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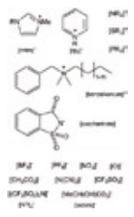

**Chemicals**

*Ionic liquids are attracting more and more interest.*

Page 5

**Chemicals**

*How serious are the environmental concerns in China?*

Page 10





## Newsflow

**Arkema has announced a plan to reduce greenhouse gas emissions from its Forane 22 production plant at the Changshu industrial facility in China, by incinerating HFC 23, a by-product of HCFC 22 manufacture. The project has been registered with the Executive Board of the Clean Development Mechanism, a body of the United Nations Framework Convention on Climate Change (UNFCCC). The incinerator should become operational by mid-2008.**

**The annual reduction in emissions has been estimated at some 6 million tonnes $CO_2$ equivalent, including a quota of 3.4 million tonnes which will be eligible for certified emission reductions (CER, or carbon credits) allocated by UNFCCC, subject to verification by an independent body.**

▶ www.arkema.com

**In a survey conducted at Informex-USA, exhibitors and visitors said they remain optimistic on the prospects for growth. Almost two thirds of respondents (65 %) called for their business to improve 5 – 10 % during the year, a statistic that virtually matched last year's 63 % projection of 5 – 10 % growth. The exhibition held Jan. 29 – Feb. in New Orleans had more than 4,000 participants.**

▶ www.informexusa.com

**Rhodia has begun building a new R&D facility in Shanghai, China. The new facility, due to open in summer 2008, will employ 150 scientists. Beyond its current development and customer support activities, the R&D center will be targeting Asian markets, particularly in the automotive, electronics, home and personal care, oilfield and agricultural formulations fields, developing innovative products such as luminophors for low energy lighting, engineering plastics, addressing automotive weight and fuel consumption, and new solvents and environmentally sustainable formulations for paper recycling, oilfield chemicals.**

▶ www.rhodia.com

# People, Not Plants

## Air Products Aims for Steady Growth

**Innovation – Maurizio Garlaschelli, Air Products' general sales manager for Performance Materials EMEA, says his company wants to grow – but not at all costs.**

Air Products with annual revenues of $10 billion, operations in over 40 countries, and 22,000 employees around the globe serves customers in industrial, energy, technology and healthcare markets. The portfolio consists of a unique composition of industrial and speciality gases, performance materials, and equipment and services. In accordance with its efforts to create a more focused, less cyclical, higher growth and higher return company, Air Products recently sold its interests in its vinyl acetate ethylene polymers joint ventures to its partner, Wacker Chemie, for $265 million. Brandi Schuster spoke with Garlaschelli about this move and the company's future strategy.

*CHEManager Europe: Air Products is the world's only combined gases and chemicals supplier; most companies today prefer a diversification strategy. Why does your company favor integration of these two businesses?*

**M. Garlaschelli:** If you were to ask all 22,000 Air Products employees, everyone would have a different but positive answer. The key is to have a balanced portfolio which provides consistent financial results that meet or exceed the expectations of the financial community – just as our competitors do. The chemicals business doesn't require a lot of capital investment and can grow without massively investing into plants. On the other hand, in order to stay competitive in the gas business, one has to keep building plants and investing in them. So the combination of gas and chemicals supply provides a good financial/investment match.

Maurizio Garlaschelli
Air Products' general sales manager for Performance Materials EMEA

Another advantage of being a combined gases and chemicals supplier is the access it gives us to technical experts. For example, if a company only sells one commodity, how can it expect to attract skilled workers in the field of technology? However, because we are present in so many areas, from electronics to additives and so on, we are an attractive company for highly skilled workers. Our most important investment is in people.

The gas industry is quite consolidated, with four or five major players. The only way to expand rapidly in this area is to build new plants in new geographies in order to take on new business. I can't see any big acquisitions taking place soon in the gases market, because whatever big acquisition you would do, you would need to resell parts of this acquisition to meet antitrust regulations.

You might think that some parts of our organization are disconnected, but it is really not the case. For example, the electronics business is essentially a gas business, which also requires experts in surface treatment, who understand the type of surface needed for an electronic circuit. And this same knowledge can be applied elsewhere within our company, such as in epoxies.

*Air Products recently ended its joint ventures APP and WPS with Wacker, narrowing your company's range of products for the construction industry. What was your company's reason for exiting the production of products for adhesives, paints and coatings, paper and carpet applications?*

**M. Garlaschelli:** Those areas are still very important for us, but with different types of technologies and products. The decision to sell the joint venture with Wacker was based on the intention to refocus our less cyclical and more differentiated Performance Materials business where we believe we can bring the most to our customer. The volume of our new products grew by 26 % last year, which highlights our ability to produce and successfully sell innovative products.

*What are your plans for growth in this area?*

**M. Garlaschelli:** Currently, new products represent an average

Continues Page 8 ▸▸

# The Center of the Chemicals Universe

## The Reach Hub Can be Found in the Great White North

**60° 10' 32 N, 24° 56' 3 E – Helsinki is not only home to 1945 chemistry Nobel Laureate Artturi Ilmari Virtanen and 2006 Eurovision Song Contest winner Lordi. Finland's most populous city is the location of the European Chemicals Agency (ECHA), which manages all Reach processes.**

Riku Rinta-Jouppi, program manager at the Helsinki Reach Centre (HRC), said it's an exciting time to be in the city, where all things related to Reach are coming together. Brandi Schuster spoke to him about what companies should be focusing on in light of pre-registration in June and the impact the legislation will have on small and medium enterprises.

*CHEManager Europe: How would you describe the atmosphere in Helsinki now regarding Reach?*

**R. Rinta-Jouppi:** A lot of things are happening simultaneously. The European Chemicals Agency is well on its way to reaching its operational level.

*Several industrial associations are also setting up offices in Helsinki.*

**R. Rinta-Jouppi:** Yes; the China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters is here. AmCham Finland, the American Chamber of Commerce, which has been fully operational here in Finland for over two years, will soon be offering a web service called Reach Out. Other non-EU industry associations are also be setting up offices to look after their members interests.

*What is the main focus right now?*

**R. Rinta-Jouppi:** The top priority now is for the Agency and the industry to get their systems ready for pre-registration. However, the European industry itself has been working on this for a long time. Non-EU companies, particularly small and medium-sized enterprises – also called SMEs – are now just waking up the fact that they might indeed have a role to play in the process.

Riku Rinta-Jouppi
Program manager at the Helsinki Reach Centre (HRC)

*How do you see the impact of Reach on small and medium enterprises?*

**R. Rinta-Jouppi:** Reach is clearly a complicated piece of legislation, and it's not easy for SMEs to deal with it all as it is for large companies that have their own specialists and data. In general SMEs who are members of industrial associations are better off than those who are not. Industrial associations have played a large role in organizing workshops and writing guides. However, it is my understanding that even in the EU, less than half of the companies in the chemical industry are members of an association.

*What would you suggest for SMEs without membership in an industrial association?*

**R. Rinta-Jouppi:** There are several centers of expertise within the EU. There are national helpdesks, which cannot tell companies how to do things, but they can tell SMEs what needs to be done. Also, many industrial associations offer help centers, such as ReachReady, which is operated by the Chemical Industries Association in the UK, and ReachCentrum, which is headed by Cefic, the European Chemical Industry Council.

*Will Reach lead to the demise of some SMEs?*

**R. Rinta-Jouppi:** That is very likely. The first two deadlines – pre-registration at the end of the year and the first registration in 2010 – are very demanding. Reach may even change the structure of the industry in general, as the legislation seems to favor more knowledgeable and well-prepared companies. It also demands a new set of skills for regulatory provisional, which is not easy to acquire at the moment.

*Reach is a kind of "survival of the fittest" for the chemical industry?*

**R. Rinta-Jouppi:** Yes. But it's not just a question of being well-prepared and knowledgeable; it also becomes a question of workload. In many companies, there is usually only one person responsible for Reach – a person who has a chemical or commercial background. And this person has to take care of the company's Reach issues in addition to his or her regular work. This is naturally demanding on many levels, from the time it takes to the level of understanding it requires – from chemistry to toxicology to regulatory affairs.

Continues Page 6 ▸▸



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## CONTENT



## Akzo Nobel Completes On Sale to Henkel


Hans Wijers
CEO of Akzo Nobel

Akzo Nobel has completed the on sale of the adhesives and electronic materials businesses, part of the former ICI's national starch business, to Henkel for £2.7 billion (€4 billion) in cash. The agreement with Henkel for the on sale of the two businesses was announced by Akzo Nobel in its offer for the ICI Group in August 2007. The transaction was subject to the completion of Akzo Nobel's recommended offer for ICI and clearance by relevant anti-trust authorities. Both conditions have now been met. Hans Wijers, CEO of Akzo Nobel said, "I am pleased that the sale has been concluded so rapidly, just three months after the ICI acquisition, and we are confident Henkel will further develop these strong businesses."

▶ www.akzonobel.com

## Novartis Gets Alcon-Majority

Nestlé provides Novartis the right to acquire 77% majority ownership of the eye care company Alcon in two steps. The transaction's first step to purchase a 25% stake in Alcon from Nestlé for $143.18 per share for approximately $11 billion is expected to be completed in second half of 2008. The second step provides rights for Novartis to acquire for a fixed price of $181 per share (totalling about $28 billion) the remaining 52% Alcon stake held by Nestlé between January 2010 and July 2011.

Alcon is the world's largest and most profitable eye care company with 2007 annual sales of $5,6 billion. The acquisition furthers Novartis' strategy of accessing high-growth segments of the healthcare market while balancing inherent risks.

▶ www.novartis.com
www.nestle.com
www.alcon.com

## Wacker: Net Profit Up 36%

Wacker Chemie has reported its full-year net income jumped 36% to €422 million amid strong demand for its silicon wafers based on the new 300mm technology. However, the company still fell short of analyst expectations of €435 million. The company also said it expects sales to grow well over 10% in 2008 as it is boosting output capacity and acquisitions. Ebita is set to increase year-on-year, it said.

▶ www.wacker.com

## Brenntag Reports Record Results for 2007

Brenntag has finished 2007 with record results. With an increase of 9%, the company's 2007 revenues climbed to €6.7 billion ($9.1 billion). Ebitda increased by 14%. Eliminating currency exchange movements removes the effects the weakened dollar had on reported results and reveals a more realistic picture of the strong underlying growth, accordingly, sales and operating Ebitda increased by 13% and 18%, respectively.

▶ www.brenntag.com

## Changes in Clariant's Board of Directors


Dominik Koechlin


Hariolf Kottmann


Carlo G. Soave


Jürg Witmer


Rudolf Wehrli

Clariant's board of directors will propose to the annual general meeting to elect Dominik Koechlin, Hariolf Kottmann and Carlo G. Soave to the board of directors. The board plans to appoint Jürg Witmer as chairman and Rudolf Wehrli as vice-chairman. Roland Lösser, Clariant's chairman, will, as communicated earlier, for personal reasons, not stand for reelection. Furthermore Tony Reis, Clariant's vice-chairman, will retire from the board, and Kajo Neukirchen, member of the board of directors, will not stand for reelection.

▶ www.clariant.com

## Bayer Healthcare to Acquire OTC Business

Bayer Healthcare's consumer care division has signed an agreement with U.S.-based Sagmel to acquire their over-the-counter (OTC) brand portfolio and related assets. Sagmel operates this business in the Commonwealth of Independent States (CIS). The companies have agreed not to disclose the financial terms of the transaction, which is expected to close during 2008. This acquisition will increase Bayer Consumer Care's presence in the CIS, one of the world's fastest growing OTC markets. The transaction will include the transfer of the assets related to the acquired brands, as well as the employees dedicated to the Sagmel OTC business including the sales force and distribution networks, marketing, regulatory affairs and supply chain personnel.

▶ www.bayer.com

## Chemtura Reports Annual Results

Chemtura has reported flat earnings for the fourth quarter of 2007. Additionally the company is reporting net earnings on a non-GAAP basis of $26 million, or $0.11 per share. The net loss for the fourth quarter includes loss from continuing operations of $3 million, or $0.02 per share, income from discontinued operations of $4 million, or $0.02 per share and loss on the sale of discontinued operations of $1 million, or $0.00 per share. On a non-GAAP basis, net earnings include income from continuing operations of $22 million, or $0.09 per share and income from discontinued operations of $4 million, or $0.02 per share.

▶ www.chemtura.com

## Lyondellbasell Completes Purchase

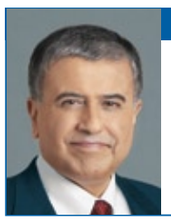
Lyondellbasell has completed the purchase of the Shell oil refinery and associated infrastructure and businesses at the Berre l'Etang petrochemical complex in France. The refinery, with production capacity of 105,000 barrels per day, is adjacent to a Lyondellbasell polyolefins complex at Berre that includes a steam cracker, butadiene extraction unit and polypropylene and polyethylene plants. Lyondellbasell also has a polyethylene plant and a site that produces propylene oxide, MTBE and ETBE nearby at Fos-sur-Mer. The company has been the largest customer of the Berre refinery, purchasing naphtha, vacuum gas oil and liquefied petroleum gas as raw material for its steam cracker.

Approximately 1,500 employees will join Lyondellbasell through this transaction.

▶ www.lyondellbasell.com

*chemanager@gitverlag.com*

## Schering-Plough Launches PTP



Fred Hassan
Schering-Plough

*"Savings and productivity improvements will be realized across the company and around the world. No area will be exempt."*

Schering-Plough has announced a new Productivity Transformation Plan (PTP) to reduce costs and increase productivity to generate a total of $1.5 billion in annual savings and synergies. The targeted savings represent approximately 10% of the combined company's full year 2007 estimated cost base. $1.25 billion of the planned savings are expected to be accomplished by the end of 2010. "Savings and productivity improvements will be realized across the company and around the world. No area will be exempt," said CEO Fred Hassan. The program responds to dramatically intensifying pressures on the pharmaceutical industry and also to the confusion in the U.S. market around cholesterol management that impacts the products of the Merck/Schering-Plough joint venture, Zetia, and Vytorin.

▶ www.schering-plough.com

## Takeda To Acquire Millennium

Takeda Pharmaceutical Company and Millennium Pharmaceuticals announced that they have entered into a definitive agreement pursuant to which Takeda will acquire Millennium for approximately $8.8 billion through a cash tender offer of $25 per share. The transaction was unanimously approved by the boards of directors of both companies. Upon completion of the acquisition, Millennium will become a wholly-owned subsidiary of Takeda Pharmaceutical Company and will continue operations in Cambridge, Mass. as a standalone business unit. Millennium will be known as Millennium Pharmaceuticals, Inc., a Takeda Company. Takeda will finance the acquisition through cash on hand. There is no financing condition to the tender offer or second step merger. Takeda expects that the acquisition will enhance Takeda's earnings starting in the fiscal year ended March 2010 before transaction related amortization. The addition of Millennium will enhance Takeda's growth profile immediately, the company said.

▶ www.takeda.com
www.millennium.com


**Future Prospects for Wind Energy** The European Wind Energy Association Conference and Exhibition 2008 in Brussels, chaired by the EU Energy Commissioner Andris Piebalgs, looked at the future prospects for wind energy in the context of European Commission proposals for 20% of the EU's energy to come from renewable sources by 2020. A video available on the website includes interviews with EU Energy Commissioner Andris Piebalgs, the CEO and the President of the European Wind Energy Association and MEP. www.ewea.org


**Rhodia Upped to 'BB' on Improved Performance and Cash Flow** Standard & Poor's Ratings Services said it has raised its long-term corporate credit rating on France-based chemical producer Rhodia S.A. to "BB" from "BB-". The outlook is stable. "The upgrade reflects our expectations that the improved operational and financial results achieved in 2007, coupled with steady debt repayment, will continue in 2008 and 2009," said Standard & Poor's credit analyst Lucas Sevenin. S&P said it expects a ratio of funds from operations (FFO) to adjusted debt of about 20%, and positive free operating cash flow (FOCF). This reflects the good polyamide supply and demand balance likely to last until at least the end of 2009, the group's material proceeds from carbon credits, very long-term debt amortization profile, various liquidity sources, a continuing financial policy of deleveraging, and ample financial covenant leeway, S&P said. Rhodia is also expected to demonstrate good operating profit resilience in 2008, achieving FFO to debt of about 20%, and positive FOCF.

"We expect that the polyamide cycle will remain favorable, that the group will be able to offset a large part of the likely raw materials and energy cost increases, and generate substantial earnings and cash flow from carbon credits, as it did in 2007," Sevenin said. "The stable outlook also reflects material cash proceeds from asset sales and limited shareholder returns and acquisitions, as per the group's financial policy."

▶ www.rhodia.com

**Novartis Downgraded to 'AA-' After Change in Financial Policy** Standard & Poor's Ratings Services has lowered its long-term corporate credit rating on Switzerland-based pharmaceuticals group Novartis to "AA-" from "AAA" due to the group's unexpected change in financial policy. At the same time, S&P affirmed the "A-1+" short-term corporate credit rating. The outlook is stable. "Novartis' lack of commitment to the former 'AAA' rating is demonstrated by its announcement to debt-finance the acquisition of a 77% stake in U.S.-based eye care company Alcon, which is owned by Switzerland-based food manufacturer Nestle, for a total of about $39 billion, leading to significantly increased leverage," said Standard & Poor's credit analyst Olaf Toelke. The rating action reflects that debt protection ratios will be significantly diluted for at least the next five years, because the transaction is to be fully debt financed, and that this action is a marked deviation from the group's former conservative financial policy. Thus, although the transaction will not materially affect the group's already superior business profile, the requirement to maintain a net cash position for the former "AAA" rating is now unrealistic. The additional leverage is likely to depress the lease- and pension-adjusted ratio of funds from operations (FFO) to net debt to below 40% by the end of 2008, pro forma for the two-stage acquisition process. Novartis will therefore more than exhaust its flexibility for the former ratings. Furthermore, as future debt-financed bolt-on acquisitions are not excluded, recovery of the credit metrics could be drawn out even further.

▶ www.novartis.com

**Linde Rating Raised to 'BBB+' on Fast Debt Reduction** Standard & Poor's Ratings Services said today it raised its long-term corporate credit rating on Germany-based industrial gases producer Linde AG to "BBB+" from "BBB." The outlook is stable. "The upgrade follows Linde's strong operating performance and conservative dividend policy in 2007, which allowed it to reduce financial debt faster than we previously expected," said Standard & Poor's credit analyst Tobias Mock. Linde exceeded its original debt-reduction target by more than €800 million in 2007. It also reduced its pension deficit by about €600 million by making extra contributions and thanks to the strong performance of pension assets. Although Linde's disposals of €3.5 billion were the main reason for debt reduction, the strong performance in its industrial gas and engineering businesses also supported operating cash flows. Free operation cash flow therefore reached about €520 million, according to Standard & Poor's calculation, and comfortably covered the company's dividend payments of €281 million.

The integration of U.K.-based The BOC Group, acquired in 2006, is well on track, and Linde has confirmed that it targets Ebitda of more than €3.0 billion for the group by 2010, up from €2.4 billion in full-year 2007.

▶ www.linde.com

# Strong Euro

## Clear-cut Competitive Disadvantage or Negligible Effect?

**Downturn – The U.S. mortgage crisis has triggered a global financial crisis, and the chemical industry has not been left unaffected.**

**Dr. Juan Rigall**
Managing Director
Droege & Comp. International Management Consultants

The last four years were marked by growth for the German chemical industry: In 2007, total sales rose by 7.5% to €174.4 billion with good developments of volume and increasing prices. Business activities at home and in foreign countries expanded at almost equal speed with rates of 7% and 8%. The exports (including foreign sales by chemical companies, re-exports and chemical exports by other industries) increased by 10% to €131.2 billon. Thus exports improved significantly and continued giving a strong impulse to the German chemical industry.

However, the last quarter of 2007 and the first quarter of 2008 showed a slight downtrend not only for the chemical industry but for the whole German economy: Increased risks due to the U.S. sub-prime mortgage crisis triggered a global financial crisis and a lower demand in North America, the ongoing price increases for raw materials and especially the strong euro are additional factors increasing uncertainty in the markets.

Currently, the impact of the strong euro on the economy is being discussed in the press. The last monthly report of the German Central Bank foresees rather a long-term than a short-term negative influence of the strong euro on the German export activities (even though the U.S. is right after France as the most important trade partner for Germany): At present, 80% of the German export business is being calculated and invoiced in euro and three-fourths of the exports invoiced in foreign currencies are protected by currency hedging. Furthermore unburdening effects are to be taken into account because most of the raw materials imported by German companies are purchased in dollar.

A different scenario is being drawn by German companies: According to its own sources, the German chemical industry giant BASF recently reported that every cent the euro increases against the dollar would count for a loss in sales of about €250 million. Bayer had to face a currency-related 4% loss in sales during the first three quarters of 2007.

In order to get a clear perspective for the chemical industry, the international management consultant firm Droege & Comp. conducted a special survey in cooperation with the CHEManager Europe amongst the CHEMonitor network including more than 250 managers and experts of the German chemical industry. CHEMonitor is a quarterly, German-language trend barometer done in cooperation with CHEManager and Droege & Comp.

### Split View on Degree of Business Impacts

More than 50% of the experts specify that the influence of the strong euro on their businesses is low (fig. 1). Thereof 9% are even reporting that the present currency situation has no effects at all on their companies. On the other hand, 37% of the interviewees are facing high impacts; thereof 7% with a very high euro influence specification.

### Positive Influence on Sourcing Activities, no Effect on Production, Negative Impact on Sales

Evaluating the effects of the strong euro for specific functions more than 50% of the CHEMonitor experts see positive outcomes of the strong euro for their sourcing activities (fig. 2) following the estimations of the German Central Bank mentioned above. Against the background of the continuing upward tendency of raw material prices, mostly calculated in dollar per ton, the parallel increasing value of the euro protects many chemical companies in the euro area. Chemical firms located in the dollar region are rather exposed without this protective effect. Even 9% are judging the strong euro effect to be very positive.

However with 21%, every fifth CHEMonitor expert is pointing out to have negative effects due to the present currency situation. These are companies that buy their raw materials in the euro area and can therefore not utilize the weak dollar for their purchasing activities. "Generally, these companies use currency hedging as financial instrument and are therefore protected in the short-run," said Dr. Juan Rigall, managing director of Droege & Comp. and head of their chemical industry practice, analyzing the situation. "In the long-run, however, they have to strategically think about 'natural hedging' options meaning that companies should focus their sourcing and increase their production capacities in the dollar area."

With 67% the vast majority of the experts are detecting no influences of the strong euro on their production activities. However 13% of the interviewees complain about at least negative consequences, thereof even 2% observing very negative effects (fig. 2).

According to the survey results, sales are the most negatively affected activity. Especially when companies manufacture their products in the euro area and sell them to the dollar area the current situation can be considered as highly critical. Especially supply chains that rely upon single sourcing in the euro area are heavily struck, for example due to tailor-made applications or special IP needed. Thus, with 58%, the majority of the CHEMonitor panel experts are pointing out to have at least negative impacts of the strong euro on their sales activities. Seventeen percent evaluate the situation as very negative (fig. 2). However in 2006, with 62.5% the majority of the German chemical exports has been delivered to one of the EU-27 countries and should therefore not be negatively influenced. This goes in line with the fact that 35% of the interviewees cannot detect any impacts on their sales activities.

### Every Fourth German Chemical Company Likely to Renegotiate Existing Contracts

Asked the question how likely existing contracts are going to be renegotiated, 24% of the chemical experts answer that they are at least likely to renegotiate purchase agreements, whereas 4% are very likely (fig. 3). However with 43% almost half of the interviewees are not considering to renegotiate existing contracts, thereof 19% express that this case is very unlikely.

### Majority of CHEMonitor panel managers is not going to expand production capacities in the U.S.

Surprisingly, 61% and therewith the majority of the interviewees is not going to expand production capacities in the U.S. (fig. 4). Only 24% are currently thinking or discussing options to expand in this dollar area. Hence, only a minority of 31% of CHEMonitor experts are pursuing acquisitions or joint venture options in the U.S. (fig. 5), although the strong euro effect is estimated to last for a long time (fig. 6). Thus, 59% are predicting the currency situation to last for more than one year.

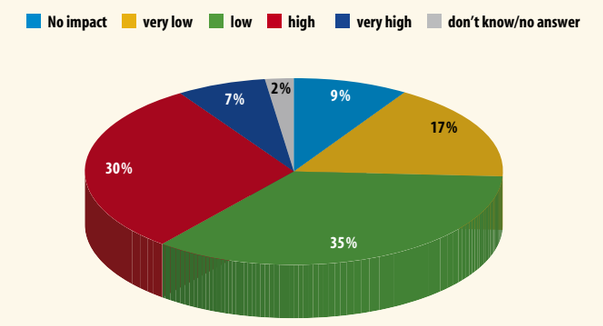
Twenty percent even foresee a strong euro for more than two years.

Comparing this with the results of a questionnaire recently published by the Droege & Comp. office in New York, the German chemical industry takes up an exceptional position. In this survey, 56% of the respondent companies of multiple industries planned to extend their capacities in the U.S., thereof even one third considered to do this in the next six months. "The industries that highly depend on markets based in the dollar region, like the automotive and aviation industry, are acting quickly to enhance their production capacities," saidLars Knorn, Director in the New York Droege & Comp. office. "In 2006, the German chemical industry has exported only 13.1% of their products to Nafta and Latin America. Thus, the dependence on these markets is limited as well as the pressure to act. Against this background the different results of both surveys make absolute sense."

In contrast to some other industries, the current dollar situation does not urge chemical industry's decision makers to heavily invest in production capacities in the U.S. "At the end of the day, the fundamental rationale of these investments should be future market demand and this is still comparatively predominant in Asia. Besides, once a site has been established it takes generations to alternate this structural set-up if it is not by divesting," Rigall said.

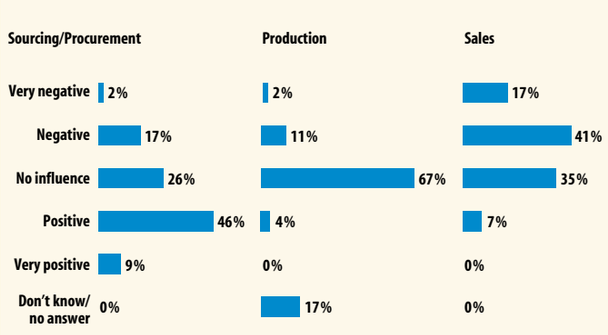
▶ www.droege.de

**Influence of EUR/USD exchange rate** — Figure 1
To what degree does the current €/US-$ exchange rate impact your business?



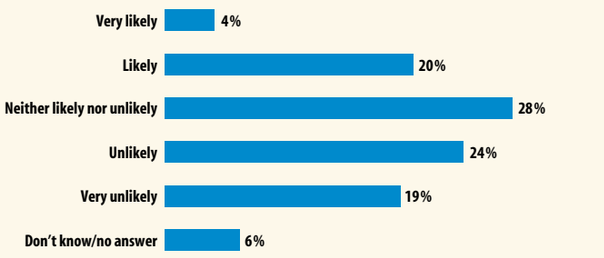

Source: Survey, March 2008 © CHEManager / Droege & Comp.

**Influence of EUR/USD exchange rate** — Figure 2
Please rate the type of impact the current exchange rate has on your business activities.



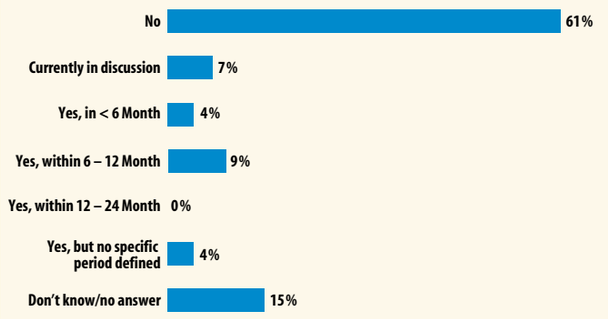

Source: Survey, March 2008 © CHEManager / Droege & Comp.

**Sourcing/Procurement** — Figure 3
How likely are you to renegotiate existing contracts?



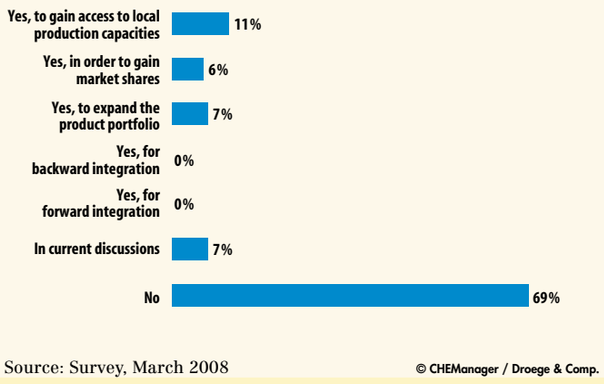

Source: Survey, March 2008 © CHEManager / Droege & Comp.

**Production** — Figure 4
Are you considering to expand your production in the U.S.?



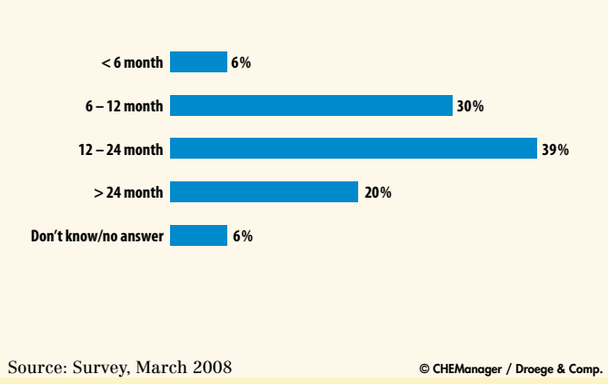

Source: Survey, March 2008 © CHEManager / Droege & Comp.

**Strategy** — Figure 5
Has the current exchange rate increases your likelihood of pursuing acquisitions or joint ventures in the dollar area?




Source: Survey, March 2008 © CHEManager / Droege & Comp.

**Outlook** — Figure 6
How long do you expect this exchange rate trend to persist?




Source: Survey, March 2008 © CHEManager / Droege & Comp.


**BASF Increases Stake in HTE** BASF and HTE agreed for BASF to increase its stake in Heidelberg-based HTE from 12.7% to 75% plus one share. The high throughput experimentation company, HTE, is a provider of technology and services for enhancing research and development productivity, in particular in the areas of catalysis, material science and formulations. Rainer Diercks, president of Chemicals Research & Engineering at BASF, said: "We will benefit especially from HTE's experience as a global leader in the application of high throughput methods to heterogeneous catalyst R&D. As a result, we will be able to develop catalysts for a variety of applications faster and more efficiently."

▶ www.basf.com
▶ www.hte-company.de

**Ineos Completes Acquisition of IACC** Ineos has completed its acquisition of the full shareholding in IACC (Ineos Asiatic Chemical Company) in Bangpoo, Thailand. The former joint venture is now, after the purchase of the remaining 40% shareholding held by the East Asiatic (Thailand) Public Company, wholly Ineos owned.

▶ www.ineos.com
▶ www.iacc.co.th
▶ www.eachemicals.com

**Dyneon Acquires Hitech Polymers** Dyneon, a 3M company, has acquired the business of Hitech Polymers, a manufacturer of specialty thermoplastic polymers and provider of toll thermoplastic compounding services based in Hebron, Ky. (U.S.). Terms of the transaction were not disclosed. Thermoplastics are used in the creation of a wide range of plastic components such as plastic bottles and molded parts, pumps, valves, and for multiple markets such as consumer, packaging, electronics, construction, and transportation. Hitech Polymers brings to Dyneon capabilities in polymer blending, alloying, formulation, ingredient compatibility, and reactive polymer processing that are critical to the process for creating compounds that can be molded into various plastic components.

▶ www.3m.com
▶ www.hitechpolymers.com

**Rohm and Haas Acquires Polymer Dispersions Division** Rohm and Haas has completed the acquisition of Finndisp, the polymer dispersions division of OY Forcit AB for €60 million. Finndisp, based in Hanko, Finland, is a producer of water-based emulsions used in the manufacture of paints and coatings, lacquers and adhesives. Their portfolio includes low-temperature, high performance products specifically designed for use in Northern Europe and the Commonwealth of Independent States. The acquisition also includes two plants – one in Hanko, and another under construction in Ramenskoye, Russia, near Moscow. These will become a part of a network of more than 30 plants worldwide.

▶ www.forcit.fi
▶ www.rohmhaas.com

**Dr Reddy's Buys Part of Dow's UK Business** India's Dr Reddy's Laboratories has signed an agreement with Dow to acquire the portion of the U.S. company's Dowpharma small molecules business in Mirfield and Cambridge in the UK.

The financial terms and conditions of the transaction were not disclosed. The deal includes Dowpharma's relevant business, customer contracts, associated products, process technology, intellectual property and trademarks as well as the transfer of the Mirfield and Cambridge facilities.

▶ www.drreddys.com
▶ www.pharma.dow.com

**Eastman Sells PET and PTA Assets** Eastman has completed the sale of its European PET and PTA assets to Indorama. Included in the sale are Eastman's PET facility and related businesses in the United Kingdom and its PET and PTA facilities and related businesses in the Netherlands. The total cash proceeds of the transaction are €224 million or approximately $354 million, subject to adjustments in working capital. The transaction will result in a gain on sale in the company's consolidated financial statements for first quarter. "This transaction completes Eastman's divestitures of its non-strategic PET and PTA assets located outside the U.S.," said Gregory O. Nelson, Eastman executive vice president and polymers business group head.

▶ www.eastman.com
▶ www.indorama.com

**Sasol Wax Acquires Luxco Wax Shares** Sasol Wax has acquired the remaining 50% share of its North American joint venture Luxco Wax, turning it into a wholly owned Sasol Wax operation. According to the company, this acquisition is a key part of a process to consolidate and focus its holdings and position in the global market place. Apart from this acquisition, Sasol Wax sold its shares in two joint ventures in mid 2007 and earlier this year acquired the outstanding 50% share in Merkur, a former joint venture with Shell in Germany. Merkur markets petroleum jelly into the personal care market and, like Luxco Wax, will be merged into Sasol Wax's global business.

▶ www.sasolwax.com
▶ www.luxcowax.com

**Ineos Chlorvinyls Sells Chlorine Business** Ineos Chlorvinyls has reached an agreement to sell its packed chlorine business to BOC, which has recently been acquired by the Linde Group. The value of the deal is not disclosed. The sale consists of the packed chlorine production facilities at Runcorn site together with the associated commercial goodwill of the business. The packed chlorine business is specialised and consists of the production, packaging and delivery of chlorine liquefied gas in both drums and cylinders, which is predominantly used for water disinfection and chemical intermediate applications.

▶ www.ineoschlor.com
▶ www.boc.com

*chemanager@gitverlag.com*

# Ionic Liquids

## Help Or Hype?

**High Potential – Salts that are molten at room temperature (ionic liquids) are subject of intense interest, some of it highlighting novel properties and potential applications, some making not-always-reliable claims of environmental benefits. Neil Winterton from the University of Liverpool puts the topic into perspective.**

### What Are Ionic Liquids?

We usually think of salts as high-melting crystalline solids, soluble in water, like table salt. However, attention is currently focused on salts that are quite different. These can form a separate, essentially pure, liquid phase simply by mixing together two solutions in water, one containing a particular cation, the other a particular anion. These liquids consist wholly of ions: hence are known as ionic liquids.

Their history can be traced back to 1914, with important developments having taken place since the 1940s. More recently, it has been realized that many combinations of cations and anions (see fig.1) give low-melting salts. This has stimulated an explosion of scientific and technical interest. Many are easy to make and are available commercially, some on the large scale. They are, however, difficult to obtain wholly pure and to purify. Indeed, contaminants, such as water or halides, even at low levels, can have profound effects on their physical and chemical properties and can catch the unsuspecting researcher unawares.

### So, Why The Interest?

Many ionic liquids differ from conventional molecular liquids in having very low vapor pressures. Exceptions are salts that dissociate on heating into volatile component acids and bases. Imagine, therefore, a reaction medium from which volatile products can be separated from solvent simply by evaporation. Ionic liquids have proved to be highly versatile solvents for a range of organic and inorganic reactions and in materials discovery. They support many catalyzed processes, including those by enzymes. There is also fascination in seeking to understand their intrinsic properties, including liquid, solid-state, phase, solvation, surface and interfacial behavior. Ionic liquids are similar to dipolar aprotic solvents in their general solvation behaviour, though hydrogen bonding, particular involving anions such as chloride, acetate and dicyanamide, holds the key to the intriguingly high solubility of cellulose, the focus of significant industrial interest. Unfortunately, most ionic liquids are relatively viscous at ambient temperatures leading to mass transfer constraints on their use as reaction media. This has stimulated much research on improved contacting through the use of membranes and other ionic liquid composite materials. Being salts, ionic liquids are also good conductors of electricity.

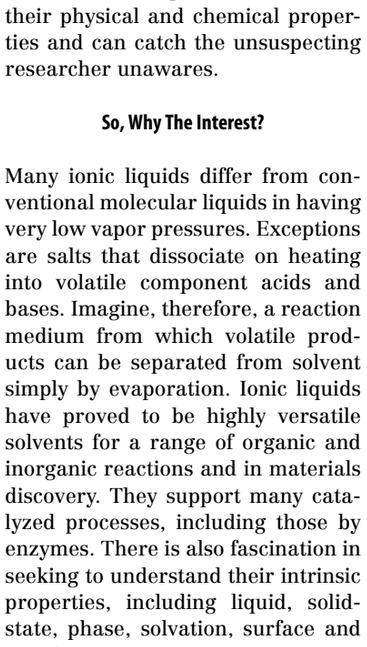


**Fig. 1**

Depending on the choice of anion and cation, some are relatively difficult to reduce and oxidise and are widely used in a range of electrochemical applications. In fact, an early patent describes the use of a low-melting mixture of [N-Etpy]Br and aluminium trichloride in aluminium deposition. Later studies of chloroaluminate ionic liquids for use in batteries and fuel cells, particularly in military and aerospace applications, identified the N,N'-dialkylimidazolium cations that are now found in many new ionic liquids. The reactivity with water has limited the wider application of $[AlCl_4]$--based ionic liquids. It took the later discovery of combinations of anions and cations shown in the Figure to provide a range of more robust ionic liquids for more general use. Some cations have been functionalized to enhance a particular property or to fulfill a particular task (hence TSILs: "task specific ionic liquids") or contain polymerizable groups that lead to novel ion-functionalized materials.

### Industrial Potential

Industrial use of molten salts has a long history. Indeed, the large-scale use of molten cryolite, $Na_3[AlF_6]$, in the electrolytic production of aluminium began in 1888. It is hardly surprising that, in parallel to the rapid growth in research interest, there have been efforts to exploit and apply the novel characteristics of ionic liquids. Many patents have been filed. Bearing in mind the length of the journey from laboratory to commercialisation, it is perhaps surprising how far down the track many developments, in fact, are. For instance, ionic liquids based on the cation $[Me_3N(CH_2CH_2OH)]^+$ are now used in large-scale operations in the plating industry, replacing traditional materials and significantly reducing environmental impact. IFP have used chloroaluminates in their Dimersol process for alkene dimerisation.

Perhaps the best known industrial application of ionic liquids is BASF's Basil process for the production of phosphonite esters from the reaction of $RPCl_2$ with an alcohol. Formerly, triethylamine was used to scavenge the HCl co-product. Solid $[Et_3NH]Cl$ precipitated from the reaction mixture and had to be removed by filtration. However, using N-methylimidazole instead yields a hydrochloride that phase-separates as a liquid, facilitating acid removal and base recovery. Reactor productivity is also enhanced $>10^4$-fold.

The current cost of most ionic liquids (particularly compared with conventional solvents) requires highly cost-effective means of recovery and recycle. However, most ionic liquids are fully N-alkylated and, while recent work has shown some do, in fact, have sufficient vapor pressure to allow them to be distilled, the temperatures, pressures and distillation rates involved rule this out as a practical means of large-scale purification, except where the high costs can be justified. Liquid-liquid extraction has also been used to remove non-volatile material from ionic liquids, with super-critical carbon dioxide showing promise, particularly as the use of volatile organic solvents is avoided. Nanofiltration, recrystallization and zone-melting have all been suggested as purification methods, though none has yet been operated commercially on the large scale. Zone-melting requires a crystalline phase to be accessible from the melt. This is not so for many ionic liquids that instead form glasses on solidification. Recycle remains a major challenge.

The separation of ionic liquids from isolated non-volatile products can also be non-trivial. For instance, their complete removal from polymers made in ionic liquids can be difficult. The degree to which removal is required will depend on the impact of ionic liquid residues in the desired application. Better might be those materials and device applications in which the ionic liquid remains present (either inert or providing a beneficial function) during their entire working life, such as in polymer electrolytes, fuel cells or photovoltaic devices.

### Are Ionic Liquids 'Green'?

Much has been said about the "greenness" of ionic liquids. These claims are usually associated with their non-volatility in comparison with molecular solvents and their potential for reducing volatile emissions. More rigorous assessments are now being made. Strictly, of course, the net environmental impact can only be assessed in the context of large-scale use or application following a full life-cycle comparison with analogous approaches using conventional liquids. While ionic liquids themselves may have low vapor pressures, the same cannot be said for the precursors used in their synthesis. Very recently, the environmental impact of two now-classical ionic liquids was traced back to the basic raw materials from which they are made, showing that their overall impact is greater than that of conventional solvents, such as acetone. However, it is still entirely possible that specific uses of selected ionic liquids will contribute overall net benefits in terms of emissions, process safety (associated with low flammability), occupational hygiene and ecotoxicity. These factors, and associated regulatory compliance, require relevant technical data, including the full range of toxicological data, to be available, but these are still in relatively short supply. The search for low-cost ionic liquids that combine a technical advantage with being fully environmentally benign continues.

### Where Next?

Despite these uncertainties, companies, individually and in consortia, such as those supporting major centers, such as QUILL in the UK, are investing significant efforts to identify exploitable uses of ionic liquids. Ionic liquids containing pharmacologically-active cations and anions with ionic-liquid-forming counterions of low toxicity have been proposed that may well limit difficulties associated with polymorphism of active pharmaceutical ingredients, formulation and delivery. New applications are reported daily: for making reflecting mirrors, as embalming fluids, to produce gels with buckytubes, in gas storage and separation, as energetic materials, in the preparation of nanoparticles. The possibilities are endless. Some will certainly make it to the market place as the basis of profitable innovations.

**Ionic Liquids Update**

An IUPAC database of physical properties may be found at http://ilthermo.boulder.nist.gov/ILThermo/mainmenu.uix.

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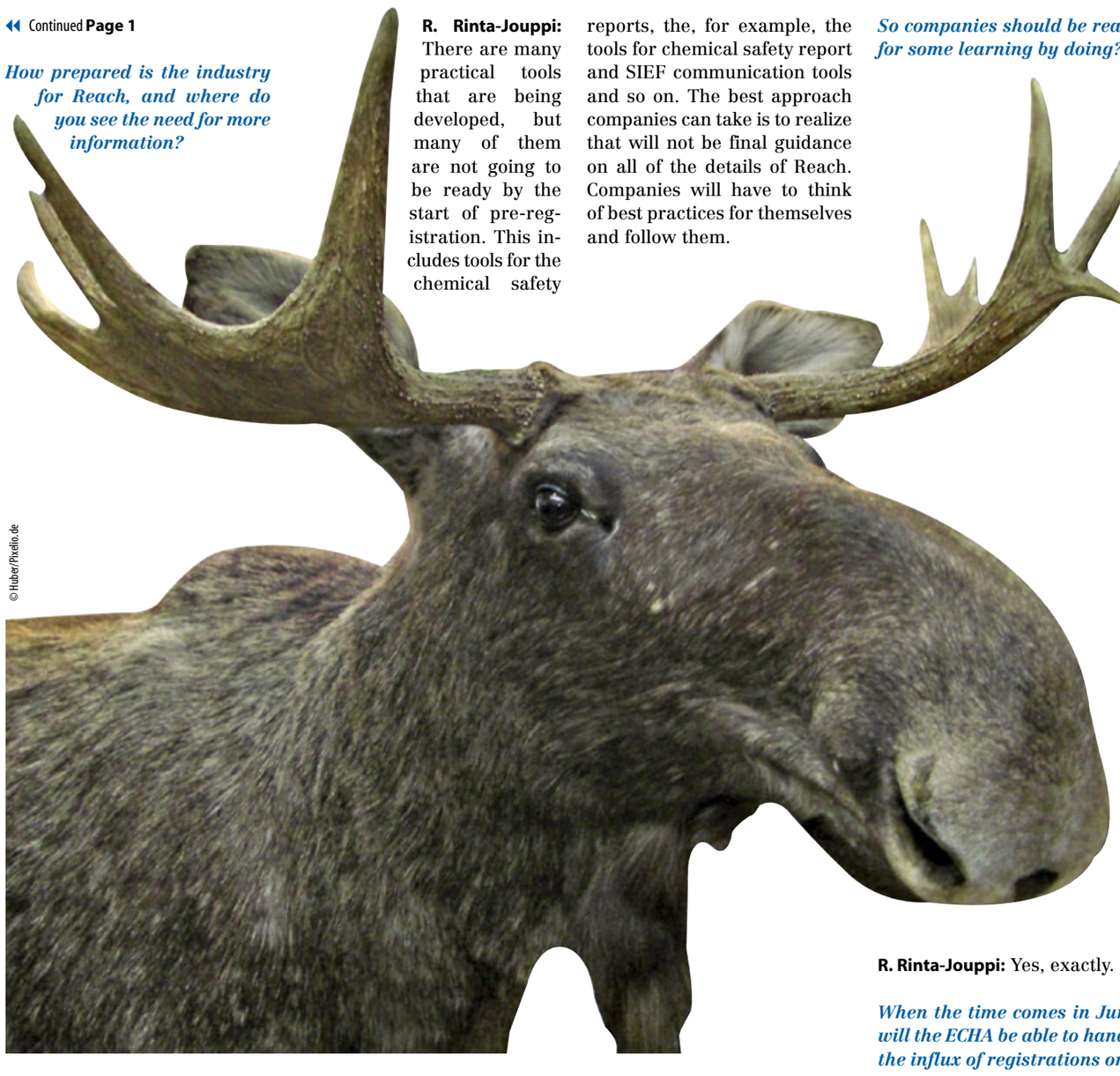
# The Center of the Chemicals Universe

## The Reach Hub Can be Found in the Great White North

Continued Page 1

*How prepared is the industry for Reach, and where do you see the need for more information?*

**R. Rinta-Jouppi:** There are many practical tools that are being developed, but many of them are not going to be ready by the start of pre-registration. This includes tools for the chemical safety reports, the, for example, the tools for chemical safety report and SIEF communication tools and so on. The best approach companies can take is to realize that will not be final guidance on all of the details of Reach. Companies will have to think of best practices for themselves and follow them.



© Huber/Pixelio.de

*So companies should be ready for some learning by doing?*

**R. Rinta-Jouppi:** Yes, exactly.

*When the time comes in June, will the ECHA be able to handle the influx of registrations or is there a possibility for some companies to slip through the cracks?*

**R. Rinta-Jouppi:** Because the pre-registration deadline is approaching quickly, it is likely that there will be companies that will miss the deadline. And also, some companies are shying away from pre-registration, because they are concerned about the administrative costs involved in the process. Although it is possible to register later on, the costs and level of knowledge needed are likely to be higher. If in doubt, companies should participate in the pre-registration round.

*How do you see Reach affecting the European chemical industry's ability to compete with the rest of the world?*

**R. Rinta-Jouppi:** The production of some substances that are intended for markets outside the EU will most likely be moved elsewhere, particularly regarding the production of dangerous substances. However, there are also benefits to be had from Reach, particularly for specialty chemicals. The more information a company has about the properties of their substances, the more they can say what kind of environmental and health effects the substances could have. It will definitely enhance a company's image to be able to say that their products are tested and safe.

However, it is currently difficult to estimate what Reach will mean financially for the European chemical industry.

*Would you say that there is worldwide interest in Reach?*

**R. Rinta-Jouppi:** There is a definite interest in uninterrupted export to Europe. Also, Reach is setting a global standard that will most likely be adapted in other countries; similar structures are being implemented or planned in various parts of the world. The Nafta countries are planning something similar, and Russia is also preparing its own chemicals regulation package.

*Is that a coincidence?*

**R. Rinta-Jouppi:** Well, I wouldn't exactly say that it's a tit-for-tat reaction, but it seems as though when there's increased regulation in the EU, many countries want to respond in kind. One thing is clear: When regulation increases in the world's biggest chemicals market, it will have an affect on other markets as well.

▶ www.helsinkireachcentre.eu

### Why Helsinki?

According to Rinta-Jouppi, the decision to base the European Chemicals Agency in Helsinki was based on a political compromise. It is essentially agreed upon that each EU member state is home to at least one agency. "The original plan was for Helsinki to be home to the European Food Agency, but honestly, there are probably more Italian restaurants in the world than Finnish," Rinta-Jouppi said. In the end, Helsinki got the ECHA and Parma, Italy, got the EFA.

### HICCS 2008 – Helsinki International Congress on Chemical Safety

**May 20 – 22 at the Helsinki Fair Centre**

The first annual HICCS congress, organised by Helsinki Reach Centre, will provide all those affected by Reach with the opportunity to have direct contact with the European Chemicals Agency (ECHA) to get clear answers to questions from the European authority responsible for managing the Reach process.

▶ www.hiccs2008.eu

# An Important Role

## The FECC Highlights the Significance of Europe's Chemical Distributors

**Linked in – From Reach to competitiveness in the chemical supply chain, chemical distributors in Europe play a decisive role. FECC Director General Hendrik Abma explains the industry's position ahead of the FECC June congress.**

Hendrik Abma
FECC Director General

The role of the chemical distribution sector is crucial for a competitive European chemical industry and an increasing number of suppliers, customers and legislators acknowledge this. In this context, the European Association of Chemical Distributors (FECC) is proud to represent the European chemical distribution in the High Level Group on the Competitiveness of the Chemical Industry. It is the first time that chemical distributors are represented at a High Level Group, which is chaired by Günter Verheugen, vice president of the European Commission in charge of Enterprise and Industry. "Chemical distributors have an important contribution to make to the competitiveness of the entire chemical supply chain," Verheugen said. "As distributors are often the last chemical operator in the supply chain, they also contribute to the safe and professional dissemination of new and innovative chemicals to downstream users, many of which are SMEs."

The first implementation stages of the requirements of the Reach Regulation, the influence of private equity, and the increasing importance of the Russian and Eastern European markets are key factors that will determine the performance of the chemical distribution in Europe in the coming years. The new challenges ahead need an effective representation at European level.

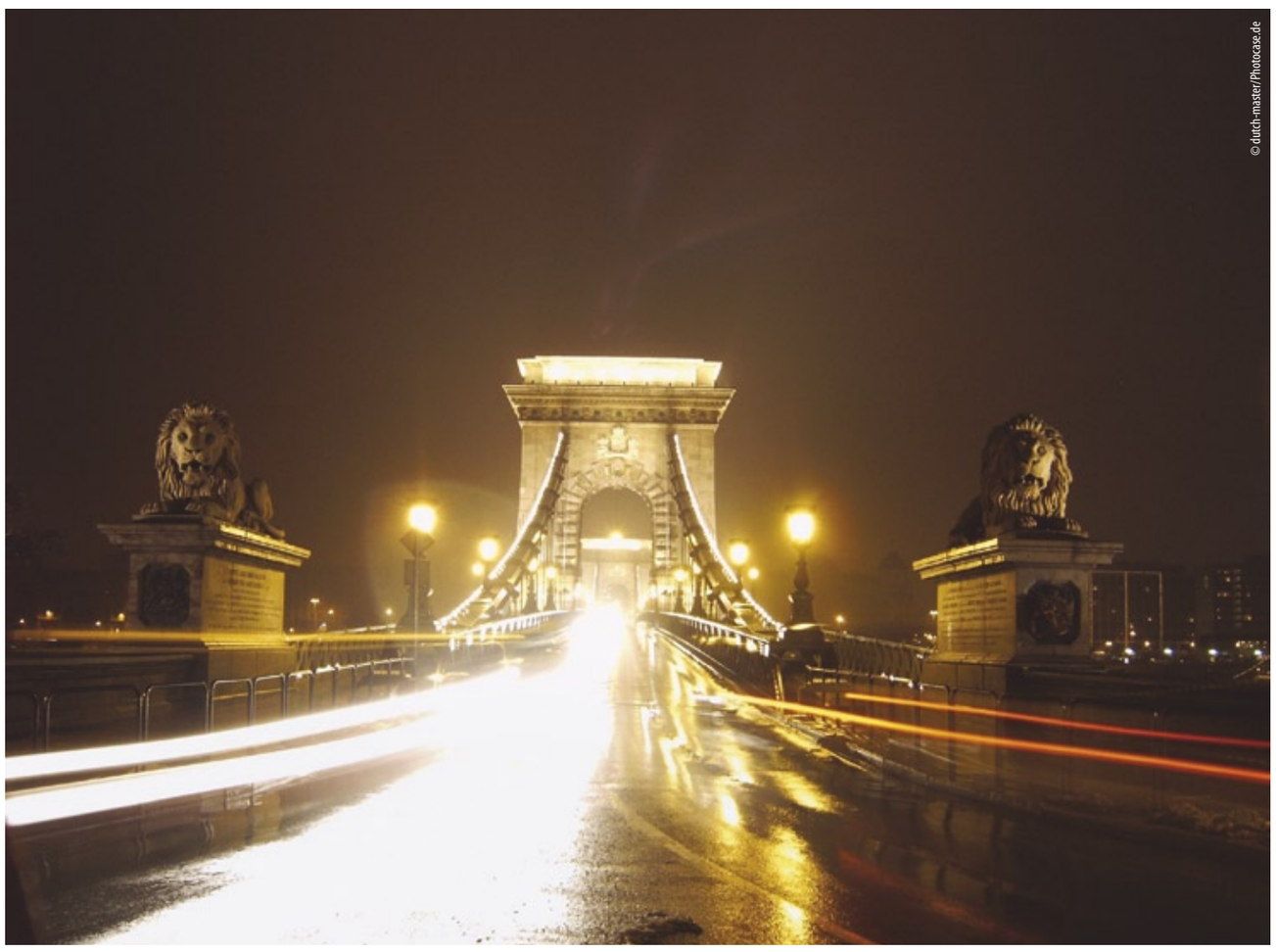
### FECC Congress in Budapest

The membership of FECC has continued to grow in 2007 and 2008; the association said it is pleased with the geographical expansion of its membership, which now covers all of Western Europe, the Czech Republic and Hungary. Due to the large number of national associations and companies in Eastern and Southeastern Europe who have shown interest in the FECC, the association has decided to hold its annual congress in Budapest. As more and more National Associations and companies in East and South-East Europe are interested in the work of FECC we chose Budapest as the location for our annual congress this year.

The 2008 FECC Annual Congress takes place June 2–4 under the motto, "Partnership for Success." The congress will focus on how chemical distributors can achieve successful cooperation with their business partners in the supply chain. Several key business players will present the latest developments in the sector, topics include the optimisation of the supply chain in Central and Eastern Europe; how to overcome the hurdles of the Russian market, and understanding customers' demands.

One of the congress highlights is the panel session on the Reach Regulation, just a few days after the June 1 opening of the pre-registration phase. Keynote speaker Otto Linher, head of sector at DG Enterprise and Industry at the European Commission, will share some of his views and expertise on the Reach Regulation. Speakers from the industry and non-government organizations will expose the main challenges and business opportunities brought by this complex piece of legislation.

The FECC said it expects to attract over 400 senior industry players from throughout Europe, U.S., Canada and Asia. The congress intends to give its delegates a complete overview of the current key developments in the industry, both on the legislation and business environment.



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### Chemical Distributors And Reach

There is no doubt that distributors will play a key role in implementing Reach. The legislation demands a significant communication of information while chemical distributors have a crucial place in the supply chain between producers and downstream users.

Distributors often have a large product range and customer base compared with the producers. FECC estimates that Europe's distributors supply products to over 1 million downstream users. FECC has taken on an active advocacy strategy on a number of fundamental points in the guidelines for industry such as a fair cost sharing system, a simplification of the communication, the use of generic Use and Exposure categories or the registration fees. Member interests have been advocated at key forums through FECC's participation in the Reach competent authorities meeting, the relevant Reach Implementation Projects and a close cooperation with the European Commission and the newly established European Chemicals Agency (ECHA).

FECC said its members are aware of their obligations within Reach and are keen to focus on its implementation in order to facilitate the information flow and dialogue between the suppliers and the downstream users. The organization of seminars, the development of support material for companies, and a number of other initiatives are in place in order to help companies to successfully implement the new legislative requirements.

FECC also participates in numerous joint initiatives with other European organisations, such as Cefic, Businesseurope, and the Downstream Users of Chemicals (DUCC) so as to promote a harmonized approach for the implementation throughout the supply chain. The use of standard tools to collect and communicate information among companies in the context of the compliance with the Reach Regulation is one of the core aims of this cooperation.

### FECC And The EU

The FECC said it has been taking on a more pro-active attitude the past couple of years in terms of membership and strategy. This has resulted in a large number of companies and new national associations recently joining FECC, resulting in a strengthened network and an enhanced representation. FECC is constantly involved in initiatives with the EU Institutions where input from the European chemical distribution sector is required. The FECC has contributed to numerous discussions on topics such as Reach; the upcoming regulation on classification, labelling and packaging; implementation of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), etc.

### What is the FECC?

FECC's mission is to advocate the interests of the chemical distribution sector to the EU institutions. The organization promotes the chemical distribution industry in order to ensure a sustainable business environment for the chemical distribution sector in the short, medium and long term by representing FECC members' interests at European and international level.
The FECC Congress will be held June 2–4 in Budapest. For registration information, go to www.fecc-congress.org

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# People, Not Plants

## Air Products Aims for Steady Growth

Continued Page 1

of 15% of the total products we sell. Our goal for this year is to move this up to 20%, meaning a sizable part of our growth will be through new products. And this can be done in areas that allow innovation. While the polymers business is a nice business to be in, it is 95% commodities, which are very unstable in terms of profitability, and you have to fight for every cent. The divestiture of the polymers business does not mean that we have exited industries such as the construction industry – we simply now offer those industries different types of products and focus. For example, 30–40% of our sales in our epoxy unit are in the civil engineering area.

*And this new focus isn't something you could have done within this joint venture?*

**M. Garlaschelli:** In order to be successful within a joint venture, it is necessary to dedicate a lot of resources and efforts into one part of the business. This can also mean fighting over prices and commodities and having a lot of uncertainty in terms of margin generation. The bottom line is we want to work on a less cyclical type of business.

*Are you looking for more flexibility?*

**M. Garlaschelli:** We would like to have more predictable and steady growth with the right profitability. Our profitability in Performance Materials is growing well; in order to succeed, we have to invest in R&D and in people. I'm not saying that this is a completely stable business, but it is an area where you don't lose customers over a two-cent price difference.

*What kind of R&D is your group currently doing?*

**M. Garlaschelli:** We are currently inventing new molecules, but clearly not in the same amount as 20 years ago. The more time that goes by, the more difficult it becomes to invent something that is truly new. However, we take a lot of impetus from our customers. For example, a major German car producer reported that they wanted a biodegradable paint. Our R&D center in Allentown, Pa. in the U.S. came up with about 10 molecules that had the same properties as those used in regular paints for cars but that were biodegradable. In the end, one molecule beat out the rest – our product EnviroGem 360 is the result. We can now offer a product with the same performance as other products but biodegradable.

*Do you find a lot of inspiration from your customers as far as R&D is concerned?*

**M. Garlaschelli:** Yes; we also try to look well head of our customers' needs. When we recognize a market need from customers, we look to see how we can meet their requirements through adapting a product we already have. Another kind of R&D we do is what we call "application development service," which is when a customer wants a products to be thicker or faster. All in all, there is always a degree of customization in our R&D.

*Since 2000, several businesses have been sold and others have been added. What can you tell us about the major changes that were brought on by this portfolio management activity?*

**M. Garlaschelli:** Portfolio management has been an important part of our global strategy since the early 2000s. We want to focus on what we do best. The businesses we sold were good ones, but did not fit in our long term strategy or did not offer the right level of return for us. Recently, we acquired Tomah3 Products, as it fits in our business model and in our strategy.

Air Products has changed dramatically over the last few years and not just in the aspect of refocusing. When the opportunity for an acquisition or a new business arises, the main question for us is whether it fits in our strategy or not. If the answer is yes, then the next question is whether it makes financial sense – we want to grow, but not at all costs.

*What specific synergies have developed out of the Tomah 3 purchase?*

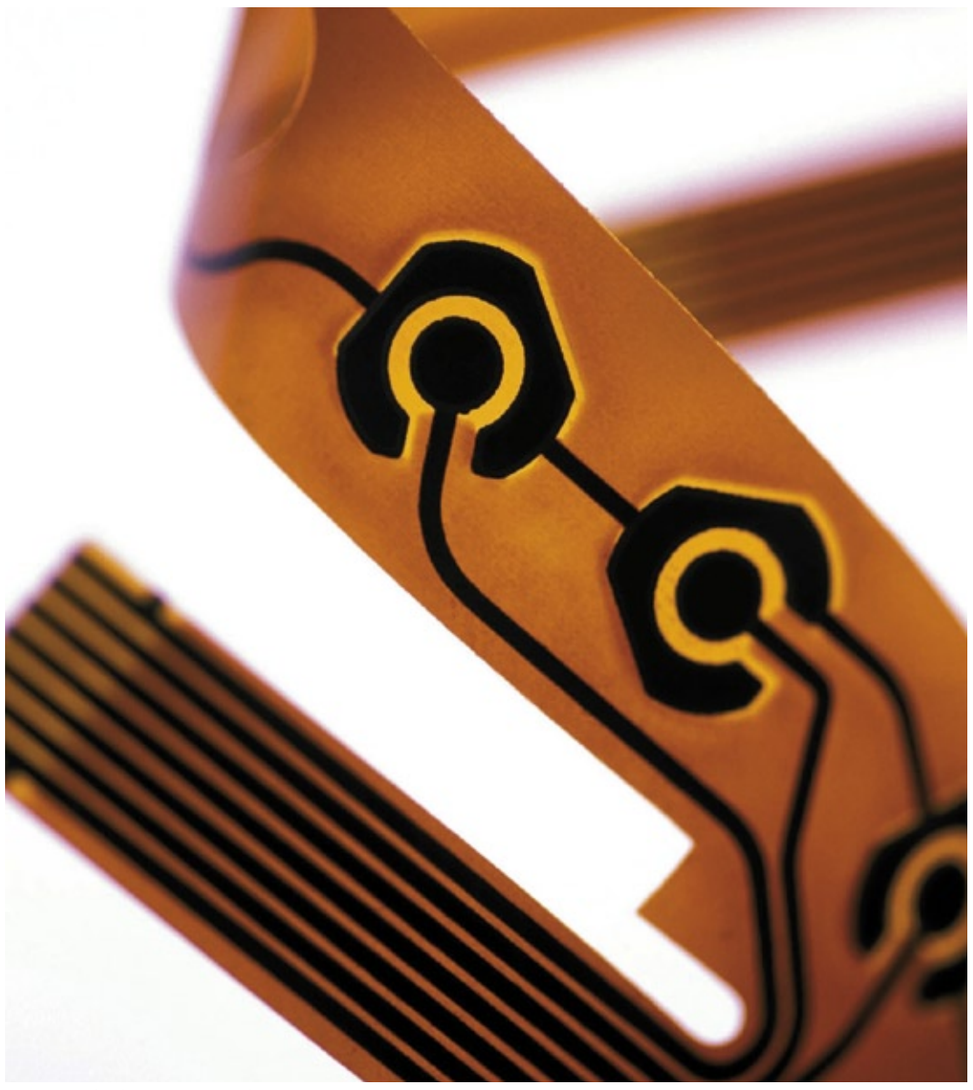
**M. Garlaschelli:** We already had a range of additives for water-based coatings in ink applications. With the Tomah acquisition, we added more capabilities, particularly in the areas related to personal care. For example, when you put something on your skin in order to protect it or give it more color, it has to stick. Similarly, a resin used to protect a concrete surface has to stick and color. Although the surfaces are different, the processes used are very similar.

*What role does Performance Materials business play in the Air Products' portfolio today?*

**M. Garlaschelli:** Performance Materials is one of Air Products' four growth platforms. I am convinced of a successful future for Performance Materials at Air Products, mainly because of our capability to have a high return on investments coupled with our ability for new innovation.

*About 50% of the Air Product's sales are outside of the U.S. What role does EMEA play in that?*

**M. Garlaschelli:** The European market now accounts for more than 30% of our Performance Materials sales. In certain business areas, we actually have a very even split among Asia, Europe and the U.S. with 33% each, in epoxy, for instance.



Close-up of circuit board surface with Parelec Parmod.

*How does Air Products walk the line between being a local and global company at the same time?*

**M. Garlaschelli:** We are both a local and global company – which means we can adapt to our customers' requirements. For example, we have several global technology projects where the applications are the same all around the world. So we put together global teams – literally people from all over the world – and they work together to develop products for those applications. We have a number of truly global customers, and those people have laboratories in different parts of the world, with perhaps one central laboratory. The set up we have with our global teams mirrors what customers want. What we are observing is that in some cases, producers claim to be a global company but they don't work in a truly global way: they are merely just a bunch of small local companies steaming from one main outfit. In reality, there are very few truly global players.

We have the advantage of being able to work with those few truly global companies – corporations that have one place and one person that negotiates deals at a global level. But we can also serve companies that have, for example, five decision makers in one country alone. What's important for us is to know what the customer wants. Once we know that, we can meet their demands.

*How does Air Products go about fostering growth and return on capital?*

**M. Garlaschelli:** We continuously review and adapt our strategies for our product lines in accordance with market changes and needs geographically. We have a solid growth strategy for each business: some stem from acquisitions, introduction of new products or from innovation. There are also businesses whose specificity makes it impossible to have growth through acquisitions; then it must come from taking more of the market share or expanding our presence in application markets.

*What kind of acquisitions do you have your eye on?*

**M. Garlaschelli:** The only thing I can say at the moment is that we are considering a number of acquisitions – as long as they fit our portfolio management strategy and provide an acceptable return on investment. The issue is that to ensure we close on one acquisition, we need to look at several possibilities. Of course, we will also be looking at more joint ventures that tie into what we are currently doing.

*How can Air Products stay competitive on the market?*

**M. Garlaschelli:** The world is very dynamic, as is the market. For instance, about 15 years ago, one of Air Products' key markets in the polyurethane additives was the shoe soles market, mostly based in Italy. However, once China learned to make and use polyurethanes in the manufacture of shoe soles, all that business moved to Asia.

It's our job to be flexible, to be able to change and follow the market. Our response? We moved resources to Asia in order to capture what had been lost in Europe. At the end of the day, they are still our sales, but the dynamics have changed, and the ability to follow the market demand is absolutely key for us. The same goes for our portfolio. If a company cannot continuously adapt to the market changes, then it simply does not have a future.

*Taking your shoe-sole market example, where do see the challenges in 10 or 15 years from now?*

**M. Garlaschelli:** I think one of the long term challenges will be to adapt to increasing difficulties in transporting chemicals. This is because of pollution, environmental issues and the risks associated with transporting chemicals. If this really develops, then the structure of the industry will have to change. This would mean having more plants per continent rather than serving customers from one central plant. Another issue could be the lack of qualified workers. While this is not new, it could become a much more significant problem in the future, and not just for the chemical industry.

*What do you see as being problems in the short run?*

**M. Garlaschelli:** One of the issues the industry is facing is the availability of raw materials. There is a worldwide shortage due to the fact that investment in the industry was limited in the last 10–15 years, due to disappointing financial return during the period. This means that the available capacity of raw materials is far below what is required, which also stems in part from the incredible growth in Asia. This will be a problem over the next five years or so, until new plants come on stream and things start again in a new direction. At Air Products, to help resolving the issue, we use the long term relationships with our key suppliers. We also keep developing property technologies that allow us to use our own exclusive amines, like Amicure PACM and so assure continuity of supply to our customers.

▶ www.airproducts.com

*chemanager@gitverlag.com*

# Catching Rays

## Nanotechnology for UV Absorbers in Coatings

**A Nano Revolution – During the last few years, the new opportunities of nanotechnology revolutionized the UV absorber technology, and many new chemistries and products have been introduced or are under development.**

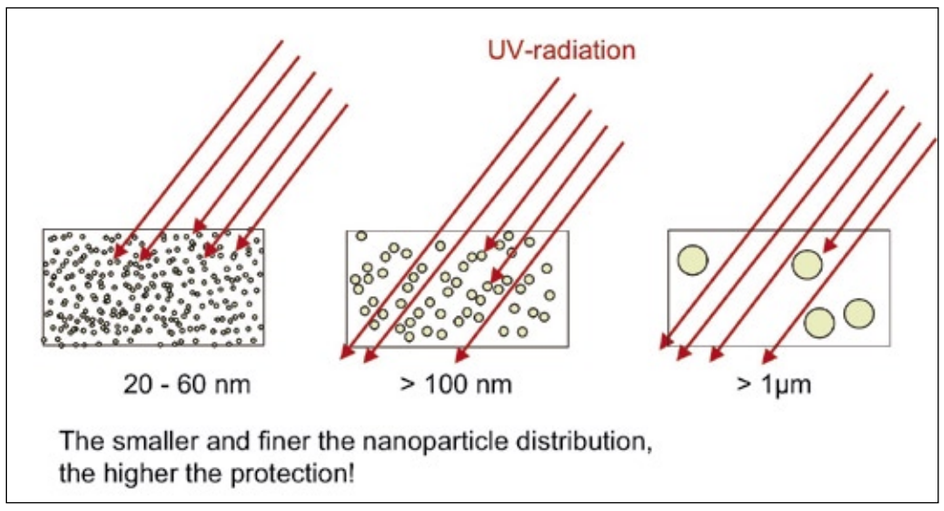



Fig.1: Schematic UV absorption of micron-size and nanosize particles, using the same level in a coating film

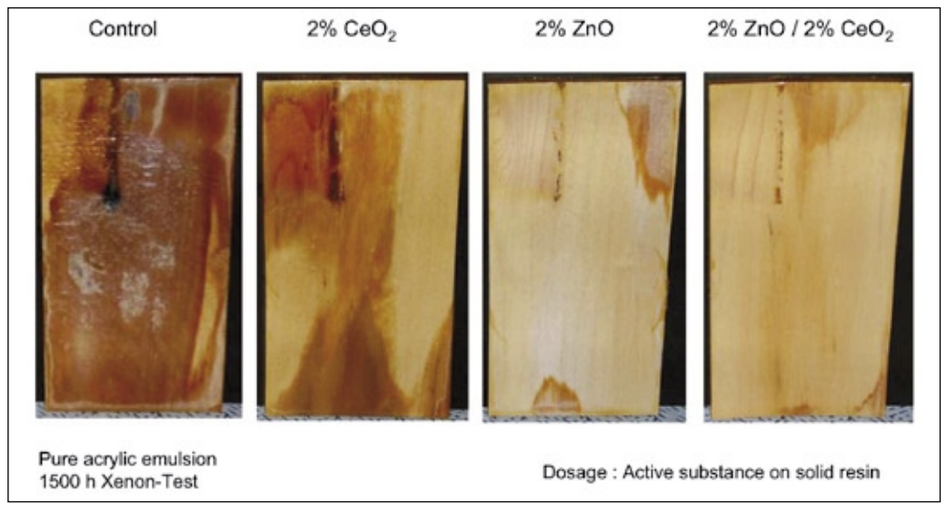



Fig.2: Xenon-test results (1,500 hours) with an aqueous acrylic clearcoat, using different UV absorbers and combinations.

Nanotechnology is used currently in coating formulations to improve the mechanical properties by using silica or alumina nanoparticles, and to enhance UV resistance by using various metal oxides. The first generation of UV absorbers (organic molecules) has been developed in the 1960s and '70s, primarily for applications in automotive clearcoats and in plastics (mainly thermoplastic polyolefines). For architectural stain applications transparent iron oxides, and later on also nanosize titanium dioxide grades have been introduced to the market.

### Organic UV Absorbers

Mainly based on heterocyclic organic molecules, organic UV absorbers are fully transparent in clearcoats, but their well-known limitations (tendency to migration, yellowish color and limited long term UV absorption capacity) forced scientists to do research on inorganic particle based UV absorbers, which are more promising in this respect.

### Inorganic UV Absorbers

The very basic condition for a high-UV absorption effectiveness and good transparency is not only the right absorption spectrum, but also the proper particle size selection. The first commercially used inorganic UV absorbers were transparent iron oxides (50–80 nm) and nanosize titanium dioxide (15–30 nm). The size of the inorganic particles matters: By using the same quantity by weight of inorganic substance, the UV filter effect increases rapidly when the particle size decreases (fig.1).

Transparent iron oxide pigments (yellow and red) are very effective in absorbing the UV light, but they are limited in clearcoats due to the strong yellow or red color. Nanosize titanium dioxide shows limitations due to the high refractive index and the resulting opacity, but also due to the photoactivity of the $TiO_2$ crystal, causing chalking and film degradation. A proper surface coating of the nanosize titanium dioxide can significantly improve the chalking resistance, but the opacity still remains a problem for applications of nanosize $TiO_2$ in clearcoats.

Later on, nanosize ZnO particle-based products (20–60 nm) have also been introduced, which already gave reasonable improvements in transparency, but the best properties have been achieved as nano-ceria based products (10 nm $CeO_2$) have been developed that are fully transparent in the visible range.

### Properties of ZnO-based UV Absorbers

According to these spectra, 60 nm ZnO provides a very similar light transmission in both the UV and visible range, like the 15 nm titanium dioxide. By reducing the ZnO particle size further to 40 and 20 nm, the transparency will be continuously improved. However, there is a slight decrease of the UV absorption, especially in the UV-A section.

ZnO – unlike titanium dioxide – is not photoactive and does not cause any film degradation or chalking starting at 20 nm and larger. On the other hand, ZnO is sensitive to acidic environmental conditions, so that the acid-rain resistance of coatings with ZnO is not superior. The positive side effect of nanosize ZnO UV absorbers is a pronounced biocide spectrum e.g. against bacteria, fungi and algae, preventing the bioflim formation on the coating surface.

### Properties of $CeO_2$-based UV Absorbers

Nano-ceria based products provide the highest level of transparency in the entire visible spectrum above 400 nm, but the UV absorption is in the UV-A range not as good as with $TiO_2$ or ZnO. Cerium dioxide is well known for the excellent UV-B absorption properties.

Cerium dioxide does not show any photoactivity (regardless of size) like titanium dioxide. The chemical resistance of $CeO_2$ is very much comparable to that of titanium dioxide: both have a very high level of alkali and acid resistance. Regarding biocide properties, cerium dioxide can be classified as a neutral substance.

### Inorganic UV Absorber Preparations

The dispersion of nanosize particles in coatings is a very difficult technical challenge, because the "normal" paint dispersion equipment (dissolvers, bead mills) is not able to provide the necessary energy input for the perfect deflocculation of nanoparticles. For this reason, the paint industry prefers stir-in type dispersions of nanoparticles in a suitable carrier, with the highest possible loading level of nanoparticles. In these ready-to-use type nanoparticle concentrates, special additives have to be used to maintain the flocculation stability, and special high energy grinding methods have to be used to achieve the full deflocculation of the nanoparticles.

Flocculation and agglomeration (increase of particle size by association of the individual particles) is a phenomenon which may significantly decrease the UV absorption of the nanoparticles.

Three different carriers have been selected for the first commercial product series: water for aqueous coatings; aliphatic solvents for solvent-borne low polarity systems (typically long oil alkyd based stains, paints, clearcoats); and methoxy propyl acetate for medium polarity solventborne coatings like polyurethane topcoats, stains and clearcoats.

### Combinations In Wood Clearcoats

Due to the properties of zinc oxide (limited for transparency, but stronger in UV-A absorption) and cerium dioxide (perfect for transparency, but limited in UV-A absorption), various combinations of these materials have been tested for durability in various types of clearcoats and stains. Accelerated UV exposure tests have been carried out which include Xenon-WOM, QUV-A-, QUV-B-tests, representing in part or totally the spectrum of the sunlight (fig. 2). Here, best test results are achieved when using a 1:1 combination of cerium dioxide and zinc oxide.

### UV Protection Improvements

In pigmented coatings, where transparency of the UV absorber is not a major issue; the commercially most attractive (less costly) pure 60nm ZnO is the best alternative to replace organic UV absorbers. Based on exterior durability studies, ZnO provides not only a more effective UV protection, but also a reasonable level of anti-microbial protection to the final coating which includes surprisingly not only better anti-fungal and bactericide but also better properties against algae.

The gloss retention of the pigmented coating is dramatically improved after a 500 and 1,000 hour QUV-A test, while the half level of 60nm ZnO particles provided a very similar protection, like 3 % of the organic UV absorber.

Another test series indicate that the bleaching out of color exterior paints by using more UV sensitive organic pigments can also be significantly reduced by using ZnO UV absorbers.

### Summary

Inorganic metal oxide (ZnO and $CeO_2$) based UV absorbers with very good overall properties have been developed for aqueous and solvent-borne coating applications. The new additives provide significant benefits over "classic" organic UV absorbers and show excellent properties in wood stains and in architectural paint formulations. Synergistic effects between nano-zinc oxide and nano-cerium oxide have been found. The new additives and their combinations are especially recommended for very durable applications in light coloured wood stains and clear varnishes, and also in exterior architectural paints.

*János Hajas and Thomas Sawitowski, BYK-Chemie*

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**Table 1: Inorganic nanoparticle based UV absorber preparations for aqueos coating applications**

| | Nano-$CeO_2$ (NANOBYK-3810) | Nano-ZnO (NANOBYK-3820) | Nano-ZnO (NANOBYK-3840) | Nano-ZnO (NANOBYK-3860) |
|---|---|---|---|---|
| Particle size | 10 nm | 20 nm | 40 nm | 60 nm |
| Active content | 18 % | 40 % | 40 % | 50 % |
| Non volatile matter | 23 % | 44 % | 44 % | 55 % |
| Carrier | Water | Water | Water | Water |

# Big Trouble in Big China

## How Serious are Environmental Concerns?

**Polluted Growth – China has long been known as a leader in market growth. However, this fast growth has been accompanied by massive environmental problems.**

### What About The Environment?

A study by the World Bank claims that 16 of the world's 20 most polluted cities are in China. Some environmental accidents occurring in China are also reported in the Western press. In November 2005, a plant operated by the China National Petroleum Corp. exploded, leading to a spill of about 100 tons of benzene into a river flowing on to Russia and impacting the supply of drinking water in the major Chinese city of Harbin. In May 2007, a serious outbreak of blue-green algae at Lake Taihu was attributed to man-made pollution as the lake is an outlet for untreated wastewater from many chemical and agricultural enterprises. And in early 2008, the State Environmental Protection Administration (SEPA) reported on an arsenic pollution accident in Guizhou province and a pollution spill in Hubei.

Not even state-run agencies claim these to be isolated incidents. According to a 2006 risk review by SEPA, 45 % of the 7,555 chemical and petrochemical plants nationwide pose major threats to the environment. The newspaper China Daily claims that as a consequence of air and water pollution combined with the widespread use of food additives and pesticides, cancer is now the most lethal disease for urban residents in China.

Awareness of these threats has also been increasing among the Chinese population. The planned construction of a paraxylene plant near Xiamen in Fujian province led to massive protests by local citizens. As a result, construction is currently suspended and will be reassessed.

### Strong Efforts …

Apart from such ad-hoc reactions to public concerns, the Chinese government does in fact undertake substantial steps towards improving the environmental situation in China, ranging from symbolical to detailed prevention measures:

China has set itself ambitious emission reduction targets for 2008, e.g., a reduction of sulphur dioxide by 6 % from the 2005 levels. Achievement of these targets is to be enhanced by high spending on environmental protection – the investment is scheduled to reach 1.35 % of GDP for each of the next three years.

SEPA has just been upgraded into an environment ministry in March 2008. This may strengthen green legislation and enforcement as it will allow put the institution on a more even level with interests represented by other ministries.

A timetable was set for pollution control at lakes, asking existing sewage treatment plants to install nitrogen and phosphorus removal facilities by the end of 2010.

Valid from June 2008, the government has banned the production of ultra-thin plastic bags, and banned shops from giving away free plastic bags. Huaqiang, China's largest plastic bag manufacturer, has already stopped production as a consequence.

Depending on the initiative of local governments, in some of the more developed regions of China chemical companies are being moved out of urban areas. For example, in Shanghai chemical companies are forced to move to specially set up chemical parks. In Guangzhou, about 50 chemical companies are to move out of the city.


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*Despite positive signals, it is still too early to conclude that China is safely on the right track towards better protection of the environment.*

### … But Also Mixed Signals

Despite these positive signals, it is still too early to conclude that China is safely on the right track towards better protection of the environment. In fact, environmental policy seems to be one of the main battlegrounds between central government and SEPA on the one side, and the local governments on the other side.

This becomes quite obvious on the official SEPA website. There, SEPA criticizes many projects quite openly, but seems not to have sufficient power to eventually stop them. A prominent deputy director of SEPA, Pan Yue, is quoted as follows: "Some of the projects did not apply for government approval before beginning construction, and some local governments provided highly-polluting enterprises asylum in the blind pursuit of economic development." In another example, SEPA complains on its website about a polluting company that has not stopped production despite SEPA intervention: "Haixin Iron and Steel was ordered to stop the project and apply for approval from environmental authorities. But it has so far failed to comply with the ruling."

Resistance from provincial leaders is also suspected to have stopped an earlier SEPA initiative to quantify the environmental effects of China's growth in a number called "Green GDP." While a first 2004 calculation estimated real growth to be reduced by about 3 % due to the concurrent environmental damage, a second report never materialized. The researchers behind the Green GDP project suspect provincial leaders of being responsible for this.

### Effects On Chemical Companies

The measures taken by the Chinese government have already led to the closure of many small chemical companies, e.g., in the Lake Taihu reaches in Jiangsu province, 1,197 small chemical plants were shut down in 2007. Large Chinese companies tend to be less affected as they have more influence, and can more easily install modern technology.

For Western companies, the benefits of tightened environmental policies tend to outweigh the disadvantages. First of all, most Western companies already operate within Western environmental standards in China and thus do not face substantial additional costs from these changes. In addition, they may benefit from the market consolidation caused by the effect of these policies particularly on small and medium-sized local companies. In some segments they may also be the only ones with the technology required by raised environmental standards.

However, Western companies also need to be aware of the risks of these changes. Some Western chemical companies are being affected by governmental requests to move chemical production out of urban areas. In addition, any M&A activities within China need to take the environmental background of the targets into account. Finally, Western companies are often suppliers of local chemical companies. Any policy affecting local companies therefore may also affect Western companies via their customer base. Whenever Stratley supports Western companies in developing strategies for China, we therefore ensure to take the effects of China's developing environmental policy into account.

### Conclusion

While concern for environmental protection is definitely growing among Chinese citizens and the government, it still faces an uphill battle. Particularly in the less developed provinces and on local levels, awareness is still limited, and there is a stronger interest in fast economic development than in environmental sustainability. The timeframe for an overall greening of the Chinese economy is difficult to predict. However, Western chemical companies are expected to benefit from this trend as it levels the playing field with the local competition.

*See also page 11*

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## Songwon Appoints Distributor in Turkey

Songwon is continuing to meet its commitments to customers, as set out in the strategic plan in 2006, to establish a network of direct channels to its range of products and services. Optima Kimya Sanayi ve Ticaret, based in Istanbul, Turkey are the latest addition to the Songwon network and follow the appointments in 2007 of Banbury Chemicals for South Africa, SUN ACE Australia for Australia and BPC Chemical Technologies for the Russian Federation, Ukraine, Belarus and CIS Countries.

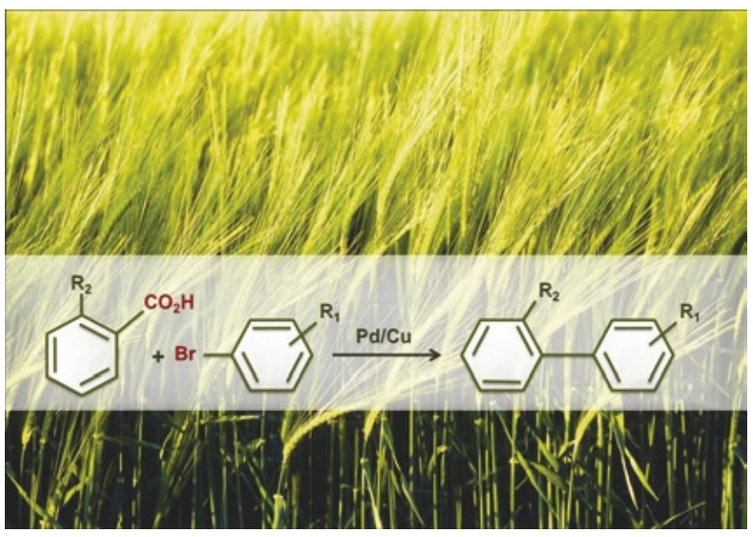
▶ www.songwonind.com

## Braskem Certifies Green Polymer

Braskem has announced the first certified linear polyethylene made from 100% renewable raw materials, developed at the Braskem technology and innovation center. This achievement was obtained through the development of technology using biobutane, which will enable Braskem to expand its line of green polyethylene. According to the company, this announcement represents a new landmark in Braskem's biopolymer development program, initiated in June 2007, with the launch of the first green resin, a high density polyethylene. The linear polyethylene was certified by Beta Analytic, attesting that the product is made from 100% renewable raw material.

▶ www.braskem.com

## Environmentally Friendly Reactions




In cooperation with research institutes, Saltigo has developed new reaction technologies to bring the ecological aspects of the production of agrochemical intermediates and active ingredients in line with the economic implications. Saltigo a wholly owned subsidiary of Lanxess has succeeded, with the aid of processes based on catalytic C-C-, C-CN- and C-O couplings, in combining the technical accessibility of complex chemical structures with their cost-effective commercial production. This collaboration between university and industry yielded reaction technologies that Saltigo was able to scale up from laboratory to production in a short time.

▶ www.saltigo.com

## BOC: Carbon Capture Projects

BOC has been selected to participate in a number of carbon capture and storage (CCS) projects, including a proposal for the first power station in the UK equipped with CCS technology. BOC is a member of the Linde Group, which is involved in projects across the globe to mitigate the impact of climate change. "The need to solve the challenge of reducing emissions while still using fossil fuels – at least in the short to medium term – is becoming increasingly urgent," said Mike Huggon, head of the regional business unit, UK and Ireland. "Carbon capture and storage offers enormous potential in this regard and governments around the world are keen to develop this technology."

▶ www.boc-gases.com
www.linde.com

## Albemarle Affirms EU's TBBPA Assessment


A compound used to improve the fire safety of circuit boards and plastics in nearly 70% of the world's electrical and electronic equipment has been formally approved by the EU for use in all of the product's designated applications, a decision commended by one of the product's main manufacturers, Albemarle.

The compound tetrabromobisphenol-A (TBBPA), made and marketed by Albemarle as a flame retardant, underwent an extensive, multi-year risk assessment by the EU to evaluate the product's effects on human health and the environment. EU member state experts concluded that TBBPA presents no risk to human health. The group also concluded that TBBPA presents no risk to the environment when used as a reactive compound, as in printed circuit boards.

▶ www.albemarle.com.

**The next issue of CHEManager Europe will be out on May 29.**

# A Few Words from the Editor

Brandi Schuster

*chemical reaction*

## Aching China

Tainted heparin, controversies surrounding its Tibet policy and the Olympic summer games, environmental problems that often resemble the ringing of the doomsday bells – these first months of 2008 have not been easy for China. A region that much of the world eyes with growing concern, however, is turning more and more into a boon land for the chemical industry. And why not? With low costs of labor and proximity to the booming Asian market, companies who want to remain competitive cannot afford to ignore the rise of the East. However, if companies want to achieve sustainability – both for their businesses and for the environment – they must take measures to ensure that their activities in China are not doing even more damage to an already suffering ecosystem.

Environmental standards have long been ignored in China; had they been heeded, the country would not have become the world's largest manufacturer over the last two and a half decades. China is now the world's first in production of coal, steel, cement and 10 kinds of metal; it produces half of the world's cameras, a third of its televisions and could produce most of the world's cars by 2015. China also is a leading importer of many commodities, including iron ore, steel, copper, tin, zinc, aluminum and nickel.

However, China's ravenous hunger – and Western companies' insatiable need to expand capacity there – does not come at the same bargain-basement price associated with many items made in Asia. Besides driving up the cost of raw material, the astonishing economic boom in China has an environmental price tag as well.

China is not a country at the beginning of environmental decline; this began long before the Western world became so keenly interested in the region. The country's ecosystem was severely damaged under Mao Zedong and his various campaigns. For example, his "backyard furnace" campaign turned millions of peasants into grassroots steel smelters, who cut down one tenth of China's trees in a matter of months in order to fuel the furnaces. Not only does the country still have to bear the brunt of the damaged caused by Mao – even over 30 years after his death – but also the country has to support the weight of the Western world on its already brittle shoulders. The environmental damage done in China can also be felt around the world. From acid rain to waste run off, China's problems have long become global.

Dr. Kai Pflug mentions in his article (see page 10), the State Environmental Protection Administration in China is taking steps to steer the country down a better path. Tell that to Wu Lihong, who was sentenced in August to three years in prison for "fraud and extortion" after his campaign to clean up China's third largest lake, Lake Taihu. Lihong had protested for over a decade that the regions growing chemical industry and its powerful political friends were destroying the lake. He was proven correct – last May, algae scum on the lake made tap water undrinkable for millions of households.

Mother Jones magazine states in a report on China: If unchecked, the devastation will not just put an abrupt end to China's economic growth, but in concert with other environmentally heedless nations (in particular the U.S., India and Brazil), will cause mortal havoc in societies and ecosystems around the world.

Brandi Schuster

# Creating Innovation

## Who Said Supply Chains Are Boring?

**New Kid on the Block – Within the corporate chemical landscape, Supply Chain Management (SCM) is a relatively new discipline, especially when compared to the well-established finance, manufacturing and commercial practices.**

Mirko Schnitzler
Global Supply Chain Director at Ticona

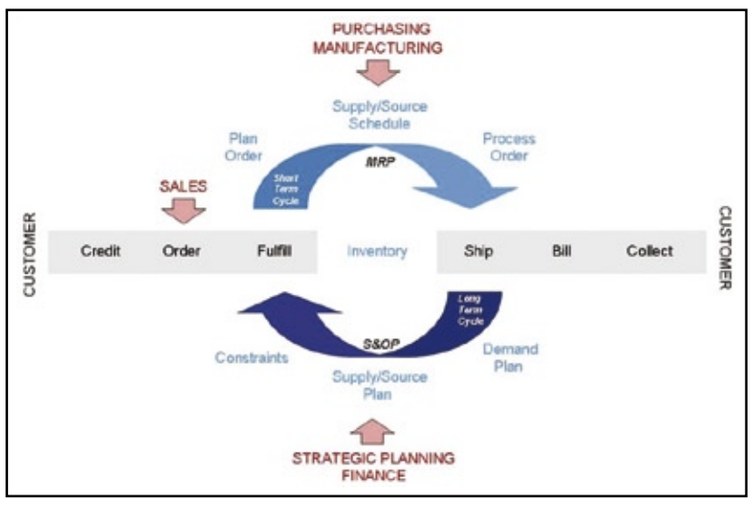
Most SCM innovations are still driven by businesses that interact directly with consumers, like Procter and Gamble, Wal-Mart or Amazon. Wal-Mart gained their supply-chain reputation mainly through their logistics innovations in cross-docking, whereas Procter and Gamble still is one of the pioneers for real-time consumer order data. They use these signals to drive replenishment activities. Amazon moved the entire book industry from an off-line, regional at best, decentralized distribution model to a global, online, more centralized structure. Once successfully established, these innovations then slowly migrate down the value chain towards the business-to-business environment in which the chemical industry typically operates.

Most chemical supply chains often still show lots of manual interactions, long feedback loops from their customers and without closed-loop end-to-end process control. Two key drivers for this are the relatively large inventory systems (raw materials) in this industry as well as our direct business interactions being far away from direct consumer interaction. Especially when comparing these chains to the business-to-consumer chain in terms of responsiveness, information richness, effectiveness and efficiency, there is much to learn and improve.

### Corporate Supply Chain Environment

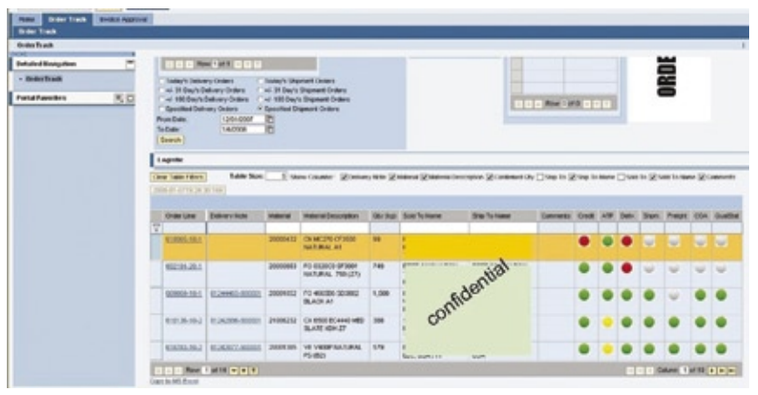
Although some chemical companies still use SCM as a logistics-only department, most actually started including customer service, planning and sometimes their quality and improvement functions as well. This is similar to how we currently operate at Ticona. However, few players in the chemical industry have also started to incorporate manufacturing and purchasing functions under the SCM umbrella to create a true end-to-end view from raw material to customer.

Whereas SCM is typically associated with physically moving goods, a large part of the activities is executed behind the scenes. Within most companies, SCM teams with their large transactional volumes are the most active users of the enterprise resource planning (ERP) system. To move from good to great, many of the innovations actually have to take place within this digital environment and not directly in the goods-movement chain.




An overview of the supply chain.

Another topic that is typically not fully appreciated is the impact that SCM decisions have on the overall manufacturing cost, customer service levels and long-term strategic capability of the company. These are far more important than the direct SCM spend on personnel, freight and direct investments in trade working capital. For example, often global inventory reduction decisions are made without understanding the long-term impacts customers, operating cost and capacity utilization. Just looking reducing inventory from a financial perspective; when reducing production to manage inventory, one should only do when it is possible to keep cost-of-goods-sold (COGS) flat. Working excess inventory off through obsolete inventory will immediate hit as an expense and reduce profit. Selling more to get rid of inventory is always the best option, when the additional cost through increased incentive pays does not outweigh the capital cost of keeping additional inventory.




The order track.

Michael Donovan, management consultant, author and renowned inventory expert, explained it like this: "The big problem with across-the-board 'global squeeze' is that it almost always reduces plant operating efficiency and decreases the customer service level. Worse, instead of improving financial performance, it often causes a sales decrease as a result of the right materials not being in inventory because they were mistakenly squeezed out by the global approach to managing inventories. Finance, without the right information at hand, is often driven by a balance-sheet view of the problem, is often the cheerleader for the 'global squeeze' approach to cut inventories."

Understandably, the need for this end-to-end view makes SCM one of the most complex disciplines within the enterprise, balancing customer interest with cost, capacity and working capital investments on both the short term (tactically) and the long term (strategically). This complexity makes SCM people the most critical success factor in the supply chain. It being a relatively new discipline within most enterprises makes it understandably more challenging for senior leadership to recognize and reward SCM talent. Not having the right SCM talent or failing to recognize and rewarding this talent, will impact SCM innovation most.

### Ticona's Approach to SCM innovation

Regardless of the function in which one operates, one needs to create an entrepreneurial mentality to make innovations part of the DNA. Within the SCM team we started with a very simple vision, consisting of five key elements:

- Improve customer loyalty
- Create lean, defect-free and digital processes
- Improve productivity and capital usage
- Take risks and innovate to add value
- Increase SCM talent bench strength.

To drive customer loyalty, Ticona introduced Net Promoter Score (NPS), a tool introduced by Fred Reichheld and commonly used within the consumer industries. It prompts the user to request feedback from customers multiple times a year and translates this feedback into a single customer loyalty score, which is arguably the most powerful feature of NPS. We then support this online measure by more detailed, personalized customer scans based on the feedback they gave us. It is our experience that customers find it easy to discuss the issues, but find it harder to really help guide towards innovations and improvements that will make them more successful.

Most companies improve their processes when there is a financial loss or customer complaint associated to it. We actually develop a three-prong approach to guide our passion in improving our processes. Firstly we look at process defects with our "defect"-glasses on, measuring overall through-put-yield of that process (TPY). Secondly we put on our "lean"-glasses and measure overall cycle-time, (non)-value-add activities and waiting time. Lastly we wear our "digital"-glasses and highlight all activities that are manual and/or analog. Innovations derived from this approach are typically micro-innovations, innovations that cause a micro-revolution a specific sub-chain of the overall process.

Like any other company, we continue to measure and model our working capital and cost. We typically review the data we find in a cross-functional team. Interestingly enough, through this approach we continue to find places where our "once-valid" assumptions are not valid anymore. These sessions often lead us to revise the assumptions, take some risk and make changes that are good for us and the customers. Innovation direct from this approach are typically macro-innovations, innovations that cause us to make structural changes to our infrastructure, vendor-base and/or SCM service model.

Our people being the "innovation"-generators, it is particularly important to focus on building and developing strong global teams. Creating senior management sponsorship, quick performance feedback and reward mechanisms, building strong development plans and giving people opportunities to develop the required competencies by rotating through the broad functional disciplines required for this role.

### Practical Examples Micro-Innovations

In our path to move SCM to the "digital" age, we draw the analogy with manufacturing. The SCM-setups in this industry show high similarities to the manufacturing world 15 years ago. At that time, man-machine pools were interacting with each other to jointly manage and optimize the process. In these 15 years much has changed in the manufacturing world; today, when walking into a chemical plant, one will find operators in a control room environment, reacting to the exceptions in the process rather then to the actual process variables.

As part of our SCM innovations, we started piloting this year with control rooms in our planning and order-to-cash processes. Although we have some way to go in maturing here, these pilot control rooms are global, create and end-to-end views on our process and deliver exceptions to our teams that help them improve performance for us and for our customers. One of the other critical SCM interfaces that we currently are working on is the one with our commercial team. Firstly, the quote-to-contract-to-price process is a critical input to guarantee high TPY in the order-to-cash process, as well as a critical input for financial compliance. By the investments we are making in getting this process lean and digital we expect to achieve a stronger performance for us (TPY) and for our customers (cycle-time).

SCM is becoming more important within our organizations. This can be driven by the financial requirements external investors put on our working capital that force us to become leaner. Or by our customers that expect a global service with the same brand experience in whatever country they transact with us. It is a complex discipline, balancing many trade-offs in different time-horizons and its decisions yield a significant exposure for the enterprise short and long-term. It is a discipline that is not fully appreciated in the chemical industry yet. However, SCM is an exciting opportunity for this industry and there are still fantastic innovations out there that will help to create more effectiveness and efficiency for us and our customers.

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### Roche Reports Revenue Drop

Roche Holding has reported a 4 % drop in first-quarter revenue, hit by a sharp decline in sales of Tamiflu. Governments are no longer buying the flu drug in bulk to prepare for a possible pandemic. The company also cited the franc's rise against the dollar and also its advances against the euro. The Swiss company said sales fell to CHF10.86 billion in the three months ended March 31 from CHF11.35 billion in the year-ago period. However, Roche said it expects group sales to expand at a high-single digits pace. Core earnings per share are also expected to be at last year's level, despite the Tamiflu drop off and an increase in R&D spending.

▶ www.roche.com

### Abbott: First-quarter Earnings Up

Abbott Laboratories announced that is first-quarter earnings increased 34 % on higher sales of its prescription drugs and medical devices and favorable foreign exchange factors. The company reported strong sales gains for its top medicines, diagnostics and other products, even excluding the benefits of the weak dollar, and projected earnings growth in the top tier of the industry. Net profit rose to $938 million, or 60 cents a share, from $698 million, or 45 cents a share, a year earlier.

▶ www.abbott.com

### Eli Lilly to Cut Jobs

Eli Lilly said it plans to cut up to 500 jobs to streamline the manufacturing of some insulin products and the osteoporosis drug Forteo. The company offered a "voluntary exit program" to about 2,000 employees in central Indiana (U.S.) with a goal of trimming its work force by up to 500 people, spokesman Phil Belt said. All the cuts will be made through the voluntary program, he said.

"There's no plan right now to supplement it with a layoff or anything like that," he said.

The voluntary program includes a severance package based on the employees' length of service. Belt declined to offer more details.The actions come a month after the company ended its development program for inhaled insulin. But Belt said productivity improvements drove the cuts.

The cuts will affect sites that make ingredients for the insulin products Humalog and Humulin, as well as Forteo. Humalog ranked fourth among Lilly drugs with $1.5 billion in sales last year. Humulin notched $985 million, while Forteo took in $709 million.

▶ www.lilly.com

### Avant, Pfizer Sign Cancer Vaccine Deal

Avant Immunotherapeutics and Pfizer have recently signed a $50 million deal to help fund development of CDX-110, a potential therapeutic vaccine for brain cancer. Avant acquired the compound after completing a merger with New Jersey-based Celldex Therapeutics earlier this year.

As part of the deal, Pfizer pays Avant $40 million up front and will also make a $10 million equity investment in the company. Pfizer has also agreed to fund all development costs for the compound.

In addition, Avant can earn more than $390 million assuming certain development and commercialization milestones are met. Pfizer, in turn, gains an exclusive global license to the treatment. CDX-110 is currently in mid-stage human clinical trials.

▶ www.celldextherapeutics.com
▶ www.pfizer.com

### Roche Considers Targeted Acquisitions

Roche said it is eyeing targeted acquisitions to build its core businesses. A company statement underlines that the Swiss drugmaker's new chief executive Severin Schwan's plans to continue his predecessor's strategy of avoiding big mergers, instead opting for close collaboration with partner companies and smaller buys for expansion. The company also said that operating profit margins are largely naturally hedged against foreign exchange rate risk by diversifying production and research & development into the same currency areas as major revenue streams. By contrast, currencies have a big impact on sales and operating costs, the company said.

▶ www.roche.com

### Omega Pharma Shares Fall

Belgium's largest supplier of pharmacy products, fell in Brussels after reporting a drop in revenue, missing analyst estimates. Omega Pharma shares fell as much as €1.33 to €26 per share. This is a 4.9 % drop in share price. The company's first-quarter sales went down 4.3 % to €196 million from €204.8 million a year ago. The company said this was the first drop in seven quarters

▶ www.omega-pharma.be

# The Long Road to a Good Product

## New Insights into Pharmaceutical Technology

**Multi-faceted** – It takes more than a good active ingredient to make a good pharmaceutical product. Technology, processes, excipients, and coatings all play important roles.

A recent international seminar hosted by the German processing and packaging group Oystar Hüttlin addressed the topic of process know-how for granulation and coating attracted some 180 participants from 35 countries. Experts presented the latest developments in solids manufacturing, focusing on process scale-up and the production of multiparticulate excipients.

Active ingredients and excipients must interact in such a way as to meet both medical and pharmaceutical requirements, and they must possess attributes that support the pharmaceutical manufacturing process. For example, the tablet mass must have good binding properties but must not stick to the equipment when it is compressed. It must also have good flow properties to enable the tablet press to run at high speeds, keeping down production costs.

Manufacturers must choose excipients and manufacturing processes to ensure that drugs act as intended inside the body. This means concentrations of active ingredients at the site of action must lie within the therapeutic window. If concentrations are too high, adverse effects may result, and if they are too low, the desired effects cannot be achieved.

### Mixing Efficiency Is Crucial

George Smith of Oystar Manesty explained that mixing efficiency inside the coating drum has a major impact on product quality and process time. He cited recent research findings showing that mixing performance determines the ability to apply uniform coatings in the required time. Factors that have been shown to have an influence on mixing efficiency and hence coating uniformity are drum speed and the position of the spray guns, along with batch size, tablet size and tablet shape. The interaction of baffle design, tablet shape and physical properties is crucial for the mixing process. On scale-up, it is important to prevent a "dead zone" spreading inside the mixing drum; failure to do so affects the spraying and mixing process. Appropriate baffle designs can go a long way toward achieving uniform coating and reduced process times. Tubular baffles have yielded the best results to date.

### Process Analytical Technology

The first presentation, by Dr. Marcus Knöll of the host company, Oystar Hüttlin, was on the topic of process analytical technology (PAT), which arose out of an initiative of the U.S. Food and Drug Administration (FDA). Its goals are to enhance product quality and cut manufacturing costs by reducing the number of rejects. The manufacturing process should be understood and controlled as the interaction of measuring technology, data analysis and process design. According to the FDA, process understanding is inversely proportional to process risk. A manufacturing process is well understood when all critical sources of variability are identified and explained, variability is managed by the process, and product quality attributes can be accurately and reliably predicted. To meet these demanding requirements, Oystar Hüttlin has integrated measuring techniques for in-line product humidity and particle size measurement in fluid bed technology. Next, Oystar Hüttlin will work on the integration of the measurements in feedback control systems to realize a manufacturing process in conformity with PAT. The in-line measurements and control of critical product parameters will make the manufacturing process more reliable and efficient.

### Faster Absorption

Manfred Assmus of Evonik Industries/Röhm, Darmstadt, Germany, discussed innovations in the development of multiparticulate sustained release formulations. Reducing administration frequency from three or four times a day to twice a day increases patient compliance and therapeutic efficacy. It is important for a drug to be released safely in the body, because tablets must contain a larger quantity of the active ingredient and dosages must be higher. Care must be taken that the active ingredient is absorbed more quickly than it is released from the tablet to ensure effective control of the quantity of the drug in the bloodstream through the application form and prevent a harmful overdose.

Assmus cited the example of the Evonik product Eudragit, which can be used to modify a drug release profile, even for very small units such as pellets, granules, crystals, or microtablets. This is achieved through a permeable film coating as well as the mixture of polymer compounds and/or use of lipophilic or hydrophilic plasticizers. Assmus explained that a fluid bed is the most suitable technology for coating such small units. No matter what problems may arise during the compression process, damage to the coating film must be avoided at all costs. Highly flexible, next-generation coatings are the answer to this problem.

### Improved Bioavailability

The poor aqueous solubility of active pharmaceutical ingredients (APIs) adversely affects their bioavailability. On the other hand, APIs only develop their full efficacy in solid application forms like tablets, pellets, or granules. Dr. Carsten Timpe of Novartis , Basel, said he thinks it is becoming increasingly important for pharmaceutical manufacturers to find a satisfactory solution to this problem. He illustrated the technological advances and the potential being tapped in this field, especially using fluid bed techniques. He went on to discuss the relative advantages and disadvantages of top-spray and bottom-spray systems, coming to the conclusion that the bottom-spray system with the DiskJet patented process gas distributor from Oystar Hüttlin is more suitable for the production of solid dispersions, because it is easier to control and more robust than the top-spray set-up. This method results in the production of granules with superior process capabilities and enables smaller tablets to be manufactured.

### Versatility Makes The Difference

Dr. Florian Wildschek of BASF examined the topics of wet granulation and pellet coating. He began by describing the BASF product group Kollidon, including the binders PVP and copovidon. The advantages of these polymers over other binders include their versatile application in all types of wet and dry granulation and direct tableting, their good solubility in aqueous and organic solvents, and their stability. The wide range of Kollidon polymers offered enables users to find a suitable product for their individual formulation.

The film former Kollicoat IR – a PVA-PEG graft copolymer – can also be used as a binder. The fast decomposition rate and high elasticity of this polymer make it a suitable protective subcoating for the development of functional multiple unit pellet systems (MUPS).

Summarizing, Wildschek said that coated pellets have a bright future for sustained release formulations because of their reliability. Functional polymers such as the polyvinyl acetate-based Kollicoat SR 30 D are ideal. He mentioned that there was a potential risk of film-forming polymers interacting with APIs. To get around this problem, a subcoating is applied between the functional coating layer and the core to act as a protective layer. Since the compression process leads to deformation of the coated pellets, both the coating and the subcoating must be highly flexible. The film coatings of the Kollicoat family of polymers are characterized by a high level of elasticity, making Kollicoat SR 30 D and Kollicoat IR especially suitable for this purpose.

### Changing Parameters

Development of new products in the pharmaceutical industry usually starts with very small batch volumes. New active substances are typically very expensive because they cannot be produced on commercial-scale equipment and are only available in small amounts, or producing larger volumes for development test series involves too much extra effort. Small-scale equipment is therefore used in the laboratory development phase. If development trials yield promising results, larger quantities are required, necessitating scale-up from small-scale machines to industrial batch size.

Fluid bed technology is typically used in the development and production of solids, since it provides ideal conditions for the manufacture of pharmaceutical forms such as pellets, granules, or tablets. Knöll talked about the factors that impact scale-up, noting that when the machinery size changes, the main attributes and relationships between the key process parameters change, although the process remains the same.

The principal physical parameters in scale-up are inlet air velocity and all parameters that affect the degree of moisture of the solid mass. These influence each other and vary with batch size and machine size. This can be demonstrated by the difference in the amount of process air used per kilogram of product on a laboratory scale compared with an industrial scale. Knöll cited the example of increasing a test batch size of 2.5 kg to an industrial batch size of 120 kg, corresponding to a 48-fold increase. Under the same process conditions, only approximately one-fifth as much process air is required per kilogram of solids in industrial manufacturing. This means other process parameters must be adjusted for industrial-scale manufacturing, having regard to critical limits, to retain the desired product attributes that have been developed.

All in all, the physical parameters that characterize both manufacturing process performance and the fluid bed production process influence product attributes and must be taken into account in scaling-up product and process design. Oystar Hüttlin has designed a software tool to resolve these issues. It supports pharmaceutical manufacturers during the laboratory development phase – which is characterized mainly by empirical values and trial and error – with a view to production and helps them design the right manufacturing process. When this process has been identified, the software tool calculates the correct parameters for the production apparatus, enabling fast and successful scale-up.

### Nanoparticle Production

Dr. Michele Müller of Micro-Sphere explained that in the majority of cases, the formulation first has to be produced in a liquid state. The lipid formulation chosen depends on the nature of the end product, in other words, on the method of action of the APIs, the size of the dosage, the administration form, etc.

Available lipid formulations comprise multi- and monolamellar liposomes and lipid micro- and nano-emulsions. The vast majority of these lipid formulations must be dried and processed into powder or granules. In conjunction with its parent company, Micro-Macinazione, Micro-Sphere has designed two processes for this: supercritical atomization anti-solvent (SAS) and supercritical assisted atomization (SAA), and combined them into a new machine in collaboration with the University of Salerno. Which of these two processes is used depends on the API's affinity to $CO_2$ and the solvent.


**HKC 600 DJ, a fluidized-bed equipment for granulation, drying and coating in Oystar Hüttlin's production hall.**

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# Indian Biopharmaceutical Industry

## Poised for Rapid Expansion and Globalization

**Potential – In terms of volumes, India is world's second and fourth largest supplier of childhood vaccines and pharmaceuticals, respectively, and the same potential lies for the biopharmaceutical segment, with a strong focus on follow-on biologics. Multinational companies are looking towards India not only for its sizeable share of domestic market, but for outsourcing R&D and manufacture.**

Rustom Mody Ph.D.
Intas Biopharmaceuticals

The focus within the biopharmaceutical sector in India is directed more towards development of follow-on biologics. This is primarily because it requires much lower risk, R&D spending and time to market. Under the Trade-Related aspects of Intellectual Property Rights (TRIPS) agreement, the pre-1995 product patents do not apply in India. This leaves as many as 48 biologicals that were patented prior to 1995 marketable in India. For some drugs, the innovators have not sought patent protection in India, creating a strong opportunity for Indian companies to leverage the huge domestic market to their advantage. Intas Biopharmaceuticals was the first company in the world to launch a biosimilar PEG-G-CSF (Neupeg) after the innovator. The company's manufacturing facility is also the first in India to be approved by the European Medicines Agency (EMEA). With a state-of-the-art infrastructure, the company is strongly increasing its R&D and manufacturing capabilities through partnerships for launching their biogenerics in Europe and U.S. and is building capabilities to expand their contract research and manufacturing services (CRAMS) business.

*Worldwide, 37 % of the drug master files (DMFs) submitted last year were from India, the largest share of any country.*

### The Indian Biopharmaceutical Market

With over 130 home-grown biopharmaceutical companies, many of which are fully integrated, the global market for Indian biopharmaceutical companies have touched $1.5 billion in revenues in 2006 with compounded annual growth rate (CAGR) of 27%. Factors influencing rapid growth include large population with high consumer base (300 million) comprising middle and upper income groups, one third of which can afford private healthcare and specialty therapies, making India the 11th largest pharmaceutical market in value terms. Also included are factors such as regulatory and health care reforms (22% increase in government spend, 200 clinical trial approvals in last 3 years), and the ability of biopharmaceutical companies to reverse-engineer the drug development process. With the enforcement of the product patent regime in 2005, the skill sets have fast progressed from the traditional reverse-engineering of drugs, i.e. progressing from the alternative dosage/formulations/novel drug delivery systems to research and development of new drug candidates. Although, Indian biopharmaceuticals are relatively in the nascent phase when it comes to new drug development, according to the latest estimate, there are over 50 new biologic drugs under various phases of development within the country indicating the seriousness with which the industry has greeted the product patent regime. In terms of quality, depth of services, range of products and capabilities, it is comparable to any global biopharmaceutical company. Indian firms are expected to reach out globally, including the regulated markets (U.S. and EU), with adequate understanding of the quality and regulatory pathway required for it.

A notable point of departure from the traditional growth pattern adopted by Indian biopharmaceutical companies in the early days is that they are now moving away from the risk-free capital investment using the revenue-generating growth model to a more risk-oriented, less-revenue driven mode primarily focused on valuation. In general, this has led to the evolution of a hybrid model which is product, infrastructure and service-based as well as intellectual property driven.


### India: Cost Effective

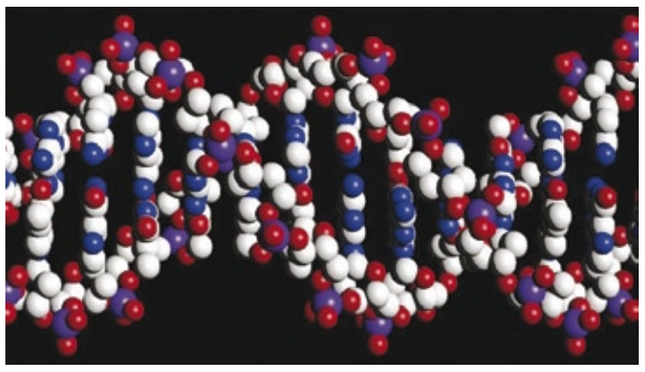
India is currently ranked as the second largest manufacturer of childhood vaccines in the world. Here again the key factor is lower cost of infrastructure (one-

Continues Page 15

# Mirror Image

## Can Biopharmaceuticals Be Interchanged?

**Not Identical – Before the EU guidelines on biosimilars were produced in 2004, there were some serious concerns that products could be put on the market that would not meet the expectations of practitioners and that indeed could be hazardous to patients.**



Laboratory work showed that there was wide variation in the range and concentration of isoforms found in different products and also for some products inconsistencies from batch to batch. Some products contained large amounts of material that could not be characterized. Other studies showed that short cuts in the purification process resulted in toxic artifacts such as bacterial endotoxins in the final formulation.

### Guidelines on Similar Biological Medicinal Products

The EU guidelines have set standards for biosimilars within the EU and have given purchasing pharmacists greater confidence. There are still issues that need to be considered and the potential for immunogenicity still remains a concern because of the potential for life threatening outcomes.

### Interchange

The very nature of biopharmaceuticals means that at present, the products made in one facility with a specific cell line will not be identical to that made by another cell line, no matter how closely the process is copied. How significant this is in clinical care is an important question. However, if we can measure the clinical response and if it is satisfactory, there may be potential to interchange from one brand to another, under clinical supervision. Indeed, this has been the case for insulins for which we have several decades of experience. This is not the same as generic substitution for chemically synthesised pharmaceuticals where the molecules can be clearly defined as identical, (even if the formulations differ).

If we examine the number of current filings for marketing authorizations of biopharmaceuticals these far outweigh those for synthesised molecules. So the future is clear and we need to move forward with that future.

That future means that as patents expire, competitors will market alternative biopharmaceuticals that could be submitted as biosimilars through the EU process. The arguments that have, and will be, put forward regarding how similar the products are at the molecular level is an academic issue. Practitioners will be looking for an appropriate clinical response with as low of a risk as possible to the patient. Whether the product is registered as a biosimilar, or as a branded biopharmaceutical in its own right, is a regulatory issue. Again this is of little importance to practitioners for the same reasons. These, and the arguments about nomenclature INNs (International Non-proprietary Names) are distractions.

### Pharmacovigilance

The case for having a good pharmacovigilance program should apply to all new pharmaceuticals no matter what their origin. The potential to identify problems early on is important if we are to prevent confusion and distress to patients.

### Checklist

It has been made clear that biopharmaceuticals from different sources are not identical. So how do pharmacists make a decision as to which they purchase? Prior to the EU guidelines, a check list to help purchasers make decisions was produced by a group of pharmacists from across Europe. This has been revised to take into account the EU guidelines and has been recently published. Much of the information asked for in this list is not new to the industry. It calls upon companies to release information on a confidential basis to national contracting teams. If this is not forthcoming, the health care systems will needlessly invest money in their own Quality Assurance organizations to repeat the work.

What is in the favor of originator products, even though their patents may have expired?

A database of information gathered over time which can inform us on

- Batch to batch variation
- Content, that might be better than the EP limits
- Formulation changes/improvements
- Clinical Experience
- Patient acceptability and familiarity
- Supply continuity
- Licensed indications

But price is often not in their favor – and that is where follow-on products gain advantage.

Reports show that the pipeline for new pharmaceuticals is fairly empty compared to previous decades. Most originator companies do not compete with generics when patents expire, so the generic companies inherit the market. Is this short sighted? Generic (biosimilar) products are therefore given the financial advantage. To compete with the originator they need to demonstrate that they too can show supply continuity, safety, consistency and have a product with the appropriate licensed indications.

Clinical experience is a more difficult issue because that comes with time and numbers of patients. How quickly prescribers extrapolate this previous experience to other products is a rate limiting step – but an accepted principle for synthetic generics. It is likely that prescribers will not have restricted themselves to one product in a group and will already have experience of several similar branded products.

Similarly, with patient acceptability and familiarity, experiences will have been over a period of time and often with more than one product. Perhaps wider research needs to be done in this field as patients are becoming more informed about their healthcare.

### Conclusion

The era of biopharmaceuticals has taken us into the 21st century and is predicted to dominate the pharmaceutical market for the next few decades. We can expect follow-on biosimilar products to be cheaper than the originals, and it is important for patient safety that they are introduced in a controlled manner.

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# Moderate Growth on U.S. Pre scriptions Market

## Patent Expirations, Fewer Product Approvals to Blame

**Slowdown – IMS Heath's annual U.S. Pharmaceutical Market Performance Review reports sluggish sales, citing the loss of exclusivity of branded medicines, fewer new product approvals, the levelling of year-over-year growth from the Medicare Part D program and the impact of safety issues.**

IMS Health has reported that the U.S. prescription market grew by 3.8% in 2007, compared with growth of more than 8% in 2006.

IMS Health has reported that the U.S. prescription market grew by 3.8% in 2007, compared with growth of more than 8% in 2006. Total U.S. prescription sales reached $286.5 billion, with slower sales growth resulting from Total U.S. dispensed prescription volume grew at a 2.8% pace compared with 4.6% in 2006. Antidepressants ranked as the leading therapy class by dispensed prescription volume in 2007. Overall, the top five therapeutic categories – antidepressants, lipid regulators, codeine & combination pain medications, ace inhibitors and beta blockers – continued to lead the market in terms of prescription utilization.

"In 2007, the U.S. pharmaceutical market experienced its lowest growth rate since 1961," said IMS's Murray Aitken, senior vice president, Healthcare Insight. "The moderating growth trend that began in 2001 resumed last year following the one-time impact on market growth in 2006 from the implementation of Medicare Part D. Last year, we saw a continuing shift away from primary care classes to biotech and specialist-driven therapies, which grew at a 9% and 10% pace, respectively. Among the leading therapy classes, oncology drugs continued their rapid growth, at 14% – the result of innovative new medicines, expanded indications and accelerated uptake of products to fill unmet needs."

With prescription sales of $18.4 billion, lipid regulators continued to be the largest therapy class in the U.S., despite a 15.4% year-over-year sales decline. Proton pump inhibitors ranked second, with prescription sales of $14.1 billion and growth of 2.8%. Antipsychotics replaced antidepressants as the third-largest therapeutic class in 2007, with prescription sales growth of 12.1% to $13.1 billion.

### Primary Factors Contributing to 2007 Market Slowdown

- Loss of exclusivity – Branded drugs representing $17 billion in sales lost exclusivity in 2007, helping to drive prescription volume growth of 10% for unbranded generics.

**2007 Top Companies by U.S. Sales**

| Rank | Corporation | 2007 Total Dollars (U.S. Billions) | 2006 Total Dollars (U.S. Billions) | 2005 Total Dollars (U.S. Billions) | 2004 Total Dollars (U.S. Billions) | 2003 Total Dollars (U.S. Billions) |
|---|---|---|---|---|---|---|
| 1 | Pfizer | 23.5 | 26.8 | 27.3 | 31.1 | 29.3 |
| 2 | Glaxosmithkline | 20.1 | 21.8 | 20.0 | 18.9 | 18.5 |
| 3 | Merck & Co. | 17.6 | 16.7 | 15.4 | 15.3 | 14.0 |
| 4 | Johnson & Johnson | 16.3 | 16.1 | 16.0 | 16.7 | 15.4 |
| 5 | Astrazeneca | 15.5 | 14.7 | 12.7 | 11.5 | 10.1 |
| 6 | Amgen | 14.3 | 14.5 | 11.9 | 9.7 | 7.7 |
| 7 | Novartis | 13.9 | 13.9 | 13.0 | 11.6 | 10.5 |
| 8 | Hoffman-Laroche | 12.3 | 10.4 | 8.2 | 6.2 | 5.3 |
| 9. | Sanofi Aventis | 10.9 | 11.0 | 11.1 | 10.2 | 9.0 |
| 10. | Lilly | 10.3 | 9.2 | 8.7 | 8.2 | 7.7 |
| | **Total All** | **286.5** | **276.1** | **253.9** | **239.9** | **219.6** |

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Source: IMS National Sales Perspectives

In 2007, generics continued to replace branded prescriptions in the major therapeutic classes, increasing their share of total dispensed prescriptions to 67.3%.

- Uptake of new products – Uptake of new, innovative medicines represented just $441 million of total sales in 2007, reflecting both the fewest new product launches in the past three decades and slower adoption by physicians of these products.
- Medicare Part D contribution – Prescriptions dispensed through the Medicare Part D program accounted for 19% of retail prescriptions at the end of last year, a modest increase over 2006, and reflective of a maturing program. Today, 65% of U.S. citizens age 65 and older are enrolled in the Medicare Part D program.
- Safety issues – Sales growth in 2007 also was affected by a significant number of "black box" warnings and product withdrawals, as well as safety concerns raised by the U.S. Food and Drug Administration (FDA) for products in the erythropoietins, diabetes and antidepressant therapy classes. Safety issues contributed to significantly lower- than-expected sales for products accounting for approximately 10% of the total prescription market.

### U.S. Pharmaceutical Market Outlook

In 2008, the expected introduction of new, novel biologics and vaccines, as well as the launch of five to eight new products with potential global blockbuster status, will help offset the impact of lower generics pricing. An additional $13 billion in branded products are likely to be exposed to generics this year.

In the U.S., IMS forecasts compound annual pharmaceutical sales growth through 2012 of 3 to 6%. Dynamics that will shape the market during the next five years include the continued loss of exclusivity in major therapy areas, new specialist-driven products, greater levels of therapeutic substitution, along with greater awareness and focus on safety issues.

"The U.S. pharmaceutical market has entered a new era – one characterized by more modest growth due to the continuing impact of new generics products, fewer and more narrowly indicated novel medications, and closer scrutiny of safety issues," Aitken said. "We will see additional lower-cost treatment options for many patients, while new and innovative therapies are delivered to specific patient groups, such as those suffering with cancer. Safety issues will be closely monitored and are likely to bring added caution to the market over the next several years.

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# Indian Biopharmaceutical Industry

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R&D laboratory setup at Intas Biopharmaceuticals.

fifth to one-tenth the cost of a comparable plant in the developed countries), lower manufacturing cost supported by highly skilled, low cost professionals in various service sectors such as clinical research organizations, bioinformatics, manufacturing and support. As per the latest estimates the average cost saving for R&D is 60% and that for manufacturing is 35% of the Western cost. This has also been the reason for many biotech companies to specialize as CRAMS, which shows a healthy CAGR of 37.6% and is expected to reach $1 billion by 2010. India, with its potential to generate high out-put value per dollar spent, have attracted major companies to set up R&D base in India or tie-up with Indian companies in order to lower their drug development costs. This is happening in a big way, with the center of gravity of many multinational pharmaceutical companies shifting towards India. This trend was first noticed in the case of the low-margin childhood vaccine business, which at one time was dominated by over 20 multinational companies all over the world, has now shrunk to six companies, four of which are located in India.

There has been a strong rise in the exports of Indian biopharmaceutical products, recording an annual growth rate of 47% in the past year. There has also been a lot of action abroad, with Indian companies acquiring, merging or investing in European biopharmaceutical companies to speed up their entry into European markets. The appetite to compete abroad is evident from the number of applications filed by Indian companies to sell their drugs overseas. Worldwide, 37% of the drug master files (DMFs) submitted last year were from India, the largest share of any country. Likewise, Intas Biopharmaceuticals has filed over 75 dossiers in various semi-regulated countries for its three biotherapeutic products.

Backed by these favorable climatic changes along with strong business opportunities on the domestic front, biopharmaceutical companies in India are becoming bullish, with both the push and pull factors working in their favor. This is evident from the fact that 8 out of top 10 biopharmaceuticals in India are "home-grown" companies, which are fast arriving on to the global scene.

### The Biopharma Sector

Measures that are fueling the rapid growth of the biopharmaceutical sector include:

- increase in the set up of partly public-funded biotechnology incubators and parks
- increase in the private venture capital, fiscal incentives and tax benefits for R&D and exports
- speed up of regulatory approvals
- active role of Indian Pharmacopoeia in issuing product specific monographs on major biotherapeutic proteins and vaccines
- increased penetration of private health insurance
- increase in the burden of diseases (especially lifestyle diseases)
- increase in per capita pharmaceutical spend
- modernization and integration of patents and other intellectual-property offices with adoption of electronic filing system
- biotherapeutics being kept outside the government price control (except in the case of insulins), the pricing of new products on the Indian market is at the discretion of the patent holder and
- soon to be developed single window drug clearance through the National Biotechnology Regulatory Authority (NBRA)

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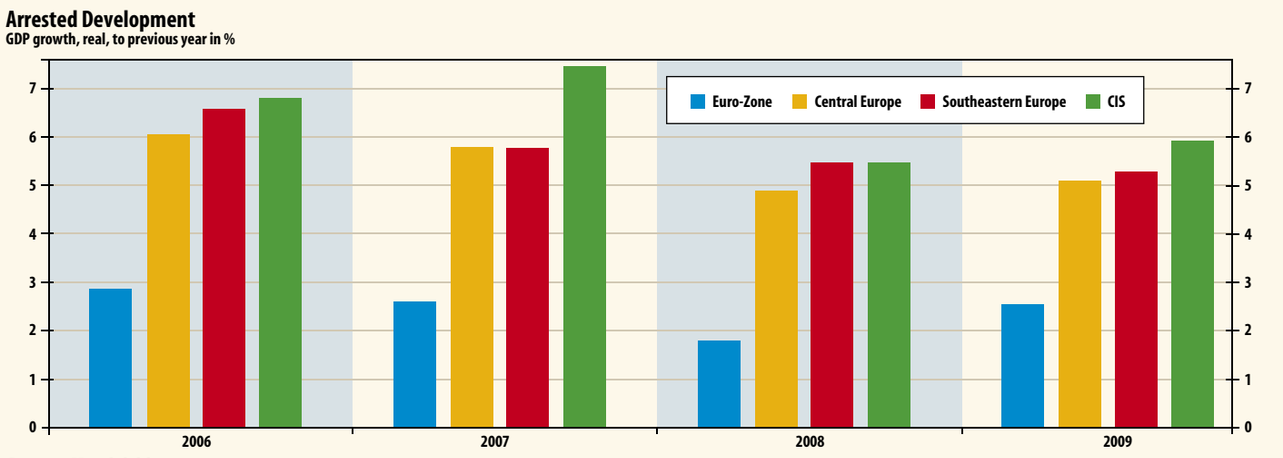
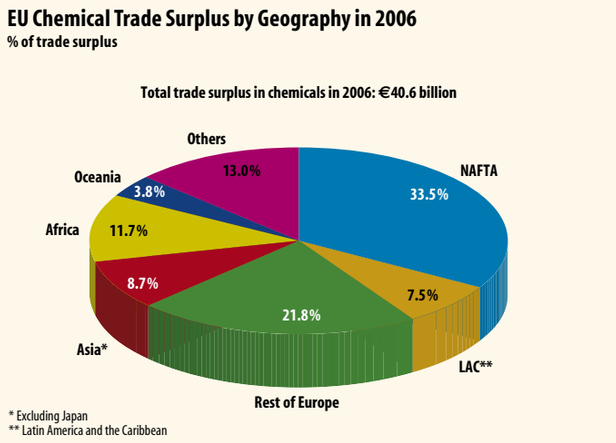
## Financial Crisis Arrives in Eastern Europe

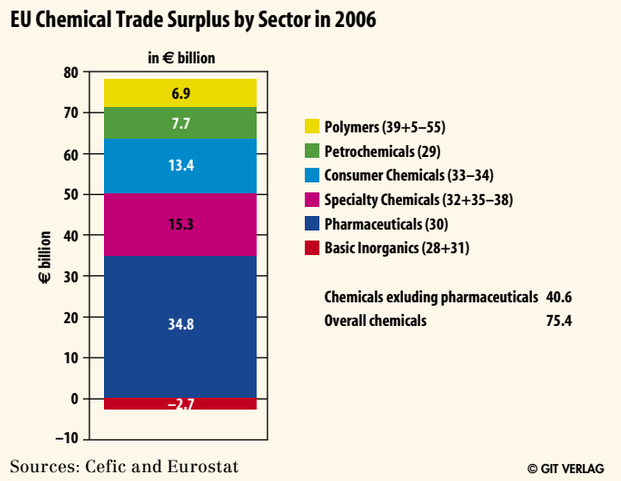



According to a survey conducted by the newspaper Handelsblatt, the heads of banks in Central and Eastern Europe (CEE) are expecting that region's economic growth to drop two percentage points to an average of 5.5%. To blame are the rising costs of refinancing, a decline in stock quotes from U.S. investors and the shrinking growth opportunities thanks to less demand from Western Europe and the U.S. According to economists, this development will also be reflected in the financial statements of banks active in CEE. These banks made strategies with the expectation of high growth in mind; if the market were to weaken, this could lead to skid marks on profit statements, according to the Handelsblatt.

## International Trade in the EU

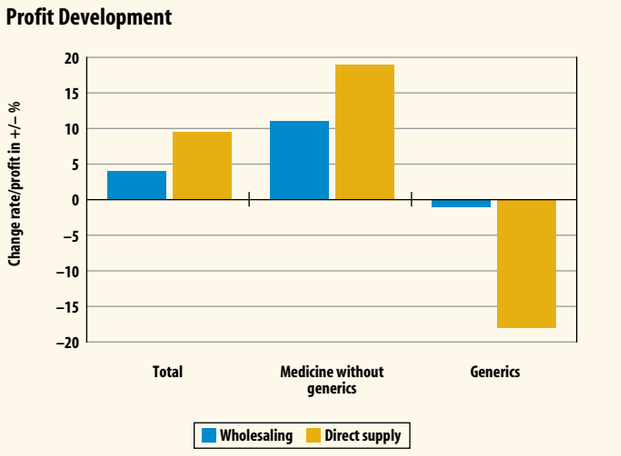


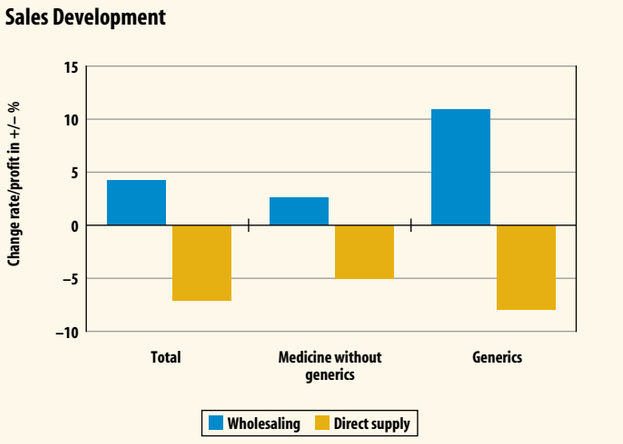

The external EU chemicals trade surplus in 2006 was mainly attributable to North and South America (41%), other European countries (not belonging to the EU) (21.8%), Africa (11.7%) and Asia (8.7%). The EU chemical industry has a positive trade balance with all regions, although for Asia it should be added that the trade surplus with important countries like Japan and India is very small and with China the EU actually has a trade deficit. Additionally, the trade surplus with Asia is diminishing.




In 2006, the trade surplus amounted to €40.6 billion. Specialty chemicals accounted for more than 37% of the EU chemicals trade surplus, with a trade surplus of €15.3, billion. With €13.4 billion consumer chemicals are the second strongest sector on the world markets, followed by petrochemicals (€7.7 billion) and polymers (€6.9 billion). Basic inorganics is the only sector with a trade deficit of €2.7 billion. Pharmaceuticals account for a trade surplus of €34.8 billion which would have to be added to the €40.6 billion.

## Pharma Market: Cutting Out the Middle Man




Direct deliveries to pharmacies went up 9% to €3.7 billion in 2007 (manufacturers' selling price). In contrast, sales to pharmacies from wholesalers rose a mere 4% to €19.5 billion. Direct supply grew as a result of 19% growth in the patented medicine market. According to amounts delivered, direct supply lost 7% here. The decline in patented medicine went down 5% and old originals with expired patents went down 9%. The situation for wholesalers is different; here the sales grew 5%, with sales in generics going up by 11%.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## Reach: Industry Urged to Pre-register

Some 30,000 chemicals currently in use (e.g. acids, metals, solvents, surfactants, glues) have to be pre-registered at the European Chemicals Agency (ECHA) between June1 and 1st December 2008. As the new chemicals legislation Reach (Registration, Evaluation, Authorization and restriction of Chemicals) will enter into operation on June 1, the European Commission and ECHA are alerting companies of their obligations. Tens of thousands of manufacturers or importers of chemicals will have to pre-register chemicals in 2008 if they want to continue manufacturing or importing them without interruption. It has been estimated that over 180,000 pre-registration files will be submitted. The pre-registration process will enable companies to share data on their chemicals and paves the way to enhanced knowledge about chemicals. This is a prerequisite for improved safety in the years to come.

Both Vice-President Günter Verheugen, responsible for enterprise and industry policy and the commissioner for the environment, Stravros Dimas said that Reach is the most ambitious chemicals legislation in the world.

"It will enable us to drastically increase our knowledge on the use of chemicals and to use them safely, thus protecting human health and the environment," Verheugen said. "Reach will make an invaluable contribution to safe management of chemicals in the EU. We will soon enter the crucial stage of pre-registration, and we strongly encourage every manufacturer and importer of chemicals, to pre-register as soon as possible."

Geert Dancet, executive director of the ECHA, said, "The countdown towards pre-registration of chemical substances has started. ECHA has worked hard to provide guidance and tools that are easy to understand. Its multilingual website and the Reachhelpdesks are ready to assist companies in pre-registering on-line."

The reminder to participate in pre-registration stems from the concern that some companies may still not be conscious of their obligations, either because they are not aware of the scope or the specific requirements or because they believe that Reach does not affect them, especially if they are not part of the chemicals sector. The Commission therefore calls upon member states authorities, industry, third countries and other stakeholders to help to make the obligations known to all enterprises concerned.

▶ echa.europa.eu

## Coming up in CHEManager Europe 6/2008:

To mark the beginning of the pre-registration period, CHEManager Europe will be publishing its third special supplement on Reach. Highlights will include interviews with industry leaders and in-depth articles.

**Out on May 29**

**This issue of CHEManager Europe contains an insert from Siemens.**

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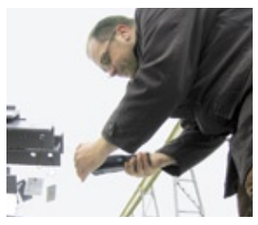

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### Sasol-Huntsman Plans Expansion in Germany

Sasol-Huntsman, a 50/50 joint venture between Huntsman and Sasol, located in Moers, Germany, has announced plans to expand its maleic anhydride manufacturing capacity from 60 mt to 105 mt by the first quarter of 2011. The 75% expansion will stem from the construction of a second world scale 45 kt reactor and purification section of the existing Moers plant. The new plant will operate independently from the existing plant to ensure uninterrupted product flow even during scheduled shutdowns and catalyst re-packs.

▶ www.sasol-huntsman.com

### Evonik and Sibur Start Feasibility Study

Evonik and Russian JSC Sibur, based in Moscow, have agreed to start an exclusive feasibility study regarding the possible construction of a facility to produce propylene oxide, together with hydrogen peroxide, for use in the Russian Federation. The study is to be completed in the coming months and will determine possible locations and capacities. Sibur is considering the construction of a propylene oxide plant that uses the HPPO process, which produces propylene oxide from hydrogen peroxide ($H_2O_2$) and propylene in a low-cost and ecologically sound manner. Evonik and the engineering company Uhde, Dortmund, Germany, jointly developed this HPPO process and are now licensing it to other chemical companies.

▶ www.sibur.ru
▶ www.evonik.com

### Carbogen Amcis Expands High Potency Offering

Switzerland-based Carbogen Amcis said its Indian Subsidiary, Carbogen Amcis India, plans to open a high potency facility in Bavla, India. The facility will be located on the Bavla site of its parent company, Dishman Pharmaceuticals & Chemicals. The facility is being designed and will be operated by the Carbogen Amcisteam to take advatage of the expertise and experience gained from high potency operations that already exist at tht dedicated Swiss high potency facilities. The building's framework has already been erected, and fit-out of the facility is already underway. The facility is expected to be operational by Q1 2009.

▶ www.carbogen.com

### Dow Biocides to Increase Glutaraldehyde Capacity

Dow Biocides, a business unit of Dow, has announced it will increase its U.S. production capacity for glutaraldehyde by approximately 60%. The capacity is expected to be online and operational by January 2009. Glutaraldehyde from Dow is produced at Institute, W. Va, U.S., a site managed by Union Carbide, a wholly owned Dow Subsidiary.

▶ www.dow.com/biocides

### Kureha Breaks Ground for New Polymer Plant

State and local dignitaries joined Kureha PGA as the company broke ground for its new, high-performance polymer, polyglycolic acid (PGA), plant. This new polymer will be sold and distributed under the Kuredux(TM) trade name. The facility, located at DuPont's site in Belle, W. Va. (U.S.), is expected to begin polymer production in early 2010. The first phase of construction will create approximately 50 new jobs and generate more than $100 million in economic impact.

▶ www.kureha.com

### Borouge Expands Operations

Borouge announced that it has initiated the feasibility study for Borouge 3: A further expansion of its polyolefin operations in Abu Dhabi to add approximately 2.5 m t/y of capacity by end of 2014. The proposed expansion would enable Borouge, a joint venture between the Abu Dhabi National Oil Company (ADNOC) and Borealis, to meet the growing demands of specific polyethylene and polypropylene markets in the Middle East and Asia. The Borouge 3 study will explore options to take advantage of additional feedstock becoming available from planned upstream ADNOC expansions to expand both Polyethylene and Polypropylene production capacities beyond the current Borouge 2 Project which is under construction and on target for start up in 2010. The proposed expansion will boost Borouge's total production capacity to 4.5 m t/y. It will be located alongside the existing Borouge 1 and Borouge 2 petrochemical complex at Ruwais, Abu Dhabi, in the United Arab Emirates.

▶ www.borouge.com

# Conceptual Design

## Sustainable Successful Maintenance

**Making Maintenance Work – With the pursuit of sustainment and improvement of the competitiveness in national and international markets, companies increase their equipment intensity, level of automation and the linking of the machinery.**

Prof. Dr. Dimitrios Kalaitzis

Dr. Walter Hahn

High maintenance costs and – resulting from unscheduled machine downtime – high plant loss costs are the consequences that substantially affect the economic situation in many enterprises. According to present estimations, maintenance cost amount to about €250 billion per year alone in Germany.

Due to this situation, enterprises and corporate groups have accomplished numerous maintenance projects in the last years and tapped the full potential of obvious fallow improvement areas, also called "low-hanging fruits." Often, the result of these projects was staff reduction in the maintenance department that led to substantial loss of know-how in important technical disciplines.

Accompanying with this development, the reluctance of the employees rose against new improvement projects in the maintenance. Further improvements in this area can be hardly realized by top-down led and on staff reduction focused maintenance projects.

Against this background, more and more enterprises are turning to a sustainable successful maintenance. Sustainable successful maintenance means a continuous, efficiency-increasing (operational excellence) and safety-increasing maintenance that is employee-focused. Objective of a sustainable successful maintenance is the further organizational and methodical development and thus the lasting improvement of maintenance processes. Thereby, this improvement process is not understood as once-only task that is completed after the end of a project, but one that becomes a permanent task of the organization. In the long run, it is intended to create a "learning organization."

In contrary to traditional cost-cutting concepts and derived from this, top-down projects, operation-specific solutions are provided and implemented on the basis of the experiences of own employees. Thus, a continuous improvement process (CIP) is used in a way that practicing experts contribute their ideas and knowledge on site. In addition to this "internal view," technical maintenance advisers ("external view") as well as experiences and experts from other industries (e.g. power supply and petrochemical industry) are actively involved.

#### Typical Success Factors

According to the experience of the authors gained in numerous well-known chemistry and pharmaceutical companies as well as at congresses, conferences and seminars, some critical success activities exist regarding the implementation of a sustainable successful maintenance.

One of these factors, in case of bottom-up projects, are precise short- and medium-term objectives that are communicated. In addition, management has to act as a coach for employees so that readiness to change and proactive thinking and acting is promoted within the organization in a systematic and methodical way. Naturally, it ranks among the fact that a possible external support goes beyond the mere submittal of Power Point presentations, but also includes specialized suggestions.

Further critical success activities in the launch period can include:

- Information workshops in combination with idea generation workshops in all involved departments
- Process walks in selected installations
- Comprehensive survey including evaluation workshops with all participants
- Work council is actively involved in all project boards and work groups

The following activities are especially important during the implementation phase:

- Piloting and testing of new concepts before the roll-out
- Assurance of the consequent implementation of identified improvement areas by establishing specialized implementation teams
- Establishing a consequent learning process on management level by e.g. peer reviews
- Definition of process-related indicators as nucleus of the implementation controlling

#### Practical Implementation

If one follows the proceeding to form teams from different departments and faculties, then the following topics arise:

- Maintenance strategies (preventive maintenance, RCM, …)
- Systematic weak point analysis (RCA, technical limit,…)
- Planning and cost controlling of running maintenance
- Budget controlling and scheduling of turnarounds
- Close co-operation of Operating and Maintenance Department
- Contractors Management
- Administrative overloading of employees from technical departments
- Spare part management

Following points are often judged as substantial improvements for the selection and application of an optimal maintenance strategy for critical plants and components e.g.

- Development and employment of a pragmatic procedure to justifiable internal expenditure
- Derivation of strategies taking into consideration costs and risks
- Creation of transparent decisions
- Involvement of all responsible employees with their knowledge (technology and operating)

Regarding planning and cost controlling of the current maintenance the following points are seen:

- Clearly defined and manageable responsibilities ("roles") determined
- Demand-oriented reporting developed for the management
- Visualization of characteristic numbers for the employees and elaboration and introduction of a priority matrix for maintenance notifications and orders (see fig. 2).

The core of the external service management often outlines a practical implementation of defined to-be processes. Significant improvements of the external service management were:

- Definition of an obligatory level for the quality of order of external services
- An obligatory and site wide harmonized process for external service handling
- Consistent using of the available IT-support
- Systematical cost controlling of the Top 10 maintenance groups of each plant

The developed best practice solutions for the improvement areas are tested regarding their practicability and then transferred to other chemical facilities.

#### The Road to Maintenance Excellence

On the way to a sustainable successful maintenance, a consistent and continuous implementation of the elaborated solutions is necessary. Organizational, methodical and process-orientated instruments are used for this. At first, several methodical instruments are usable for an efficient implementation-controlling. In particular, process indicators are used to promptly point out whether the introduced processes run goal-orientated or whether countermeasures have to be quickly initiated. In order to ensure comparability of the separately determined indicators, general rules for determination, compilation and usage have to be set up and implemented.

In medium-term, these process indicators are transferred into a balanced scorecard (BSC) derived from the enterprise and maintenance department objectives.

An additional significant instrument for implementation controlling is the peer review. This is used to detect the level of implementation and process improvements for each site in comparison to the indicator development and if necessary to work out additional measures with the affected site.

For peer reviews, it's important that all involved people are aware of the same tenor:

- We are on the way to a learning organization.
- We are not perfect, but we are actively working to become better step by step.
- We are running a learning process and it is necessary to run a positioning time by time.
- An important part of the learning process is the comparison of the self and external perception of the site.

With the tenor of the peer reviews, the described instruments above and the conceptional layout, a learning culture will be established, following the vision of a learning organization.

#### Summary

The above-described concept with its approach and the implementation measures is based intensively on the experience of the own employees and is designed as a bottom-up approach. The concept is based on a continuous improvement process with the involvement of local senior experts in the analysis of processes and generation of ideas. Senior experts from other industries (e.g. power supply, petrochemical industry) were involved for introduction of external expertise.

The positive experience through peer reviews during the phase of implementation controlling demonstrates that a learning culture could be established within the organization. This affects the process of continuously elaborated and implemented improvements.

*Prof. Dr. Dimitrios Kalaitzis and Dr. Walter Hahn, Managing Partners of Dr. Kalaitzis & Partner*

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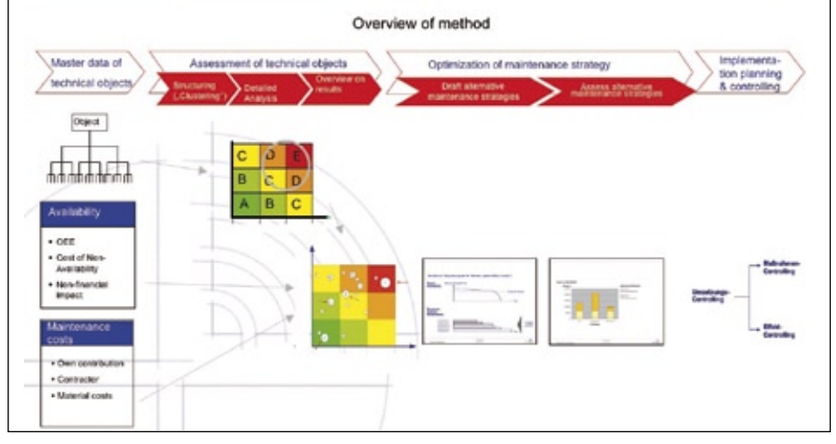
### Survey Partcipation

In order to support and develop the concept of "sustainable successful maintenance," the empirical survey "Status-quo as well as tendencies in the development of maintenance in internationally operating enterprises" is being conducted by the authors. Enterprises interested in participating in that survey are welcomed.

Practical implemented RCM (PIR) Fig. 1




The priority matrix makes the determination of priority rates for maintenance orders more objective Fig. 2

| Effects | | Work Protection | Environmental Protection | Availability | extra efforts and cost | | Incident rate: Minimal (probably less then one a year) | Low (probably one incident within one year) | Medium (probably incident happens within a month) | High (probably incident happens within a week) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | S | U | V | Z | | A | B | C | D |
| None | | None | No effects | No influence | No additional effort or cost | 0 | Priority 3 or 4 | Priority 3 or 4 | Priority 3 or 4 | Priority 3 or 4 |
| Low | | low impact (acceptable) | Low impact | Functional limitations of the component | Low additional effort/ cost | 1 | Priority 3 or 4 | Priority 3 or 4 | Priority 3 or 4 | Priority 3 or 4 |
| Medium | | Limited impact (additional safty measures necessary) | Limited impact within the power plant | Breakdown of component without impact to the block | Medium effort and cost | 2 | Priority 3 or 4 | Priority 3 or 4 | Priority 2 | Priority 2 |
| High | | Accident risk Priority 1 1 | Significant environmental impact (outside power plant) | Limitation of block availability | High effort and cost | 3 | Priority 3 or 4 | Priority 2 | Priority 1 | Priority 1 |

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# Beyond The Wire

## New Trends for Industrial Communications, Part 2

**Safety First – Once a case is made for wireless technology in general, there are various solutions to choose from for actual implementations. And last not least, there are additional safety considerations for applications in hazardous areas.**

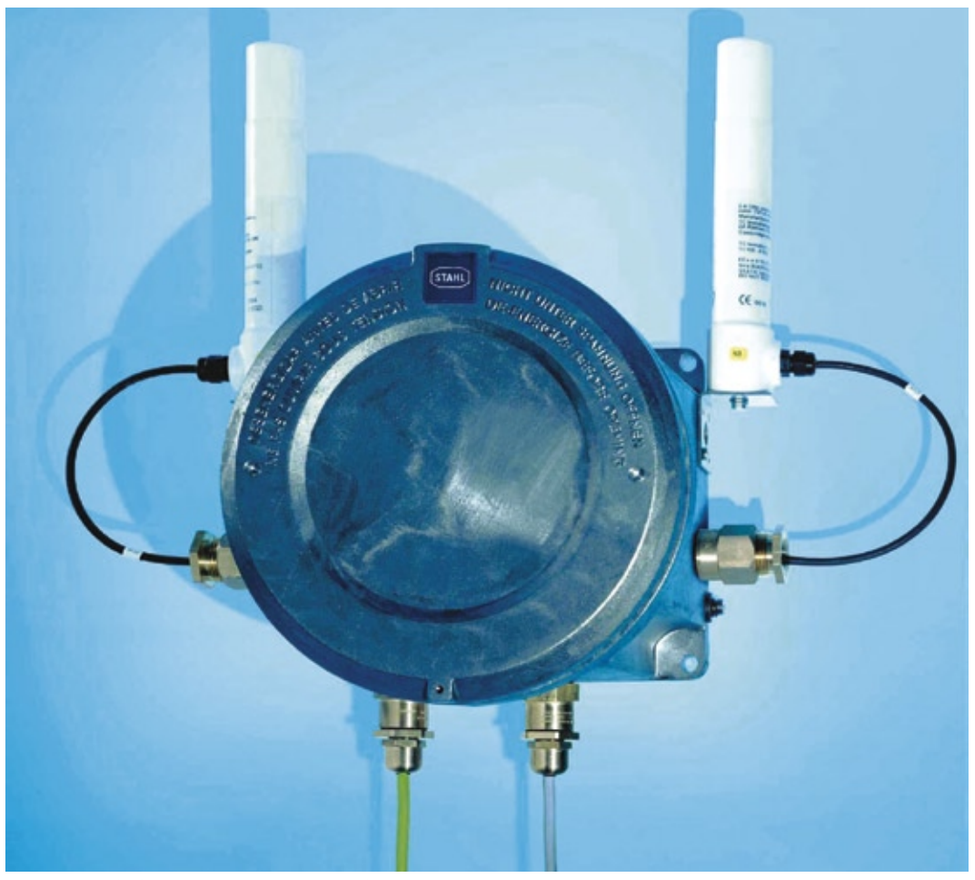
Users can resort to a number of different wireless communications solutions. As usual, there is no one standard that meets all requirements. All radio technologies currently available on the market have specific advantages and disadvantages. It should be noted, though, that the most widely used solutions in particular have originated in the office IT sector, meaning they were not originally designed for industrial applications.

### WLAN (IEEE 802.11)

WLAN is most suitable for use with portable equipment such as barcode scanners or handheld human-machine interfacing (HMI) devices. It provides the greatest bandwidth (802.11b – 11 Mbit/s, or 802.11g – 54 Mbit/s gross data throughput) and is designed for the transmission of Ethernet-based protocols. In a WLAN network, an access client such as e.g. a PDA can also roam from one access point to another without any interruption in transmission. This means users carrying portable devices can move freely around the site without losing their connections to the network. State-of-the-art WLAN systems also do ensure secure data handling, unlike earlier revisions which only relied on wired equipmentp-Privacy (WEP), an encryption method that was very easy to break by brute force.

### Bluetooth (IEEE 802.15)

Bluetooth does not provide a bandwidth that will match



WLAN access point in flameproof enclosure for use in Zone 1.

WLAN networks, but recent systems do achieve transmission rates of up to 2 Mbit/s. In addition, due to its synchronous communication modes, Bluetooth provides a very good basis for real-time applications. One key Bluetooth feature is the frequency hopping spread spectrum (FHSS) scheme, which makes this technology significantly less susceptible to interference than WLAN. FHSS also provides some additional protection against eavesdroppers. Bluetooth works well for networks with up to eight users, while a greater number will require increased technical effort. Bluetooth radio consumes less power in operation than WLAN. Due to its characteristics, it is particularly suitable for integrating fixed devices such as terminals or sensors. Both wireless standards discussed so far have one feature in common: their specifications have been internationally agreed upon, which ensures that devices from different manufacturers are fully, or at least largely, compatible with each other.

### ZigBee (IEEE 802.15.4) for Wireless Hart

ZigBee enables data to be transmitted at a rate of up to 250 kbit/s and requires significantly less power in operation than either Bluetooth or WLAN. The protocol profiles approved by the ZigBee Alliance at the time of writing are by and large tailored to applications in building automation. It is unclear which other areas of application ZigBee will eventually focus on in the course of its ongoing development. ZigBee constitutes the basis for the wireless Hart protocols and some wireless solutions with self-configuring, meshed wireless networks, or so-called wireless sensor networks. Like Bluetooth, ZigBee features frequency hopping which makes it less susceptible to interference.

### Other Alternatives

There are also numerous other proprietary protocols such as NanoNet, Trusted Wireless, etc. However, users will more often than not be inconvenienced by them due to incompatibilities between devices from different vendors. Based on the existing standards for WLAN, Bluetooth and ZigBee technology, various committees and organisations are currently trying to improve standardisation and provide users and manufacturers with implementation guidelines. In Germany, for example, institutions at the national level working in this field include the VDI/VDE GMA working committee 5.21, the ZVEI, and a Namur subcommittee. The VDI/VDE 2185 standard e.g. provides information on how to evaluate existing wireless technologies. In 2007 and 2008, similar activities have also been and still are underway at the international level, e.g. in the ISA's (Instrumentation, Systems and Automation Society of America) SP100 committee and in the HCF's (Hart Communication Foundation) Hart Wireless group. The number of organisations alone is testament to the growing interest in wireless technology from users in many industrial sectors. The eventual approval of standards can be expected to further facilitate the acceptance of and increase the number of wireless solutions in industrial applications.

### Mixed Installations

Most common wireless solutions use ISM frequency bands, which are license-free and therefore help to reduce operating costs. However, the drawback of this situation is that different applications have to share the frequency band. The standardization forums are aware of this fact and have already come forth with new approaches to resolve this problematic issue. Bluetooth e.g. uses an adaptive frequency hopping scheme that skips frequencies where the transmission has previously been impaired by interference. As a result, it is possible to operate WLAN and Bluetooth networks at the same time in the same environment without experiencing interference. However, not only in this case, but also as a general rule, users need to have detailed knowledge of existing networks before they plan and deploy a new wireless infrastructure.

### Hazardous Area Requirements

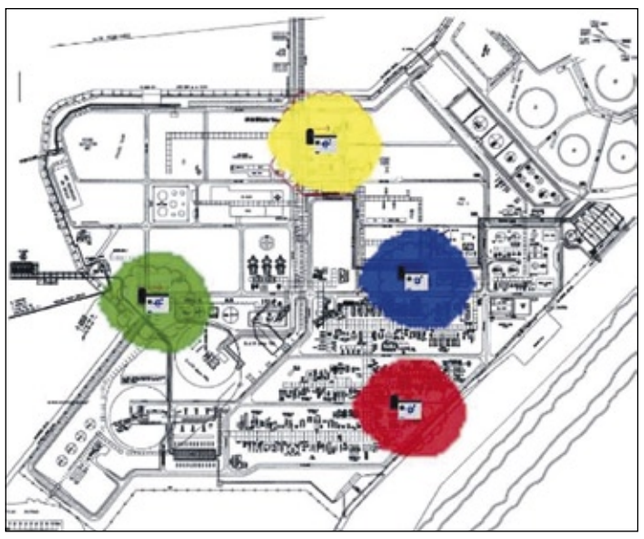
Radio devices emit electromagnetic radiation that is clearly a possible source of ignition in an explosive atmosphere. The main risk lies in the induction of currents in metallic objects or inadequately EMI-protected electronic circuits. These currents can result in excessively high temperatures and the formation of sparks. Other dangers, such as direct ignition of an explosive atmosphere, are much less relevant. Laboratory experiments have shown that RF sources with several hundred watts of energy are necessary for an electromagnetic field to directly trigger an explosion in a hazardous atmosphere.

On the other hand, IEEE studies on electromagnetic radiation in hazardous areas have shown that even RF powers of 6W can become a potential hazard in terms of induction in metal objects. Still, for a long time, international standards have not provided any guidelines on this subject. The closest thing users will find are recommendations in some national standards. All of them merely discuss RF sources installed outside the hazardous area, which only transmit into this area. For RF sources inside the hazardous area itself, users are referred to EN 60079-14 (Electrical installation in hazardous areas). However, even that EN standard just contains a brief note stating that in designing electrical installations, the effects of electromagnetic radiation must be limited to a value that is not hazardous. No figures are spelled out, and the standard makes no mention of adequate means for actual implementations.

### Explosion Protection And Performance

With few exceptions, automation components and devices currently available on the market must not be used in Zone 1 right out of the box. This restriction is largely a consequence of the rapid pace of development for new devices, which are released in very short intervals and are therefore often affected by incomplete standardization.

One possible solution to the problem is an installation of such RF equipment without Zone 1 approval in housings featuring a flameproof enclosure, i.e. Ex d type of protection, or another suitable type. The majority of these Ex d enclosures are made of metal, which shields electromagnetic radiation from the antenna as a side effect. Obviously, not just any antenna can be installed inside a housing of this type without additional measures. In some cases, a housing with a glass pane can be used in combination with a directional antenna installed within. However, tests have shown that only antennas specially matched to a particular type of flameproof enclosure will actually work well, since the signal loss is otherwise excessive. The second option is the use of external antennas. However, hazardous area requirements demand that special explosion-protected antennas have to be installed in this case. In most cases, they have to be designed for increased safety (Ex e) protection, because, in the event of a short circuit between the power supply and the output or input stage in the RF device, no excessively high currents/voltages are allowed to coincide with the explosive atmosphere without protection.



Planning and defining the WLAN frequency bands

### Deployment And Maintenance

Wireless network installations cannot do without special attention to planning, and planning starts with the definition of the requirements for the wireless network. A range of aspects have to be considered, e.g. bandwidth, mobility, hard requirements in terms of real-time signal transmission, the encryption system, IT department demands etc. Using a floor plan, it is possible to assess the RF coverage in the area with the aid of planning programs. Users deploying a new network also have to know exactly which wireless systems are already in use in the same place and in neighboring areas. The location and selection of the antennas can then be established. In the next step, the deployment plan should be verified with an on-site survey. This is a live on-site inspection of the area to check the values previously determined on the computer in the real environment, using a portable access point. In this confirmation process, some additional information can be gathered that cannot be anticipated in a floor plan, e.g. on the effects of vehicles passing through, or of mobile containers which may have appeared in more or less unexpected places. The survey will also allow users to realistically determine the effective bandwidth in the central and the outer areas of RF coverage. Finally, the RF system can be installed, commissioned, and put through a final test under real operating conditions to avoid unpleasant surprises. While the many steps of this procedure might appear to incur significant extra expenses, they have proven to be by far the most reliable way to ensure that a new wireless system really works as expected and brings about the desired process improvements.

*Stephan Schultz, R. Stahl*

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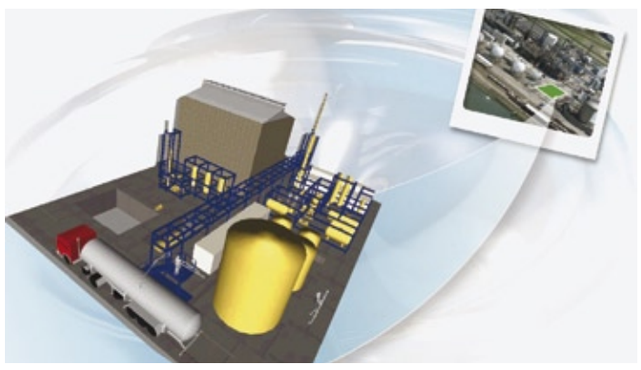
## BASF, Sinopec Expand Site in China

BASF and China Petroleum & Chemical Corporation (Sinopec) have submitted the technical and commercial feasibility study for the approval of the planned $900 million expansion of their joint chemical Verbund site in Nanjing to the Chinese government. The site is operated by the joint venture BASF-YPC. The completion of the study was formalized by Wang Tianpu, president of China Petrochemical Corporation (Sinopec Group) and Dr. Martin Brudermüller, member of the board of executive directors of BASF, at a signing ceremony in Beijing.

▶ www.basf.com
www.sinopec.com

## Akzo Nobel: Remote-controlled Chlorine Production



Akzo Nobel Base Chemicals, together with partners Uhdenora and Uhde, introduced a new concept for chlorine production with state-of-the-art technology: small-scale remote controlled chlorine production units.

In addition to the existing, large-scale production of chlorine, Akzo Nobel now offers to build and operate small-scale chlorine production plants forming an environmentally driven alternative for chlorine transportation or an economical alternative for the replacement of smaller plants that still use the outdated mercury electrolysis. Specialist Akzo Nobel personnel will operate the installations by remote control.

The small-scale chlorine plants have a maximum capacity of 15,000 mt/y. Installations are equipped using standardized engineering which we have succeeded in down-scaling to maximize efficiency. This also applies to the compact electrolysis cells, and to the other components that make up the installation, which are built up in modules and skid-mounted by Uhdenora. Due to the modular nature of the plant, very little construction activity is required at the site itself. The space taken up by the plant is comparable to half a football field (36 x 46 m).

The small-scale chlorine production units were developed by Akzo Nobel Base Chemicals (Amersfoort, the Netherlands) together with engineering and construction companies Uhdenora (Milan, Italy) and Uhde (Dortmund, Germany), well-known for building electrolysis cells, and both long-standing business partners of the company.

▶ www.akzo.com
www.uhdenora.com
www.uhde.biz

# RFID Technology

## Utilization in the Life Cycle of Complex Machinery and Plants

**Ubiquitous – Radio frequency identification (RFID) technology is entering ever more domains of logistics and engineering. RFID components are for example used in the manufacture of complex machinery and equipment and in their delivery to customers and commissioning as well as in the subsequent phase of maintenance by plant operators. An issue parallel to the physical handling of RFID components is the use of RFID to support cross-company information exchange.**

Cathrin Plate
Project manager Material Handling Engineering and Systems

Klaus Richter
Head of Material Handling Engineering and Systems

Gerhard Müller
Deputy Director of the Fraunhofer IFF

Radio technologies are widely used in society, not only to communicate but also to identify, localize and track objects. RFID systems are a further development of static identification technologies ranging from linear or matrix barcode and direct part marking (DPM) to dynamic data management.

Moreover, RFID permits mechanical covering without reducing read quality. As a pure radio solution, RFID is resistant to contamination and mechanical stresses. What is more, RFID can keep variable data on an asset up-to-date since the content of the data is not only readable but also writeable and upgradeable within the memory limits when being processed.

RFID is frequently employed as a generic term for the complete technical infrastructure. A radio frequency (RF) or RFID system includes:

- A transponder (a word made up from transmit and respond; also called an RFID tag or label),
- A transceiver unit (reader with integrated antenna) and
- Integration with servers and service and enterprise resource planning systems by using a middleware.

Readers are either available as stationary units (gate or tunnels systems) or integrated in mobile terminals such as PDA or industrial handhelds. Other distinctive features of RFID technology are the transponder's design (as a paper label, cast in glass or synthetic resin, as a screw, etc.) or the transponder's form of mounting (bonded or bolted on a surface, glued in a borehole, affixed to an object, concealed attachment, etc.).

### Basic Application Scenarios

RF technologies provide the functionalities presented below upon which application scenarios can be built:

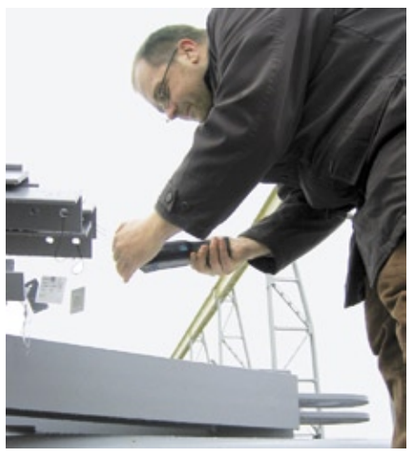
- Identification: Identification of machine objects or components
- Data Storage: Storage of Information on the machine object
- Localization: Locating of mobile objects
- Condition Monitoring: Determination of the condition of machine object over time and throughout processes

The functionalities mentioned can be employed in different stages of technical development in the industrial manufacturing, delivery and construction processes, maintenance and dismantling/disposal of complex machinery and plants.

### RFID In Manufacturing

Approaches to using active transponders to track semifinished or finished products in manufacturing can be observed. Such projects are primarily found in the automotive sector to track autobodies and the skids carrying them.

Other manufacturers are also discovering the advantages passive RF technology though and other frequency ranges are also being used, e.g. 13.56 or 868 MHz. In Germany for instance, first pilot projects have been carried out in small and medium-sized enterprises within a dual strategy:



1. Monitoring production flows and controlling the progress of manufacturing of a machinery object.
2. Electronic nameplate and maintenance history file for object maintenance by after sales service.

### RFID in Industrial Plant Construction

The increasing complexity of technical installation and the requirements of reliable and cost effective plant operation are generating increasing demand for information in logistics and construction. Engineering effective and efficient logistics and assembly processes necessitates being able to store and retrieve assured and up-to-date information about configuration, state changes and past measures as well as requisite documents on components, assemblies and equipment in real-time directly on site. From the standpoint of logistics, beneficial aspects of RF technologies are:

- Status and condition detection of assets (e.g. construction material and humidity) and related jobs (asset received at the construction site – stored – installed),
- Precise identifiability and localizability of assets (components, machinery parts, personnel, tools, etc.) in the company/at the construction site,
- The advantages of RFID are above all in the monitoring of delivery and assembly processes and in the prevention of
- Information media breaks between the different DP systems of those involved and
- Errors caused by manually transferring data into these DP systems.

Generally, different operations are accelerated (e.g. receipt of incoming goods) and unproductive labour time moving about searching for delivered components are reduced.

### RFID In Maintenance

The first pilot projects in Germany on the utilization of passive transponders in maintenance were already underway in the mid 1990s in big enterprises. Today small and medium-sized enterprises are increasingly discovering the advantages of RFID for themselves. Virtually every industry is represented here, for example manufacturer of electric motors, paper manufacturing, steel and aluminium industries, automotive industry, power generation industry or hospital management. In 2008, the number of existing and published RFID projects in maintenance in Germany is over 100, even in such critical environments like oil refineries or chemical industry in general (explosion-proof systems).

Order management with mobile terminals can involve using RFID to identify maintenance assets. The automatic identification of maintenance assets or spare components helps internal and external employees when they are executing orders. Furthermore, disassembly, industrial safety or maintenance instructions can be transmitted together with electronic orders or received from asset's transponder. This reduces time researching information.

The chief advantages of using RFID in maintenance processes are:

- Precise identification of maintenance assets when required maintenance work is being done (the right activity in the right place),
- Decentralized storage of data relevant for maintenance (e.g. servicing and inspection data) directly on a particular object,
- Option of integrating third parties, e.g. refurbishing shops, equipment vendors or external maintenance and data exchange with these third parties.

### Current Development

RF technologies are on the threshold of entering the mass market. Users are forming strategic partnerships in order to establish a close relationship between the developers and users of RFID hardware and software. Current activities in these fields are having and will have an impact on other sectors such as mechanical and plant engineering or the maintenance industry. So far, RFID pilot projects have characteristically been undertaken by individual plant operators with the goal of improving the effectiveness and efficiency of their internal manufacturing or maintenance processes. Since there are no mandatory technical or DP standards at present for cross-company use of RFID technology in manufacturing and maintenance, interest groups are forming around this issue. The continued use of tags already installed by suppliers for various processes (e.g. warehouse management, assembly and disassembly, maintenance, shutdown) is giving the plant construction and maintenance sector as well as manufacturers a competitive edge too. Future developments will go beyond single company applications to standardized cross-company applications.

*Gerhard Müller, Deputy Director of the Fraunhofer IFF*
*Klaus Richter, Head of Material Handling Engineering and Systems*
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**Existing RF Technologies**

| Frequency Range | Wavelength | Operating Mode | Key Functions for Applications (effective communication range) |
|---|---|---|---|
| < 135 kHz | low frequency (LF) | passive | Identification, communication (0.5 m) |
| 13.56 MHz | high frequency (HF) | passive | Identification, data storage and condition monitoring, communication (0 – 0.6 m) |
| 433 MHz | ultra high frequency (UHF) | passive | Identification, communication (6 – 8 m) |
| 868 MHz | ultra high frequency (UHF) | passive, active | Identification, data storage and condition monitoring, communication (2 – 4 m) |
| 2.45 GHz | microwave | active | Identification, localization, communication (50 – 200 m) |
| 5.8 GHz | microwave | active | Identification, localization, communication (50 – 200 m) |
| 3 GHz to 10 GHz | ultra wide band (UWB) | active | Identification, localization, communication (50 – 300 m) |

# Reliable Heat Exchange

## Safe Processes in Compact Form

**Heart of the Process – Heat exchangers are at the core of many technical processes. Reliability and robustness are two of the qualities found at the top of the list of requirements. As space is generally at a premium in most chemical facilities, a compact unit offering maximum performance is what is needed. An example of this in practical operation is the new Gea Bloc series in an adipic acid production plant.**

Radici Chimica's site in Germany produces intermediate products for nylon 66: being adipic acid, cyclohexanol and nitric acid.

With a surface area of 54m², over 200 plates and an output of 1,450 kW, the Gea Bloc keeps the hot nitric acid cool.

Whether in clothing, sports, furnishings, automotive parts or electrical/electronic components – everyday life would be that much more difficult without polyamides. One of the leading companies in the field of polyamide production is the Italian RadiciGroup. It covers all of the processes in the polyamide production chain – from chemical intermediates such as adipic acid through polyamide 6 and 66 right up to engineering plastics and synthetic yarns. This means that the company offers the complete range of products for the fibre and textile market.

In addition to production locations at Novara, Villa D'Ogna and Casnigo in Italy, an essential role is played by the facility in Tröglitz, situated between Leipzig and Gera in Germany, where Radici Chimica Deutschland produces the important intermediate products for nylon 66, these being adipic acid, cyclohexanol and nitric acid. Using the three starting materials of ammonia, phenol and hydrogen around 300 employees are involved in the production of adipic acid using oxidation of cyclohexanol with nitric acid. Adipic acid crystallises into a non-hygroscopic white powder that is then delivered in bulk form by road or rail.

In 1999, around €210 million were invested in the new location. Nowadays, with its production capacity of 80,000 t of adipic acid, 70,000 t of cyclohexanol/cyclohexanone and 80,000 t of nitric acid, this is one of the mainstays of the company and an important producer for the European market.

Success was not a matter of chance. In this market close cooperation with the customer is extremely important. In addition to high quality the products supplied are tailored to the customer's specific requirements and investments are necessary in continuous innovation, research, development and the constant expansion of the product range. Meeting these strict criteria requires reliable equipment that works perfectly.

### At the Core of the Plant

But not all of the equipment in the Tröglitz facility operates as problem-free as this. In the NOx scrubber section – right in the middle of the adipic acid plant – a plate heat exchanger needed urgent replacement. Its function was to cool down the hot nitric acid from around 55 to 30 °C.

"There had been problems for years with the tightness that kept on leading to partial shutdowns," said Werner Schwehm, head of maintenance and engineering at Radici Chimica Deutschland and responsible for planning, engineering and conversions in Tröglitz. "A further problem was that the spare parts had to be supplied from the U.S., and we had to reckon with delivery times of between four and five months." In the summer of 2006, things came to a head and the heat exchanger had to be shut down completely. "We were lucky that due to a conversion project a spiral heat exchanger was available that we could use as a provisional measure." But this was not a permanent solution to the problem.

Since last year, the Sarstedt-based company has had three series of fully welded plate heat exchangers in its portfolio. Whereas the GeaShell model is suited for smaller throughputs and the GeaFlex series designed for complex applications, the new GeaBloc is distinguished by its broad range of possible applications on the basis of standard components. Plant operators are provided with a cost-effective component solution and benefit from the customer-oriented service. And the introduction of this new plate heat exchanger perfectly complemented the existing portfolio of products.

### Accessible From All Sides

GeaBloc is a fully welded frame-mounted plate heat exchanger in which two different types of plate may be used. Each plate is positioned at 90° to the adjacent one and welded, the channels formed differing depending on the plate profile.

The frame consists of four columns, a base plate and a top plate together with four side panels with ports. All frame components are bolted together and can be easily dismantled to clean and inspect the plate pack. Adjustable baffle plates enable the heat exchanger to be adapted to its operating points. The GeaBloc works at temperatures up to 315 °C and pressures up to 32 bar.

The heat exchanger plates are available in a wide range of materials – for example in stainless steel, nickel base alloys, nickel, duplex and titanium. These high-quality materials and the fact that the plate pack is fully welded and therefore gasket-free make it resistant not only to high temperatures and pressures, but also in particular to aggressive media. Its principal uses are in the oil/gas industry, the petrochemical and chemical industries, the motor industry, the pharmaceutical industry and also in papermaking.

"This new series was exactly what we needed," Schwehm said. "We had already had good experience with compact heat exchangers as five similar units were already operating very reliably in other plant sections." A different exchanger type was out of the question for this production stage. "Tube bundle heat exchangers need too great a surface area and are therefore too large for our plant," Schwehm said. "And because of the nitric acid it was essential to have a gasket-free heat exchanger."

What impressed and finally convinced Radici Chimica was the fast delivery undertaking by Gea Ecoflex. "When we were promised delivery of the GeaBloc within four months, despite the generally long delivery times with higher-quality materials, our decision was taken very quickly," Schwehm recalled. There was an acute need for action to be taken to enable the company to resume concentrating on adipic acid production.

### Smooth Changeover

The GeaBloc was delivered at the beginning of January 2007 and started up operation in February. "Admittedly, it wasn't that easy to integrate such a large and heavy unit into an existing plant already in operation, but thanks to the compact design, everything went according to plan."With a surface area of 54 m², around 200 plates and a capacity of 1450 kW it now provides reliable cooling of the hot nitric acid. "We were completely satisfied with the way the project was handled," Schwehm said, adding that he couldn't exclude the possibility of future cooperation.

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# 2008 FOYA Winners

## Five Companies in Europe and the U.S. Take Home Honors

Five pharmaceutical manufacturing facilities pertaining constructed by companies located in Germany, Switzerland and the U.S. have been selected as category winners in the fourth annual Facility of the Year Awards (FOYA) program sponsored by ISPE, Interphex and Pharmaceutical Processing magazine. The program recognizes state-of-the-art pharmaceutical manufacturing projects that utilize new and innovative technologies to enhance the delivery of a quality project, as well as reduce the cost of producing high-quality medicines. The companies and respective award categories include:

### FOYA for Facility Integration: Boehringer Ingelheim

To accommodate the growing number of development projects and promote the application of new technologies, Boehringer Ingelheim decided to create a new facility on its major R&D site in Biberach in southern Germany. A central goal was to integrate all major functions for pharmaceutical development in one building to promote synergies, optimal communication, and seamless cooperation across the relevant disciplines. Modern and flexible good manufacturing practice (GMP) facilities for internationally acceptable manufacture of investigational medicinal products were required to support clinical trials phase I to IV. Planned as a development facility, maximum flexibility was of utmost importance to enable handling of a broad diversity of product types, batch sizes, potencies, and dosage forms. With a growing number of highly potent active compounds emerging from research, suitable areas were necessary for safe handling without compromising flexibility.

The solution of this variety of requirements was the construction of a new building. On 9,000 m² utilization area, the building contains state-of-the-art formulation laboratories, pilot plants for solids and parenterals, GMP facilities, and office areas. Both building layout and the concept for technical support systems allow easy adaption to future needs and the implementation of new technologies.

### Facility of the Year Award for Equipment Innovation: Bristol-Myers Squibb

This innovative facility brought early and late phase clinical manufacturing and development scale-up together within a single facility to create a Pharmaceutical Development Center of excellence on the Bristol-Myers Squibb (BMS) New Brunswick, N.J., U.S. campus.

A phased approach was initiated to adapt an existing building to allow full implementation of lessons learned as containment and process automation technology was integrated into existing operation. Phase one implemented a state-of-the-art clinical supply operations expansion facility-including full containment for expanded oral solid dose (OSD) operations and the most flexible clinical-scale continuous barrier line in the U.S. for sterile products, according to a spokesperson for BMS. This highly technical facility was designed for manufacturing OSD batches up to 400 kg and parenteral liquid fill batches up to 250 l. The goal was to create a flexible facility capable of performing multi-product clinical scale manufacturing and processing solvent-based and potent compound operations. The first phase consisted of approximately 93,110 ft² including processing, manufacturing, support and mechanical space.

Phase two built upon the technologies in phase one and added additional processing space and scale to the OSD clinical operation and a new stand-alone Product Technology Center for development scale-up activities. The addition to OSD Operations allows the manufacture of long term stability batches within the clinical supply operations facility in at least one-tenth commercial scale.

### Facility of the Year Award for Operational Excellence: IDT Biologika

In the last decade, new technologies were developed based on in-house development work considering the latest regulatory demands. Most challenging was safeguarding all operations in a multipurpose facility; excluding cross-contamination and expensive lead time between manufacturing campaigns. Use of disposable technologies, room sterilisation procedures as well as transparency of operations and process flow were major demands to comply with regulatory and client expectations.

These criteria and the operational expertise were used to design the new facility for production of live human viral vaccines IDT 201.

The total production area of 4,698 m² includes two contained manufacturing lines allowing segregated operations for preparation of cells, virus propagation and virus purification using highly efficient technical systems like fermentors and robotic systems. In-process control areas, offices and storage areas complement the manufacturing plant. The building was constructed within 19 months and provides capacities for development and manufacturing of vaccines for clinical trials Phase I to III, as well as for commercial supply.

### Facility of the Year Award for Process Innovation: Pfizer

Pfizer Manufacturing Deutschland in Illertissen, Germany, is a strategic site in the Pfizer Global Manufacturing network. The site is focused on OSD Forms and is a center of excellence in containment manufacturing.

Project "Newcon" combined all existing site expertise and led to a novel concept in high-containment manufacturing operations with the highest degree of integrated automation. All unit operations are located within a single containment module, supported by automation systems without any manual handling. The single containment module ("cell concept layout") enabled attention to be focused on sequence and flow. All equipment within the cell has been fitted with suitable barrier technology such as isolators and split valve technology. Related process control is located in an adjacent room with connection to all automation systems and levels that support processes like MES and laser guided transport vehicles. As a consequence, no operator attendance is required inside the containment suite and no personnel protection equipment is required upon routine operations.

The 7,800 m² size facility became operational within a period of 25 months since start of construction.

### Facility of the Year Award for Project Execution: F. Hoffmann La Roche AG

Headquartered in Basel, Switzerland, Roche is one of the world's leading research-focused healthcare groups in the fields of pharmaceuticals and diagnostics. To increase production capacity for its innovative cancer drugs, Roche constructed two new biotech production facilities – one at the Roche site in Penzberg, Germany, one of the world's largest biotech centers. The new plant "Biologics IV" is four storeys high and consists of two highly automated production lines as well as associated.

▶ www.facilityoftheyearaward.com



Norman Gilsdorf

**Norman Gilsdorf Joins Honeywell** Honeywell has appointed Norman Gilsdorf to vice president and general manager for Honeywell Process Solutions operations in Europe, the Middle East and Africa. Gilsdorf was formerly senior vice president and general manager of UOP's Process Technology and Equipment business unit, where he and his team grew the business by more than 25%. He replaces Paul Orzeske, who now leads the integration of Honeywell's acquisition of Hand Held Products.

▶ www.honeywell.com


Léo Apotheker


Ernie Gunst


Jim Hagemann Snabe


Bill McDermott

**SAP Strengthens Management** Léo Apotheker has been named co-CEO alongside SAP's CEO Henning Kagermann, effective immediately. According to the company, with the decision, SAP is preparing another smooth management transition at the top of the company. Henning Kagermann and Léo Apotheker will jointly guide SAP's future. The supervisory board also appointed three new corporate officers Erwin Gunst, Bill McDermott and Jim Hagemann Snabe, effective July 1.

▶ www.sap.com

**Expert for Semiconductors Joins BASF** BASF has announced that YuZhuo Li from Clarkson University, U.S., has joined the company. Li, an expert in the area of chemical mechanical planarization (CMP), will lead BASF's global CMP research and development team to develop innovative solutions for the semiconductor industry. Li has 20 years experience in the research area in the industry. After completing his Ph.D. in organic chemistry, he initially focused on biotechnology before shifting his research focus to the semiconductor industry.

▶ www.basf.com


Ian Stewart

**Veolia Names Ian Steward CEO** Veolia Water Solutions & Technologies (VWS) has announced the appointment of Dr. Ian Stewart as CEO for the company's operations in the UK, Germany, Austria and Switzerland. Steward has been managing director of VWS in the German speaking countries since 2004 and succeeds Roger Mudd who becomes chairman. In Germany, Steward was responsible for integrating newly acquired companies, Elga Berkefeld and Kruger Wabag into the VWS group. Prior to joining Veolia he worked in the automotive industry in various countries. In his new role he will be working on further development of whole range of technologies and services for industrial and municipal customers in the UK.

▶ www.veolia.com

**Ashland: Retirement of CFO Marvin Quin** Ashlands senior vice president and chief financial officer J. Marvin Quin will retire after 36 years of service, effective May 31. Lamar M. Chambers, currently vice president and controller, will be elected to serve as chief financial officer, effective June 1, when the board of directors meets in May.

▶ www.ashland.com


Chinh E. Chu

**Chinh E. Chu to Resign from Executive Board** Celanese has announced Chinh E. Chu, senior managing director, the Blackstone Group, resigned from the board of directors effective April 24, the date of the company's annual meeting of shareholders. Chu has been a member of the Celanese board of directors since November 2004 and served as chairman of the board from December 2004 until February 2007. The Blackstone Group exited its ownership position of the company in May 2007.

▶ www.celanese.com
▶ www.blackstone.com

**Nova Chemicals Names New President of Olefins and Feedstocks Business** Nova Chemicals announced the appointment of Grant Thomson as president of the Olefins and Feedstocks business. Thomson will be responsible for leading Nova Chemicals' Olefins and Feedstocks business from the company's Canadian Operating Center in Calgary. He will report to Chris Pappas, President and Chief Operating Officer of NOVA Chemicals.

Thomson is currently Senior Vice President of the Olefins and Feedstocks business and has over 20 years of experience in the petrochemicals, plastics and energy industries.

Val Mirosh will take on the role of Special Adviser to the COO. Mirosh will focus on specific activities that will facilitate further growth of NOVA Chemicals' Olefin and Polyolefins business in Alberta and Ontario.

▶ www.novachem.com

**Gen. James L. Jones Nominated to Chevron Board of Directors** Corporation announced that Gen. James L. Jones has been nominated for election to Chevron's board of directors. Jones is currently president and chief executive officer of the Institute for 21st Century Energy, a policy, economic and educational center in affiliation with the United States Chamber of Commerce. Jones will be considered for election to Chevron's board at the company's annual stockholders meeting on May 28. If he is elected, the board will increase from 14 to 15 members, and Jones will serve on the Public Policy Committee and the Board Nominating and Governance Committee.

▶ www.chevron.com



## P&G Wins Sustainability Recognition

Procter & Gamble's long-term commitment to corporate sustainability was rewarded before an audience of European business leaders, politicians and press at the 2008 European Business Awards – the annual gathering to celebrate Europe's top businesses and business people. During the final award ceremony in Paris, the global personal care product manufacturer Procter&Gamble collected the Award for Corporate Sustainability.

▶ www.businessawardseurope.com

## Albemarle: Changes in Management

Albemarle has announced several organizational changes to the company's manufacturing leadership team to help build upon the company's operational and financial performance. Luther C. "Luke" Kissam has been named senior vice president, manufacturing and law, and corporate secretary. Previously senior vice president, general counsel and secretary, Kissam will lead Albemarle's manufacturing and law functions worldwide. Dr. Ronald C. Zumstein has been named vice president of manufacturing operations, with global responsibility for all of Albemarle's manufacturing facilities. Lloyd Crasto has been appointed vice president of manufacturing technology, with global responsibility for deploying all of Albemarle's process development and technology resources. Karl Meyer has been nominated vice president of strategic manufacturing. In this new role, Meyer will lead all strategic projects and issues involving manufacturing. Nicole C. Daniel has been named assistant general counsel. Daniel, who will manage the global legal function, brings a diverse set of global experiences in corporate governance, investor relations, and general commercial matters to this role.

Further, Albemarle has promoted Dr. Niomi Krzystowczyk to division vice president, health, safety and environment (HS&E). In her new role, Krzystowczyk will have global responsibility for all of Albemarle's HS&E activities, working to enhance current programs while identifying and implementing new initiatives.

▶ www.albemarle.com

## Merck: Executive Board Changes


Walter Zywottek


Dr. Bernd Reckmann

Merck KGaA announced that Walter Zywottek, general partner and member of the executive board with responsibility for the Chemicals business sector, will retire on July 1. Dr. Bernd Reckmann has been appointed to succeed him in this function. Reckmann is also a general partner and member of the executive board and currently is responsible for production and engineering, site management for Darmstadt and Gernsheim (Germany) and other functions. The majority of these functions will be integrated with his new position as head of chemicals. Hence, from mid-year, one executive will have the over-all responsibility for the chemicals business sector with respect to the two chemicals divisions, production and business development, as is already the case in the pharmaceuticals business sector.

As of July 1, Merck's executive board will consist of four members: Dr. Karl-Ludwig Kley, chairman; Dr. Michael Becker, finance; Elmar Schnee, pharmaceuticals; and Dr. Bernd Reckmann, chemicals.

▶ www.merck.de

## Technology Fair HET Instrument Again Entirely Sold Out

**ADVERTORIAL** The largest event for technology in the Benelux – HET Instrument – will take place in spring from May 20–23, in the "Jaarbeurs" buildings in Utrecht. We expect a lot of novelties; the internationalisation of the event proceeds apace; the quality in the quantity of the elements of the conference is better than ever and there is a lot of "experience marketing" present. FHI, Federation of Technology Branches, who organises the fair and conference points out a few subjects as Reach, process intensification, inline analysis, safety & security and nano-technology.

Just as with the 2004 and 2006 editions, the fair is completely booked out. By applying an even more precise sub-division of the five halls of the fair there is room for even a few more stands. This promises to be a busy May.

**Experience**

There will be a lot to see and to do for the 25,000 highly educated visitors expected. "Novelties in Technology" will present an unusual number of novelties. The "LiveLab" demo-stand for clean sports allows you to walk through a complete laboratory that has been specially designed for doping checks and for the promotion of healthy exercising. An AGV – Automated Guided Vehicle – drives around in the LivePIL – Production Integration Line – whilst a production line produces solar cells. Visitors will tour a number of stands where they will be provided step by step with parts that will leave them in the end with a complete accelerometer. The nano-pavilion will make nanoparticles visible. Various pavilions have been laid out for communication bus-systems for industrial computerisation and there is one pavilion providing software systems for industry. Speakers will climb their soapboxes in the LABplaza.

Organised groups of students will be received in selected stands and pampered as future technologists of which we have too few today.

**People Create Technology**

The theme of HET Instrument – people create technology – may be experienced through meeting one or more 'meeters'. These are lookalike actors who will bring scientists such as Albert Einstein back to life.

Real knowledge may be acquired through the programme of the conference: 20 daily periods, each dealing with a different technological subject that will be presented intensively: process intensification, inline analysis techniques, high end motion control and plc-technology, cyber crime fighting in process industries, life sciences, diagnostics of infectious diseases, Reach, vacuum and clean room technology, measuring and testing, high-tech product development, ERP, engineering and operating software for industry.

▶ www.hetinstrument.nl

## Chemistry 2008 to Address Key Issues

Movers and shakers in the chemical industry will gather for the ninth time at the Handelsblatt annual conference Chemistry 2008 May 5–6 in Düsseldorf, Germany. The event will provide a two-day information and networking platform where delegates can discuss the main standpoints and themes that characterise today's chemical industry. Industry experts will be on hand to present and debate the current issues affecting the international chemical industry. Delegates will have an opportunity to tap into strategies that will determine developments in tomorrow's chemical market. Visitors will have a chance to talk with CEOs, board members, executive directors, senior managers and project heads representing the chemical industry, the chemicals trade and related branches, with a special focus on strategic corporate planning; finance/controlling; purchasing; sales and marketing; research and development; innovation management and new business development; legal affairs; and public relations.

▶ Euroforum
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EVENTS

**Global Distribution Strategies** Within a dynamic and evolving market the need to keep up to date with the distribution strategies employed by world class companies has never been greater. How manufacturers and retailers organise their supply chains, the political, economic and social influences on their decisions and the effectiveness of the execution of their strategies is critical to competitive advantage. The Global Distribution Strategies 2008 conference will address all these issues by bringing together the leading practitioners in the industry within a single forum. The conference, which will be held May 13–15 in Amsterdam, is being organized by market research company Transport Intelligence.

▶ www.transportintelligence.com

# Chemical Logistics

## Market Research and the Newest Trends

**Not Your Mother's Logistics – Logistics in the chemical industry has gone through a lot of changes over the last few years. Dr. Carsten Suntrop and Cord Matthies highlight the biggest ones.**

The logistics business in the chemical industry has changed significantly during the last 10 years. The focus of chemical companies on their core competences has led to logistics and infrastructure services being outsourced, if not fully sold to dedicated service providers. Specialized and independent LSP have morphed from companies that initially had transport and/or storage as their core business. The chemical logistics market is characterized by significant entry barriers: a high degree of compliance to safety and environmental regulation, specialized and often dedicated assets and a very high level of integration into the chemical principals' supply-chain systems. Besides, the principals' desire of international coverage by their LSP has the side effect of initially family-driven LSPs expanding into international groups.

The diversification of the chemical industry finds its counterpart in the equally diversified chemical logistics market – from pharmaceutical logistics with good manufacturing practice (GMP) requirements via packaged goods and liquids to highly sensitive products such as peroxides, or non-critical products such as polymers. The diversification requires a specialization of behalf of the LSP, in addition to the challenge of contract logistics. A close collaboration between LSP and the chemicals principal is required over an extended period. These long-term contractual relationships are usually built on trust. The need to integrate seamlessly into the complex and global chemical chains is paramount. In view of their accounting and supply-chain systems, the chemical industry works predominantly on SAP, and the LSP must provide transparency to the chemicals principal on his part of the IT system and the supply-chain. The successful LSPs are those that follow their customers' globally networked and IT-enabled value chains.

The factors of increasing sophistication of LSPs in conjunction with the advent of B2B e-commerce standards and platforms has allowed a progressive interconnection of chemical value chains. Logistics in the chemical industry is not only storage and transport logistics, but the selection of the ideal set of transport and storage modes for product transfer between sites, plants and machinery. The logistics industry that serves the chemical industry has changed to at least a comparable degree as the chemical industry itself. Increasingly, chemical companies turn to their LSP to shoulder their share of investment in intelligent logistics platforms. Four main change drivers are discernable, of which each requires a significant adaptation of the LSP's business model.

### Trends In Chemical Logistics

The major trends are:

- Establishment and growth of internationally operating LSP with 3PL and 4PL competence as full-service supply-chain partners
- Industries such as automotive and consumer goods that require transparent and collaborative supply-chain management from their chemicals and polymer suppliers, of course heeding the full set of applicable regulation
- Introduction of ERP Systems, mostly SAP, in conjunction with the ensuing transparency in process and controlling
- The development of an industry-wide communication standard that allows connecting ERP systems along the value chain, across company borders, thus allowing a highly increased value-chain transparency.

Several leading chemical companies have understood that professional management of these four drivers are significant enablers in the M&A process and allow for speedy, effective and transparent integration of newly acquired companies.

A former procurement head of a leading consumer goods company underlined the trend during a supply-chain conference: He did not see the chemical industry as an entity of its own, but rather as an integral part of the consumer goods value chain. He predicted that the chemical industry would have to heed the challenge of collaborative planning of supply-chains, logistics and production, such as is common today between the FMCG and the retail industry. The ICT departments of each supply-chain partner would be required to horizontally support the product value chains across company lines, while serving the traditional vertical corporate controlling lines.

New customer requirements, concepts and methodology have spawned new types of collaboration between chemical principals and their LSPs. Logistics has morphed from provision of storage or transport to effective and efficient management of the entire flow of products and information, from the raw material to the customers' production lines. ICT-based concepts are today state-of-the-art that were hardly known to the initiated 8-10 years ago, e.g. 3PL, 4PL, LLP, VMI, e-Hub, RFID, CPFR (collaborative planning, forecasting, replenishment), etc.

Multi-modal and container logistics has all but exploded in the recent years. Containers are unbeatable in their flexibility, and they can be used simultaneously for storage and transport, often even serving as an intermediate process tank. They allow to de-couple the transport medium from the payload while solving the dilemma of dedicated assets that is so prevalent in chemicals logistics. Chemical LSPs like principals have embraced the container with a vengeance, and that independently of their whereabouts in the world.

Last not least, LSPs increasingly offer supplementary value-add services to their principals, such as bagging, octabin filling, palletizing or kitting. Such activities in conjunction with low-cost channel e-business portals may eventually allow the principals to take back some of the business they so willingly ceded to distributors in the very recent past.

LSPs are increasingly regarded as partners on equal level for chemical principals, characterized by the LSP adopting a service provider plus consultative role. Switching cost is high due to the high degree of ICT and business integration into the fulfillment of the principal's own contractual obligations. As an example, a storage provider offers his customers full real-time visibility into their off-site stock, directly fed into the principals' SAP systems and thereby integrating these stocks into the available-to-promise engine within the SAP sales and distribution process.

LSPs serving the chemical industry have changed, often to become highly competent international partners in contract logistics that locate their own multimodal storage, cross-docking, packaging and kitting and transport capacities in or directly adjacent to their customers' production sites. The chemical principal, on the other hand, may allow his LSP to develop in a fenced-off corporate environment.

The concept of the lead logistics provider (LLP, also called 3PL/4PL) has shown significant traction in the last 10 years. The LLP, asset-based as 3PL and usually asset-free as 4PL, is the lead logistics contract holder to the chemical principal. He arranges and sub-contracts the entire contract and transport logistics, however also signs full responsibility for execution vis-à-vis the principal. A pure 4PL operates a network into which logistics subcontractors are connected. The added value of a 4PL lies in the network effect, e.g. he offers a shared-service expertise that would otherwise need to be maintained in-house. For example a 4PL can thus handle a parcel tanker shipment via one customs agent and one surveyor, much rather than one of each for each shipper of a cargo that is then reporting to a marine freight specialist in the principal's corporate head office. Many large specialized chemical LSP now offer global LLP and 3PL services.


Most leading LSP in the chemical space are located along the Rhine/Schelde rivers, in the major seaports of Belgium and Netherlands and the Rhine riverports of Germany and Switzerland.

### What Counts

The following market participants play a significant role in chemical logistics, as based on CMC²-Project experience and market research:

1. Transport LSP for liquid and packaged dangerous goods (land-based, air, short-sea, deep-sea),
2. Chemical Contract Logistics as core business
3. Contract logistics providers under ownership of a Chemical company
4. Complete integrated logistics (transport logistics all modes, contract logistics, LLP, logistics consulting)
5. Project logistics and courier services

### Market Research on Logistics in the Chemical Industry

Research by CMC² on LSP in the Germany-Benelux region that serve the chemical industry has revealed that the large logistics groups such as DHL, Schenker, Kuehne & Nagel, Panalpina or ABX have limited exposure to the chemical industry. In many cases, these logistics companies operate contract logistics for lower hazard classes or palleted goods. Contract or transport logistics for higher hazard classes is often conducted by specialists. Supplementary services such as packaging, bagging, filling and re-filling, kitting, palletizing, cross-docking is being done by such specialists. Contract logistics companies propose capabilities in warehousing of liquids and solids, logistics services in procurement, production and distribution as well as logistics consulting and support of chemical companies on outsourcing to LLP/3PL/4PL.

Most leading LSP in the chemical space are not surprisingly located along the Rhine/Schelde rivers, in the major seaports of Belgium and Netherlands and the Rhine riverports of Germany and Switzerland. Around 50% of the European chemical output is produced in this set of chemical clusters: Rotterdam, Antwerp, Cologne-Ruhr, Ludwigshafen and Basel. Many of these areas focus almost exclusively on chemicals, while others have a dedicated chemical business.

The majors among these are Katoen Natie, Hoyer, Bertschi, Vos Logistics, Talke, Lehnkering, Geodis, UBC, ADPO or Simon Storage as predominantly inland-based LSP. In addition to these LSP providing land-based logistics, there are specialist LSP for sea-based chemical logistics. Stolt-Nielsen and Odfjell have grown to full-service LSP focusing on deep-sea logistics and seaport storage while Vopak globally leads liquid storage. BDP International is the leading global LLP/4PL for sea and air logistics, providing full-service logistics arrangement from transport via storage plus customs and survey services. Several chemicals LSP combining 4PL and contract logistics were spun off the major chemical companies, such as Chemion, Infracor or Infraserv.

The majority of these companies combine contract logistics with provision of transport via road, rail, barge, short-sea and/or multimodal. In most cases the specialists are asset-based in several areas of logistics and can provide LLP/4PL capacities in the logistics areas they do not cover themselves. An interesting development is the arrival of companies that finance and build logistical parks for lease by the LSP, such as ProLogis.

From our research in chemical logistics, we deduce the following market trends:

- Transport LSP diversify into full-service logistics providers, expanding their portfolio by warehousing and storage, packaging and re-packaging, 4PL services, logistics consulting, etc. to provide their customers with a one-stop shop approach
- Incumbent chemical-site based LSP co-operate with large full-service logistics groups; on occasions they are being taken over in order for the LSP to develop an industry-specific full-service concept
- large full-service logistics groups develop chemical competences and assets in order to establish a new chemical industry focus
- Logistics departments of a chemical site operator are established as separate entities while remaining consolidated in the parent company's accounts; the LSP morphing into a provider of 4PL and contract logistics, often in close partnership with asset-based external LSP and in new joint models of collaboration
- The incumbent consolidated site logistics provider is partially or fully sold to established contract logistics partners

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# Qatofin and Talke Sign Major Logistics Agreement


Qatofin and Talke Logistic Services have signed an agreement covering the construction of a logistics terminal and the provision of logistic services in Mesaieed Industrial City, State of Qatar. The agreement is one of region's largest logistics contracts, with logistic terminal valued at $38 million; the facility launch is slated for the first quarter of 2009.

The new construction and operation agreement struck between Qatofin and Talke for the Qatofin facility includes completing building work by the end of 2008 as well as the 15-year operation in one of the biggest and most advanced silo logistics centre on the Arabian Gulf.

The deal between Talke, a logistic service provider for the chemical and petrochemical industry and polyethylene producer Qatofin covers the onsite silo logistics centre located some 40 km south of Qatari capital Doha. Talke Logistic Services gains one of the largest contracts in company history. The transaction involves the acquisition of Vos Silo Logistics Qatar and Vos Middle East Holding.

Covering a total area of 100,000m², the facility consists of around 55,000m² of covered storage space, 14,500m³ of silo volume, 15 loading docks and a container terminal that can hold up to 1,000 containers. Twelve 1,100m³ silos will be supplied directly from production via feed lines with polyethylene, a thermoplastic. The material is filled into bags with two fully automatic mobile bagging lines, while an additional machine handles the filling of big bags. Belt throwers are used to load a large portion of the product into maritime containers, which enables the end recipient to unload the material directly into production or silos.

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## Ashland Distribution In China

Ashland Distribution, a division of Ashland, has increased its logistics capabilities to better serve the growing China market. Utilizing facilities located in key manufacturing areas, Ashland Distribution's China operations are providing customers with a complete line of branded thermoplastic resins.

"A key element of our strategic plan now is to expand geographically into higher growth regions such as China," said Larry Hunt, commercial director, Ashland Distribution China. "We are building a thriving business here, leveraging our knowledge of the chemical/plastics markets, our global supplier network, and our large customer base to create value for our customers in China."

▶ www.ashland.com



## Advances in the Logistics of Liquid Goods

In the chemical and plastics industry, speed and efficiency are of the essence. This applies not only to production, but also to the transportation of the products. Bayer MaterialScience has now developed a logistics system for the loading of road tankers with polyols in which the driver fills the truck. In the petrochemical industry, where few products are marketed but the volumes are large, this form of road tanker loading is already fairly common. Polyols, on the other hand, are a group of products with a large number of individual types and grades.

"Until now, these products have been loaded into the tankers by the production workers to be certain of avoiding any mix-up of products. The new system is so sophisticated that filling the tankers with the wrong product is virtually impossible," said Dr. Ilias Mitulidis, production manager at Bayer MaterialScience. "If the drivers load the tankers themselves, the logistic procedures can be speeded up considerably. This lowers costs and gives the haulage companies, their drivers and the employees in the production department of Bayer MaterialScience the opportunity to work more flexibly and freely." Polyols are used as raw materials in the production of rigid and flexible polyurethane foams, which are, in turn, used throughout the world in large quantities for the manufacture of high-performance thermal insulating materials, upholstered furniture, mattresses, car seats and shoe soles.

The loading procedure according to the new system is as follows: when the driver reports to Chemion Logistik – the logistics service provider in the Chempark – they are given the usual freight documents. The truck is weighed to establish its unladen weight, and its maximum payload is documented. The driver then takes his truck to the loading bay, where he navigates the vehicle with the aid of a video camera so that the upper hatch of the tank is positioned exactly below the loading boom. The Bayer MaterialScience employee responsible for the loading procedure checks the delivery papers and hands the driver a chip card to activate the loading process at the relevant bay. On the loading platform, the responsible person swipes the chip card through an electronic reading device and receives the authorization to operate the unit. This enables them to fill the truck with the specified volume of the product. With the aid of a joystick, the driver then guides the loading boom into the hatch and begins the filling procedure. The driver can track its progress easily on the display and, if needed, can also take samples. When the filling operation is complete, the person raises the loading boom, weighs the truck and exchanges the freight documents with the person in charge before leaving the company site.

▶ www.bayermaterialscience.com

## Agrium Acquires Network

Agrium has announced that it has entered into an exclusive agreement to acquire a 70% equity position in Common Market Fertilizers (CMF), one of Western Europe's largest fertilizer distribution companies. CMF has annual sales revenues of $500 to $600 million, crop nutrient sales volumes of 2 to 2.5 million t and an annual Ebita of approximately $10 million. The purchase price for 70% of the business is $16 million plus working capital of approximately $50 million. The transaction is expected to close in the second quarter of 2008, subject to concluding a definitive purchase and sale agreement, due diligence and regulatory approval. Oscar Geyer will remain as CEO of CMF, and will continue to hold an equity position in the company.

▶ www.agrium.com



## Chemtrade Invests In Meranol

Chemtrade Logistics Income Fund announced that it is investing $2.5 million in Buenos Aires-based Meranol, an Argentine producer of sulphuric acid and other sulphur products. Meranol, including its predecessor companies have been in the chemical business for approximately 120 years. Chemtrade's investment is in the form of convertible notes which are convertible into 10% of the equity of Meranol. Chemtrade also has options to increase its investment to up to 45% of Meranol's common stock at a pre-determined price.

Meranol is a producer of sulphuric acid and also produces aluminium sulphate, iron oxide pigments and linear alkyl benzene sulphonic acid at its integrated plant in Buenos Aires. Meranol is uniquely situated to capture the increasing Argentine demand for sulphuric acid driven by the significant growth of the fertilizer industry. This investment will allow Chemtrade and Meranol to solidify their existing relationship and enable Chemtrade to participate in a dynamic long-term market for sulphur and sulphuric acid.

▶ www.chemtradelogistics.com
www.meranol.com

# Temperature-controlled Shipment of Vaccines

## A Humanitarian Outreach from Toronto to Tashkent

**Fragile Wares – When establishing logistical processes for the global transportation of life science products, careful measures must be taken to ensure the viability of the product while in transit.**

**Gordon Johnson**
Manager, Business Development & Implementation at Lifeconex

Each unit of each product transported is not merely representative of the high-value of the product itself; the fact of the matter is that each unit of product transported potentially represents a patient's life. Successful global transportation of life science products requires the establishment of integrated processes between the manufacturers, forwarders, airlines, ground handling agents, packaging companies and other members of the supply chain. A quality agreement must be reached with acknowledgement of all parties in order to encompass such intricacies as airport warehouse storage and holding specifications, tarmac exposure time, government import and export regulations, etc.

This case study addresses the details and necessity of having an end to end temperature controlled transportation solution in place to rigorously coordinate and measure all partners involved in the supply chain.

### Synopsis

Origin to Destination: Toronto, Canada (YYZ) to Tashkent, Uzbekistan (TAS)

Product Description: 50 pallets (approximately 18 t) of a life saving vaccine used to help prevent whooping cough, tetanus, diphtheria and polio.

### Logistics Challenge

When approached by a non-profit organization who advocates the protection of children's rights, Lifeconex agreed to manage this temperature sensitive vaccine along the above indicated transit route. With over three years of experience in assessing and providing solutions for life science companies, this was not the first time the company had been challenged with devising how to get delicate products to remote areas.

The timeline and expectations for this humanitarian effort were clear: With the onset of winter weather and the holiday season fast approaching, this vaccine had to be delivered as quickly as possible and failure (i.e. loss of vaccine) was not an option. The challenging move required temperature-sensitive truck and air transport from Toronto to Tashkent with control and visibility from point of pick up to point of delivery – ensuring the viability of the vaccine upon reaching final destination.

Lifeconex began coordination with the integral parts of the supply chain: the suppliers, the freight forwarder, the airlines, as well as the airlines ground handling agents at the airports in Toronto, Frankfurt (transit stop) and Tashkent. Tashkent, Uzbekistan, is not a widely serviced location for most airlines. The list shrinks dramatically when one considers airlines servicing Uzbekistan that offer cargo planes capable of transporting vaccines in the type of bulk required for this particular move.


Unicooler in transit.

Airlines offer different levels of expertise in the handling and storage of life science products. This vaccine required an environment of +2 °C to +8 °C from end to end. The company carefully evaluates airlines and has agreements with preferred partner airlines in place that possess industry leading standards in the shipping and handling of life science products. For this particular shipment, an airline was chosen that offered a service level that – when coupled with the built-in synergies Lifeconex shares with the preferred airlines within the network – assured that safe guards would be in place such as: special storage for the vaccines while in transit at a stopover on its way to Tashkent; regular temperature checks of the vaccines along the entire route; and pro-active escalation procedures in the event of any unforeseen circumstances.

### Proper Packaging Is Key

Packaging was an integral part of the initial analysis conducted by the company – considering the volume and the small window of allowable temperature range. Lifeconex chose an active heating and cooling container. Twenty-six of these LD3-sized containers were necessary to transport the intended volume of vaccines. This type of container was the best available solution for this particular shipment because it operates utilizing a calculated amount of dry ice, while simultaneously possessing the capability to be plugged in due to its rechargeable batteries. In effect, the power provided by the batteries enables the container to maintain a set temperature that will not fall below the indicated mark. This also lessens the impact of varying temperature conditions on the outside of the container while in transit. For instance, the recorded average temperature in Toronto for November is a high temperature of +7 °C and a low temperature of –1 °C. The potential for deviating below the allowed set point of +2 °C for this vaccine would be increased had the container solution not been chosen from the outset.

Another consideration to take into account was customs regulations involved in transporting vaccines into a remote country such as Uzbekistan. The majority of airlines would not allow for special containers to be transported into areas that are still considered to be emerging markets. This is primarily due to the fact that many of the airline hubs in these emerging markets are not equipped to handle or store such special equipment. This was the case with Tashkent, Uzbekistan. Leveraging relationships and working with integral partners would be the only means of realizing this particular transport. Because of the humanitarian nature of this project, Lifeconex was able to negotiate with the airline to lift the ban on transporting the heating and cooling containers into Tashkent for these shipments.

*Packaging was an integral part of the initial analysis conducted by the company – considering the volume and the small window of allowable temperature range.*

© Wolfgang Pilz/Flickr

Loss of vaccines through logistical mistakes is never an option.

### Coordination: Toronto To Tashkent

Securing the capacity for 18 t of vaccines was attained with support provided by the airline. The company assured that blocked space across a scheduled four flights over four weeks would be provided for the 26 LD3-sized heating and cooling containers for lots of 6, 6, 7, and 7 containers.

For each of these shipments, Lifeconex coordinated with the forwarder in Toronto to dispatch temperature controlled trucks set to +20 °C to pick up the already pre-conditioned (set at +5 °C) containers from the airline in Toronto. This same temperature controlled truck was then utilized to transport the containers directly to the manufacturer's warehouse in Toronto. The pre-conditioned pallets of vaccines from the shipper's warehouse in Toronto were then strapped inside the containers to protect the vaccines from the physical hazards involved in the movement itself. Temperature sensitive measuring devices were placed inside the pallets containing the vaccines to ensure that the temperature of the vaccines was constantly measured. These same devices would have to be verified before the vaccines could be released for distribution in Tashkent.

Upon arrival at the transit stop for this route, the company checked with the airline to ensure that the containers were removed from the aircraft as quickly as possible and stored properly in +15 °C conditions. The containers were then connected to outside power sources and dry ice was replenished as necessary as the flight to Tashkent was not scheduled to leave until the following day.

### Uzbekistan's Role

From the start of the process, Lifeconex had been working with a non-profit organization in Uzbekistan as well as the local government authorities in Uzbekistan to lessen any delays in clearing customs upon arrival of the vaccines at the airport in Tashkent. As a result of these negotiations, the local governing authorities offered to provide the temperature-controlled trucks necessary to deliver the vaccines directly to the end user's warehouse in Uzbekistan. These same temperature controlled trucks would also act as temporary storage facilities for the vaccines during the customs clearance process, because the airline in Tashkent did not possess a temperature controlled facility.

The company worked with the airline to allow for the temperature-controlled trucks to have access to the tarmac directly underneath the plane. The pallets of vaccines could then be unloaded from the containers directly into the temperature controlled trucks on the tarmac, keeping handover risk and temperature exposure to a minimum.

Once the vaccines were delivered to the end user's warehouse in Tashkent, the temperature monitor readings were read and found to be within specifications for all 4 lots of vaccines transported to Tashkent. The 750,000 vaccines sent, allowed the children of Uzbekistan to be immunized properly throughout the remainder of the winter season.

Lifeconex was the decisive factor in creating this tailor-made solution. Successful execution of critical temperature sensitive life saving vaccine shipments relies on dedicated people focusing on developing, implementing and process managing a customized cold chain logistics solution.

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# Pharmaceuticals at the Right Temperature

Pharmaceuticals require temperature controlled transportation at all times, on ground, during storage and in the air, as they do not admit long transit times.

Currently, Cargolux's pharmaceutical shipments are mostly generated by the company's European stations, with the biggest part contributed by Cargolux, Germany, Belgium and Switzerland, with destinations in the U.S., Asia, the Middle East, Africa and Australia.

The biggest share of Cargolux Germany's pharmaceutical shipments is destined for Indianapolis, which was specially added to the Cargolux route network for this purpose. Cargolux Brussels has mostly been involved in the transportation of human vaccines destined for Asia, Australia, New Zealand and the U.S., plus some ad-hoc shipments to South America. In order to offer a better service to their clients, the vaccines are directly picked up at the client's plant, guaranteeing perfect temperature control. Furthermore, from Denmark regular insulin shipments for South America and Lebanon have been carried out.

Switzerland is the traditional market for pharmaceutical and chemical products with a worldwide distribution platform, fully supporting the Cargolux service, and mostly using cool containers for those products, either Cargolux owned or leased containers from other suppliers. Imports of pharmaceuticals are mostly from the U.S. and from Japan into Europe.

The company is well-established in the pharmaceutical community, with more and more pharmaceutical companies shifting their business to Cargolux.

Due to stricter regulations implemented by the U.S. Department of Agriculture (USDA) and the U.S. Food and Drug Administration (FDA), the unbroken cool chain is a real challenge to maintain the required temperature. For this purpose, Cargolux has created a ,"keepcool team," based on a cross-divisional function, with the aim to optimize the process, the follow-up, the monitoring and the supervision of the unbroken cool chain up to the final destination. The keepcool team also works closely together to provide solutions to our customers and to Cargolux stations for any new temperature sensitive business.

About three hours prior to departure to Luxembourg, the thermo-trucks are pre-cooled to the required temperature. Upon arrival in Luxembourg, the precious shipments are stored at the required temperature during their short transit time in Luxembourg, then loaded o/b Cargolux's B747-400 freighter, under the supervision of dedicated Cargolux staff. The Luxair Cargo Center offers special cool cells for the storage of such high-sensitive products, where the temperature can be regulated from 0–20 °C.

In case of any discrepancy occurring during storage or transportation, forwarders and shippers are informed pro-actively. Upon arrival at final destination, shipments are immediately taken care of and stored in the available cool storage area at destination, to await pick-up by the customer.

At selected airports, complete ULD's can be picked up at the aircraft and immediately stored in the cool truck. In order to provide the required space for those shipments and to prepare the thermo trucks in line with client's request, the forwarders communicate their space and service requirements in time. Confirmation of the booking has to follow 96 hours prior to shipping, and instructions to Cargolux have to be clear and precise.

It should be mentioned that the transportation of pharmaceuticals requires team work – stretching from the shipper to the consignee where everybody involved in the supply chain has to perform according to the requirements of the product.

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