemicals production recorded a 1.9% decrease in the first four months of 2012 compared with the same period in 2011, according to the latest Cefic Chemicals Trends Report. Monthly data for April 2012 showed a 1.9% decline compared with April the year prior. April 2012 data show that the EU chemicals production level remains 5.2% below the peak in 2007.

Prices for chemicals in the European Union continued to climb on a year-on-year basis in April, up 3.2% during the month against the comparable month in 2011. The price increase was led yet again by the overall price increase in basic inorganics. Latest trade data show the EU chemicals trade net trade surplus improved through the first quarter of 2012 by €2.4 billion compared with the same period of last year, reaching €12.5 billion. According to the latest EU Commission survey from May 30, confidence in the EU chemicals industry deteriorated in May, based mainly on a strong deterioration in managers' expectations for the months ahead.

## Year-on-Year April Chemicals Output Lower

Consumer chemicals was the only subsector to avoid a drop in the

April EU chemicals production index, up 1.6% in April 2012 compared with April 2011. Specialty chemicals and basic inorganics production decreased in April by 4.2% and 3.8% respectively on a year-on-year basis. Polymers production declined in April 2012 by 2.7% against the comparable period the year prior. Petrochemicals experienced no change in the same period. Monthly data for April 2012 showed a 1.9% decline for the EU chemicals industry compared with April the previous year.

## EU Trade Surplus Improved by €2.4 Billion Through First Quarter of 2012

March 2012 trade data indicate a €12.5 billion overall EU chemicals net trade surplus. An EU net trade surplus with the NAFTA region contributed significantly to the additional surplus generated in January-March, reaching €3.3 billion, up €1.3 billion compared with the period from January to March 2011. The EU net trade surplus with the rest of Europe was €3.4 billion in first quarter 2012, up €500 million compared with first quarter 2011. A €1.5 billion surplus occurred with Asia, excluding Japan, and China, which fell €500 million compared with first quarter 2011.

## Prices for Basic Inorganics Climbed by 4.4% in April

Year-on-year EU chemicals prices rose in April by 3.2%, driven by the

price for basic inorganics, which increased by 4.4% during the period. Prices for petrochemicals climbed by 2%, while pharmaceuticals prices edged down by 1.2% in April as compared with the year prior.

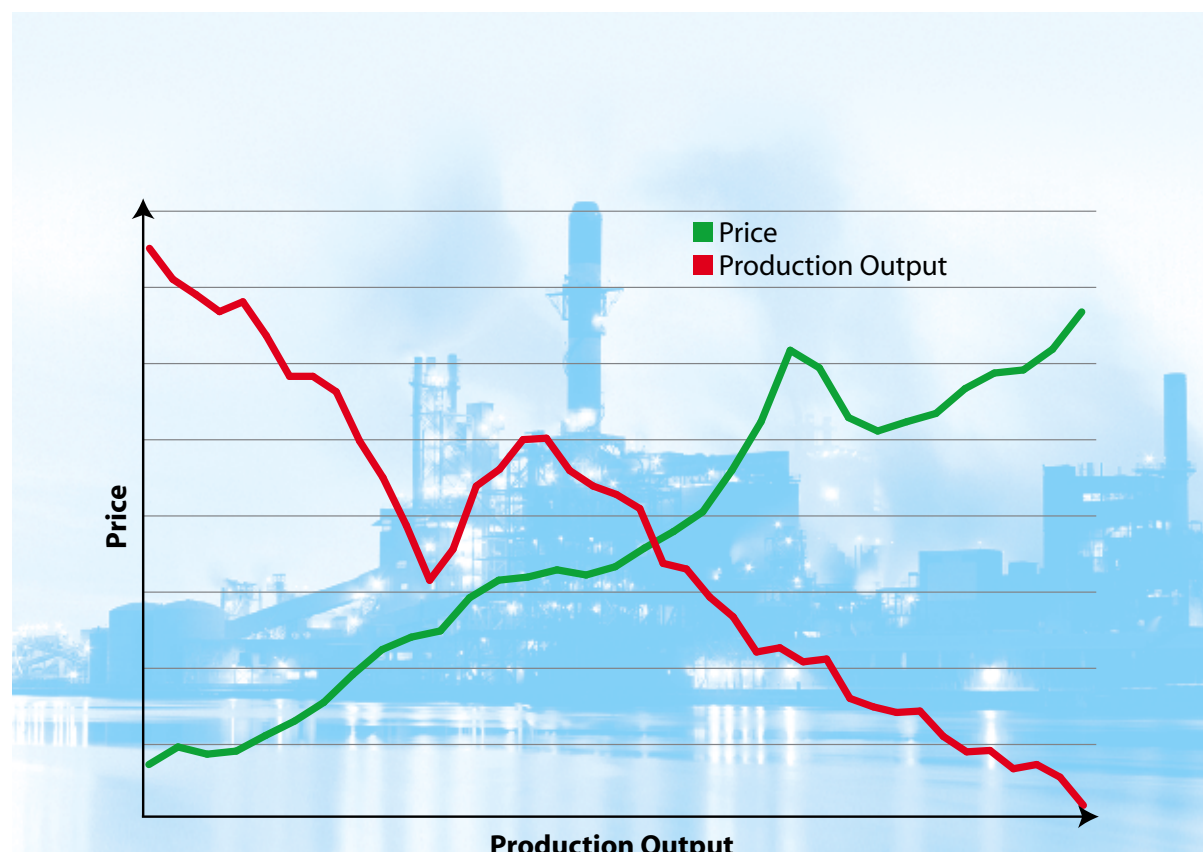
## EU Sales in January-March 2012 6.1% Higher Than 2008 Precrisis Period

EU chemicals sales for March 2012 were 1.4% lower compared with March the year prior. The overall

sales level continues to surpass the precrisis peak reached at the beginning of 2008. Compared with full-year sales levels in 2008, the total value of sales through the first three months of 2012 was 6.1% higher.

## EU Chemicals Confidence Indicator (CCI) Falls in May 2012

According to the latest EU Commission report (business and consumer survey results, May 30, 2012), confidence in the EU chemicals industry deteriorated markedly (-5.4%) in May 2012, based mainly on a strong deterioration in managers' expectations for the months ahead (-8.5%). Moreover, managers' assessment of their companies' current level of order books deteriorated sharply (-4.2%). Also, the assessment of the adequacy of current level of stocks of finished products worsened. Managers' assessment of their companies' past production and current level of export order books also deteriorated. Employment plans were further revised down. At the same time, selling price expectations decreased modestly.



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## Germany No.1 Chemical Exporter 2011

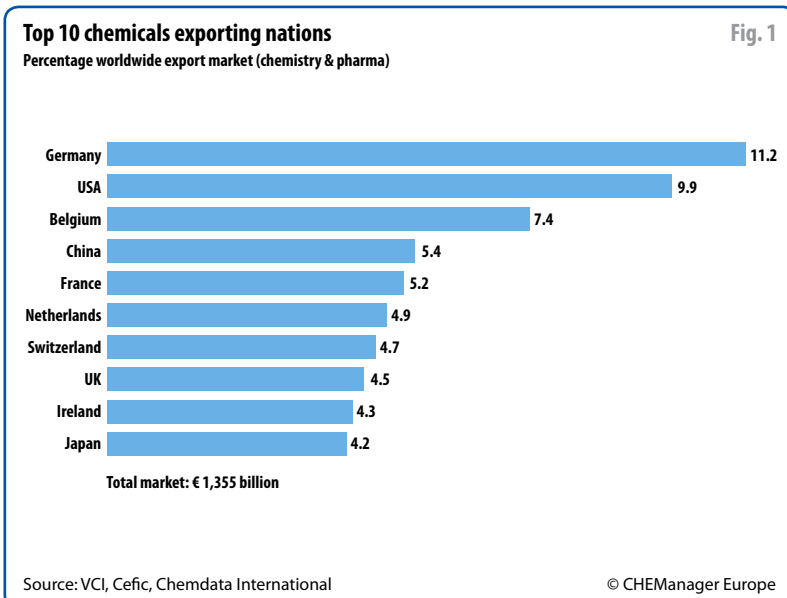


Fig. 1: Germany is No.1 Chemical Exporter 2011

No other nation exports more chemicals. In 2011, German chemical companies sold chemical products worth over €150 billion euros to customers abroad. With a share of 11.2 percent in the global chemical export market, Germany was the world export champion for the ninth consecutive time – followed by the USA (9.9%), Belgium (7.4%) and China (5.4%). These results were

presented by the German chemical industry association VCI during Achema 2012 in Frankfurt.

### The 7 Success Factors

From the VCI's viewpoint, seven factors are particularly important for the continually good position of German chemistry in international competition. Dr Utz Tillmann, the VCI's

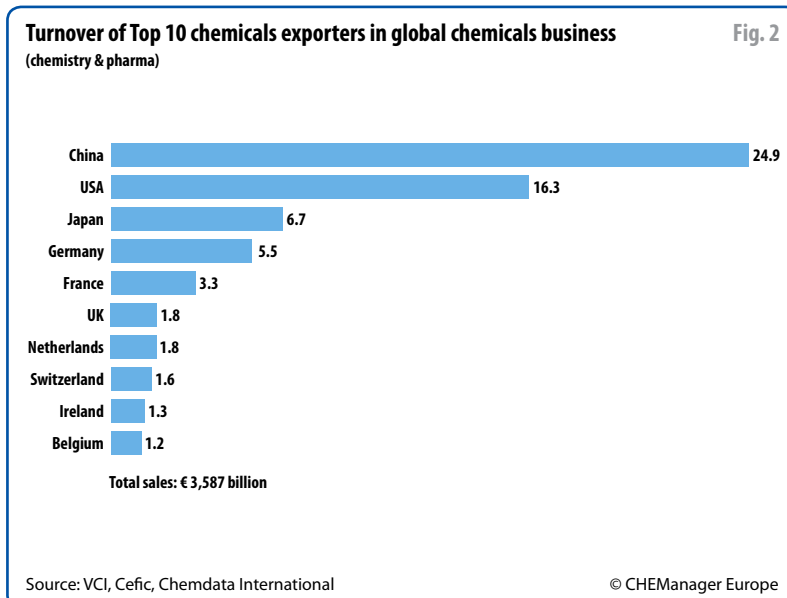


Fig.2: Germany ranked No. 4 in global turnover in chemistry

director general, stated "Our central role in the network of industries, innovative strength, intensive cooperation with science and the orientation of product strategies to megatrends and sustainability are decisive strong points for our industry. Add to this the diverse group of small and mid-sized enterprises, a pragmatic social partnership and the successful concept of chemical parks which is

increasingly being put into practice also in other countries. This combination of qualities is found nowhere else in the world", so Dr. Tillmann.

With current economic risks to the industry location Germany in mind, Tillmann points to the unpredictable development of raw material prices and the lasting uncertainty about the outcome of the EU debt crisis. According to Tillmann, the

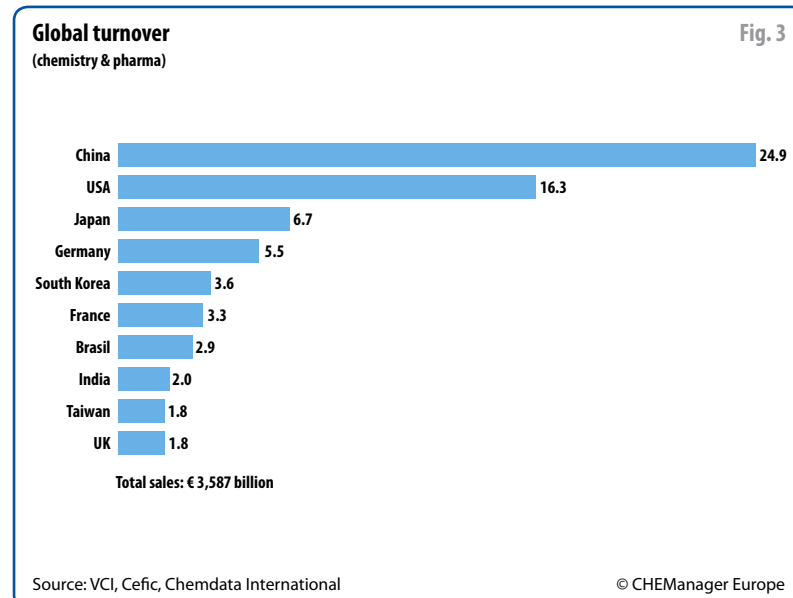


Fig. 3: Top 10 chemicals nations

further course of the Energiewende – or energy transition – will have an enormous influence on the competitiveness of the chemical industry, too. Tillmann emphasizes: "If electricity costs run wild in Germany for energy-intensive industries such as chemistry or steel – i.e. industries whose products make the energy transition possible in the first place – industry as a whole will be driven

towards disaster. However, I am under the impression that both the federal government and the federal states are realizing how serious the situation really is."

[www.vci.de](http://www.vci.de)



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# US Chemical Market Status 2012

## The American Chemistry Council's Mid-Year 2012 Market Situation & Outlook

**Go USA** – Following a strong 4<sup>th</sup> quarter 2011, the US economy seemingly started the year on firm ground with gains in consumer spending, manufacturing output, and even housing. It is unclear to what extent the mild winter weather played a role. What is clear, however, is that the recession in Europe and slowdown in China, other Asian nations, and some Latin American economies have taken a toll on demand for US exports.



Confidence has suffered as well as the world holds its breath, waiting to find out how the financial crisis in several European countries will be contained. First quarter growth was mediocre and the 2nd quarter may have been even weaker. The outlook for the rest of the year is for slow growth with improvements in investment spending and residential investment as the bright spots. Lower energy prices will support modest gains in consumer spending and help to offset the effects of high unemployment and low wage growth that are constraining incomes. The consensus forecast for US GDP is for continued growth, expanding by 2.2% in 2012 and 2.4% in 2013. The recovery remains fragile with multiple risks on the horizon and the wrong trade, tax or other policy initiatives could derail activity.

### Global Economy

Over the past several months, the headwinds facing the global economy have intensified. The financial crisis in Europe has deepened with serious doubts that the Eurozone can continue in its current form. Uncertainty about future fiscal policy is also eroding confidence. Further, Chinese manufacturing has slowed considerably again raising concerns about the health of the world's second largest economy. As a result, the outlook for global GDP (market exchange rate) has weakened with 2.3% growth expected in 2012 and 2.9% in 2013.

### Manufacturing

In the United States, the recovery of key chemistry end-use markets has been mixed. The manufacturing sector, which is the largest

consumer of chemistry, was strong during the early part of the year. It has weakened, however, as export markets softened and because of renewed retrenchment from uncertain households and businesses. Inventories remain roughly in balance and an inventory correction on the scale of the 2009 event is not expected. Motor vehicle production rose sharply as pent-up demand from both consumers and the business sector propelled vehicle sales to their highest rates since the start of the recession. Vehicle sales are expected to rise to 14.4 million in 2012 before increasing to a 14.7 million pace in 2013. Following six years of steep declines and bumping along the bottom, housing remains weak with starts expected to grow only modestly in 2012 to a 750,000 unit pace. In 2013, however, housing may finally see shoots of a recovery as housing starts improve to a 920,000 unit pace.

Despite gains in vehicles and housing, weakness in export markets and domestic manufacturing will likely limit gains in chemical demand. Production of chemicals, excluding pharmaceuticals, has eased as demand from both domestic and export markets have slowed. Improvements in capacity utilization have stalled as the manufacturing sector cools. Reflecting the soft patch in global manufacturing, trade volumes in chemicals have slowed during the 1st quarter. Nonetheless, US based petrochemicals have enjoyed a competitive position last seen in the 1990's due to the abundance of natural gas and natural gas

liquids from shale. This will enhance US exports and trade volumes are expected to pick up when a recovery resumes. American chemistry output is anticipated to rise by 0.5% in 2012, before accelerating to a 2.3% growth rate in 2013. With some sort of resolution expected in Europe in coming years and with rebounding growth in emerging markets, American chemistry is expected to play to its cost advantage. Growth in chemistry is expected to accelerate in the years ahead, growing faster than GDP.

### Pharmaceuticals

Output in pharmaceuticals is expected to decline 1.4% in 2012 before recovering to a moderate 2.4% growth rate in 2013. For chemistry excluding pharmaceuticals, we expect to see 1.9% growth in 2012 before expanding by 2.3% in 2013 and 2.2% in 2014. Production of basic chemicals is expected to grow by 1.1% in 2012 and 2.2% in 2013 following a decline in 2011. Strong growth is expected in inorganic chemicals, plastic resins and synthetic rubber. Production of specialty chemicals is expected to grow 5.1% in 2012 driven by demand from end-use markets before improving further to a 3.0% pace in 2013. Comparatively strong gains are expected in agricultural chemicals and consumer products as well.

### Capital Spending

Strong gains in capital spending by American chemistry are expected

during the next several years, the result of announced new investment in petrochemicals and derivatives arising from shale gas developments. The need to add capacity and improve operating efficiencies will play a role as well. Capital spending in the business of chemistry will reach \$35.5 billion in 2012 and will steadily rise to \$51.5 billion by 2017.

### Global Chemistry

Global chemistry continues to advance, with expectations for output to grow by 2.3% in 2012, 4.3% in 2013, and 4.7% in 2014. Output of chemicals in emerging markets will outpace production in developed countries. China, the world's largest chemical sector, will continue to grow strongly, but at a slower pace than the previous decade. India and other emerging markets in the Asia-Pacific region will continue to expand. Africa and the Middle East will also experience strong growth as will Latin America after 2012. From a product standpoint, the strongest growth in 2012 is expected in specialties, consumer products, and agricultural chemicals. As the global manufacturing sector cools, so will demand for basic chemicals. Looking ahead, however, growth will be driven by the cyclically sensitive sectors such as petrochemicals and organic derivatives, plastic resins, synthetic rubber and man-made fibers as well as specialty chemicals and consumer chemistry. Rising incomes and consumption in addition to other demographic factors (i.e. aging populations) will support growth in pharmaceuticals. In the long-term, global chemistry growth will average 4.0% per year, a pace exceeding that of the over-all global economy.

The full report is available at [www.americanchemistry.com](http://www.americanchemistry.com).

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## The Latest From SOCMA

### FDA Reform Act Signed into Law

In a major victory for the American people, President Obama recently signed into law the U.S. Food and Drug Administration's Safety and Innovation Act that will allow the U.S. government to speed approval of lifesaving medicines, reduce drug shortages and improve the quality and availability of drugs in the U.S.

The new law includes authorization of the Generic Drug User Fee Act (GDUFA), which will level the playing field and improve the drug supply chain by requiring inspection of all foreign and domestic drug production facilities. Domestic pharmaceutical companies are inspected every two to three years by the FDA, but most of their foreign counterparts have never been inspected by the FDA.

Up to 40% of all drugs Americans take are imported, according to the U.S. Government Accountability Office (GAO), and about 80% of the active pharmaceutical ingredients in those drugs come from foreign sources. Passage of the bill was a key step in **safeguarding the U.S. drug supply by ensuring** greater scrutiny of drug manufacturing in high-risk regions of the world.

The Bulk Pharmaceuticals Task Force (BPTF), an affiliate of the Society of Chemical Manufacturers and Affiliates (SOCMA) that has since 2006 advocated for increased resources for the FDA to conduct these inspections, hailed the signing of the bill, calling it a turning point in the fight to eliminate contaminated or counterfeit drug products from consumer shelves.

"For too long, the U.S. drug supply has been susceptible to sub-par quality drugs due to the lack of FDA enforcement of basic drug quality inspections of foreign facilities," said BPTF Chair Patty Benson, Quality Assurance Director of SAFC. "By signing this bipartisan, bicameral bill into law, the President has demonstrated his commitment to improving the quality of drugs entering the U.S. and encouraging domestic job production by eliminating the economic advantage of foreign manufacturing facilities."

As an organization focused on advancing drug safety, BPTF is a key stakeholder that worked with other industry groups last year to negotiate the terms included in GDUFA. BPTF members are among those who will pay nearly \$1.5 billion over the course of five years to accomplish the goals of GDUFA and more. With company budgets tight and economic uncertainty at an all-time high, these generic drug producers voluntarily agreed to pay these fees in order to avoid another heparin-like tragedy.

BPTF's goals of holding all players contributing to the U.S. generic drug system to the same inspection standards and enhancing the agency's ability to identify and track registration and contributors involved in each drug product sold in the U.S. are encompassed in the new law, which was overwhelmingly passed by both the U.S. House of Representatives and the U.S. Senate in May.

GDUFA will expedite the availability of more affordable, high-quality generic drugs. It will provide the FDA, which previously had been unable to accurately identify all foreign facilities manufacturing drugs entering the U.S., with the resources to create a system to track these facilities for the purpose of quality inspections.

GDUFA will also enhance the FDA's ability to prevent substandard and misbranded drugs from entering the supply chain. Significantly, the legislation also authorizes FDA to confiscate and destroy counterfeit, adulterated or misbranded drugs that reach U.S. borders rather than returning them to foreign manufacturers. Past practices forced the FDA to send the drugs back to their country of origin, where they were ultimately returned to the drug supply chain in other countries.

The new law will be implemented in stages over the course of the next few years and will only succeed through the diligence of all stakeholders, according to BPTF.

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

## One Hundred Twelfth Congress of the United States of America

AT THE SECOND SESSION

Began and held at the City of Washington on Tuesday,  
the third day of January, two thousand and twelve

### An Act

To amend the Federal Food, Drug, and Cosmetic Act to revise and extend the user-fee programs for prescription drugs and medical devices, to establish user-fee programs for generic drugs and biosimilars, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

#### SECTION 1. SHORT TITLE.

This Act may be cited as the "Food and Drug Administration Safety and Innovation Act".

#### SEC. 2. TABLE OF CONTENTS; REFERENCES IN ACT.

(a) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Sec. 1. Short title.	Sec. 2. Table of contents; references in Act.
TITLE I—FEES RELATING TO DRUGS	
Sec. 101. Short title; finding.	Sec. 102. Definitions.
Sec. 103. Authority to assess and use drug fees.	Sec. 104. Reauthorization; reporting requirements.
Sec. 105. Sunset dates.	Sec. 106. Effective date.
Sec. 107. Savings clause.	
TITLE II—FEES RELATING TO DEVICES	
Sec. 201. Short title; findings.	Sec. 202. Definitions.
Sec. 203. Authority to assess and use device fees.	Sec. 204. Reauthorization; reporting requirements.
Sec. 205. Savings clause.	Sec. 206. Effective date.
Sec. 207. Sunset clause.	Sec. 208. Streamlined hiring authority to support activities related to the process for the review of device applications.
TITLE III—FEES RELATING TO GENERIC DRUGS	
Sec. 301. Short title.	Sec. 302. Authority to assess and use human generic drug fees.
Sec. 303. Reauthorization; reporting requirements.	Sec. 304. Sunset dates.
Sec. 305. Effective date.	Sec. 306. Amendment with respect to misbranding.
Sec. 307. Streamlined hiring authority to support activities related to human generic drugs.	Sec. 308. Additional reporting requirements.
TITLE IV—FEES RELATING TO BIOSIMILAR BIOLOGICAL PRODUCTS	
Sec. 401. Short title; finding.	Sec. 402. Fees relating to biosimilar biological products.

SOCMA is a U.S.-based trade association dedicated solely to the batch, custom and specialty chemical industry. Since 1921, SOCMA has represented a diverse membership of small, medium and large chemical companies and has now a global membership of more than 210 companies.



## Ready, Set, Go!

Continued Page 1

As a TOP Sponsor of the Olympic Games through 2020, Dow is also committed to improving the infrastructure and legacy of future host cities. We work with industry associations and the OCOG – the Organizing Committee of the Olympic Games – to raise sustainability awareness and standards, and to facilitate the adoption of new technologies.

Projects at Sochi include, among others, "Good Chemistry", a multi-year donation project and employee volunteer effort, which aims to educate, inspire and improve living conditions for nearly 100 children in Russia's Krasnodar region. It includes chemistry lessons, Olympic quizzes, and sporting events for orphaned children.

**Do you have any expectations how Dow's partnership with the Olympics will pay off?**

**K. Wiggins:** Olympic infrastructure contracts offer major business opportunities for Dow. Every dollar invested in the Olympic Games is not



only investing in the Olympic spirit, but in our business. Dow's Worldwide Olympic Partnership helps to

further the dialogue with its customers around Dow's solutions based product offering. And we also keep

track of important metrics related to our reputation and the satisfaction of our employees. In addition, the prestige of being a TOP sponsor of the Olympic Games gives Dow an advantage over its competitors when it comes to recruiting talent. Sponsorship of the Olympic Games makes Dow distinctive.

### Full Interview

Read the full interview including more information on contributions Dow has been making for the London 2012 Olympic Games on CHEManager-Online: [www.chemanager-online.com/en/tags/london-2012](http://www.chemanager-online.com/en/tags/london-2012)

# Sustainable Solutions

## ICCA Highlighting Innovations Made Possible by Chemistry at Rio+20

### Shaping Tomorrow Today

– During the United Nations Conference on Sustainable Development (“Rio+20”), the International Council of Chemical Associations (ICCA) showcased the chemical industry’s contributions to sustainable development and the green economy at a panel discussion held in conjunction with the Business Action for Sustainable Development (BASD) Business Day.

“Since the first Earth Summit in 1992, the chemical industry has played an essential and integrated role in delivering solutions that enable inclusive and greener economies,” ICCA President Andrew N. Liveris, chairman and CEO of The Dow Chemical Company said. “Today, more than 20 years later, our industry is a proactive participant at Rio+20, highlighting innovations, technologies and processes that are applied around the world, every day, delivering on the promise of sustainability and made possible only through the application of chemistry.”

The ICCA panel, which featured industry leaders as well as key stakeholders from government and

labor organizations, underscored the role of the chemical industry in enabling society to meet pressing global needs, including ensuring a safe and plentiful food supply, providing clean drinking water around the world, protecting public health through medical breakthrough, transforming the way energy is used, and reducing greenhouse gas emissions for a cleaner environment.

ICCA also released its new report, ICCA and Sustainability: The Global Chemical Industry’s Contributions to Sustainable Development and the Green Economy, at Rio+20.

At the panel discussion, ICCA highlighted one of its key priorities at Rio+20 – advancing and strengthening SAICM, the Strategic Approach to International Chemicals Management, the preferred international forum for making progress toward the 2020 goal for safer chemicals management. ICCA is supporting the development of a flexible, customizable roadmap to a green economy that focuses both on resource efficiency and economic growth as an outcome of Rio+20.

“Resource efficiency is crucial to enhance sustainable use of scarce resources,” Carlos Fadigas said, CEO of the Brazilian chemical company Braskem and a participant in the ICCA panel. “We must focus on

sustainable consumption as well as sustainable production, with a commitment to producing goods and services efficiently and consuming them differently. In order to achieve that it is crucial that each company put the sustainability as a core driver of its business strategy. More and more chemical companies are doing that.”

ICCA and the chemical industry are working to ensure the safe, responsible and sustainable management of chemicals throughout their entire life cycle, and for their intended use, through its Responsible Care and Global Product Strategy initiatives.

“Responsible Care is the centerpiece of the global chemical industry’s commitment to sustainability,” Frank Sherman said, president of AkzoNobel Inc., North America, and a participant in the ICCA panel discussion. “Through Responsible Care, we are continuously improving our environmental, health and safety performance and effectively

managing chemicals through the value chain.”

Other chemical industry priorities at Rio+20 included strengthening the United Nations Environment Programme to enable it to more effectively coordinate and address environmental issues within the overall context of sustainable development, as well as enhancing the science-policy interface among international institutions, encouraging participation from developing countries, and building links between policy frameworks and financing for relevant institutions. Furthermore, the focus of discussions around the Institutional Framework for Sustainable Development must be on pragmatic, practical reform, to ensure an integrated approach to sustainable development at the inter-governmental level.

► [www.icca-chem.org](http://www.icca-chem.org)

[chemanager-online.com/en/tags/sustainability](http://www.chemanager-online.com/en/tags/sustainability)



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### Arkema Invests in Fluoropolymers

Arkema announced a major project for the development of its Kynar PVDF business in Europe. Over €70 million are to be invested into the Pierre-Bénite site in France, in particular to increase Kynar PVDF production capacity by 50%, and so support customers in high-growth applications.

This capital expenditure plan will help increase by 50% fluoropolymer

production capacity in Pierre-Bénite by 2014. It also entails major technological advances such as the implementation of an innovative high purity process, a new effluent treatment plant, and a contribution to investments for the implementation of the site’s Technological Risk Prevention Plan.

### AkzoNobel Realigns Pakistan Activities

AkzoNobel has completed the restructuring of its activities in Pakistan by establishing AkzoNobel Pakistan Limited as a separate legal entity from ICI Pakistan. As previously announced, the split means that the company has started the formal sale process to divest its 75.81% shareholding in ICI Pakistan.

The new AkzoNobel Pakistan Limited business is focused on three core areas - Decorative Paints, Performance Coatings and Specialty

Chemicals. An appropriate management and organizational structure is currently being finalized, with Jehanzeb Khan having been appointed as its CEO.

The coatings activities of ICI Pakistan were transferred to the newly-formed AkzoNobel Pakistan Limited through a legal process of demerger. ICI Pakistan’s business now comprises polyester fiber, soda ash, life sciences and chemicals.

### Potash Piles up as India Stops Buying

A dramatic buildup in North American potash inventories is largely due to a lack of sales to India, but the situation will not last too long. Stockpiles of potassium chloride climbed last month to 3 million tons, up 3.9% from April and up 4% from the five-year average, according to data released by Potash Corporation of Saskatchewan.

“I think it’s just reflecting India not pulling (potash),” Agrium CEO Mike Wilson told Reuters in an interview. “Once India starts to pull,

and assuming we settle with China, everything should be fine.” Agrium, based in Calgary, Alberta, is a major producer of nitrogen and potash fertilizers, and is the largest U.S. retail seller of products like seed, chemicals and fertilizer to farmers.

India is one of the biggest consumers of potash, and a new sales contract through Canpotex - the Canadian potash export consortium owned by Potash, Mosaic and Agrium - should happen in August or September, Wilson said.

### Lanxess Sets Its Sights on Turkey

Lanxess plans to expand further in the Turkish market. One important step in this direction is opening a new subsidiary in Istanbul. Lanxess Kimya Ticaret will manage the company’s business in this growing market in the future.

Lanxess generated record sales in Turkey in 2011 amounting to some €125 million, nearly triple the amount achieved in 2009. The company anticipates that the Turkish economy will grow between 4 and 5% a year between 2013 and 2016, significantly faster than Western Europe.

The most important sectors in Turkey for Lanxess are the automotive and tire industries. The company expects the automotive industry in Turkey to grow by 8.5% in 2013 and then 3.5% per year from 2014 to 2016. In the construction industry, Lanxess foresees growth rates of between 4 and 5% in the upcoming years.

The new company will initially start off with 20 employees under the management of Ömer Bakır, general manager of Lanxess Kimya Ticaret Ltd. Åzti.



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# The Long Way Back

## The Chemicals and Pharmaceuticals Industry in Great Britain

### Business in Great Britain

Since 2008, the UK chemical industry has gone through one of the biggest downturns in production of all the world's leading producers of chemicals. Now it faces the challenge of finding ways of returning to a steady growth in output, so that it can make up for the ground it has lost over the past four years.

From 2008-2010, turnover in chemicals in the UK fell by 14%, from £42 billion (€52 billion, \$66 billion) to £36 billion, according to figures from the country's Office of National Statistics (ONS).

The decrease was particularly steep in commodities, which accounts for around 40% of the UK chemical industry's turnover. In basic organic chemicals, mainly petrochemicals, turnover plunged by 31%. Specialities and consumer chemicals, which evenly share the remaining 60% of the industry's turnover, fared better, with perfume and toiletry producers seeing their turnover rise by 14%.

By the end of 2010, the ONS production index for chemicals in the UK showed that output in constant prices taking into account inflation was 20% below the average level in 2008. During 2011, the decline levelled out before production started to rise slightly, so that by the spring of this year the gap was less than 14%.

However, despite the small improvement in production in recent months, the country's post-2008 performance is still trailing well be-

hind that of other major producers. Two other poor performers have been the US and Italy, but the decline in their output for 2008-2011 has been half that of the UK, according to figures from the American Chemistry Council (ACC), which tracks trends in global chemicals production.

### UK and Europe

In Europe, other big chemical-producing countries suffered drops in output in 2009, but their chemical output subsequently recovered much more quickly. Last year, output in all the leading national chemical industries in Western Europe increased, except the UK (with a fall of 3.9%) and Italy (with a fall of 2.4%), says the economic forecasting consultancy Oxford Economics.

Prior to the financial crisis, UK chemicals output had been increasing relatively consistently, with production in early 2008 around 15% higher in real terms than it was in the late 1990s.

However, much of the growth had been driven by buoyant sales in commodities. Specialities, by contrast, did worse than expected mainly because of competition from low-priced Asian exports in segments like fine chemicals.

The UK chemical industry was also helped by a flourishing UK pharmaceuticals sector, dominated by GlaxoSmithKline and AstraZeneca, which is one of its biggest customers. By mid-2007, pharmaceuticals output was over 30% higher than seven years previously.



### Investing in the Future

Nonetheless while enjoying growth in production and sales, much of the UK chemical industry, particularly its commodities segment, failed to raise capital investment. In basic chemicals, annual capital investment levels were around 30% lower than they were at the turn of the century.

As a result, when the recession struck a lot of elderly chemicals plants in the UK that needed upgrading were among the first to be closed. Typical of the closures was a decision by Dow Chemical in 2009 to shut

down a 320,000 tons-a-year ethylene oxide unit and a 275,000 tons-a-year ethylene glycol unit at Wilton, Teesside, triggering capacity cutbacks by their surfactant-making customers.

"These plants closures were one reason why the commodities sector, particularly petrochemical producers, has not been able to recover quickly from the effects of the recession," explains Alan Eastwood, senior economist at the UK Chemical Industries Association (CIA). "Petrochemicals output is still around 30% below what it was in 2008."

UK pharmaceuticals production has also dived over the past two years, mainly as a result of cuts in health budgets by governments as part of their post-2008 austerity programmes. Some observers reckon that the pressures in the pharmaceuticals market, particularly in Europe, were a major reason why the bounce-back by the UK chemicals industry has been delayed.

"The UK industry contracted for a further two years after 2009 largely because of the weakness of the pharmaceutical sector which carries a large weight in terms of chemical output as a whole," says Amit Sharda, chemicals analyst at Oxford Economics.

The plight of the UK chemicals sector was highlighted in April when its exports and imports balance showed a deficit of around £300

million, raising the prospect of losing its long-established annual trade surplus. "We have [had] one or two months before when there has been a deficit of a few tens of million but not of this size, which is really quite serious," says Eastwood.

In fact, even before the recession, the industry's trade surplus had been gradually declining: from around £3 billion 10 years ago to £1 billion in 2008. By last year, the surplus had shrunk to only £37 million.

The shrinking of the trade surplus has coincided with changes in the industry's structure. There are fewer chemical producers, with numbers of chemical and man-made fibre companies falling by about 40% to around 2,500 between the mid-1990s and 2010. There are fewer large UK-owned players: ICI, the biggest since the 1920s, was broken up and finally disappeared four years ago when it was taken over by AkzoNobel. Now 70% of the membership of the CIA, which represents the country's larger producers, are foreign-based multinationals.

Over the past two years, the UK chemicals sector has also been hit by problems in the Eurozone, which it is by far its biggest export market. On the other hand, with the UK being a non-euro country, it has been less affected by the crisis than its Eurozone counterparts.

### Outlook

Analysts are predicting that the UK chemical industry will start to recover this year with output increasing slightly, while production in Germany, France, Italy and Spain – all euro members – will decrease because of the euro crisis.

Then UK chemicals output should start to rise faster than GDP. Oxford Economics reckons that from 2012 to 2021, UK chemicals output will rise by an average 1.6% annually – about the same rate as in Germany and only slightly below the average in Western Europe.

UK growth is likely to come from a revived specialities segment, centred on the northwest of England, which has the biggest chemicals cluster in the UK. It has the highest number of new chemical companies in the country, many of them spin-offs from the area's universities, such as Manchester and Liverpool.

While the country's traditional petrochemicals-based sector – centred on Teesside, the UK's other major chemicals cluster – is likely to continue to decline, it should be replaced by projects based on low-carbon technologies using renewable and hydrogen feedstocks.

R&D investments, some coming from government funds, will stimulate growth in new high-end sectors such as printed electronic materials, battery chemicals for electric vehicles and chemicals for biotechnology processes.

These innovative segments, galvanised by the country's strengths in university education and research, should provide a platform for long-term growth. In the short to medium term, the country will have to be satisfied with a slow expansion in production to make up for the effects of the 2008 crisis. "Despite a gradual rise in output, we expect chemical output will only just reach its pre-2008 peak by the end of this decade," says Sharda.

*Author: Sean Milmo, freelance science and business journalist, Essex, United Kingdom*



Wilton International chemical complex.

## Fertilizer Industry Performs Best, Biofuels Worst among Chemical Sectors

The fertilizer industry has been the best share performer over the past five years, and biofuels industry shares performed worst during the same period of time according to the Valence Global Chemicals Indices, a unique benchmark and share performance tool for the diversified global chemicals industries.

The Valence Group is a specialist investment bank offering M&A advisory services exclusively to companies and investors in the chemicals, materials and related sectors. The tool breaks down the overall chemicals sector into more than 30 sub-sectors in order to track their individual share performance. Chemical sub-sectors' stock performance can now be measured relative to each other, as well as to broader share price indices. The Valence Global Chemical Index (VGCI) is an aggregate of nearly 250 public chemical and materials companies from all geographies. Companies with limited stock liquidity or equity value below ca. \$100m have generally been excluded.

Sub-sector developments can be extracted and analyzed in many ways. The fertilizer industry, for ex-



Peter Hall  
Partner, Valence Group

ample, has been the best performer over the past five years, reflective of the increasing need for food and rising commodity prices globally. In contrast, the worst performer has been the biofuels industry, due in part to skepticism over government

**Chemicals sub-sector indices provide insights into the performance of this complex industry.**

resolve to support alternative energy sources and the on-going debate over diverting resources (corn etc.) from the food chain to biofuels production.

The VGCI's hence facilitate comparison of specific companies to the performance of a directly relevant peer group, rather than a less comparable broad 'chemicals' index.

Importantly, the various indices can also provide useful leading economic indicators, as chemicals are often key elements of many production processes, applied at a very early stage in the manufacturing and supply chain.

Commenting on the indices, Peter Hall, Partner at Valence said "Chemicals sub-sector indices with this level of granularity have not previously existed. They provide highly accessible insights into the performance of this complex industry at a much more detailed level than just 'com-

modity' and 'specialty' – increasingly meaningless phrases. They also provide a great leading view on what is happening on the manufacturing floors around the world and are a great bellwether for the economy as a whole."

www.valencegroup.com

## Hovione's Sales Grow 24%

Hovione announced that the consolidated sales for the fiscal year ended March 2012 amounted to \$180 million, the sixth consecutive year of sales growth, representing a growth of 24% in relation to last year.

In addition to the financial results overall 2011 represented a year of great achievements, namely: Hovione stood behind 3 NDA approvals, these were all major NMEs – and in two cases the approvals were

full QbD filings in which Hovione was central to the design and data generation. All Hovione plants underwent several successful GMP inspections by one or more of the major Medicines' Agencies. ■

## BASF Acquires PU Specialist ITWC

BASF has acquired Malcolm, Iowa-based ITWC, a specialist in cast elastomer polyurethane systems and polyester polyols, for an un-

disclosed sum. The US company employs more than 80 people in Malcolm and in Riverside, California. The deal includes assets picked

up by ITWC in its November 2010 acquisition of Hydroseal Polymers in Riverside. ■

## Clariant with Clear Strategic Targets up to 2015

Clariant will continue to consistently implement its profitable growth strategy during the next three years, as announced by CEO Hariolf Kottmann and CFO Patrick Jany at this year's Capital Markets & Media Day in Munich, Germany.

The goal is to increase the company's EBITDA margin from 13.2% in 2011 to above 17% in 2015 and to achieve a return on invested capital (ROIC) that is above peer group average. Clariant will in future generate more than 70% of its sales with core non-cyclical business units.

In order to achieve these goals, considerable progress has to be made in all four strategic directions.

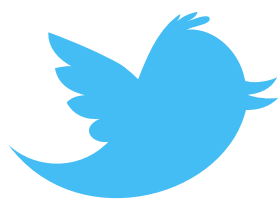
Within the existing business units, a further profitability increase is planned through performance management and functional excellence measures. Increased market shares in emerging markets such as China, India and Brazil will further boost profitable growth.

An active portfolio management will play an important role on the path to a sustainably profitable company. As already announced with the publication of the 2011 full year results, the company will sustainably increase the quality and performance of its product portfolio. In this context, Clariant is evaluating strategic options for the business

units Textile Chemicals, Paper Specialities, and Emulsions, Detergents & Intermediates. These options are planned to be implemented during the next 18 months.

The acquisition of Süd-Chemie was an important first step. In 2011 the former Süd-Chemie businesses contributed significantly to the company's results. Until end 2013, an additional EBITDA improvement of CHF 90-115 million is expected from synergies resulting from the integration. The transaction will be accretive in 2013, i.e. in the second year after the acquisition. In addition, the transaction was fully refinanced within less than twelve months. ■





## News

### Bayer Sustainable Building Initiative Honored at Rio Summit

Bayer MaterialScience's Eco Commercial Building Program was honored at the Rio de Janeiro Earth Summit in June as a worldwide model for sustainable building. The award for Best Practice of Global Green Building was presented to the Bayer team of experts by the Global Forum on Human Settlements. The global sustainable building program was established by BMS in 2009. It bundles the expertise of experts in various disciplines. Some 50 partners participate in the scheme, including ThyssenKrupp, Stiebel Electron and Phillips.

### ICL-IP Consolidates With IMCD in UK and Ireland

Effective 1 July, ICL Industrial Products, a producer of brominated, phosphorous and magnesium-based flame retardants, consolidated its portfolio with that of IMCD UK & Ireland. The deal includes Fyrol, Fyrolflex, Phosflex and FR grades. IMCD UK & Ireland has distributed the phosphate flame retardants for eight years. With the recent deal, the brominated products have been added to the portfolio.

### Brenntag Acquires ISM/Salkat Group in Australia and New Zealand

Brenntag signed a purchase agreement to acquire the entire business of the ISM/Salkat Group. ISM/Salkat Group is a distributor of specialty chemicals in Australia and New Zealand. Brenntag will start integrating its existing organization with the ISM/Salkat Group shortly after closing. The ISM/Salkat Group expects sales of AU\$117 million for the year 2012. The closing of the transaction is expected in the course of July 2012.

### DKSH, Induchem Sign Distribution Agreement

DKSH and Induchem, a Swiss manufacturer of personal care raw materials, have entered into a distribution partnership for Mainland China. At the same time and in recognition of the continued development within the region, DKSH Performance Materials has opened a fourth China sales office in Beijing and strengthened the Management Team in China with the appointment of Kevin Bee as new Head Business Line Personal Care Industry.

### Lilly Resumes Share Buyback

Eli Lilly, facing revenue pressure from patent expirations to top products, said it was resuming its program to buy back its stock. The Indianapolis-based company has not bought back its shares since the middle of the last decade, choosing to use its cash for other purposes. Lilly's board authorized the company to resume a share repurchase program that had begun in 2000, under which it had spent \$2.58 billion of a total authorization of \$3 billion.

Lilly expects to buy the remaining \$420 million by the end of the year and anticipates resuming share repurchases following the completion of the current program.

### Univar, Oxea Sign New Distribution Agreement

Univar has signed an agreement with Oxea to distribute its Oxfilm 351 coalescing agent in Benelux, France, Italy, Spain, and the Nordic region. Oxfilm 351 is a low odor, near-zero-VOC coalescing agent with a plasticizer effect. It has a VOC content of less than 0.5%, and at the same time is 10-20% more efficient in reducing the minimum film forming temperature than comparable products. Oxea has developed this product for use in next-generation indoor coatings.

## Flexibility to Invest, Agility to Respond

Following management buy-out Dow Haltermann UK has reverted to the previous identity of Chemoxy

**Change of Ownership** – In 2011, Dow divested all of the Haltermann companies. The only affiliate that retains the name is Haltermann in Germany. The former Dow Haltermann subsidiary in Antwerp is now trading as Monument Chemicals. Dow Haltermann Custom Processing UK has become an independent company following a management buy-out of Dow Chemical's Custom Processing facilities at Middlesbrough and Billingham. With the new independence, the business has reverted to the previous identity of Chemoxy, which had been abandoned in 2001 when the business had been named Haltermann. The new Chemoxy provides custom manufacturing services to petrochemical and specialty chemical companies as well as to companies with niche applications. Michael Reubold spoke with Chemoxy's CEO, Ian Stark, about the legacy and the future of the company.

*CHEManager Europe: Chemoxy is a specialty chemicals manufacturer with over 100 years of operating experience, but the name may not sound familiar to many of our readers. Who is Chemoxy?*

**I. Stark:** The last time the Chemoxy name was used was about 12 years ago, but it had a lot of brand equity

in the paint and coatings industry where companies are looking to reduce the amount of volatile organic compounds in their formulations.

And the third platform is solvent recycling. We take in solvent streams from the UK, from Ireland and from continental Europe and we recycle quite a lot of solvents from the pharmaceutical and electronics industry.

ties and demand has also grown for our low-VOC solvents, which comply with the latest low emission regulations in several European countries. We have launched a new product called Coasol 290, which is a coalescing solvent for latex paints. It has got high efficacy and it is one of the first products that meets all of the legislative emission standards.

*Where are Chemoxy's production sites?*

**I. Stark:** The Custom Processing business operates two sites in Teesside in the UK with a capability to process volumes from tonnes to kilotons. The Middlesbrough site has been carrying out distillation since 1868 and the Billingham site was added to the portfolio in 1994. Key technologies include esterification, high-resolution distillation, batch and continuous reactions, methyl chloride chemistry and hydrogenation.

*Looking back at the company's past decade: after becoming an independent company in January, what are your thoughts about the time as an affiliate of Dow?*

**I. Stark:** I was very proud that we were with Dow for 10 years and we are determined to keep all of the health and safety excellence and the plant compliance we learnt from Dow. Chemoxy has a long established reputation for technical excellence, confidentiality and EH&S compliance. But we can be more



Ian Stark, CEO, Chemoxy

agile now as a small company. With that agility we are able to respond to our customer needs more quickly.

*More agile and more flexible?*

**I. Stark:** Absolutely. This year we invest about €1 million on plant expansion, and we have completed the first phase of a 20% capacity increase by bringing back on line two reactors which were idled in 2009. So, these are exciting times and our plants are running at high utilization, at 80+%, and that is why we are expanding, because we need some spare capacity. We are well advanced in the design of a further capacity expansion which is expected to come on line in the fourth quarter of 2012.

*What is your strategy or vision for the next five years?*

**I. Stark:** Our strategy on custom processing is to continue to focus on combined reaction distillation where we have some strength. And we also have some unique capabilities on methyl chloride handling for capping projects et cetera. We are planning to expand further and we have a vision to put a brand-new €7 million investment on our plant in the 2014 timeframe.

Our strategy on own products is to come up with environmentally friendly solvents. We are looking at high-boiling solvents, but we are also launching a range of naturally solvents based on oleochemicals. And we are already evaluating new bio-derived raw materials like citric acid that are going to come from bio-processes.

*So we are talking green chemistry ... are those environmentally friendly or bio-derived products required by your customers?*

**I. Stark:** Green chemistry, yes. Our customers are using a lot more of our solvents, because methylene chloride is being phased out in favor of more environmentally friendly products. But green solvents still have to perform. People won't buy a product just because it is green. It does need to be green, have efficacy, be able to perform, and it also has to be cost-efficient. And customers won't pay a huge premium just because it is green. Our desire is to find cost-effective bio feedstocks. And the prices are coming down all the time. So, I think there is going to be a lot of new bio products coming out, and we are going to look at making the derivatives.

*In recent years, there has been a lot of change in the UK chemical industry landscape, including the set-up of the new Chemoxy. How would you describe the chemical sector in the UK today?*

**I. Stark:** Generally, I think speed, flexibility and creativity are the great attributes of the UK chemical industry. There are a lot of small and medium-sized companies that have tremendous flexibility. The chemical industry is one of the biggest contributors to export sales and it is one of the few manufacturing sectors that have a positive balance of payment in the UK.

**“ People won't buy a product just because it is green; products need to perform and be cost effective. ”**

in those days. We were with Dow Chemical for 10 years trading as Dow Haltermann Custom Processing. Following the change of ownership on January 1, 2012 we decided to go back to the old name of Chemoxy. We serve a diverse range of industries from pharmaceutical, electronic and flavor & fragrance through to oil drilling, fuel additives and industrial solvent users. In addition, the company manufactures a range of environmentally friendly solvents, which are used in paints and cleaning products. We employ about a hundred people and we have sales of around €45 million, a large proportion of which are exports sales.

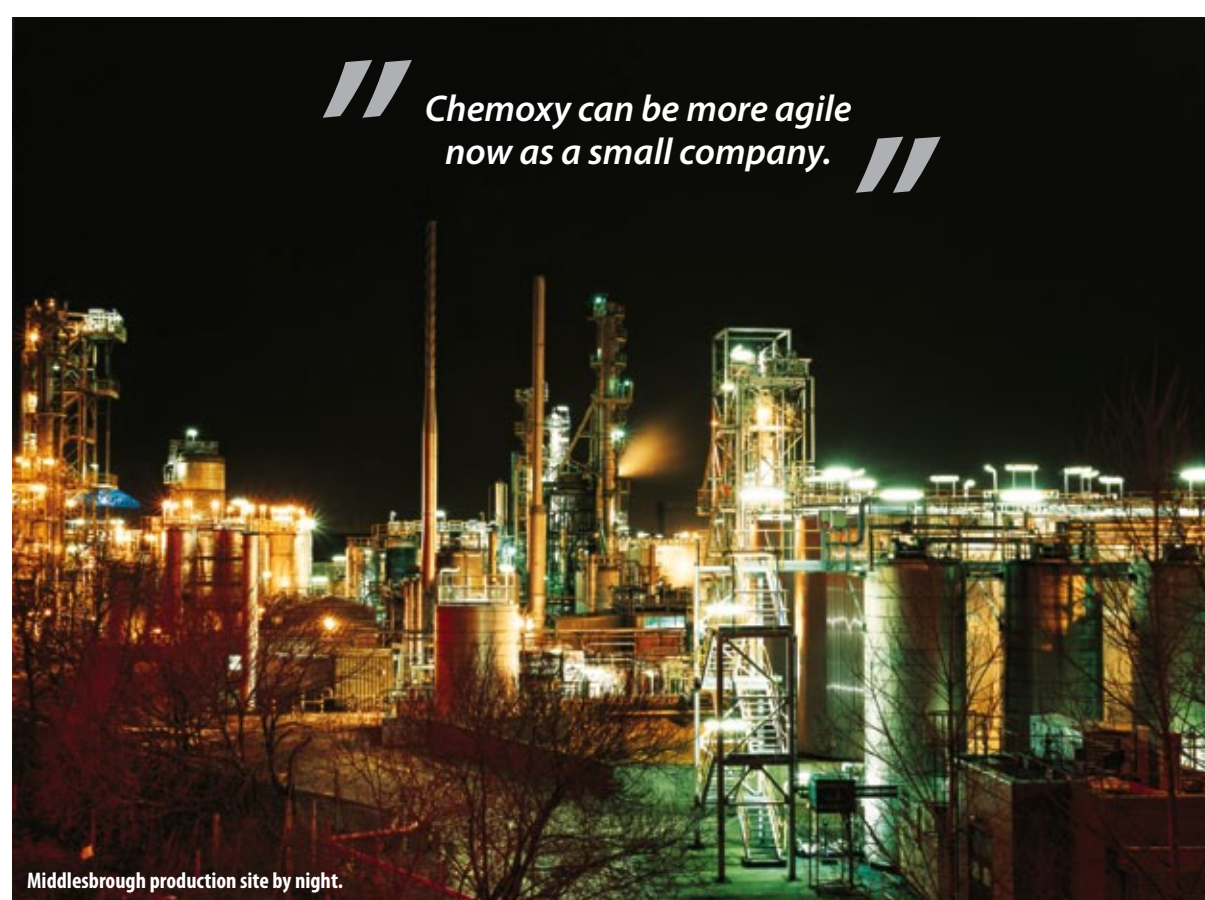
*How is the company organized, what are your key areas?*

**I. Stark:** We have three platforms: Custom Processing, Chemoxy Products and Solvent Recovery. In Custom Processing, we are working for a global customer base, but the majority of our client base is continental European.

The second platform, which we are very excited about, contains our own niche products. Here we are seeing some substantive growth, which is being led by emission legislation for low-VOC solvents. With our products Estasol low-VOC solvent and Coasol low-odor coalescing agent, we have a very strong presence in the

*You talked about growth. What are your growth expectations for these platforms?*

**I. Stark:** We are experiencing a growth in custom manufacturing requirements and recycling activi-



Middlesbrough production site by night.

**“ Chemoxy can be more agile now as a small company. ”**

### Generic Drugmaker Teva Profits from Copaxone Ruling

Teva Pharmaceutical Industries, the world's largest generic drugmaker, has won its patent-infringement suit against fellow generics producers Momenta Pharmaceuticals and Sandoz as well as Mylan Laboratories and Natco Pharmaceuticals.

Ironically for a generics producer, the lawsuit concerned Teva's branded multiple sclerosis drug Copaxone. One of the Israeli company's potential blockbusters, the MS treatment is expected to generate \$3.8 billion of Teva's \$20-21 billion total revenue in 2012.

Under the ruling by a U.S. district court judge – that can be appealed

– a generic version of Copaxone cannot be sold before September 2015. The news was received positively by the stock market. Teva's shares rose by more than 1% after losing 17.5% in 2011 and 5% since the beginning of 2012 as investors worried about the possible patent loss.

In early June, Teva said a Phase III clinical trial met a primary endpoint of reducing the annualized relapse rate by 34.4% compared to placebo in a 40 mg Copaxone dose administered three times a week. The drug is currently a 20 mg dose given daily.

### Univar Exclusive Distributor of National Starch in Turkey

Univar announced it has entered into an exclusive agreement to distribute National Starch's full range of specialty starches in Turkey. This builds on a 20-year partnership between the two companies

that has grown to cover the UK, Ireland, Iberia, and the Nordic region.

With a population of over 70 million and a fast-growing food sector, Turkey is a key territory

in Univar's global food strategy. Univar has a strong local business in the region following the recent acquisition and integration of well-established Turkish distributor, Eral-Protex.

### New Akzo Nobel Plant to Use Caustic Soda Evaporation System

Akzo Nobel Industrial Chemicals will use what is described as a "unique" caustic soda evaporation system in its new 275,000 metric ton per year membrane electrolysis plant set to start up in Q4 2013 in Frankfurt,

Germany. The company hopes to achieve energy savings of 20%.

The system supplied by Alfa Laval will concentrate caustic soda from 32 wt% solution to 50 wt% solution, through the use of evaporation and

condensation heat exchangers. Combining the advantages of different types of heat exchangers will enable for the first time the concentration of caustic soda in a 4-effect evaporation system, Akzo Nobel said.

# Trends in Pharmaceutical Outsourcing

## The Pharmaceutical Supply Chain

**Mean and Lean** – The pharmaceutical supply chain has gone through a dramatic transformation over the past few decades, with an ever-increasing number of players involved in developing, manufacturing, marketing, and distributing drugs. Today, companies in the pharmaceutical industry are frequently turning to Contract Research Organizations (CROs), Contract Manufacturing Organizations (CMOs), and Contract Research and Manufacturing Services Organizations (CRAMS) to fill knowledge and technology gaps and realize cost-savings. It is no secret that the R&D-focused pharmaceutical industry is struggling with discovering new products and getting them through clinical trials. In order to bridge the gap, pharmaceutical companies are increasingly using complex R&D cooperation models where they work simultaneously with several partners, including academia.

When it comes to manufacturing, pharmaceutical companies must make a decision whether to invest significant amounts in developing

the new capabilities with the right capacity available the right time, or to work with partners who already have the required capabilities and



Kate Kuhrt  
Thomson Reuters

capacity available. Due to financial pressures and the need to prove favorable return on individual project investments compared to other projects within the company that also require investment, making a case for investment in new capabilities may be difficult. Additionally, as the R&D side of the industry is putting more focus on patient-specific medicines, the amounts of a particular product needed to meet market demands will likely decrease which may further push the scales in CMOs favor. An increasingly complex regulatory environment, associated with rising costs of maintaining compliance, is frequently cited as another reason for outsourcing.

It has been common for pharmaceutical manufacturers to outsource the manufacturing of older and less expensive products, thus making room in their own facilities for newer products and allowing for tighter control of proprietary technologies and know-how. Even in the absence of suitable products to fill the pipeline, outsourcing continues due to the difference in the cost of manufacturing the product as compared to the cost of buying it from a third party, frequently located in India or China.

Abbott was the powerhouse when it came to manufacturing erythromycin. For years, they continued making the fermentation-based product in their North Chicago plant despite having higher costs than their Chinese counterparts who were making material of lesser quality. Today, however, there are plenty of sources of acceptable-quality erythromycin available in China allowing Abbott to discontinue the manufacturing of this product. Last year, Abbott announced that it will shut down the North Chicago manufacturing facility.

Outsourcing decisions cannot be made lightly. Once you hand over manufacturing of your product to a third party, you relinquish a significant amount of control, even if you have excellent contracts in place. Most likely, you will not be the third party's only customer, meaning that they will have to juggle the needs of

all their customers who often come from different cultures with different regulatory requirements which at times may be contradictory. And the third party will also have their own financial objectives and margin requirements which can lead to sacrifices when it comes to regulatory compliance.

Among generic drug manufacturers there seems to be continuous debate over the pros and cons of making active ingredients in-house versus working with third parties. An increasing number of companies do both. Having API manufacturing in-house gives you more control over pricing and intellectual property. But few, if any, generic drug manufacturers can make active ingredients for all the products in their portfolio, so they need to work with third parties regardless. Economies of scale may dictate manufacturing capacities that are too large for internal consumption, while finding customers may prove difficult; other competitors may choose to buy from independent API manufacturers rather than their competitors.

Of the 464 API manufacturers rated by Thomson Reuters as Established or Less Established, meaning that the companies have experience with supplying active ingredients to regulated markets, approximately a third are pure API manufacturers with others associated with groups that are also involved with finished dose products. (Figure 1)

### So, who should one work with?

Both generics and Big Pharma are continuing to focus their attention on emerging markets to find low cost sources of raw materials, active ingredients and finished dose manufacturing. Among emerging markets, India is a popular destination for finished dose, while both China and India continue to enjoy a significant presence as outsourcing destination for API. The number of suitable sources of low cost active ingredients in India and China has increased considerably during the past decade. As seen in Figure 2, the number of API manufacturers rated by Thomson Reuters as Established or Less Established doubled in India and China since 2005. Meanwhile, the number of Italian-own groups has decreased, mostly as a result of acquisitions by foreign companies.

The costs of manufacturing in India and China have increased as



well: salaries are growing at double-digit rates, there is increased regulatory compliance, and environmental controls continue to be strengthened. If you add to the mix recent quality issues with both API and finished dose manufacturers and continued issues with IP protection, it is easy to see why some Western companies may be looking again toward their Western partners. A strong pipeline of oncology drugs that require complex and technically challenging HPAPI (High Potency Active Pharmaceutical Ingredient) manufacturing has also benefitted many of the more capable and experienced Western firms. However, contract manufacturers in North America have not been immune to regulatory issues either. For example, many pharmaceutical companies, generics, and API manufacturers have been hurt by Ben Venue's on-going troubles.

It remains to be seen what the impact of GDUFA (the Generic Drug User Fee Act) will have on the outsourcing decisions. The various fees, which are supposed to come into effect in Q4 of 2012, will apply to both finished dose and API manufacturers. Some of the fees will be linked to manufacturing facilities and will need to be paid every year, while others will be linked to individual filings, such as ANDAs and DMFs. It is likely that CMOs will pass at least some of the fees on to generic companies, so some generic companies may find it more attractive to work with manufacturing partners located in the US; facility fees for sites based in the US will be slightly lower than for over-seas sites.

As a result of GDUFA, contract manufacturers in emerging markets will no doubt face greater scrutiny and more frequent inspections than

they have in the past. If regulatory compliance goes up as a result, some Western companies may be more likely to use them. On the other hand, especially in the short term, the risk of something going wrong during those additional inspections may increase, possibly scaring away some customers. It is also clear that compliance does not come cheaply, which may further diminish the cost differential between Eastern and Western manufacturers.

Outsourcing is here to stay. In order to gain the maximum benefit from outsourcing, companies will need to very carefully evaluate what to do in-house and what to outsource. Another set of important decisions surrounds who to partner with. Both decisions need to be based on core competencies and not just the price tag. Too much emphasis on price can lead to cutting of corners on quality which can lead to disastrous results for all involved.

Outsourcing arrangements are likely to become increasingly complex involving many parties in many parts of the world, so it is absolutely crucial that companies continuously invest in building and managing the outsourcing relationships. Clear lines of communication are crucial, but so is a system of multiple checks at multiple points in the process.

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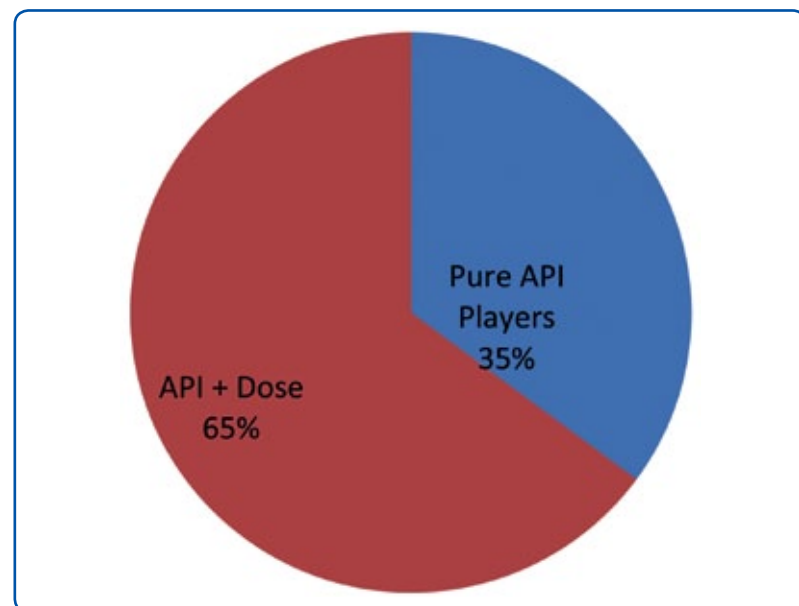


Fig. 1: The Share of Pure API Manufacturers as Compared to Forward Integrated Manufacturers  
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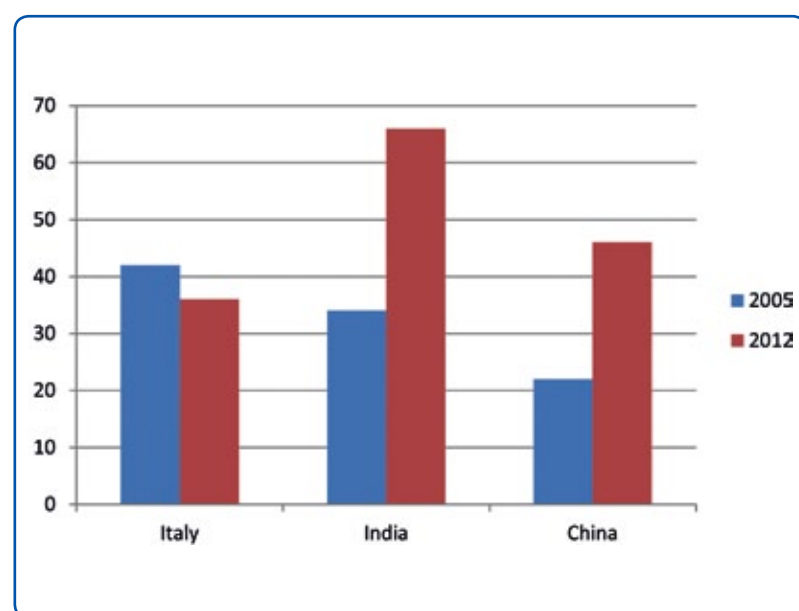


Fig. 2: Changes in the Number of Established and Less Established Manufacturers in Italy, India, and China.  
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## Finding the Formula for Success

### Key Messages from the Fecc Congress

#### For a Brighter Tomorrow

– More than 200 participants from across the chemical industry met at the Fecc Annual Congress 2012 in Lisbon to learn and exchange on the latest trends in the industry. Covering the most relevant topics in the sector, the event continues to establish itself as one of the most important dates in the European chemical industry's calendar.

Aiming at reaching the next level and turning targets into real change, the European Association of Chemical Distributors (Fecc) appropriately chose the theme Sustainable and responsible distribution: the formula for success. When welcoming the participants, Fecc's President Edgar E. Nordmann, noted: "Inspired by the industry's drive to find the formula for success, we developed a well-rounded program that covered a wide range of topics. With the

sessions we aimed to challenge the participants to recognize the changing landscape in the business world, think more about the leadership challenges and the different ways to respond to them".

With its daily work Fecc fosters cooperation within the chemical distribution industry and the supply chain. The Fecc congress has become an optimal platform where exchange between all stakeholders is greatly encouraged. This year the participants enjoyed diverse and much appreciated networking opportunities.

In the current challenging economical climate, chemical safety, competitiveness and sustainable development remain our industry's priorities. These topics were recurrent across all the five sessions of the congress.

#### Fitting in the Supply Chain

The unique position of the chemical distributors in the supply chain presents both challenges and advan-



Dr. Uta Jensen-Korte  
director general, FECC

tages. Having a profound knowledge of the industry environment is a key part to a successful business strategy. It is clear that there's not only one viable market strategy, however as highlighted in several presentations, knowledge, adaptability and innovation play a key role in enhancing efficiency.

Distributors often extend their activities, as they include not only the delivery of goods but also of services and know how. Innovative business models like chemical leasing look one step ahead to increase sustainability and provide competitive advantages.

As in any other sector providing outstanding solutions to the customer is essential for chemical distribu-

tors. Aligning your company's values to those of your customer will lead to increase your success probability.

#### Sustainability

Responsible Care and its importance as a unique global initiative which is not only about health, safety and environment but also about the public image of our industry, was a subject present throughout the sessions. Public and private sectors have dedicated vast resources towards more sustainable and responsible business operations. Leading by example the chemical industry has taken actions to improve performance while giving a better use to the resources and taking into account environment conservation.

The congress emphasized the link between sustainability, high performance and opportunity by encouraging the participants to include sustainability and environmental programs in their business strategy. When introducing sustain-

ability in your business strategy you must consider the importance it has for your customers. A sustainability strategy will improve processes and will help you go from research to concrete solutions.

It is crucial that adaptable communications are integrated in the company's strategy in order to reach all stakeholders. This will ensure that all the efforts and actions taken are widely known, leading to tangible competitive advantages.

#### Business Opportunities

Most of today's market leaders are those who had the foresight to recognize the changing landscape in the business world. Emerging markets like Asia and Latin America present a chance for both small and large enterprises to go global. Fecc continuously studies emerging markets and regularly reviews and disseminates factsheets regarding the chemicals sector in the focus regions and related macro-economic data.

With India and China focusing on chemical production and highly competitive prices, distributors starting in these markets, must be well informed and gather sufficient knowledge that will lead to a successful business strategy and efficient operations.

With an estimated worldwide market size of €121 billion for 2011 (provisional estimates, Chemagility), the chemical distribution sector is determined to meet future challenges. Fecc is confident that the lessons learned during the congress equipped the delegates with resources to respond to the complexity of the challenges we face as an industry.

We look forward to seeing you next year in Hamburg from June 17 to 19!

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# Protection Pending

## Intellectual Property Safeguards in China No Longer an Insurmountable Obstacle

### Diminishing Risk of Copycats

– In the Western world, the protection of intellectual property is often a key issue in investing in China. For example, in the book “The Chemical and Pharmaceutical Industry in China” (Springer, 2005), a chapter titled “Intellectual Property — The Real Killer Topic” states “China is notorious for its lack of IP protection.” In contrast, this article will argue that despite obvious dangers in this area, the actual risk is diminishing and can be further reduced by a number of protective measures.

First, why is it likely that IP issues have been overrated in many areas and will probably also become less serious with time?

An obvious starting point is that while in the early days of foreign investment, the multinational chemical companies were the only ones owning any notable intellectual property, this situation has now changed. In chemical areas such as batteries (e.g., BYD), fluorochemicals (e.g., Bluestar), and fine chemicals/pharma (e.g., Hengrui Medicine), Chinese companies have their own attractive patent portfolio. In 2010, the total number of patents filed in China increased by about 25% to 1.22 million applications, far above the 480,000 patents filed in the U.S. And with the recent rise in R&D activities of domestic companies, these are certain to be extended.

Politically the trend also seems to go toward a greater protection of intellectual property, as acknowledged by Bayer's China head of IPR, Dr. Oliver Lutze, recently: “The policies generally referred to as ‘indigenous innovation’ focus on building an innovative country by 2020. They will likely lead to more efficient IP protection for innovations, which are a key factor to foster investments in R&D.”

Furthermore, there have already been cases of domestic acquisitions partly based on intellectual property (e.g., the acquisition of Tiantong Fine Chemicals by Shanghai Huayi in order to get access to the patented benzoguanamine production process) as well as successful court cases of Chinese companies defending themselves in U.S. courts from infringement accusations (e.g., the Sinorgchem-Flexsys case in rubber additives). All these developments will lead to a rapidly increasing acceptance of the system of IP protection in China as it starts to protect not only the interests of multinationals but also of domestic chemical companies. Multinational companies will obviously benefit from this changed attitude toward intellectual property.

Secondly, in chemicals, successful innovation needs to be a continuous process. No company not continuing to innovate for a few years can expect to still have an edge on its competitors, whether or not past innovations have been protected by patents. And continuous innovation is based less on individual pieces of knowledge that can be protected by patents (and thus potentially copied) but rather on a whole body of knowledge accumulated by the R&D work a company has done in the past (including the knowledge of all the research work that ultimately proved to be fruitless and thus never resulted in a patent). Or to put it differently, if intellectual property is seen not as limited to a specific point in time but rather as stretching into the past and the future, it is much harder to imitate.

Finally, intellectual property is more and more a complex combination of products and services rather than a single formula or blueprint. What makes an iPhone



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more successful than a mobile phone produced by Motorola arguably is not the technological basis of the product but rather the complex infrastructure added on to the iPhone via apps, design and branding. Similarly, in specialty chemicals it is not so much the individual chemical formulation that makes a company successful, but rather the capability of this company to select the right product for a specific customer, to adapt the product to customer needs, to know how to produce consistent quality, and to provide customized technical service. Again, such a broader and more realistic view of IP also results in a much lower danger of IP simply being copied by a competitor.

Even though the risk of IP loss in China is often overestimated and in any case decreasing, it is still advisable for companies to take a number of relatively simple precautionary measures. This applies not only to foreign companies but also to established domestic companies as they are at the same risk of losing knowledge to Chinese competitors as multinationals.

Such measures should start with a solid understanding of a company's intellectual property. What kind of intellectual property does the company own, and where is it located within the company? In this respect, intellectual property should be defined broadly — it includes any kind of knowledge item that is not public and may be useful to potential competitors, such as customer lists, staff names, names of suppliers, process knowledge, formulations, specifications of individual raw materials, etc. This should be followed by a prioritization of all items of intellectual property by their value for the company.

Subsequently, measures to protect all or selected parts of the intellectual property should be taken. These may include:

- Limiting the access of staff to IP. In particular, limit the number of staff having access to all relevant knowledge, not just that required for a specific area of work.
- Bringing IP in as a “black box” from outside. This may be from outside of China for multinational companies, or from outside of a production site, for example, for a domestic company. This can apply to mixtures of raw materials, equipment parts or software.
- Using legal measures to keep competitors from using own IP.

Apart from these direct measures, there is a broad range of supporting measures that should also be utilized, for example:

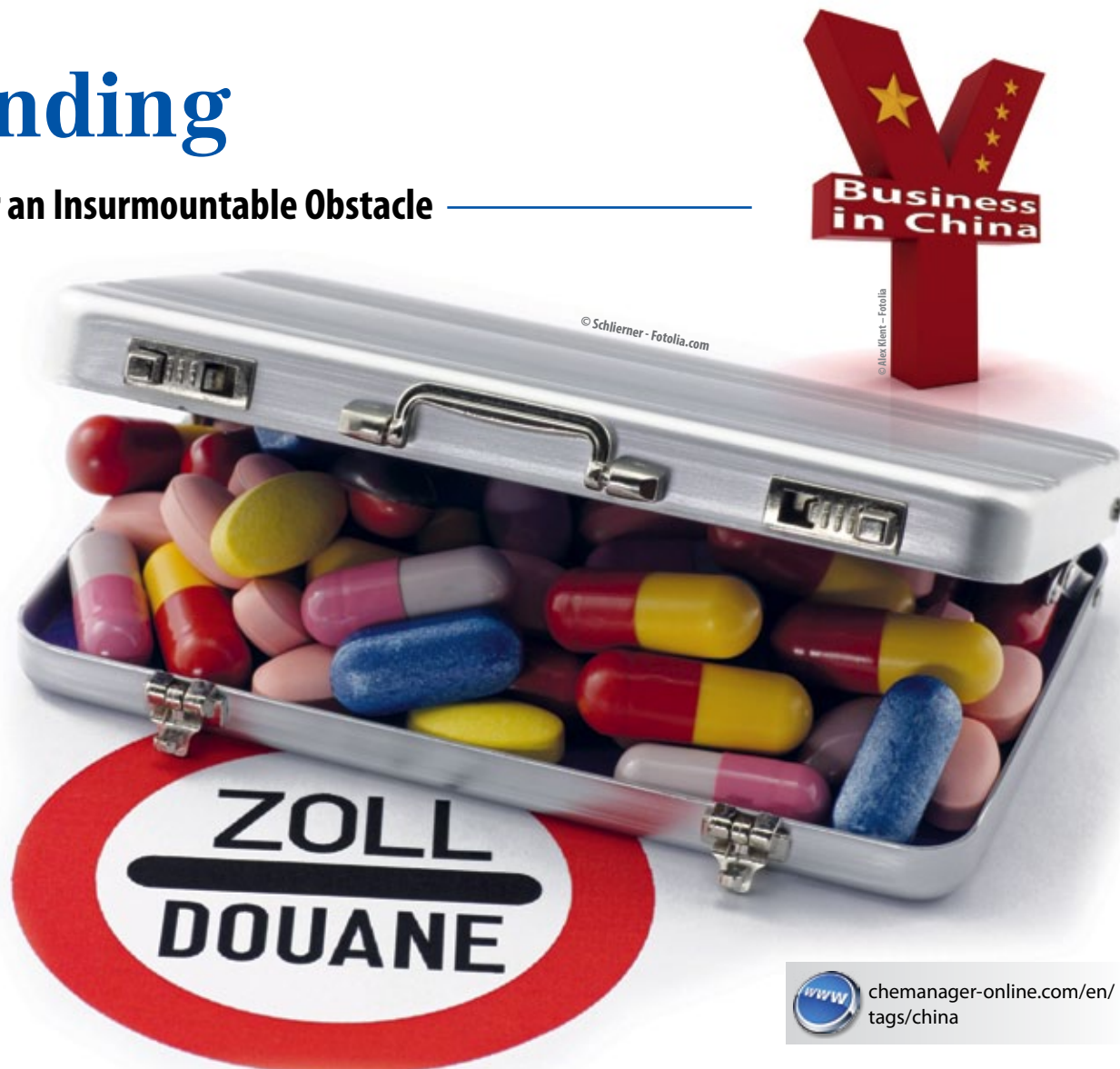
- Creating long-term career plans and incentives for employees with access to IP.
- Establishing good relationships with the local government.
- Limiting the number of production sites.

Admittedly, all these measures will only limit IP loss, not completely stop it. On the other hand, any German or U.S. research chemists leaving a chemical company in their homeland and joining another company nearby will also carry intellectual property with them. In fact, this knowledge is probably the key at-

traction for a new employer despite legal barriers that may formally prevent scientists from using past knowledge. This has hardly ever stopped a chemical company doing business in these locations. And the rapidly increasing number of R&D centers in China indicates that even the development of intellectual property in China — rather than just its application — is no longer considered off-limits for multinational chemical companies.

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## C'MON TO THE CHEMANAGER PORTAL

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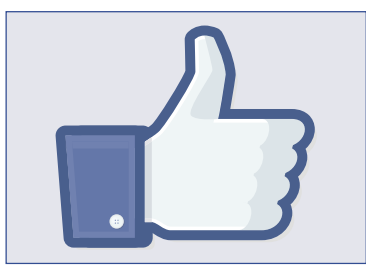


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## Every Drop Counts

### Zeroing In on the Water & Carbon Footprint

**Drop by Drop** – Recycling holds the key to sustainable use of industrial process water. Closed-loop water management reduces water consumption, provides a basis for material recycling, minimizes effluent volumes and also cuts energy consumption. Industry worldwide uses about one-fourth of the available water, in particular as a coolant, solvent and cleaning agent. Consumption varies depending on the extent of industrialization, and especially from one industry to the next. According to the German Water Association "Vereinigung Deutscher Gewässerschutz", as a rule of thumb the actual amount of water consumed to produce one dollar's worth of goods in the U.S. is 100 l compared to 50 l in Western Europe and around 20 l in the Asian region ("water footprint" or "virtual water"). How can the water which is needed for production be used in a more sustainable manner?

#### 21st Century Industrial Water Technology

Innovative techniques to enhance process water and effluent management are being developed to reduce the environmental impact and increase cost efficiency. These techniques can be aimed at reducing the volume of effluent released into the environment or at lowering contamination levels (e.g. residual COD (Chemical Oxygen Demand), AOX (Adsorbable Organic Halogen Compounds), trace substances and salts). Other objectives can be to extract usable substances from the effluent flow for recycling (e.g. lignin and polyphenols) or to reuse the water resources.

On the other hand, energy exploration (oil sand and shale gas) using hydrofracking is definitely not sustainable. Large volumes of water are used to bring the substances to the surface. Additives are often mixed in so that the pumps can keep the substances moving freely. Hydrofracking is common practice in the U.S. and Canada, and initial projects are now underway in Germany as well.

Apart from such "dirty technologies", industrial water technology actually is moving towards a holistic approach which includes recycling of process water and recovery of usable substances and/or chemicals used for water treatment. The approach to effluent management is also changing. Water treatment, extraction of usable substances and recycling of the treated water are easier and cheaper if the effluent flows are concentrated and unmixed.

Over and above these considerations, energy consumption and the carbon footprint throughout the equipment lifecycle are becoming an increasingly important argument in the contract award process, according to the German Engineering Federation VDMA and its Special Group Water and Wastewater Technology.

#### The Water Treatment Carbon Footprint

Krüger Wabag and other companies which are part of Veolia's water management business agree with that view. As a result, they systematically assess the emissions of greenhouse gases over the entire lifecycle of the water and wastewater treatment process. Based on a positive carbon balance, the company is able to identify a range of water treatment solutions and highlight savings opportunities along with the associated costs and benefits.

On public projects in the UK for example, an assessment of the anticipated greenhouse gas emissions is now a standard part of the bid solicitation process. This is also an issue in industry as well. A number

of global players including some which are involved in food production have set goals for gradually reducing their emissions, and they generate ongoing progress reports. Others are concentrating on improved energy efficiency (which is worthwhile also for monetary reasons) as well as sustainable management of natural resources. This also has a positive effect on CO<sub>2</sub> lifecycle emissions.

When the systems are built, an emissions assessment is carried out based on a breakdown of the individual parts. The raw materials such as steel, aluminum and various types of plastic are counted up and multiplied with a CO<sub>2</sub> emissions coefficient. The coefficients are taken from several internationally recognized databases. The major factors during ongoing operation are energy consumption, process equipment and the types of raw water used.

#### Integrated Water Management

A production plant that does not need to release any water is probably one of the most uncompromising examples of water conservation. The Dutch company Evides Industriewater B.V. is working towards the realization of such a project in China. A demonstration effluent treatment plant to produce high-grade process water is currently under construction in the dry north of the country. The plant will be part of a process water recycling loop for the continuous recirculation of treated water. Solids left over after the highly-concentrated contaminants are put through an evaporation process will be sent away for disposal. Freshwater is scarce in the region, and there is a lack of receiving water bodies into which effluent can be released.

Water treatment for recycling is one of the technologies in which this supplier specializes. At the port of Rotterdam for example, a new approach to process design has significantly improved water quality for industrial customers. There is high demand for ultrapure demineralized water, but the salt content of ground and surface water is expected to rise. Proven process methods have been combined with new technology on this large project. Brielse Meer, a nearby lake, is the main source of water for the Demineralized Water Plant (DWP). The process design includes flotation, filtration and ion exchangers together with membranes. New membrane technology reduces the use of water purification chemicals and increases membrane life. Valves are installed on vertically mounted pressure pipes to let air in during the cleaning and reverse flush cycle. This reduces cost and also protects the environment.

#### Energy-efficient Sea Water Desalination

If the experts are right, water consumption worldwide will rise by 40% over the next 15 years. Desert nations and small countries like Singapore which have few sources of freshwater are making increasing use of sea water desalination. That, however, has been very energy intensive. About 10 kWh of electricity is needed to evaporate 1 m<sup>3</sup> of sea water. Reverse osmosis on the other hand only uses about 4 kWh for the same volume.

Siemens has reduced energy consumption for sea water desalination by more than half. A pilot plant in Singapore processes 50 m<sup>3</sup> of water a day and uses only 1.5 kWh of electricity per m<sup>3</sup>. Demonstration plants are planned for construction in Singapore, the US and the Caribbean by mid 2012.

The new low-energy Siemens process is based on electrodesialysis. The posi-

tively and negatively charged salt ions are removed from the water with the aid of an electric field. Special membranes, which only allow one type of ion to pass, form channels where saline solution or purified water collects. However, the process becomes inefficient as the salt concentration decreases, because the electrical resistance of the water increases. The final percent of salt is removed using continuous electrodeionization (CEDI). Ion exchange resin located between the membranes absorbs the ions and assures their further transport.

#### Electrolytic Treatment of Raw and Process Water

Electro-physical precipitation (EpF) is a process that was established at the German Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB). The water to be treated flows through a reactor in which electric current flows through sacrificial electrodes. Electrochemical reactions take place between the electrodes which dissolve, releasing their metal ions. In Advanced Oxidation Processes (AOP) reactive radicals are produced as well as metal hydroxide flocs. The metal hydroxide flocs formed through the electrolytic process are highly adsorptive and can bind to finely dispersed particles. In addition, dissolved organic and inorganic material is precipitated in the co-precipitation and occlusion precipitation reactions which also occur. The precipitated substances can then be separated out mechanically.

Oxidative and adsorptive techniques such as EpF can be combined depending on the task at hand. These techniques have the further advantage that they are suitable for stand-by operation and can be switched on and off at any time. They can easily be deployed at existing plants, and automation including autonomous operation or remote control is also not a problem. Continuous online capture of total organic carbon (TOC) data can be used to support a demand-driven, energy optimized treatment process.

Because they reduce the consumption of chemicals, electrolytic and oxidative techniques are a cost-effective and sustainable option for treatment of industrial, process and waste water which contain substances that cannot be broken down in a biological treatment process. The electricity needed to run the process can be obtained from renewable sources such as PV and wind generation.

#### Process water recycling in electroplating

Re-use and recycling of process water is more common in surface finishing than is generally the case in the chemical industry. The sub-process flows upon which these solutions are based offer opportunities for the deployment of membrane technology in the chemical industry as well. As a general rule however, segregation and separate treatment of sub-flows requires a new water logistics strategy at the plant, and that takes time and effort to develop. The Membrane Bio Reactor (MBR) has established a solid foothold in recent years, particularly in the pharmaceutical industry. The applications are normally end-of-the-pipe. The membrane ensures

that the biological purification process is highly effective, and it acts as a barrier to solids. The very high purification performance of MBR applications is a major prerequisite for the deployment of technologies such as reverse osmosis in effective water recycling applications. The approach is already being used in the chemical and pharmaceutical industry and closely related sectors. It definitely offers an opportunity for reducing specific water consumption.

To cite one practical example, Oftech Oberflächentechnik applies coatings to automotive and electrical/electronic parts. When the company made the transition from Cr(VI) to Cr(III), it installed a mobile system containing an ion exchanger to remove contaminants from the process solutions (electrolytes) at an early stage. This resulted in a reduction in the consumption of acid pickling solution and electrolytes, and the service life of the treatment vats increased considerably.

#### Water Recycling in the Beverage Industry

Bottle washers use more water than any other piece of machinery at bottling plants. Bottles are rinsed with 100 to 1000 ml of cleaning solution per bottle in a multi-stage process. The rinse water is normally reused for presoak and/or in the crate washer. A considerable amount of energy is used to heat the cleaning solution.

The water recycling process philosophy at FuMA-Tech GmbH is based on the creation of a "sink" for all water contamination induced by the rinsing process. The treatment process combines ultrafiltration and reverse osmosis together with two-stage neutralization using carbonic acid. UV disinfection equipment along with automatic membrane cleaning and system disinfection on the recycling system prevent bacterial contamination even when raw water parameters are at a critical level (BOD (Biochemical Oxygen Demand), temperature). Water recycling typically reduces the consumption of fresh water by 50% to 60%. Most of the salt is removed from the product water, and the water meets drinking water quality standards.

#### Reducing Losses in the Piping Network Saves Energy

The best way to cut down on water usage is to avoid or reduce losses. Agricultural irrigation accounts for 70% of water consumption worldwide. Efficient irrigation systems can lower evaporation losses from 50% down to 10%. 30% to 50% losses are the rule rather than the exception in drinking water supply networks. Around 900 million liters of drinking water leak out in London every day. The average rate of water loss in the developing countries is 43%. The figure for the European water distribution networks varies between 15% and 30%. Germany at 8% is at the low end of the scale. But even here, 500 million m<sup>3</sup> of water are lost each year due to the poor state of the water pipes. 13 billion euros need to be invested to solve the problem. Reducing the losses cuts electricity consumption as well as water consumption. 90% of the energy consumed in the municipal water system is used to convey the water.

#### Process analytics and process automation

There is a need for new analytical techniques to support process analytics in industrial water engineering. Data analysis and evaluation are also needed to provide a basis for generating material and process data. The goal of process automation and optimization is to maintain consistent product quality while minimizing cost and operating a safe, eco-friendly process.

Suitable techniques for making a differentiated performance assessment and carrying out quality control on water management equipment are still lacking. This applies in particular to toxic, refractory and trace substances. Putting this type of system in place requires robust methods that remain stable over a long period of time along with automated techniques that run cyclically to detect problems and trigger corrective action. To ensure that monitoring is effective, process analyzers are needed which analyze multi-component mixtures in a single operation. In addition to biological and photometric techniques, chromatographic analysis will be used more frequently in the future. This will require development of techniques for assessing the state of the analytical column and detecting degradation in the column's properties at an early stage.

#### ChemWater: Sustainable Industrial Water Usage

Europe will have to use its water resources more efficiently, and the chemical industry has to play a major role. It is one of the largest water consumers, and at the same time it provides key water management technologies. The goal of the EU-funded ChemWater Project is to promote synergies between European initiatives within the framework of existing technology platforms and beyond, providing a basis for evaluating new discoveries in nanotechnology, material research and process innovation. The intention is to exploit this new knowledge for the purpose of achieving sustainable industrial water management.

The essential idea behind the project is not only to look at water usage in chemical production, but also to harness the water management expertise of the chemical industry. This will reinforce the process industry's roll as a technology provider and storehouse of expertise. Taking the chemical industry as the starting point has the advantage that the new knowledge will be transferrable to many other sectors of industry.

This article is based on a trend report compiled by specialized international journalists on behalf of Dechema Gesellschaft für Chemische Technik und Biotechnologie (Society for Chemical Engineering and Biotechnology), a nonprofit scientific and technical society based in Frankfurt am Main, Germany.

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# A Matter Of Time

## New Natural Resource Base in the Chemical Industry, Growing Markets for Bio-Based Polymers, Lubricants and Surfactants

**Bio-Based Chemicals** – As raw materials become increasingly scarce and expensive and the effects of global warming become progressively evident, the scientific, business and government communities along with society at large are developing strategies aimed at a structural transition from the fossil-based economy to the bio-based economy. Chemical production is no exception. Although only about 8% of total oil production output is supplied to the chemical industry, increasing the proportion of renewables in the feedstock mix appears to have definite advantages.

The list of benefits includes a reduction in CO<sub>2</sub> emissions from fossil sources, access to complex structures produced by natural synthesis and higher consumer acceptance of bio-based products. This of course assumes price competitiveness and a characteristics profile which is at least comparable, and that depends on high raw material and process efficiency. Examples include plastics, bio-based solvents, surfactants and lubricants where biodegradability and the avoidance of harmful emissions are primary considerations. REACH regulations could also lead to increased use of bio-based substances in the chemical industry.

### Bio-based Polymers

According to information published by the trade association Plastics Europe, around 265 million MT of plastics were produced worldwide in 2010. That equates to 6 % of global oil consumption which was nearly 4 billion MT (BP Statistical Review of World Energy 2011). In contrast, only 0.7 million MT of bioplastics were produced during that year. Growth however has been forecasted to be enormous. According to current estimates presented by Hans-Josef Endres (University of Applied Sciences and Arts in Hannover, Germany) during a presentation in November 2011, the figure is now approaching 1.7 million MT which equates to an annual increase of 20 %.

Bioplastics are however a heterogeneous group which includes bio-based as well as fossil-based plastics as long as they are biodegradable. Traditional biodegradable plastics are made from the natural polymers cellulose and starch. Then in the 1990's, the thermoplastic polymer polyhydroxybutyrate (PHB), which is used by bacteria as energy storage, was placed on the market under the trade name Biopol. This was the first bio-polymer which was used as a compostable alternative to PE in packaging applications. In recent years however, the approach has been not to use biopolymers directly. Instead biotechnology or chemical techniques are employed to extract monomers from renewable feedstock to provide a basis for new (functional analogue) or traditional (structural analogue) polymers.

Currently the most popular functional analogue bio-based plastic is polylactic acid (PLA). PLA has properties similar to those of conventional mass-produced thermoplastics and can be processed on existing production lines. Because it is compostable, PLA has considerable potential for throw-away packaging such as beverage cups and plastic food packaging trays. One disadvantage of PLA is its low melting point which makes it unsuitable for items that are exposed to heat.

Biotechnology and chemical techniques are used in combination to

make the lactide polyester. Sugar or starch is fermented to make lactic acid, and a chemical dimerization process is then used to produce lactide. Finally, ring-opening polymerization is performed on the lactide monomer.

Industrial production of PLA got underway in 1994. Worldwide production capacity exceeded 110,000 MT/a in 2010. Production plants are located in the US, the Netherlands and China, and additional production facilities are scheduled for construction in countries like Thailand. According to information provided by Hans-Josef Endres (Bioplastics and Biocomposites Institute at the University of Applied Sciences and Arts in Hannover, Germany), production capacity is expected to double by 2015. Although PLA has good biocompatibility because it is bio-based, development of recycling or composting infrastructure could drastically improve its biocompatibility. Intensive research is currently underway on how to do that. At the moment for logistical reasons, incineration is the only option.

An entirely different approach is used for the production of bio-based polyethylene (PE). PE is not biodegradable, but established recycling paths exist, at least in Europe. By making the platform chemical ethylene from renewables, the existing value-added chains starting from the production of different plastics and continuing right through to the end-of-life scenarios can be utilized.

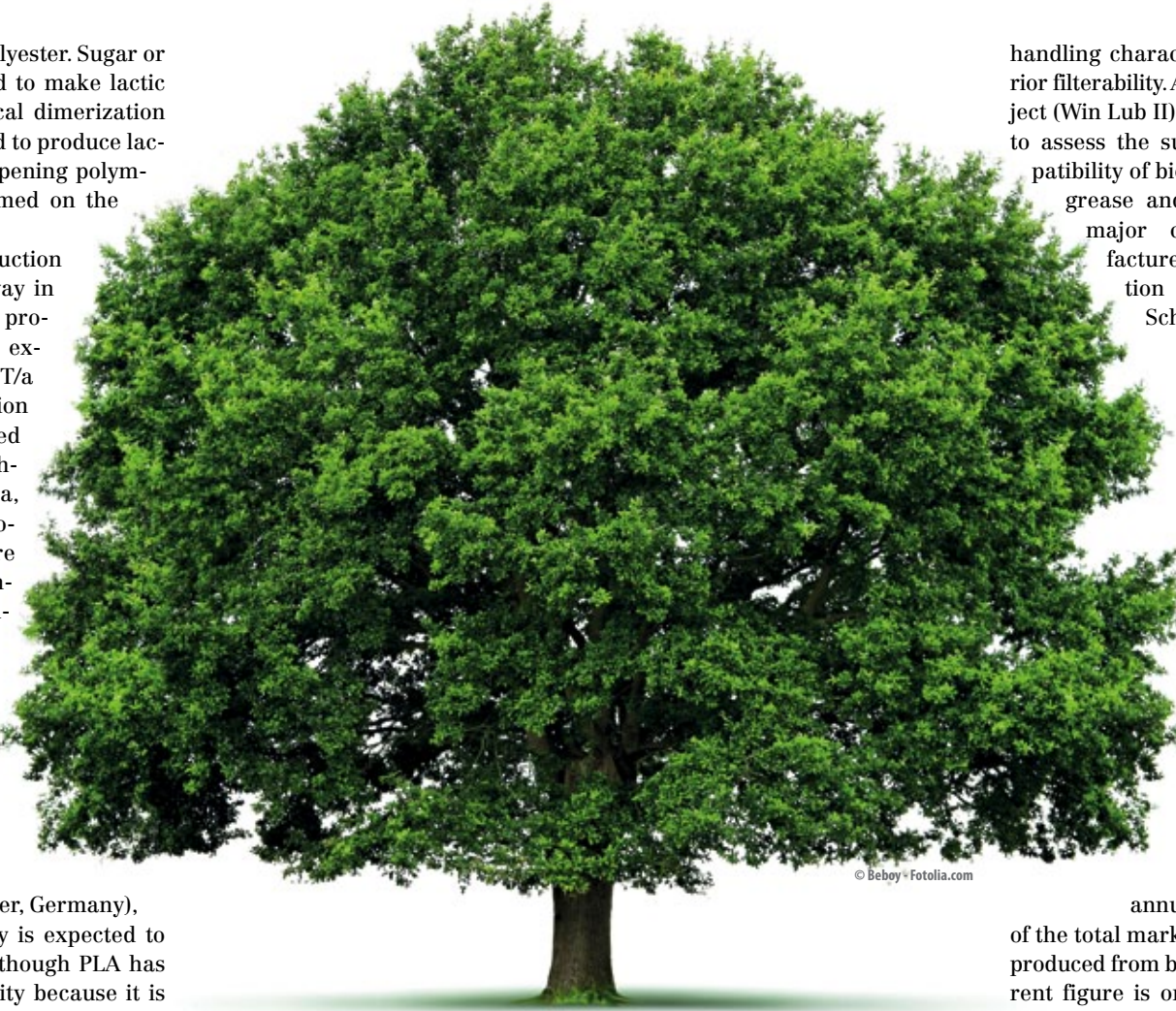
In 2010, Braskem of Brazil launched production of a bio-based structural analog using bioethanol as the base. Two additional PE plants as well as production facilities for polypropylene and PVC have been announced with an expected completion date of 2015. PE production capacity will double. According to the World Bioplastics study published by the Freedonia Group in 2011, Brazil is expected to start production of fully bio-based PET on an industrial scale by the end of the decade.

The higher degree of functionalization (alcohol and acid groups) of bio-based monomers compared to fossil feedstock can be exploited in a variety of plastics applications. To cite some examples, bio-based dicarboxylic acids (succinic acid) and polyols (castor oil, 1,3-Propandiol) are used in bio-based polyesters. Polyols are also used in polyurethane. Dehydration of lactic acid produces acrylic acid, a monomer of polyacrylic acid. Other acrylate polymers can be made through esterification of acrylic acid with castor oil or epoxidized vegetable oils. Butadiene which is used in the production of synthetic rubber can be made from ethanol. Castor oil derivatives are used in polyamides.

Many of these examples involve fine chemicals currently sold in niche markets where special functionality provides a unique selling point which justifies the higher product price. These features may include biodegradability or surface-specific properties such as reduced foaming in beverage cups as in the case of PLA. Further market penetration depends not merely on production costs and availability. Complete recycling systems are also needed to ensure resource-efficient production (and use).

### Bio-based Lubricants

According to information contained in the World Lubricants report pub-



lished by the Freedonia Group in 2011, worldwide demand for lubricants was 36.7 million MT in 2010. That figure is expected to rise to around 42 million MT by 2015. The German Agency for Renewable Resources (FNR) reported that more than 1 million MT of lubricants are used in the country each year including 35,000 MT of biolubricants (3 %).

Biolubricants are not the same as bio-based lubricants. They include all lubricants that are readily biodegradable regardless of whether they are bio-based, mineral-based, made with recycled oil or synthetic. Because this terminology is used, bio-based lubricants are not listed separately. Price is (still) an impediment to widespread use of biolubricants which are 2 to 3 times more expensive than conventional lubricants according to a market study conducted by Global Industry Analysts.

In contrast to mineral-based lubricants, bio-based lubricants are generally made from vegetable oil. Depending on requirements, they

are used either in their native state (natural ester) or they are chemically modified (synthetic ester). The range of applications for bio-based lubricants covers the entire spectrum of conventional lubricants including hydraulic oil, multi-function oil, engine and transmission oil, lube oil and grease and special oils. The European Committee for Standardization (CEN) recommends a biogenic content in excess of 25 % (CEN Technical Report 16227).

Because of their long service life, low toxicity and fast biodegradability, bio-based lubricants are particularly attractive for environmentally-sensitive applications. Off-shore wind power generation is a particular challenge.

Although work is still in the R&D phase, there are already indications that bio-based lubricants may be suitable for wind power applications. By nature, bio-based lubricants provide better lubrication than comparable mineral-based products. They contribute to improved system operation in a number of ways, and they have good

handling characteristics and superior filterability. A new research project (Win Lub II) has been launched to assess the suitability and compatibility of bio-based lubricating grease and hydraulic oils at major component manufacturers under the direction of Fuchs Europe Schmierstoffe.

### Bio-based Solvents

In a study carried out on behalf of the German Ministry of Economics and Technology (BMWi), the Fraunhofer Institute for Systems and Innovation Research (ISI) estimated that the global solvents market is in the region of 19.7 million MT per annum. At least 12.5 % of the total market volume could be produced from biomass, but the current figure is only 1.5 %. Solvents are fluids that are able to dissolve, dilute or extract other substances without changing the chemical composition of the substances or of the solvents themselves. Solvents belong to the aromatic and aliphatic hydrocarbon, alcohol, ketone, ester, ether, glycol ether and halogenated hydrocarbon groups.

Production of most solvents is based largely on fossil feedstock. Due to sustainability and environmental protection considerations, the spectrum is expected to shift towards bio-based solvents. The list of new bio-based solvents includes things like fatty acid methyl esters, which are also used in biodiesel, and esters of lactic acid with methanol (methyl lactate) or ethanol (ethyl lactate) as well as natural substances such as D-limonene which is obtained from the rind of citrus fruits.

Another trend is to replace conventional organic solvents with biogenic solvents. Conversion of bio-based succinic acid or furfural (a byproduct of the cellulose industry) to tetrahydrofuran (THF) is one example.

### Bio-based Surfactants

Bio-based surfactants (surface-active molecules) are produced by microbial fermentation or enzyme-catalyzed reactions. According to ISI, worldwide production volumes are in the region of 17 million MT.

Surfactants normally contain both hydrophobic and hydrophilic

groups. In the case of bio-based surfactants, at least one of these groups is made from renewable resources.

The bio-based hydrophobic group is usually made from coconut oil or palm kernel oil. A hydrophilic group is normally made from carbohydrates such as sorbitol, sucrose or glucose. The use of animal fat has significantly decreased.

In contrast, the market for bio-based surfactants is expanding. Due to their good biodegradability and low to zero toxicity, they are used in specific applications by the paint, cosmetic, textile, agricultural, food and pharmaceutical industries. The mining and ore processing industry uses them as an emulsifier to facilitate oil production and for biological cleanup of contaminated sites.

### Outlook

Given the scenario described at the beginning of the article, bio-based products are clearly in the ascendancy. The question is not whether the chemical industry will exploit a new resource base. It is only a question of when. Biological feedstock has been used for a long time to make surfactants, so the transition should be relatively easy assuming that adequate bio-based alternatives are available. In the plastics sector, it appears that eco criteria will not initially be the prime consideration in the search for bio-based alternatives. Instead, the feedstock will simply be substituted as is the case with PE and other plastics which are derived from ethylene. However, the availability of ethylene made from ethanol will be a limiting factor. 8.5 million MT of bioethanol would be needed just to supply a substitute for the 5 million MT of ethylene which are used each year in Germany. That is ten times the country's current production capacity.

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# Energy Dynamics

## Dynamic Energy Management for the Processing Industry

### Energy Costs are High

– This especially impacts companies in processing industries. Process chains are subject to fluctuations in performance, which are hidden, but available potential reserves. These can be activated with Dynamic Energy Management. This is made possible by new technologies. IT-automation, digitalisation and database systems require the use of mathematical methods. Special visualisation of the results and participation in success create an intensive dialogue between “man and machine”.

### Energy Efficiency

Dynamic energy management is the synchronous management of the flow of energy and materials in real time. In the production process, the consumption of products and the consumption of energy are continuously monitored. The recycling process chains are also measured. It does not matter whether energy is generated of from biological waste or the recycling of process heat. What is decisive, is the fact that the input and output are recorded as data series and evaluated. This is the basis for all activities for increasing energy efficiency (Fig.1).

The application is carried out with an energy management information system (EM information sys-

tem) by Roesberg Engineering. This is a special database software into which the algorithms of Dynamic Energy Management are integrated. After evaluation and optimisation, the energy efficiency of the process chain can be increased by more than 25%. In addition, a new level of transparency on-site produces a continuous improvement of the processes.

Special graphs of the EM information system show the evaluation of input and output data for the process chains. These enable the teams to smooth out fluctuations in performance and increase energy efficiency.



Dr.-Ing. F. Heinrich Lehn  
Dr. Lehn Business  
Consultants



### Pump Storage Technology

Fig. 2 shows the specific energy consumption in a large sewage plant. In the early morning, this is extremely

high. The causes for this are a low intake of waste water and unregulated pumps. Here, electricity can be saved every day by implementing pump storage technology.

Pipeline systems are usually equipped with pumping stations.

These can be used as pump storage facilities. Dynamic Energy Management demonstrates that intake fluctuations can be transformed into a constant intake by means of pump storage technology.

Fig. 3 shows the input and output for a large sewage plant. In this case, the treatment of sewage is the production. The electricity consumption is almost constant. The fluctuations in intake due to consumers is extremely large. By cushioning this with the aid of pump storage technology, energy efficiency is increased by 25%. For this sewage treatment plant, energy costs of €1.1 million per year can be saved.

### Energy Specifications

The energy specifications “Ve” are important for the management of energy. These are precisely calculated with the EM software. There are two basic applications:

for production, where  $V_e$  = energy consumption/quantity of material for energy generation, where  $V_e$  = fuel quantity/energy generated

### Innovative Processes

Investigations confirm the positive effect of Dynamic Energy Management in various industries:

- the processing industry can increase overall energy efficiency

- municipal sewage treatment plants can become up to 100% independent in regard to energy
- Wineries can cover up to 50% of their energy requirements with wine residues
- Non-ferrous metal foundries can save more than 25% of their energy requirements

In order to motivate teams, it is advisable to let them participate in the success. Integration into business improvement management is simple. The evidence is provided via the Input/Output balance of Dynamic Energy Management. The dividend is paid to the team members on a quarterly basis according to their attendance.

### Benefits

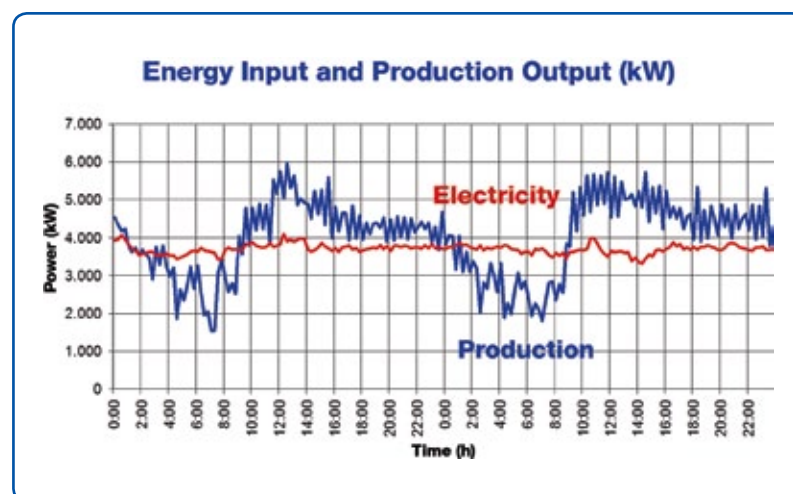
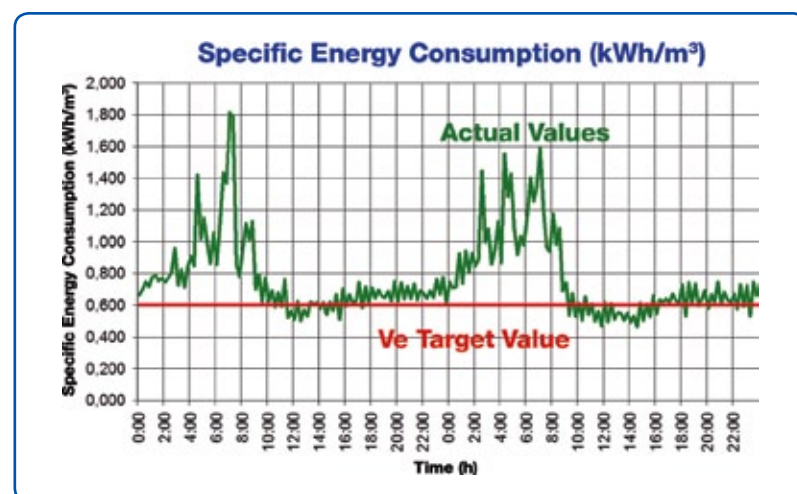
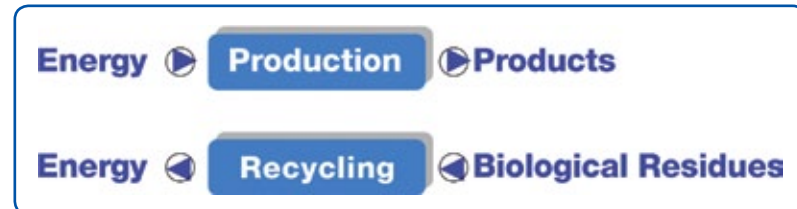
The benefit of Dynamic Energy Management for the entire processing industry is illustrated in many ways: The energy efficiency of production is increased by more than 25%. Process chains within the company are continuously improved. The generation of biogas from organic residues is increased. These examples are only a small illustration of the possibilities which exist.

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## German Chemical Business Holds Its Own in 2012 First Half

Despite the challenging economic environment marked by volatile raw materials markets and the widening euro crisis, the German chemicals economy held up relatively well in the first half of 2012, the industry association Verband der Chemischen Industrie (VCI) said at a news conference in mid-July.

Figures for Europe's largest chemical industry and Germany's third largest sector show production down 4%. In a reverse of the usual pattern, chemicals held up better than pharmaceuticals. Sales revenue decreased by 0.5% due to the euro's weakness, despite 3% higher producer selling prices that VCI said reflect the pass-through of higher feedstock costs.

Sales in the home market improved by 0.5% to €89.2 billion while foreign sales receded by 1% to €53.7 billion. The “foreign” component encompasses trade within the European home market. Including direct and indirect sales to foreign consumers, chemical exports improved by 1% to €77.2 billion. Imports increased by 2% to a value of €54.1 billion.

Employment across the industry rose 2% in the year's first half to 437,000 people, while German chemical producers on average



spent €6.7 billion on tangible capital assets, some 5% more than in the same period of 2011.

All in all, the industry is relatively satisfied with the performance in H1 2012, VCI president and Evonik CEO, Klaus Engel, said in Frankfurt. Despite alarm bells ringing across the euro zone, he said producers assume that business will gain momentum in the second half year and that the sector will see a 2% upturn in sales year-on-year to €188 billion.

Ironically, Germany's position will be boosted by the euro's weakness, which is the reverse side of the problems plaguing its close-to-home export markets. Engel stressed that the common currency's survival is important for German business and that it can be successfully achieved if southern Europe remains competitive.

## BASF to Invest in New Butadiene extraction Plant at Antwerp Site

BASF plans to invest a “high double-digit million” sum in a new 155 metric ton per year butadiene extraction plant at its integration production site at Antwerp, Belgium. The new facility, which the world's largest chemical producer said will ease the “increasingly tight” supply of butadiene on global markets, is due on stream in 2014.

Volume supply of butadiene has declined significantly over the past several years, while demand from the tire industry has been rising, BASF said, adding that “this has led to a considerable increase in prices.”

The German company already operates a 105,000 metric ton per year butadiene extraction plant at its Ludwigshafen headquarters.

## CNOOC Starts Building \$1.6 Billion Taizhou Crude Facility

CNOOC, China's third-largest state-run refiner, has started building a 60,000-barrel-per-day crude processing facility in eastern China, to boost its still nascent refining and fuel marketing business in the world's second-largest oil market. The new facility, to be built in Taizhou city of Jiangsu province, costs 10.2 billion yuan (\$1.6 billion) and is slated to begin operations in 2015.

Company officials said the new investment, including 10 main pro-

cessing facilities, would be on top of an existing plant at the same site that produces mainly asphalt and fuel oil. CNOOC, parent of offshore oil and gas specialist CNOOC Ltd., is operating its first major oil refinery in Huizhou of southern Guangdong province, with a capacity of 240,000 bpd. CNOOC plans to add 200,000 bpd of refining capacity in Huizhou by around 2014.

## Evonik's New PA 12 Line to Go On Stream in Singapore by 2014

Evonik has confirmed Singapore's Jurong island as the location for its new 20,000 metric ton per year PA 12 plant due to start up in 2014. The Asian line will complement the company's existing capacity at Marl, Germany, that is currently off stream.

The loss of production at the polymerization plant reported to have capacity of around 40,000 metric tons dates to an explosion and fire

in an upstream plant for cyclododecatriene (CDT), a precursor of key PA 12 feedstock lauro lactam, on March 31.

The blast killed two workers and caused a global market shortfall for PA 12 as the German company is the sole integrated producer. According to Evonik's current planning, the CDT plant will go back on stream in the fourth quarter of this year.

## Oxea Launches New Phthalate-free, Low Migration Plasticizers

Oxea announced the launch of its latest additions of phthalate-free and non-VOC plasticizers. The new products Oxsoft Duo 1 and Oxsoft Duo 2 are specifically designed to help manufacturers tackle the challenges concerning migration of plasticizers. Their low migration properties are aimed at increasing the quality and sustainability of end products while their processing properties are further improved. Oxsoft Duo is recommended in applications like the production of wall coverings, floorings,

roofings and artificial leather. It is available in samples for testing.

“Oxea supports the significant growth of phthalate-free plasticizers by investing into new products and production capacity,” said Miguel Mantas, responsible for sales and marketing within Oxea's Executive Board. “To better serve our customers, Oxea is extending its current European capacity to 60-70kt and a new production unit in Nanjing, China, is already under construction,” he added.

## Linde and Technip Nail Down Russian Petchem Contracts

German engineering group Linde has nailed down two contracts for two major petrochemical plants in Russia. The contract from ZapSibNeftekhim, a subsidiary of petchems giant Sibur, encompasses licensing and front-end engineering (FEED) for one of the world's largest ethylene crackers with capacity for 1.5 million metric tons per year.

The plant at Tobolsk in western Siberia also will produce 100,000 metric tons per year of butadiene derived from ethane, propane and n-butane. Part of the output will feed production of polypropylene for the 500,000 ton polymerization plant Linde is building for Sibur at Tobolsk. This unit is set to go on stream in 2013.

French engineering contractor Technip has secured two FEED contracts from the Sibur subsidiary.

These include a linear low/high density polyethylene plant and a second unit for high density PE using the slurry process, both using technology licensed from Ineos.

Separately, Linde has won a contract to build a new Alpha-Sablin plant for production of 37,500 metric tons per year of linear alpha olefins (LAO) for Russian petrochemical producer Nizhnekamskneftekhim (NKNH) at Nizhnekamsk.

The order for the unit due to start up in 2014 encompasses license, basic/detail engineering as well as supply of equipment and materials for revamping NKNH's existing LAO plant. The Alpha-Sablin production process was developed and is jointly owned by Linde and Saudi Arabia's SABIC.

## Lanxess Biodiesel Stabilizer Successfully Tested

Lanxess has been awarded “no-harm certification” from Arbeitsgemeinschaft Qualitätsmanagement Biodiesel (AGQM) for its new biodiesel stabilizer Baynox Solution 50%. Working closely with oil corporations in Germany, AGQM (a German consortium for biodiesel quality management) investigated the undesirable side-effects of mixing antioxidants for biodiesel with brand-name diesel and their behavior in combustion engines. The Lanxess antioxidant concentrate passed the numerous tests without any restrictions and has been included by AGQM in the no-harm list.

Baynox Solution 50% is a highly concentrated solution of Baynox, a biodiesel stabilizer. It combines the benefits of easy handling with

the outstanding properties. The effective antioxidant ensures the biofuel obtained from natural raw material remains stable and can therefore be used for longer. The disadvantage of biofuel is that the unsaturated fatty acid structures easily oxidize in contact with atmospheric oxygen. The oxidation of oils and fats through atmospheric oxygen is known as rancidity. Heat, light and other stress factors accelerate this process, making the oil rancid within a short time. The consequences of this oxidation are, on the one hand, a decomposition of the biodiesel into short-chained fatty acids and, on the other, the formation of insoluble polymers (gums). This can cause damage to the engine and the injection system.



## EVENTS

### 2012 ChemOutsourcing Conference & Exhibition, 10 – 13 September 2012, Long Branch, New Jersey, USA

ChemOutsourcing is a unique, annual pharmaceutical chemistry show. The event hosts a conference with over 100 speakers, mostly chemists from pharma and biotech companies, and an exhibition for 100 chemistry service providers. It is held at a beachfront resort in New Jersey, the epicenter of the life sciences and chemical industries.

Every year, increasing numbers of small molecule biotechnology company chemists are speakers and attendees at the show. The conference discussions center around Chemistry Sourcing/Outsourcing, Process R&D, Chemical Development, CMC, Procurement, Medicinal Chemistry, Drug Discovery, and New Chemical Technologies.

► [www.chemoutsourcing.com](http://www.chemoutsourcing.com)

### 46<sup>th</sup> EPCA Annual Meeting, 6 – 10 October 2012, Budapest, Hungary

The European Petrochemical Association's (EPCA) 2012 Annual Meeting will be held under the theme "Talent and Technology: Drivers of Innovation in the Chemical Industry" symbolizing – chemically spoken – two major catalysts for future growth of the petrochemical and downstream chemical industry.

The EPCA Annual Meeting is a world class event in the chemical business community with more than 2,500 delegates coming from all over the globe. Delegates are CEO's and other business executives of all the major chemical companies and their service providers from more than 56 different countries.

At the 2012 meeting, the introductory speech will be given by Dr. Ajit Baron Ajit Shetty, a former Chairman of the Board of Janssen Pharmaceutica and former President Global Chemical Pharmaceutical Operations and Corporate Vice President Supply Chain of Johnson & Johnson. John Kao, Chairman of the Institute for Large Scale Innovation and Chair of the World Economic Forum's Global Advisory Council on Innovation will also address the audience in Budapest. The capital of Hungary, that has hosted EPCA Annual Meetings before, is the cultural gate between Eastern and Western Europe.

► [www.epca.eu](http://www.epca.eu)

### CPhI Worldwide 2012, 9 – 11 October 2012, Madrid, Spain

Join industry experts, suppliers and customers of the pharmaceutical industry in Madrid for CPhI Worldwide 2012, the world's leading pharmaceutical networking event with 28,500 attendees from 140 countries and over 1,900 exhibitors, and meet face-to-face with international pharmaceutical companies, stay informed about the latest industry trends and remain one step ahead of a constantly changing pharmaceutical market.

► [www.cphi.com](http://www.cphi.com)

## Wacker Honors Researchers for Novel Dispersions



John Boylan, Bruce Gruber and Christian Daniels, this year's recipients of the Alexander Wacker Innovation Award (from right to left), with Wilhelm Sittenthaler, member of the Wacker Executive Board.

Wacker Chemie bestows this year's Alexander Wacker Innovation Award on Christian Daniels, John Boylan and Bruce Gruber. The researchers have developed two novel dispersions based on vinyl acetate-ethylene copolymers. These kinds of dispersions are increasingly replacing the established coatings for paper applications, especially in the USA. This year's €10,000 innovation award focused on product innovation.

The new Vinnapas EF 101 and Vinnapas EF 575 dispersions are mainly used as coating material in paper processing. The coating ensures that the print on cardboard packaging is particularly durable and vividly colored. This year's €10,000 innovation award focused on product innovation.

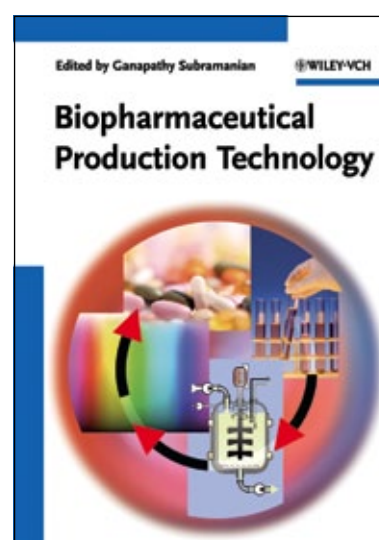
etate-ethylene-based dispersions differed from those of acrylate-based products, especially with regard to viscosity and heat resistance.

"These new dispersions have conquered the North American paper market within a remarkably short period of time. That has changed the rules of the game in this market," Wacker Executive Board member Dr. Wilhelm Sittenthaler said in his congratulatory speech. Dr. Sittenthaler presented the award as part of the annual R&D symposium held in Burghausen (Germany). This year marked the event's fortieth anniversary.

Since 2005, the Munich-based chemical company has honored employees' outstanding R&D work as part of its annual research symposium. Named after the company's founder, the €10,000 "Alexander Wacker Innovation Award" rotates between the categories of product innovation, process innovation and basic research. Next year's research competition focus will be on process innovation.

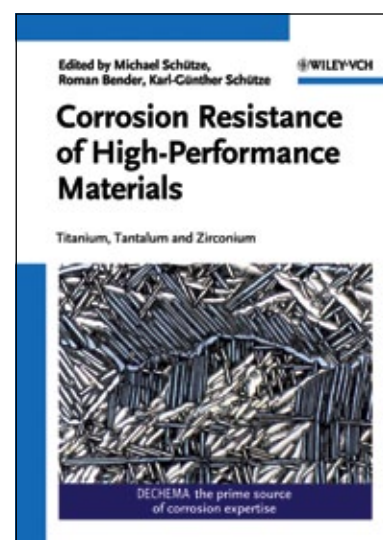
## Corrosion Resistance of High-Performance Materials

Although titanium, tantalum and zirconium are not noble metals, they are the best choice whenever high corrosion resistance is required. The exceptionally good corrosion resistance of these high-performance metals and their alloys results from the formation of a very stable, dense, highly adherent, and self-healing protective oxide film on the metal surface. This naturally occurring oxide layer prevents chemical attack of the underlying metal surface. Only very few inorganic and organic substances are able to attack titanium, tantalum or zirconium at ambient temperature. As the extraordinary corrosion resistance is coupled with an excellent formability and weldability these materials are very valuable for a large number of applications, such as heat exchangers or reaction vessels. Derived from the renowned Dechema Corrosion Handbook, this textbook provides a comprehensive overview of corrosion protection and prevention on the high-performance materials Titanium, Tantalum and Zirconium.



► Corrosion Resistance of High-Performance Materials  
- Titanium, Tantalum, Zirconium  
Michael Schütze, Roman Bender, Karl-Günther Schütze (Eds.)  
Wiley-VCH, 2012  
526 pages, €199.00  
ISBN: 978-3-527-33435-3

## Biopharmaceutical Production Technology



Systematically addressing the key steps and challenges along the biopharmaceutical production process, this two-volume handbook provides key knowledge for medium to large scale producers of biopharmaceuti-

cals. The volumes are divided into six major parts, on upstream technologies, protein recovery, process development, analytical technologies, quality control, and an outlook section that addresses new and emerging technologies, such as single-use processes and integrated process design. With contributions by some 40 experts from academia, as well as small and large biopharmaceutical companies, this unique handbook is full of valuable first-hand knowledge on how to produce biopharmaceuticals in a cost-effective and quality-controlled manner.

► Biopharmaceutical Production Technology  
2 Volume Set  
Ganapathy Subramanian (Editor)  
Wiley-VCH, 2012  
944 pages, Introductory price (until 31st December 2012): €349.00  
ISBN: 978-3-527-33029-4

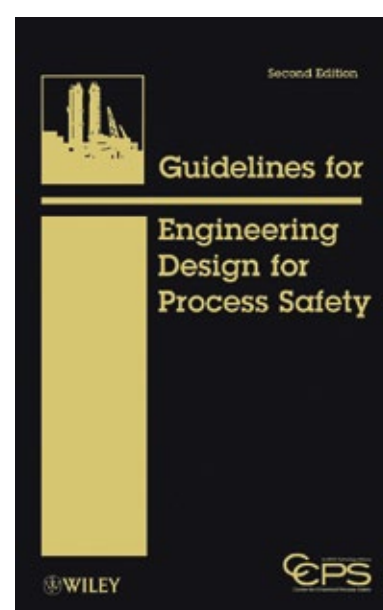
## Elements of Environmental Chemistry

Providing readers with the fundamentals of environmental chemistry and a toolbox for putting them into practice, this book is a concise, accessible, and hands-on volume designed for students and professionals working in the chemical and environmental sciences. Tutorial in style, this book fully incorporates real-world problems and extensive end-of-chapter problem sets to immerse the reader in the field. Chapters cover mass balance, chemical kinetics, carbon dioxide equilibria, pesticide structures and much more.

This Second Edition includes new chapters on atmospheric chemistry, climate change, and polychlorinated biphenyls and dioxins, and brominated flame retardants. In addition, new practice problems and a helpful tutorial on organic chemistry names and structures have been added to improve both the scope and accessibility of the book.

► Elements of Environmental Chemistry  
Hites, Ronald A. / Raff, Jonathan D.  
Wiley-VCH, 2012  
ISBN: 978-1-118-04155-0

## Guidelines for Engineering Design for Process Safety



This updated version of one of the most popular and widely used books from the Center for Chemical Pro-

cess Safety (CCPS) provides plant design engineers, facility operators, and safety professionals with key information on designing chemical, petrochemical, and hydrocarbon processing facilities, while addressing process safety concerns. The book discusses how to select designs that can prevent or mitigate the release of flammable or toxic materials, which could lead to a fire, explosion, or environmental damage, with key information on failure modes and potential design solutions. New topics covered include inherently safer design, safety instrumented systems, and layer of protection analysis.

► Guidelines for Engineering Design for Process Safety  
Center for Chemical Process Safety (CCPS)  
Wiley-VCH, 2012  
ISBN: 978-0-470-76772-6



## PEOPLE

**Change in the Supervisory Board of Altana** The new supervisory board of Altana has constituted itself with Dr. Klaus-Jürgen Schmieder being elected as its new chairman. Dr. Schmieder, a former management board member of L'Air Liquide, had previously served as chair of Altana's audit committee and has been a member of the company's supervisory board since 2001.

Dr. Monika Engel-Bader, president of Chemetall until 2011, Dr. Lothar Steinebach, a member of the management board of Henkel until the end of June 2012, and Dr. Antonio Trius, CEO of Cognis until 2010, were newly elected to the supervisory board.

Ulrich Gajewiak and Susanne Klatten remain deputy chairpersons of the supervisory board. Dr. Lothar Steinebach was elected as new chairman of the audit committee.

Dr. Fritz Fröhlich, the previous chairman of the supervisory board, as well as Dr. Helmut Eschwey and Dr. Carl Voigt retired.



Alfred Stern

**Alfred Stern Joins Borealis Executive Board** Borealis appointed Alfred Stern to executive vice president for Polyolefins, effective July 1, 2012. Alfred Stern joined Borealis as senior vice president Innovation & Technology in 2008, coming from E.I. Du Pont de Nemours where he held several leadership positions in the areas of research and development, marketing and sales, as well as quality and business management in Switzerland, Germany and the United States.



Nicole Hamelau

**Management Change at Biesterfeld Spezialchemie** Dr. Nicole Hamelau has been appointed managing director for Biesterfeld Spezialchemie beside Dr. Onno Graalman. Dr. Nicole Hamelau takes over the administrative management of Biesterfeld Spezialchemie and its subsidiaries and affiliates. She will be in charge of accounting, finance and controlling, responsibilities previously held by Wilfried Dannheiser, who has retired.



Laura L. Parks

**Laura L. Parks appointed President and BU Director at DSM Pharmaceutical Products** Laura L. Parks, Ph.D., has been appointed president and business unit director of DSM Pharmaceutical Products. Laura will continue to report to Alexander R. Wessels, president and CEO of DSM Pharmaceutical Products, as a member of the management team.



Prisca Havranek-Kosicek

**Prisca Havranek-Kosicek, New CFO of DSM Pharmaceutical Products** Dr. Havranek-Kosicek has been appointed CFO of the entire business group. Dr. Havranek-Kosicek will report to Alexander R. Wessels, president and CEO of DSM Pharmaceutical Products.



Sébastien Gallet

**Sébastien Gallet New Euro Chlor Manager for Chlorinated Solvents** Sébastien Gallet has joined the Euro Chlor as sector group manager of the European Chlorinated Solvent Association ECSA. He takes over the responsibilities of Wolfgang Marquardt who has been working in the Euro Chlor secretariat for five years and leaves the federation the end of July to pursue new opportunities in his homeland Germany.



Anas Nowarah

**Songwon Appoints Anas Nowarah to a Leadership Position** Anas Nowarah has been appointed sales, technical service & marketing manager for the Middle East & Africa region of Songwon Industrial, effective July 1, 2012. In this new position, Anas Nowarah will be responsible for capitalizing on the growth potential in the region and providing technical support to ensure that Songwon's products deliver performance, productivity and added value to customers.



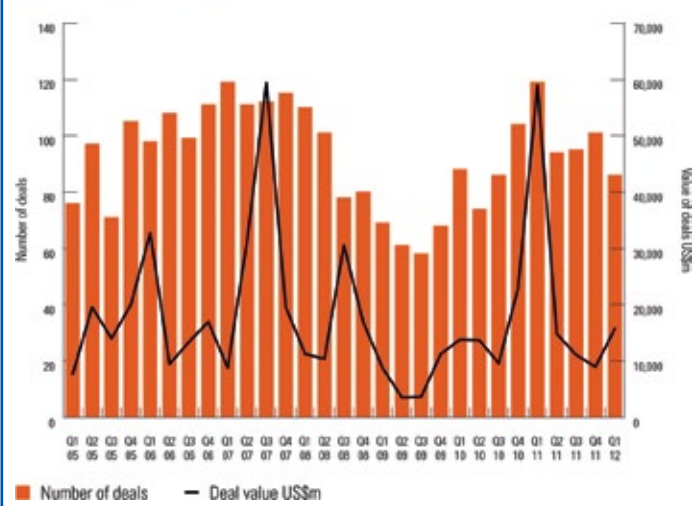
Hans-Joachim Müller

**Hans-Joachim Müller to Leave Clariant** Former member of the Managing Board of Süd-Chemie, Dr. Hans-Joachim Müller, who is now member of the Executive Committee of Clariant, has decided to leave the company on June 30, 2012, for personal reasons. His current responsibilities will be transferred to the other members of the Executive Committee.

**Siegfried Appoints René Imwinkelried Head of R&D** The board of directors of Siegfried Holding appointed René Imwinkelried, Ph.D., to the company's new head of R&D and member of the executive committee. He is currently head of technical development Small Molecules at Roche in Basel. René Imwinkelried will start in his new function on September 1st, 2012. For personal reasons, Beat In-Albon, Ph.D., has resigned from the Board of Directors of Siegfried Holding.

## M&A: Spotlight on Transactions in Chemicals and Materials Sector

Chemicals and materials M&A trends

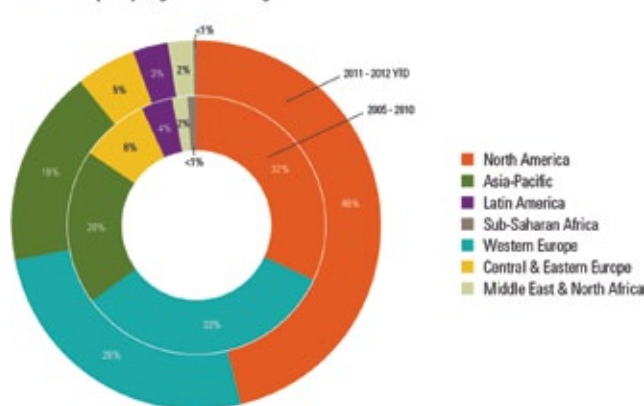


### M&A Value and Volume

The global chemicals and materials sector – which covers an eclectic mix of subsectors including petrochemical bases and derivatives, agrochemicals, fine chemicals and food additives – was hit hard by the drying up of the credit markets in 2009. M&A came to a virtual halt that year. But a new study of worldwide M&A activity in the chemicals and materials sector conducted by global legal practice Squire Sanders in association with M&A intelligence service Mergermarket shows a rebound in deal making activity with deal value reaching its highest level since 2007 (Fig. 1). In 2011 chemicals and materials M&A increased 16% in volume and 56% in value from 2010 to reach 409 deals worth a combined \$93.8 billion globally.

Sources: Squire Sanders, Mergermarket

M&A value split by target dominant region

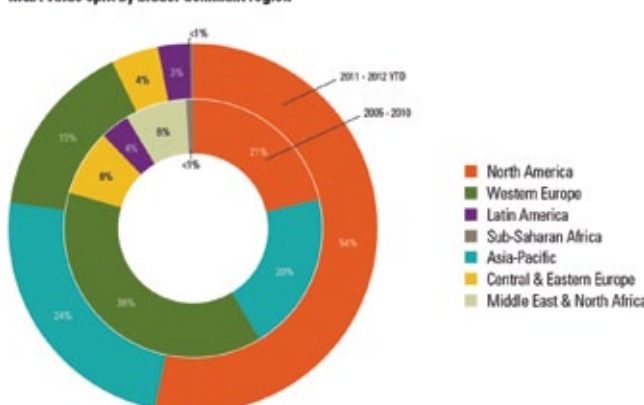


### Regional insights: targets

From a regional perspective, more than one-third of M&A targets (Fig. 2) came from Western Europe (34%) in 2011 and 2012, followed by the Asia-Pacific region with 28% and North America with 22%. Strategic acquirers' appetite for growth in emerging markets has been a defining feature of the chemicals and materials industry in recent years, and is illustrated quite clearly by some of 2011's largest transactions: the \$6.4 billion acquisition of Rhodia by Solvay aims to strengthen the combined entity's presence in emerging markets, while the \$4.6 billion acquisition of Solutia by Eastman Chemical is part of its strategy of expanding into the Asia-Pacific region.

Sources: Squire Sanders, Mergermarket

M&A value split by bidder dominant region

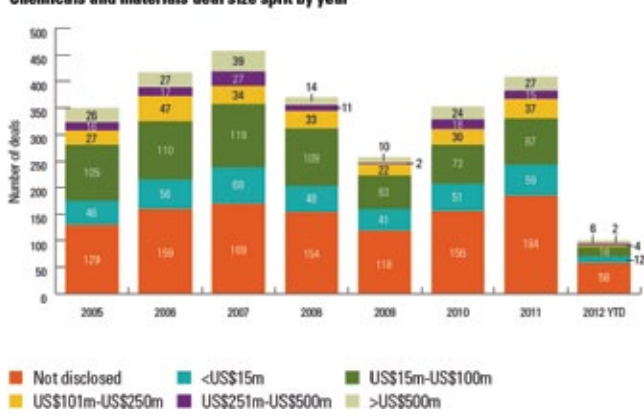


### Regional insights: bidders

Looking at the most active bidders (Fig. 3), Western European and North American acquirers both accounted for 32% of announced deals, while the Asia-Pacific region accounted for just under one quarter. However, emerging market players have been active acquirers. Cross-border M&A increased by 9% in volume and 152% in value from 2010 to 2011, and Asia-Pacific investors – particularly state-backed entities with an insatiable appetite for raw materials, technology and innovation – played an important role in boosting these figures. In one of 2011's most notable deals, China National Agrochemical Corporation acquired a 60% stake in Israel-based Makhteshim Agan Group (MAI) from Koor Industries.

Sources: Squire Sanders, Mergermarket

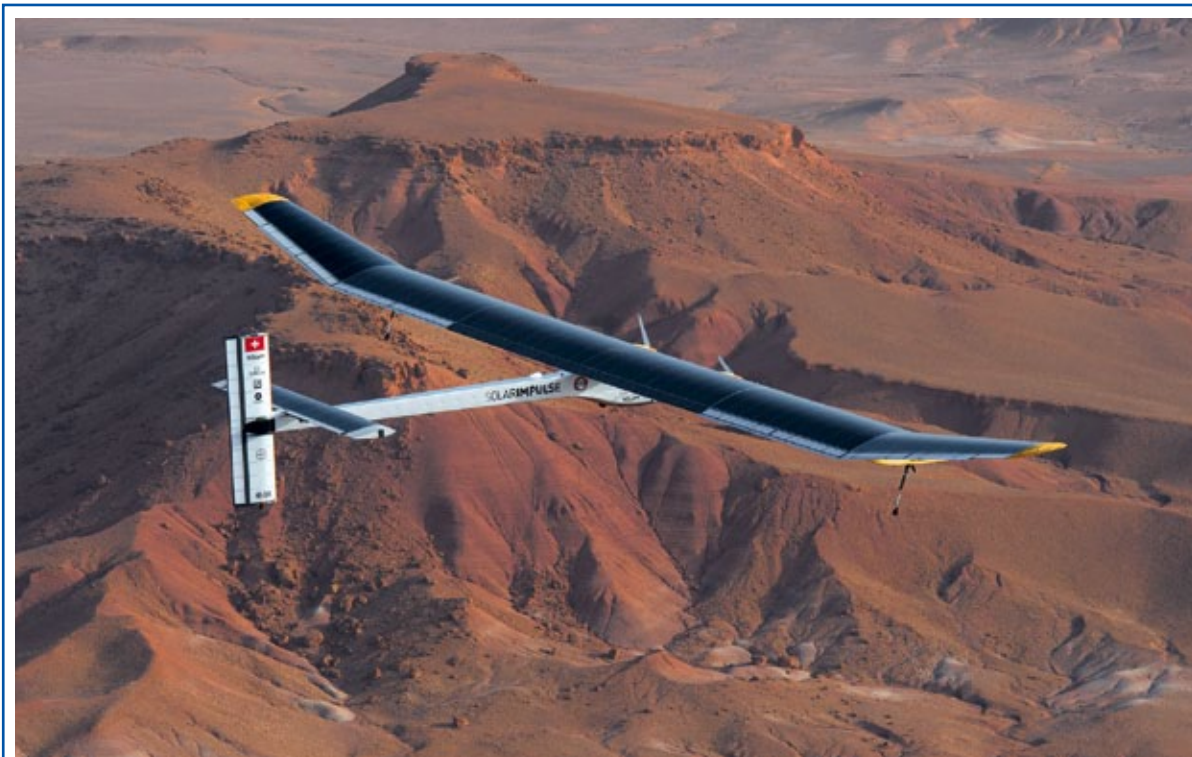
Chemicals and materials deal size split by year



### M&A deal size trends

While the multi-billion dollar deals naturally draw the most media attention, the most substantial amount of M&A activity can be found in the lower mid-market, where deal volume in 2011 totaled 88, up from 74 in 2010. And it is these deals that demonstrate just how fragmented the market remains and just how many opportunities exist for mid-market acquirers, both strategic and financial. Corporate disposals and private equity exits should continue to drive chemicals and materials M&A through 2012, particularly if eurozone uncertainties are eased. The year so far has seen around 100 chemicals and materials deals worth \$16 billion globally, with about 43% of total deal volume coming from the \$15 million to \$100 million range.

Sources: Squire Sanders, Mergermarket



**Solar Power** – Solar Impulse, the first airplane designed to fly day and night without requiring fuel and without producing carbon emissions, again demonstrated the potential held by new technologies in terms of energy savings and renewable energy production. On June 22, Solar Impulse completed its flight from Rabat to Morocco's Southern region of Ouarzazate, where the solar aircraft safely landed after a 683 km flight lasting a total of 17 h 20 min. The 12,000 solar cells integrated into the wing of the airplane supply four electric motors with renewable energy and charge lithium polymer batteries, enabling the aircraft to fly at night. The Solar Impulse project is supported, among others, by Solvay and Bayer Material Science.

## UK Chemical Engineering University Applications Rise Again

UK university applications to study chemical and process engineering have risen by 12% this year despite an overall drop in applications across all subjects.

New figures published yesterday by the Universities & Colleges Admissions Service (UCAS) reported 13,520 applications to study chemical engineering compared to 12,061 last year. While there was an overall 7% decline in applications across all subjects, physics (+7%) and mechanical engineering (+4%) both recorded improved figures. The news was less positive for chemistry (-0.4%) and civil engineering (-12%).

Since 2002 the number of student applications for chemical engineering has rocketed by 167% from 5058 to 13520 this year. Student intake has also more than doubled with a record number of students currently studying the subject at university.

Chemical engineering is the best paid of the engineering disciplines with 2011 graduates earning a median starting salary of £28,000/y, making it the third highest paying degree course after medicine and dentistry.

IChemE communications manager Matt Stalker says: "It's another record-breaking year for chemical engineering with more and more students identifying it as career choice that promises a wide range of career options and outstanding earning potential."

"It wasn't so long ago that the number of student applications to study subjects like civil engineering or chemistry were three times that of chemical engineering but that gap is closing. There are a range of factors that have helped to fuel the interest in chemical engineering but we know that our "whynotchemeng" campaign has been key," adds Stalker.

IChemE's "whynotchemeng" campaign was launched in 2002 to tackle the shortage of students applying to study chemical engineering. The campaign helps young people find out more about studying chemical engineering at university and career opportunities on offer. A survey of 2011 first-year chemical engineering students revealed that 1 in 4 had been positively influenced by the campaign.

Stalker says that while application figure increases are good news, further capacity at UK universities remains key: "It's important that university course capacity grows hand-in-hand with this increased interest so new courses in places like Bradford, Hull and Westminster have been important, along with the continued expansion of established departments."

► [www.icheme.org](http://www.icheme.org)

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