



Markets

A New Menu for Petrochemical Feedstock: Prospects Depend on Oil Prices, Shale Gas, and China

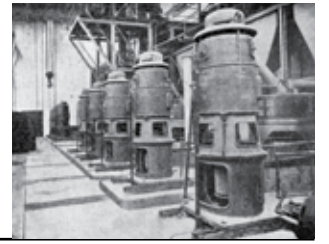
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THE NEWSPAPER FOR THE
CHEMICAL AND
LIFE SCIENCE MARKETS

Production

A Pioneer through the Years: Ullmann's Encyclopaedia of Industrial Chemistry turns 100

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NEWSFLOW

Companies:

Lanxess announced in a surprise move on January 26 that CEO Axel Heitmann would step down on Feb. 28 and be succeeded by former CFO, Matthias Zachert who will return from his current engagement with Merck KGaA, at the latest in May.

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Economy:

CEFC released its latest Facts and Figures report providing the most up-to-date information about the EU chemicals sector.

More on Page 16

M&A-News:

Actavis of Dublin, Ireland is acquiring specialty pharmaceuticals company Forest Laboratories, New York, in a cash and stock deal valued at about US-\$25 billion.

Bayer has met its target for the acquisition of Norwegian pharmaceutical producer Algeta. On Feb. 26 it had received acceptance from an estimated 97.23% of the company's share capital.

Merck KGaA has once again extended its offer for AZ Electronic Materials because additional time is needed to allow the Chinese antitrust authority to review filings.

More on Pages 5-6

Investments:

Toray Industries has purchased 400 acres of commercial land in Spartanburg County, South Carolina, to build up a U.S. base for advanced materials. The company said it planned to invest US-\$983 million at the site up to 2020.

BASF and Sinopec have broken ground for the world-scale isononol (INA) plant the two groups are building at Maoming, China and scheduled for start-up in 2015.

More on Pages 9, 14

Pharma:

German drugmaker Boehringer Ingelheim is being confronted with more than 2,000 lawsuits in the U.S. related to its blood thinner Pradaxa.

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An Entrepreneurial Spirit

International Chemical Investors Group is Looking to Expand its Two Major Platforms, Says Achim Riemann

Investing in Chemicals — International Chemical Investors Group — better known by the initials ICIG — has become a household name in the chemical industry recently. The privately owned industrial holding company focuses on buying up chemical and pharma assets from companies looking to divest; since its inception in 2005, ICIG has acquired 20 businesses, most recently Germany's AllessaChemie and Clariant's Detergent and Intermediates business unit. When asked about his company's role model within the industry, Managing Director Dr. Achim Riemann said, "Definitely Ineos on the commodity chemical side." Brandi Schuster caught up with him in his Frankfurt office on the company's direction and plans for growth.

CHEManager International: ICIG seems to be in the market for companies with a long-standing history and origins in major global chemical or pharmaceutical corporations. Is this just a coincidence or is it a part of your strategy?

A. Riemann: It is definitely a part of our strategy. We deal primarily with large corporations who are looking to sell off assets that are no longer strategic. We were founded in 2005, a time when a lot of change was happening in the chemical industry; back then, companies were particularly interested in divesting fine chemicals assets. Later we moved into pharma, but the principle was the same. Many large companies are unable to fully utilize their assets, and an overriding theme right now is custom manufacturing. In our pharma business, about 70% is CMO for APIs and drug products. We almost always turn down offers from privately owned sellers because that is not our direct focus.

So your focus is on buying up parts of companies who are looking to divest anyway, such as your recent purchase of Clariant's Detergents & Intermediates business unit.

A. Riemann: We obviously look for businesses that fit into our two major platforms: WeylChem for non-GMP fine chemicals and intermediates and CordenPharma for pharma. We are interested in anything that fits under those two umbrellas; the assets we buy are typically plants themselves or businesses with plants. The Clariant acquisition, for example, was two plants with a business and a good fit: It's custom manufacturing and includes products that fit into our existing fine chemicals product range.

What about aggressively going after assets rather than waiting for a divestment?

A. Riemann: We also go after things we want, and we ask people if they are willing to sell. This usually happens when we have the feeling that an asset is no longer strategic to the potential seller. However, we are usually approached by sellers.

ICIG owns facilities in Europe and in the U.S. Are there any other regions where you'd like to get a foot in the door?

A. Riemann: In our Pharma platform Corden, we have assets where Big Pharma is divesting; while we would be interested in plants in India or China, there is simply nothing up for sale there. That's where most of the pharma companies are currently investing in plants.

What trends are influencing how you buy and your overall strategy?

There are a few assets on the market that are of interest to us.



Dr. Achim Riemann, Managing Director, ICIG



A. Riemann: We certainly look at competitiveness, and this has dramatically changed in the fine chemicals

We want to double, if not triple, our pharma business.

area. Within non-GMP fine chemicals, most of the excess capacity has disappeared, particularly in North America. There are not very

many players left who can supply agro customers as contract manufacturers, for example. The same holds true for Europe. This area is now well consolidated, and with the increased competitiveness of North America, particularly in light of its low-energy costs and raw-material advantage, we are happy to have a substantial site there. We are also seeing good utilization of our plants in Europe.

What about the cost disadvantage of manufacturing in Western countries?

A. Riemann: I am convinced that we have seen the maximum difference in cost competitiveness when comparing Europe to China. The gap is narrowing, and people are now more and more interested in reestablishing supply chains in Europe.

How do you plan to grow these two integrated businesses with the APIs under Corden and the non-GMP fine chemicals under WeylChem?

A. Riemann: Our strategy for Corden is to acquire additional sites from Big Pharma. We are currently involved in ongoing discussions with pharma companies regarding API and drug product plants; we are particularly interested in assets that comple-

ment our CMO technology base, but we are also interested in adding capacity. For the time being, we are not interested in acquiring a smaller CMO; that is not our focus.

What role does ICIG play after these assets have been purchased?

A. Riemann: We typically restructure them; the assets we buy were either neglected or are in areas where there is a high competitive intensity with low margins. We work to create an entrepreneurial spirit within those companies by having a management team that focuses solely on the business and cost structures. Looking at our two bigger platforms, we are also able to generate substantial synergies. However, we are also flexible; we are willing to open up another platform apart from pharma or the non-GMP fine chemicals sector.

Could you be more specific?

A. Riemann: There are a few assets on the market that are of interest to us, but I don't want to be more specific than that for now.

What are your company's goals in terms of size and growth?

A. Riemann: Looking at WeylChem, it is a top five company worldwide in terms of non-pharma custom manufacturing, which means we have been able to build up a considerable amount of critical mass. This is something we're still working towards for our pharma business; we want to double, if not triple, our business here, getting it into the €1 billion range in the mid- to long term. Our pharma business is at around €350 million right now, but there are plenty of opportunities out there, and I am confident that we can reach our goals in due course.

"The secret of joy in work is contained in one word – excellence. To know how to do something well is to enjoy it."

Pearl S. Buck, Pulitzer Prize winner

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Brandi Schuster,
CHEManager International

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Auf Wiedersehen!

Before I even began my role as editor in chief of the (then) brand-new newspaper CHEManager Europe, my soon-to-be boss Michael Klinge sent me a few issues of CHEManager with a note:

Enjoy these last couple of weeks before CHEManager Europe takes over your life.

It kind of sounded like a threat that was only somewhat watered-down by the smiley face he had drawn at the bottom of the note. Wondering what the hell I had gotten myself into, I showed up to my first day of work in August 2005 completely overdressed with very little knowledge of the chemical industry. What followed were weeks and months of baptism by fire, figuring out how to get good authors to write about good topics for us ... and what those topics were. A few months into the job, I found myself at the CPhI in Madrid, almost as clueless as I had been a few months prior, but not so much overdressed. In the press office, a fellow journalist engaged me in a conversation, then said, "What are you doing here? You don't really belong here, do you?"

He was right; I came to CHEManager Europe from a job teaching English at a school in Frankfurt. My only redeeming qualities were my degree in journalism, an internship I had done at the prestigious Frankfurter Allgemeine Zeitung and the fact that I could speak English and German. I spent my first year on the job asking questions, leaning on my wise colleagues for support and learning to navigate my way through the maze that is the chemical industry.

Since then, CHEManager Europe has grown by leaps and bounds, becoming one of the leading newspapers for the chemical and pharma industries. We've established a strong online presence ... and our Twitter feed now boasts over 1,500 followers. This year, CHEManager Europe became CHEManager International, and looking back on the last nine years, I can say that the newspaper has exceeded my wildest expectations.

Since 2005, I have had the opportunity to interview some fascinating people — from German chemist Michael Braungart to Danish academic Björn Lomborg — and I have been fortunate enough to build up a solid network of colleagues within the industry who I know I



can call on for anything at a moment's notice. I have had the honor of working with fantastic authors and industry experts, all of whom have played an integral role in making CHEManager International into the newspaper it is.

This issue is the last issue for me as editor in chief; I am leaving to join the internal communications team at Henkel in Düsseldorf on April 1. Thanks to the years-long support of our readers, authors and clients, I know that we have laid the foundation for a successful future for the CHEManager brand. It has been such a rich time for me and an honor to have been at the helm of this publication.

When that fellow journalist asked me, "What are you doing here," I didn't have an answer. But now, almost a decade later, I think the results speak for themselves. Here's to many more successful years of CHEManager International.

Brandi Schuster

Lanxess CEO Heitmann Steps Down

BUSINESS— Former CFO Zachert to Return and Take the Helm in May

In a surprise move, German chemicals, plastics and rubber producer Lanxess announced that Axel Heitmann, chief executive since the company's split from Bayer in 2004, would step down on Feb. 28 and be succeeded by former chief financial officer, Matthias Zachert.



Matthias Zachert



Axel Heitmann

Germany — Current CFO, Bernhard Düttmann, will function as acting CEO until Zachert returns, at the latest in May. In mid-2011, Zachert moved from Lanxess to German chemicals and pharmaceuticals producer Merck KGaA, where he currently serves as CFO.

Lanxess said Heitmann's resignation was by mutual agreement. While remarking that the 54-year-old CEO "played a key role in shaping the company since its creation, through consistent restructuring and strategic portfolio measures," supervisory board chairman Rolf Stomberg said, "Lanxess is facing significant challenges, for example,

in terms of market capacities and business portfolio, and the board "believes it is the right time to hand over responsibility to a new leadership in order to overcome these challenges."

The board is said to have been unhappy with the recent performance of the world's leading manufacturer of synthetic rubber. The weakness of automotive markets has hit hard. In September 2013, Heitmann announced the "Advance" efficiency scheme, set to run until the end of 2015 and achieve annual savings of €100 million. It goes hand-in-hand with the loss of 1,000 jobs worldwide.

The 46-year-old Zachert, who Stomberg said "performed excellent work as chief financial officer

and has an outstanding reputation among employees as well as in the capital market," will have his work cut out for him. On Feb. 26, Lanxess said it expected to report a net loss of €159 million for full year 2013.

Due to expected development of overcapacities, as well as raw material and energy costs, future cash flow contributions may no longer reflect the book values of the business units Keltan Elastomers and High Performance Elastomers, as well as Rubber Chemicals the company said.

At the beginning of Q4 2013, full-year guidance already had been narrowed, with EBITDA pre-exceptionals in the range of €710-760 million forecast. The previous target was up to €800 million. (dw)

W.R. Grace Exits Bankruptcy in U.S.

U.S. — Chemical producer W.R. Grace has emerged from Chapter 11 creditor protection after almost 13 years. The company filed for protection in April 2001 after facing nearly 130,000 personal injury and property damage claims attributed to asbestos contamination from its products.

Some 120 of the claims stemmed from mining operations in Montana, where Grace operated a vermiculite

mine and processing mill from 1963 to 1990. In 2008, the company filed its first joint reorganization plan to facilitate emergence from bankruptcy. However, it took until early 2011 to settle appeals cases.

The final reorganization plan, which took effect on Feb. 3, establishes two independent trusts, funded with US-\$4 billion, to finally resolve all claims. Prior to declaring

bankruptcy, Grace had paid more than US-\$560 million in claims.

While operating under Chapter 11, Grace completed 25 acquisitions, including the US-\$500 million takeover of the Unipol polypropylene licensing and catalysts business from Dow Chemical, in December 2013. Over the period, sales revenue grew from US-\$1.6 billion to US-\$3.2 billion. (dw)

Major Staffing Headaches

Swiss Anti-Immigration Vote Could Impact Chemical / Pharmaceutical Sector

Switzerland/EU — Switzerland's narrow 50.3% approval of the nationalist party SVP's referendum to limit immigration on Feb. 9 could cause major staffing headaches for companies such as Novartis, Syngenta and Roche, observers said as the outcome became known.

One of the implications of the vote is that priority must be given to Swiss nationals when filling new positions. It is not specified, however, how high the ceiling for non-citizens should be. This will be up to the Swiss government to determine over the next three years.

An estimated 45% of all employees of the country's chemical, pharmaceutical and biotechnology industries are believed to be foreigners, and multinational enterprises that move personnel between their worldwide operations could

potentially face barriers. Another estimate pegs employment of non-Swiss in the health care sector at about 50%.

Around 56% of Swiss exports go to the EU. As the country is home to five of the top 50 European companies by market capitalization, it relies heavily on skilled migrants as staff.

Reports said Canton Basel, the center of Switzerland's chemical industry, voted heavily against the limitations on migrants, as did Canton Zurich, where the international finance sector is located. About half of the Swiss financial industry is said to be steered by foreigners.

Many top executives of Swiss chemical and pharmaceutical companies are foreign citizens. Richard Ridinger, CEO of Basel-based Lonza, is German, as is Clariant CEO Hariolf Kottmann. At Syngenta, only one of the executive board members, Christoph Mäder,



is Swiss, responsible for legal and tax matters, is Swiss.

The remaining nine are British, American and German. CEO of Vifor Pharma, David Ebsworth, is British.

Ironically, SVP member Christopher Blocher, former owner and

chairman of chemical producer Ems-Chemie, was one of the initiators of the anti-immigration forum. In 2004, when he was elected to the lower house of parliament, the Bundesrat, he ceded all shares in the company to his children.

While the Ems group's managing board is purely Swiss — Blocher's

daughter, Magdalena Martullo, is CEO — one of the four supervisory board members, former BASF executive Werner Prätorius — is German. Of the 1.8 billion Swiss franc total, 863 million francs in annual sales represent trade with the European Union.

The anti-foreigner vote has caused ripples throughout the EU, which 12 years ago signed a bilateral agreement with its Alpine neighbor, guaranteeing freedom of movement and allowing EU citizens to work in Switzerland. The Swiss initiative "runs counter to the principle of free movement," a spokesman for the EU commission said on Feb. 10.

Leaders of the EU were scheduled to convene the same day to assess the fallout from the referendum. The initiative's success is seen generally in Europe as a rebuke to the Swiss government, as well as leaders of business, banking and industry, who argued that a fa-

vorable vote could have undesired economic consequences. Immediately following the vote count, the government in Bern said it would go to work drafting a proposal to parliament on how to implement the results.

According to the stipulations of the referendum, the government must renegotiate its accord with the EU within three years. While some observers said the Swiss parliament could revoke the free movement rules altogether, European officials and the European Parliament said there was no scope for negotiation.

Switzerland has one of Europe's highest proportions of foreigners. Although many job seekers have arrived from countries hit by the euro crisis, the largest national contingent is from Germany, an estimated 300,000, followed by Italy. Another impending referendum calls for capping the immigration rate at 0.2% of the Swiss population, which totals 8 million. (dw)

Productivity Declines, Wages Increase

TARIFF — Belgium and Germany With Highest Labor Costs in EU

Chemical industry workers in Belgium and Germany are still the EU's best paid, the latest survey of labor costs by the German chemical employers' association (BAVC) shows. The survey, published shortly before the beginning of negotiations on a new contract for German workers, also looked at pay in the U.S. and Japan.

Belgium/Germany — In western Germany — a different pay scale applies to the five "new" states in the former German Democratic Republic — the association said chemical company wages in 2012 for the first time passed the €50 per hour mark, rising to €51.50. Industry-wide pay in western Germany also grew the fastest of any other EU country, it added, noting that in 2011 and 2012, wages in western Germany rose by 5% and 5.2% respectively, in the east by 9.4% and 7.2%.

Due to the euro crisis-fed recession, labor costs in Spain rose by only 2.3%, in Ireland by 2.7% and in Slovenia by 2.9% in 2012, while declining by 7.1% in Greece and 4.2% in Portugal. In euro terms, industry wage costs rose 8.7% in Sweden and 8.6% in the UK; however, BAVC said in national currencies the rise was only 4.8% and 1.5% respectively. In euro terms, U.S. chemical workers saw a 5.7% pay increase and Japanese workers a 7.7% rise, but in national currencies, wages actually sank by 2.5% and 0.6% respectively, the survey shows.

Behind Belgium and Germany, euro-denominated industry pay in Sweden, The Netherlands, France

and Denmark was the highest in 2012, with the latter on the same level as Japan, at €43 per hour. U.S. wages averaged €31 per hour. The worst-paid workers were in Bulgaria, earning only €4.28 per hour, followed by Romania, Poland and Slovakia. Hungary and the Czech Republic were the next worst paid at around €11 per hour.

Noting that the cost of labor is important not only for chemical producers' unit costs but also plays a role in where companies decide to invest, BAVC said productivity in Germany declined in 2011 as wages increased.

Even while calling for a cap on pay rises, the employers association agreed to a 3.7% wage increase for German workers. The union IG BCE had asked for 5.5% more over a 12-month period. The new contract on wages and working conditions in the German chemical industry agreed on Feb. 5 calls for a linear pay increase of 3.7% over a 14-month period for about 550,000 employees of approximately 1,900 chemical and pharmaceutical companies.

Industry apprentices also will receive more pay. Over the period 2014 to 2016, the employers have pledged to create 9,200 new apprenticeships per year.

The agreement will take effect retroactive to Feb. 1 in three federal statements. In the thirteen remaining states it will be put in place from Mar. 1 or April 1.

Both sides also agreed that companies in financial difficulty can postpone the increase for two months. In separate statements, IG BCE and BAVC called the new contract "a reasonable and viable compromise." (dw)

France Adopts „Florange Law“

France — Businesses that close plants deemed to be still economically viable face fines under a new law adopted by the French parliament.

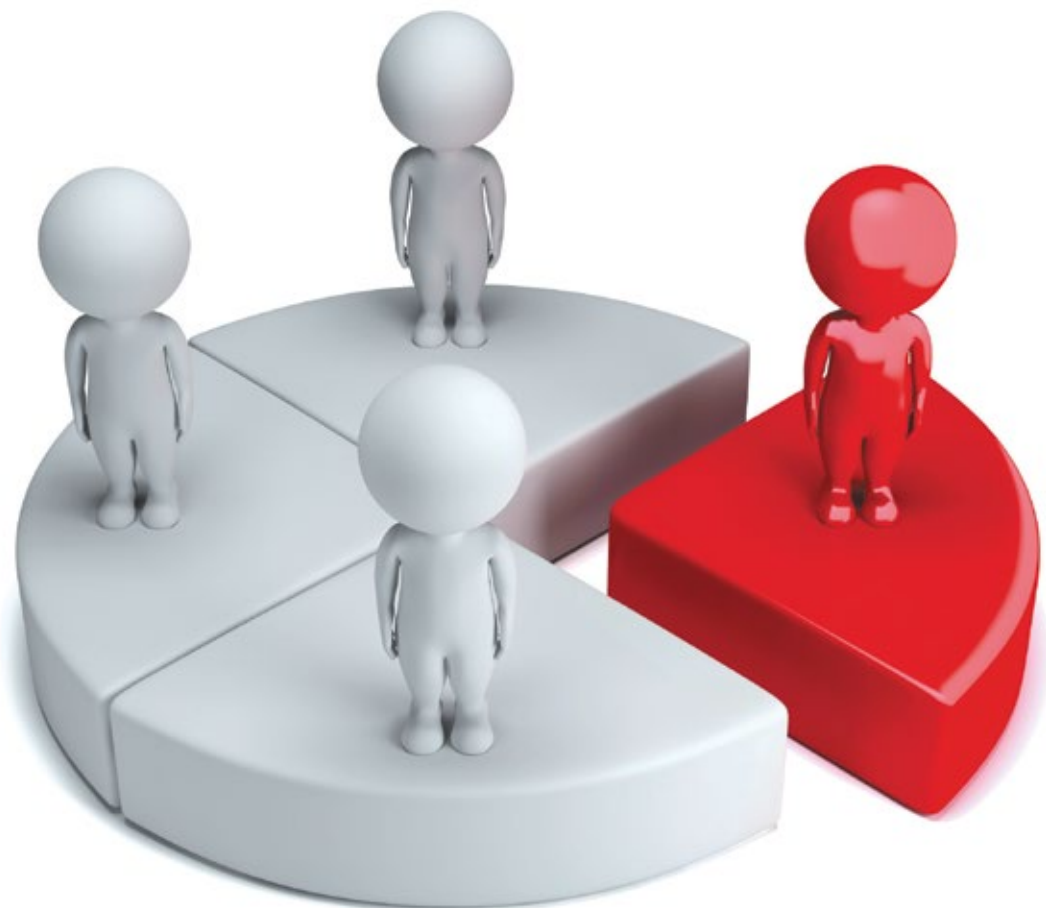
The so-called "Florange Law" was named after an ArcelorMittal steelworks in the northeastern French town where the plant's imminent closure became a symbol of prime minister Francois Hollande's 2012 presidential campaign.

It obliges the head of any company employing more than 1,000 people to spend three months look-

ing for a buyer before closing a plant. Failure to do so carries a fine of €28,000 per job lost, up to 2% of annual revenue.

The Florange plant did eventually close, but the law fulfills a promise President Hollande made to workers that has attracted criticism from both sides of the country's fierce debate over industrial policy. Employers' groups say the law contradicts Hollande's pledge to be more business friendly, while trade unions say it does not go far enough to protect French workers. (dw)

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Countering Commoditization

The Aging of the Chemical Industry

From Unique To Common

In the business world, commoditization is defined as the process by which goods that are initially distinguishable in terms of attributes (uniqueness or brand) become simple, undifferentiated and easily available. Commoditization is usually accompanied by prices changing from differentiated and relatively high to undifferentiated and relatively low as the number of competitors increases.

The chemical industry is a relatively mature one, with many big products already on the market for several decades. Commoditization, therefore, is highly relevant for the industry and is the reason behind many activities of key industry players. On one hand, commoditization has pushed many chemical companies toward decreasing their portfolio's share of basic chemicals while increasing the share of specialty chemicals. On the other hand, commoditization exerts constant pressure on specialty chemicals companies. How can they protect their products from becoming commodities? Or is the process unavoidable and only countered by constant innovation and the creation of new products?

Know Your Position

The current overall product range of the chemical industry is best regarded as a continuum between pure commodity chemicals and pure specialties. However, successfully operating in the market for a specific chemical requires a good understanding of the position of this chemical in the continuum. For the key to success in commodities — spending as little as possible to produce a standardized product — is very different from that in specialties — spending as much as can be justified by the specific features differentiating the product.

For a chemical company, it is mandatory to know the market life cycle of its products: Which products are commodities; which are specialties? Typical indicators for commodities are an increase in the number of competitors, excess capacity and lower demand, decreasing need for



Dr. Kai Pflug
CEO,
Management Consulting

technical service, emergence of low-cost competitors and decreasing effectiveness of the sales force.

For most chemical businesses today, the situation is not as clear as that. They operate somewhere between the two extremes, competing in a zone where commoditization prevents players from exclusively focusing on specialties, and encourages commodity-oriented players to capture additional value. In this no man's land, price- and performance-based competition coexist uneasily.

Survival In Commodity Chemicals

Pure commodity chemicals have only one market price. As a consequence, commodity players' margins depend directly on their cost positions. Players without a viable business have costs that are higher than the market price; the costs of marginal players are close to market prices. Therefore, improving the situation requires improving the cost position, for which options such as outsourcing, reduction of production and raw materials costs, and lower-cost distribution channels (e.g., web-based sales of low-margin standard products) can be considered. In some cases, it may be possible to successfully brand a price-sensitive commodity, particularly if end applications with particular focus on quality or specific properties can be identified. Customers in these application-oriented segments may be willing to pay a price premium and may in the long run also be offered specialties with tailor-made attributes. The key is to be market-oriented rather than product-focused. For steel, Tata has successfully utilized this approach, establishing a very strong brand name in steel and also engaging in co-branding with some of its major customers, particularly in automotive.

Doing Well In Specialties

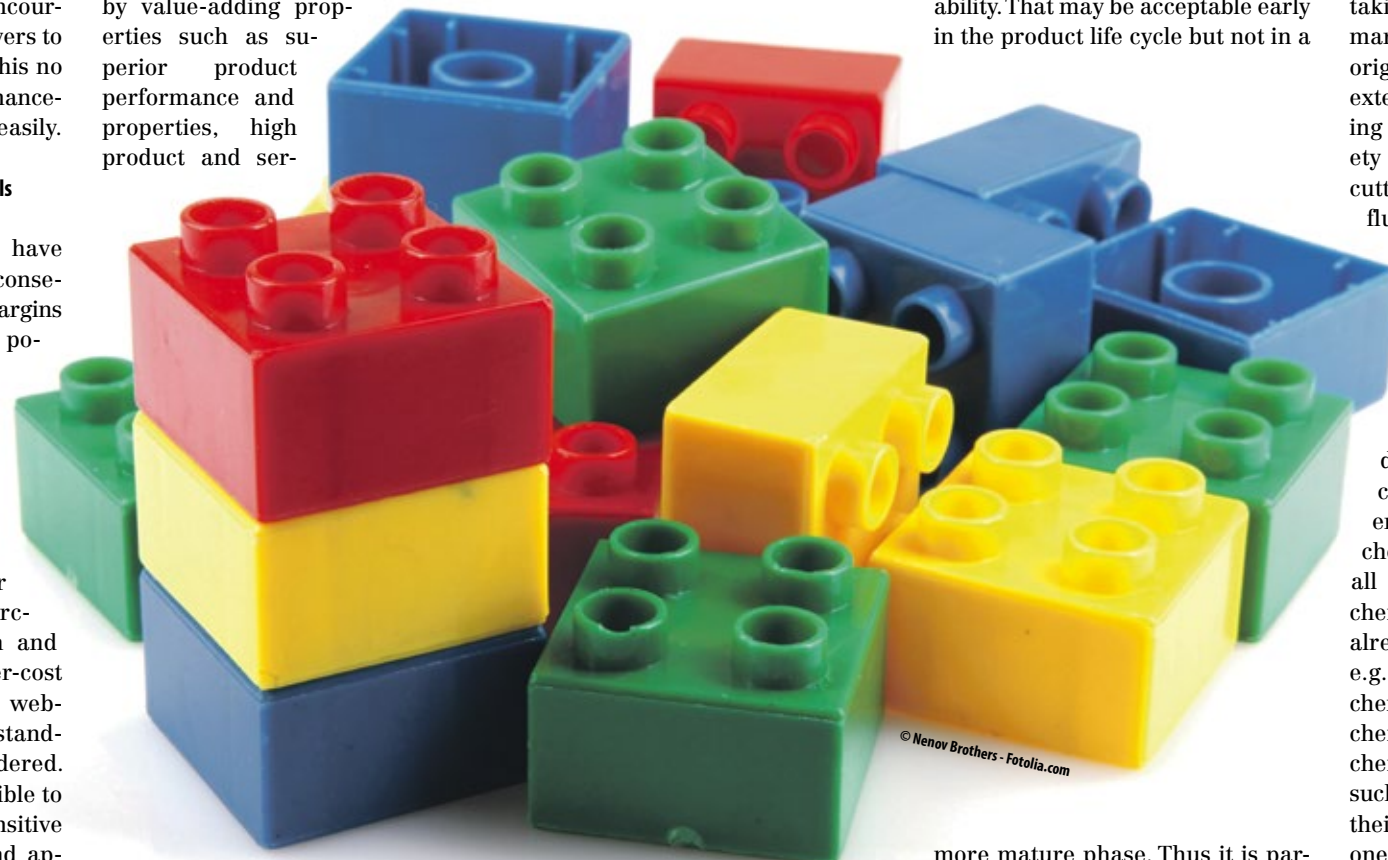
At the other end of the continuum, specialty businesses compete on the

basis of differentiation. Successful specialty players' margins increase the more they invest, whether in manufacturing differentiated high-value products, in research and development leading to new offerings, or in marketing and sales to convince customers that their premium pricing is justified. In contrast, non-viable and marginal players do not spend enough — or wisely enough — to justify the premium prices they seek. Attention, however, has to be paid to SKU management.

In any case, the threat of commoditization is always there and needs to be countered by value-adding properties such as superior product performance and properties, high product and ser-

customer relationships and do buy some time for breakthrough innovations. However, they also add to internal complexity and cost, particularly with regard to the supply chain. Customized products are particularly relevant for customer industries with a small number of dominant customers with high entry barriers, such as automotive OEMs, which may require the certification of individual grades of polymer blends supplied by polymer producers and compounders.

Specific measures for products in the transition from specialties to commodities. Measures that focus



more mature phase. Thus it is particularly relevant in those markets that only now reach some kind of maturity, e.g., China. Here, many multinational companies have already shifted from incentives based on sales volumes to one on profit, though this necessitates the establishment of additional tools and the broader sharing of profitability knowledge with the sales staff.

Cost optimization. Trim costs and acquire competitors (with profitable customers) to extract maximum scale economies in procurement, manufacturing and distribution. The establishment of the low-cost, online-only Xiameter brand of Dow Corning is an example of such a cost optimization.

Pricing. If you are not a low-cost producer, do not base your prices on material volume or another easily comparable parameter but rather on the value created by your products. For example, a German specialty chemicals producer developed a polymer additive for drying nets used in paper production. This product doubled the lifetime of the nets. Pricing was then based on this fact, leading to a price increase of 30% compared with competitive products and to additional profit for the producer.

Cooperation with customers. Enhance the customer relationship both on a vertical and horizontal level by linking problem-solving innovation, marketing and operations. For example, Ajinomoto, a leading manufacturer of amino acids, has partnered with Toray, a leading

manufacturer of nylon, for the creation of bio-based nylon products from Ajinomoto's raw materials.

Volume expansion. Examine the potential for volume expansion, e.g., via regional expansion or scale-driven mergers. For example, BASF has considerably expanded its portfolio and presence in specialty chemicals via a number of acquisitions, including Cognis and Ciba.

Portfolio diversification. Does the customer need other products in conjunction with products you offer? Consider offering them. Decide whether to make or buy these other products. In the latter case, consider taking up a dealership or regional marketing partnership with the original manufacturer. Oemeta has extended its portfolio in metal working fluids to include a broad variety of categories from coolants and cutting oils to lubricants, hydraulic fluids, cleaners and additives.

One-stop shopping. Are chemicals only a minor production input for the customer? In this case you can offer to purchase all chemicals for the customer, thus helping the customer to reduce complexity and potentially cost. If you can do this for several customers, you can buy the chemicals in bulk, achieving overall lower purchasing prices. Such chemical management service is already offered in some industries, e.g., in aerospace (e.g., Haas offers chemical management of aerospace chemicals). And of course, leading chemical distribution companies such as Brenntag and Univar regard their offer of one-stop shopping as one of their key strengths.

Branding. Devise a branding strategy that focuses on the unique value of your offering: product, service, supply and logistics benefits, and added value beyond customer's expectation and needs. Explain to your customers why your prices are higher and show them how you deliver more value. Deliver this message through every channel. Branding can either focus on the corporate brand (e.g., BASF, DuPont) or on individual product brands (e.g., Plexiglas, Dulux).

In conclusion, there are two basic approaches to combatting commoditization. One is to create new products while accepting that established products will commoditize. The other is to slow down this very process by modifying the existing products. Given the damage commoditization can do to the profits of chemical companies, they are well advised to pursue both approaches simultaneously.

Dr. Kai Pflug, CEO, Management Consulting — Chemicals and Dr. Ralf-Roman Rietz, Oemeta

Contact:

Dr. Kai Pflug
Management Consulting — Chemicals
Hong Kong, China
Tel.: +86 1 36 81 87 39 92
kai.pflug@mc-chemicals.com
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vice quality, speed of service and delivery, and other unique added values. In particular, consider the following:

Focus on new products. While this has long been regarded as the most promising way to escape commoditization, it is increasingly difficult to create breakthrough products in an industry as mature as the chemical one. The success rate — at least of internal R&D — is reported to be decreasing unless the work focuses on purely incremental innovation (which obviously has a lower potential to create true new specialties). In addition, customers seem to get pickier about untried chemicals as they often are already fairly happy with existing solutions, particularly in markets with a strong "good enough" segment, such as China. On the other hand, there is also the danger of a vicious commoditization circle caused by insufficient spending on innovation. Another issue is to find the right balance between business unit-driven research (which tends to result in new products for existing customers) and corporate-driven research (which may also lead to new products for new customers). For example, Evonik stresses the difference between the two types with separate organizations (individual BUs and Creavis).

Product customization. Customized products are a way to deepen

on helping the customer to save money (specifically, operating cost or capital costs) are particularly suitable as the shift from specialties to commodities is very frequently accompanied by increasing cost pressure on the part of the product users. For example, Stepan offers vendor-managed inventory for surfactants customers in cosmetics.

Service improvement. Align the service level with the amount the customer is willing to pay. This level may be different for different customers and for different parts of the service, e.g., customer service, after-sales service, technical support. Also pay attention to other service aspects accompanying the core product, such as delivery times, shipment quantities and payment terms. In some areas, the combination of products and services may lead to entirely new offerings, an example being the life-cycle management offered by sulphuric acid producers such as Rhodia (now part of Solvay).

Bundling. Offer other products or after-sales service at a discount. This may lead to a decrease in relative margin but will also increase the absolute one. For example, in polyurethanes several companies, including BASF and Bayer, have strengthened their systems business via the establishment of additional systems houses, which by definition focus on offering bundled PU systems.

Arkema Finds Chinese JV With Jurong, Eyes Acquisitions

France/China — Arkema and Jurong Chemical, China, have formed a joint venture, Sunke, in which Arkema will have the undisclosed majority stake. The new company will consist of the assets of Jurong's acrylic acid production at Taixing, China, started up in 2012.

The French chemical producer said the deal, which follows its recent start-up of a coating resins plant at Changsu, China, will enable

it to accelerate the development of its Coating Solutions segment in China and in Asia and supply customers in fast-growing markets such as superabsorbents, paints, adhesives and water treatment.

With an initial investment of US-\$240 million in a 160,000 t/y production train, Arkema will have an option to immediately double output to 320,000 t/y at a cost of US-\$235 million. (dw)

Kraton Performance Polymers and LCY to Merge

U.S./Taiwan — Kraton Performance Polymers, a producer of engineering and styrenic bloc copolymers (SBC), has announced plans to merge with Taiwan's LCY to create what the U.S. company called "an industry leader" in the SBC sector with annual sales of more than US-\$2 billion.

The deal foresees LCY selling its SBC business to Kraton in exchange for shares in a newly created 50:50 joint venture. Kevin Fogart, cur-

rently CEO of Kraton, will head the new company.

For Kraton, the merger will facilitate access to fast-growing markets in Asia, and the U.S. styrenics producer will also benefit from LCY's cost-efficient asset base and strategic sourcing of raw materials in Asia. LCY will gain access to Kraton's differentiated products, R&D platform and global market reach. (dw)

D-40211 Düsseldorf
Louise-Dumont-Straße 25
☎ +49 (0)2 11 / 15 97 76-0
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Viewing: Saturday, 8 March 2014, from 9 am to 3 pm and Monday, 10 March 2014, from 9 am to 5 pm and on the auction days from 8 – 9.45 am

Full auction catalogue upon request and at www.industriewert.de

A New Menu for Petrochemical Feedstock

Prospects Depend on Oil Prices, Shale Gas and China's Production and Consumption

Crack To The Future — The petrochemical feedstock world is changing. Historically most petrochemical feedstock came from the refinery, with refinery naphtha and liquefied petroleum gas (LPG) used as cracker fields. Some gas crackers were in regions where gas was readily available.

The oil boom in the Middle East initially created a problem: What to do with the associated gas? However, the potential for gas was soon recognized, and a huge expansion of petrochemical production occurred in the Middle East, with producers such as SABIC becoming major players, based on ready availability of cheap ethane.

Things are changing now in the Middle East; gas is becoming much tighter because of the competing needs of the power generation sector and petrochemicals production, and there have been signals that the subsidy, while not ending, may certainly become less advantageous in the future.

The Shale Gas Revolution

The shale gas revolution is starting to have a huge influence on petrochemicals. Shale gas has become economically viable because of advances in hydraulic fracturing and horizontal drilling techniques.

Shale gas availability is making U.S. gas competitive compared with crude oil; hence naphtha and U.S. petrochemical producers now have a significant cost advantage over competitors who are reliant on liquid feeds. Only the Middle East remains cheaper. But, as noted, gas availability is fast becoming an issue, and many new projects are using liquid feedstocks, effectively eliminating the competitive advantage.

So it is not surprising that the shale revolution is going global.



Andy Gibbins
Vice President,
Middle East, Euro
Petroleum Consultants

Huge potential exists in the Middle East, North Africa, Latin America, Asia Pacific and, very significantly, China. The most rapid developments are taking place in the Middle East and North Africa, where the oil field services are all in place and are already highly active. Developments have begun most significantly in Saudi Arabia, Oman, United Arab Emirates and Algeria. There is also significant potential in Libya, Egypt, Tunisia, Jordan and Morocco.

China is, not surprisingly, also active in developing its unconventional resources. The Chinese government has issued a development plan with a road map to turn to shale gas instead of coal; this is both for financial reasons and to reduce emissions. China anticipates a shale gas output of 6.5 billion cubic meters by 2015 — a very ambitious target given that output is close to zero now.

In summary, unconventional gas developments are accelerating and

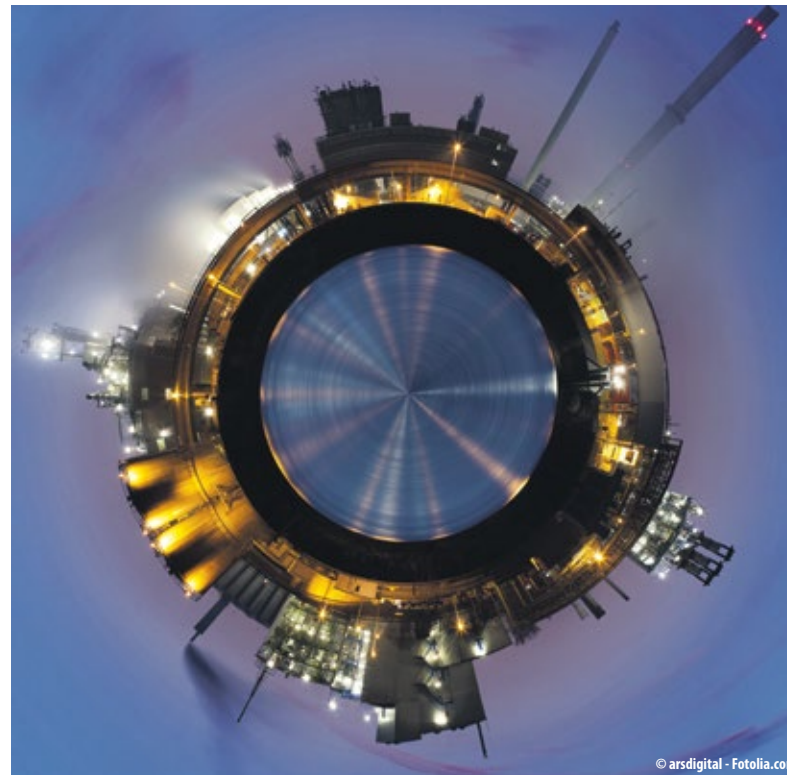
are having a huge influence on petrochemicals feedstocks. The attractiveness of liquid feedstocks will depend entirely on the future oil price; other routes to petrochemicals, including those from coal, are increasingly attractive, provided that some of the technical and environmental challenges can be addressed.

Technologies for a New Era

Coal is in abundant supply around the world. There are two internationally recognized methods for assessing world coal reserves. The first one is produced by the German Federal Institute for Geosciences and Natural Resources (BGR) and is used by the International Energy Agency (IEA) as the main source of information about coal reserves. The second one is produced by the World Energy Council (WEC) and is used by the BP Statistical Review of World Energy.

According to BGR, there are about 1 trillion tons of coal reserves left, equivalent to 130 years of global coal output in 2011. Coal reserves reported by WEC are lower: 861 billion tons, equivalent to 112 years of coal output.

China is the largest producer and consumer of coal. The reason behind



the dash for gas is that, environmentally, coal is less attractive currently than alternative feedstocks. Also, investment costs for coal-derived petrochemical facilities tend to be high.

However, as technology develops, these issues will be addressed, making coal an attractive route to petrochemicals. A number of technologies

are already in existence and more are being developed.

Coal can be used to produce olefins, chemicals such as VCM and PVC via acetylene, aromatics, ethylene glycol and ethanol. China is leading the way with development and implementation of such technologies.

Conclusions

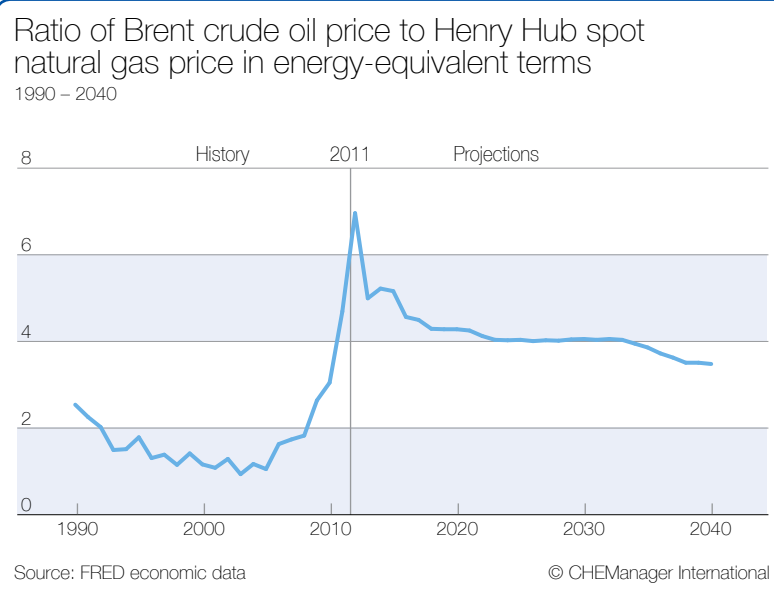
Against this backdrop, the future of petrochemicals feedstocks will continue to evolve. Shale gas and shale oil was virtually unheard of only five years ago but is now having a major influence on global supply and demand.

- The future of liquid-based petrochemical feedstocks will depend on future oil prices. Analysts expect prices to soften, at least in the short- to medium-term, which will give some relief to those operating liquids crackers. OPEC, of course, will try to maintain oil prices, but the growth of production by non-OPEC countries is a major challenge to the Organization of Petroleum Exporting Countries.
- Usage of gas as feedstock will continue to grow. The shale revolution is truly underway and will have a huge influence on availability of gas around the globe. Those countries that develop shale will have access to cheaper feedstocks. The U.S. is already feeling the positive effects of shale, with significant investment taking place in petrochemicals. China is uniquely placed given its dual status as producer and major consumer.
- China will continue to take advantage of abundant cheap coal and as technology develops, others may well follow China's lead. The environmental issue is the only factor that will inhibit growth in this area.

Andy Gibbins

Andy Gibbins is Vice President, Middle East with Euro Petroleum Consultants [EPC] based in Dubai. Prior to joining EPC, Andy spent over 20 years with Shell and NOVA Chemicals. EPC is a technical oil & gas consultancy with offices in London, Dubai, Moscow, Sofia and Kuala Lumpur. They are also the organizers of leading oil & gas conferences and training courses. EPC is organizing the MENA Shale 2013 conference in Abu Dhabi in December. Please visit www.mena-shale.biz or www.europetro.com for further details.

Andy Gibbins,
President, Middle East,
Euro Petroleum Consultants



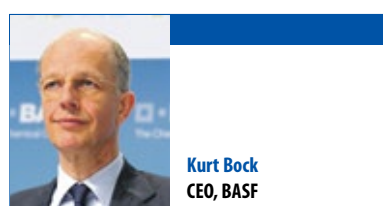
BASF Exudes Confidence at Results Presentation

SALES & PROFITS Shale Gas Perspectives in North America and Europe

At BASF's annual results presentation on Feb. 26, the mood was upbeat. Although the 2013 figures — group sales up 2.6% to €4 bn, EBIT before special items up 8% to €7.2 bn — would surely please management of most chemical producers — they are only part of the reason for the German group's confidence.

Germany — The message from Ludwigshafen seems to be that the world's largest chemical producer has positioned itself in the markets where it wants to be and has the financial and political clout to play hard ball.

Despite diversification into the "softer" fields of agriculture or nutrition, CEO Kurt Bock and CFO Hans Engel made it clear that BASF will continue to focus on its traditional fields of oil & gas and petrochemicals. "Ours in a fossil fuel-based society, and even adding renewables, fossil fuels will not fall below 85% of the energy mix," Bock asserted.



Kurt Bock
CEO, BASF

In contrast to U.S. rivals, BASF's perception of its own economic muscle evidently allows enough maneuvering room to dance to its own, rather than the stock market's tune. The group has no plans to launch another share buyback Bock said, instead preferring to invest in new plant and equipment or technology-driven acquisitions. From 1999-2008, it purchased around €10 billion worth of its own stock.

That — for the first time — BASF this year will spend more than half (51%) of its year's €20.2 billion capital spending budget outside Europe is an audible signal that the world is its home. As usual, China will swallow large sums in 2014, even if Bock hinted at a lack of enthusiasm for

the People's Republic plans to favor coal feedstocks.

In North America, where BASF has long had a strong presence, the lure of shale gas has executives in thrall. BASF Total Petrochemicals, the 40:60 venture with France's Total, is currently retrofitting a naphtha cracker to run on an ethane-butadiene mix. But Bock stressed that — unlike Ineos — his group has no plans to export shale gas-derived ethane to Europe, as "this is too costly."

Engaged in vertical hydraulic fracturing (fracking) for many years in northern Germany — in the CEO's words "without a single problem" — the Ludwigshafen chemical giant is eager to produce shale gas at home. It is currently participating in seismic studies to determine any earthquake risk. Quoting estimates that Germany could have sufficient reserves to meet its needs for around 10 years, Bock said it "would be foolish not to take advantage of this." (dw)

Merck Extends Offer for AZ Electronics Again

Germany — Merck KGaA has for the fourth time extended its offer for AZ Electronic Materials. The German chemical and pharmaceuticals company said additional time is needed to allow the Chinese antitrust authority to review filings. The newest deadline for AZ shareholders to accept the offer is March 14. While

discussions with the Ministry of Commerce of the People's Republic of China (MOFCOM) are proceeding constructively and are advancing, MOFCOM's review is still continuing in the ordinary course, Merck said. Antitrust clearance in Japan was granted on Feb. 10. Authorities in Germany, Taiwan and the U.S. have

already given the green light. As of Feb. 28, AZ shareholders had tendered stock worth around 64.03% of the company's existing share capital, Merck said. On December 5, Merck announced it had agreed to buy AZ Electronic Materials for about £1.6 billion (€1.9 billion) in cash. (dw, mr)

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Pharma In Africa

Continent Full of Challenge and Promise

Up And Up — Long known for its struggles with infectious diseases and poverty, the continent of Africa is experiencing widespread economic growth. An increasing middle class and changes in lifestyle now drive demand for medicines to treat chronic, non-communicable diseases, such as diabetes.

The African Union is comprised of over 50 countries and can be loosely divided into three regions; North Africa (NA), Sub-Saharan Africa (SSA) and South Africa (SA). Africa holds 15% of the world's population at 1.1 billion, and that number is growing. Pharmaceutical spending, according to IMS, is expected to reach US-\$30 billion by 2016 and could potentially hit US-\$45 billion by 2020. Meanwhile, Africa is dependent on importation of essential medicines.

On The Ground

Big Pharma has had a presence in Africa for decades having established supply, marketing and distribution agreements with domestic pharmaceutical companies such as Aspen PharmaCare and Adcock Ingram. Finished dose (FD) manufacturers exist throughout the continent; however with only a handful of active pharmaceutical ingredient (API) manufacturers, FD production also heavily relies on importation of raw materials. Further, many domestic FD manufacturers are not yet capable of qualifying for World Health Organization (WHO) good manufacturing practices (GMP) status and consistent quality is a concern.

Infectious disease remains one of the greatest challenges facing the African population. Africa carries almost one quarter of the global disease burden rife with malaria

and tuberculosis. Further, 75% of the global population with HIV/AIDS is in Africa. Opportunities exist in these markets and a growing number of foreign companies are seeking access to the continent.

Investment and Partnering in Africa

Various approaches to investment in Africa have been employed to enter these markets. If companies focus on building relationships with non-government organizations (NGOs) and governments; they may find these alliances can help with market access and patient outreach. Through alliances in Africa, Ranbaxy and Dr Reddy's have provided affordable medicines; which has allowed these companies to enter the continent and become familiar brands among patients and caregivers. In 2001, responding to a call from Médecins Sans Frontières for cheaper medicines to treat HIV/AIDS; Cipla announced it would sell a triple combination of antiretroviral (ARV) medications for US-\$350 per person per year (PPY)—far below the estimated US-\$10,000-US-\$15,000 PPY ARV combination offered by Innovators.

Partnering with local manufacturers, establishing licensing agreements and providing technology and raw materials requires a low level of investment and may be a successful route to entry. In 2012, 1A Pharma, a subsidiary of Sandoz International, partnered with Cinpharm in Cameroon for production of generic drugs. Raw materials and technology would be supplied by 1A Pharma for manufacture of generic drugs in addition to providing guidance to help Cinpharm integrate cGMPs into a facility built in 2010.

Of course, building or acquiring facilities to manufacture locally requires much higher levels of financial investment and strategic planning. In the SSA region a number of



partnerships have emerged. Hikma recently announced a partnership with MIDROC Group to build a FD manufacturing and distribution center in Ethiopia. Cipla and their Ugandan partner, Quality Chemical Industries, plan to expand their operations in Uganda and build a new plant to triple production of HIV drugs. To assist its members with logistical costs associated with exporting to African countries, Pharma Export Council of India (Pharmexcil) has plans to build a warehouse facility in Nigeria.

In North Africa, Recordati has completed the acquisition of FD manufacturer Opalia Pharma in Tunisia. Increasing their stake in NA, Sanofi has announced plans to expand manufacturing capacity in Algeria with construction of a third plant which will produce dry and liquid FD and house a distribution center.

Spotlight On South Africa

South Africa has seen a number of developments in the pharmaceutical sector. South Africa's pharmaceutical industry is more established than those of NA and SSA. Doing business in South Africa is more clearly defined; regulatory and intellectual property systems are evolving and road and railway systems are more established. Chile's CFR Pharmaceuticals is currently working to negotiate takeover of Adcock Ingram while Adcock moves ahead with plans to expand into other African markets. Missing from the African pharmaceutical investment landscape is domestic API manufacturing.

Challenges Ahead

Although pharma interest in this region has increased, many challenges

remain. Vast improvements to all aspects of infrastructure including transportation and reliable electricity are necessary in Africa. The World Bank recently announced Africa is in need of US-\$93 billion annually until 2020 for infrastructure development. These issues have been outlined and a long term strategic plan called the Programme for Infrastructure Development in Africa has been formulated by the African Union Commission (AUC) in partnership with the African Development Bank and the United Nations Economic Commission for Africa and NEPAD Planning and Coordinating Agency.

However, the continent faces other hurdles in attracting industry including a lack of information for doing business in African countries, lack of regulatory control, skilled labor, political stability and market

data. Companies interested in entering markets in NA and SSA will find NGOs, foundations and governments working on a number of initiatives to facilitate doing business in these areas.

Pharmaceutical Manufacturing Plan for Africa

The AUC and the United Nations Industrial Development Organization has developed the Pharmaceutical Manufacturing Plan for Africa (PMPA). The PMPA cites roadblocks facing the development of the pharmaceutical industry on the continent, such as human resource development and defines steps that need to be taken to build a foundation for the industry. The goal of the PMPA is to expand the pharma industry in Africa to improve access to affordable, quality medicines as well as to become less dependent on imports of APIs and FD thereby improving Africa's self-reliance.

Despite the challenges presented by these emerging markets, Africa holds a wealth of opportunities for the pharmaceutical industry from innovation to generic penetration. Innovators will find research and development prospects with an estimated 80% of the natural raw materials in Africa have not yet been subject to standard scientific testing. Additionally, generics may find options to expand their markets by reaching growing populations on the continent.

*Shannon Bennett,
Pharmaceutical Research Analyst, Thomson Reuters*

Contact:

Shannon Bennett
Thomson Reuters
Portland, Maine, U.S.
shannon.bennett@thomsonreuters.com
www.thomsonreuters.com

Bayer Reaches 92.7% of Takeover Candidate Algeta

M&A German Healthcare Group also to Buy Chinese Pharma Company

Bayer group has now met its target for the acquisition of Norwegian pharmaceutical producer Algeta.

Pharma — The German group said on Feb. 26 it had received acceptance from an estimated 97.23% of the company's share capital, valuing the company at 16.2 billion Norwegian crowns (€1.9 billion).

Bayer offered shareholders €2.1 billion, 37% more than the closing price on Nov. 25, 2013, the day before the takeover plans were announced.

As all regulatory clearances already have been obtained, the transfer of shares and the payment of the offer price will take place no later than Mar. 12, Bayer said. Subsequently, the Leverkusen-based

pharmaceuticals, agrochemicals and material science group plans to begin a squeeze-out of Algeta's remaining shareholders and then delist the company from the Oslo stock exchange.

The takeover is expected to be formally completed during the first quarter.

On February 27, Bayer announced plans to acquire 100% of the shares of Dihon Pharmaceutical, Kunming Yunnan, China, a privately held pharmaceutical company specializing primarily in over-the-counter (OTC) and herbal traditional Chinese medicine (TCM) products. Dihon is a leading player in China's OTC industry. Financial details have not been disclosed. The transaction is expected to close in the second half of 2014. (dw)

Actavis to Buy Forest Labs for US-\$25 billion

Ireland/U.S. — Dublin-based generic drugmaker Actavis is acquiring specialty pharmaceuticals company Forest Laboratories, New York, in a cash and stock deal valued at about US-\$25 billion.

The deal is being described as the biggest ever for Actavis, known until 2012 as Watson Pharmaceuticals. Reports said it will change the company's mix of sales, result in more than US-\$1 billion in cost savings and extend sales of Forest's brand-name products to more markets.

Forest, whose biggest competitors include Teva and Mylan, in Jan-

uary of this year acquired privately held gastrointestinal and cystic fibrosis drugmaker Aptalis for US-\$2.9 billion. In recent past years, Actavis has bought up several specialty drug makers to boost profit margins and sales. In 2012 it acquired Zug, Switzerland-based Actavis and took the company's name.

Ireland's Warner Chilcott, added in 2013 for US-\$9.2 billion including net debt, enabled the drug maker to expand in women's health and urology and also gained the Irish domicile that lowered its tax rate. (dw)

Novartis Said to Be Mulling a Jobs Shift to India

PHARMA Swiss Drugmaker Still Eyeing Vaccines Sale

In a move designed to enhance its presence in India, Novartis plans to build a new business center in Hyderabad, but the Swiss pharmaceutical giant has disputed reports in the newspaper Neue Zürcher Zeitung that it may cut or transfer up to 4,000 jobs as part of the move.

Switzerland — Citing an internal email, the paper said a cost-cutting plan could affect as much as 6% of the company's pharmaceuticals workforce. Later, Novartis issued a statement saying that while it intends to "prioritize and reallocate resources, primarily in pharmaceuticals, to focus on planned product launches and other growth areas," the workforce would remain flat in 2014.

Reports suggest that, despite the denial, a significant number of jobs

conceivably could be moved to India. The new center is expected to open in late 2015 or early 2016 and will link Novartis' operations currently spread across three sites in Hyderabad, as well as providing for future growth.

Separately, Novartis may be moving closer to selling its over-the-counter, animal health and vaccines businesses as it prepares to focus on core businesses in pharmaceuticals, eye care and generics. While the two units initially were planned to be sold together, news agencies quote anonymous sources as saying that the vaccines may be sold separately.

Novartis is said to have informally talked to both Eli Lilly and Bayer about the animal-health business even as it continues negotiations with Merck & Co of the U.S. about a package deal for animal health and vaccines.

Bayer, Novartis said to Eye Consumer Health unit of Merck & Co.

U.S. — A handful of consumer and healthcare companies including Germany's Bayer and Switzerland's Novartis are exploring a deal for Merck & Co's consumer healthcare business, people familiar with the matter told the news agency Reuters. Reckitt Benckiser and Procter & Gamble are also said to be among the companies holding discussions with Merck about buying the unit, which includes products ranging

from sunscreen to OTC allergy medicines.

Despite the large size of a potential deal - rumored to be worth as much as US-\$10-12 billion - and the diversity of the product lines, Merck & Co. is reportedly focused on selling the consumer health business in its entirety. The U.S. drugs group is expected to seek second-round offers in late March. (dw)

German Drugmaker Boehringer Faces U.S. Lawsuits

U.S. — German family-owned drugmaker Boehringer Ingelheim is being confronted with more than 2,000 lawsuits related to its blood thinner Pradaxa (dabigatran). Plaintiffs charge the drug led to severe bleeding. Links to over 1,000 deaths have been claimed, but not all verified.

On the U.S. market since 2010, Pradaxa is one of a new class of blood thinners used in stroke prevention, designed to replace the widely used generic drug warfarin, which requires extensive blood testing.

Cinven to Acquire Medpace for \$900 Million

U.K./U.S. — Private equity firm Cinven, based in London, has agreed to acquire U.S. pharmaceutical contract research organization Medpace from buyout firm CCMP Capital Advisors for a little over US-\$900 million, news agency Reuters said, quoting people familiar with the matter.

Founded in 1992, Medpace, headquartered in Cincinnati, Ohio, has more than 1,500 employees in over 45 countries and generated adjusted earnings before interest, tax, depreciation and amortization in 2013 of US-\$94 million.

The U.S. company's primary focus is on helping — mostly small- and medium-sized — biotechnology companies with clinical studies. About 40% of its employees working in its clinical operations are in Europe.

Newer products such as Pradaxa and Xarelto, launched by Bayer and Johnson & Johnson, along with Eliquis developed by Pfizer and BMS, have been touted as requiring less monitoring while being at least as effective at preventing strokes and blood clots in patients with atrial fibrillation.

Pradaxa, reports said, has been prescribed to 850,000 U.S. patients, with sales totalling US-\$2 billion. The U.S. Food and Drug Administration, FDA, recently agreed to conduct new studies on the risks of the new anti-coagulants. (dw)

Reuters quotes analysts as saying that Cinven, which specializes in European M&A, pursued Medpace because of the company's substantial presence in Europe, as well as the opportunity to expand its business in Asia. (dw)

The contract research organization (CRO) industry has benefited in recent years from the pharmaceutical companies' drive to cut costs, reduce clinical trial times and expand their research and development (R&D) presence around the world.

"We estimate only about half of R&D is outsourced, with an opportunity for large CROs to pick up a substantial portion of the 7 - 10% of spend that could be outsourced in the next several years," Citi equity analysts wrote in a February 18 research note. (dw)

Growth in Africa

Key Sectors Drive Movement in Sub-Saharan Chemicals Market

Urbanization And Diversification — Africa is set to enter a growth cycle. Although Asia is anticipated to continue dominating the global chemicals industry with expected market-share growth from 32.3% in 2010 to 40.4% in 2020, Africa, along with the Middle East, will also experience growth in the chemicals segment.

This has been predicated by significant increases in gross domestic product growth and foreign direct investment (FDI) in parallel with decreased conflict and foreign-debt-to-GDP ratio since the early 2000s, writes Avril Harvey, team leader for Chemicals Materials & Food at Frost & Sullivan. The average African GDP growth in 2013 was 4.8%.

A number of influencers will contribute to this significant growth within the chemicals sector, namely mega trends, construction and economic growth.

Mega (Macro) Trends

Frost & Sullivan defines a mega trend as a long-term global transformation process. Mega trends arise from changes that influence business, economy, society, cultures and personal lives, thereby defining our future world and its increasing pace of change. These trends not only affect all key organizational functions but also allow companies to predict market direction and future demand and to respond to opportunities and threats.

One of the key mega trends that will influence chemicals sectors in

Africa is increasing urbanization. By 2020, about 43% of people on the African continent will live in urban areas. Infrastructure development will also play a significant role, as it is estimated that \$810 billion will be required in the next five years to upgrade, rehabilitate and expand Africa's infrastructure, whereas just more than half of that amount is being spent now.

These key mega trends will act as drivers on specific African industries. Increasing urbanization, for example, will have a strong effect on the development of infrastructure in Africa. Development and high growth are expected in electricity, road and rail, health care, water sanitation, and port infrastructure. A total of \$363 billion has currently been spent on infrastructure projects (based on active projects in 2011), with the bulk of

this in the transport and energy sectors.

Construction

The mega trend of increasing urbanization gives rise to a subtrend of construction, driving greater demand for building materials, paints and coatings, and construction chemicals in key African countries. South Africa is the leader in investment into infrastructure development; however, Nigeria, Mozambique, Kenya, Angola and Zambia also represent high value growth opportunities.

Revenue from infrastructure chemicals is anticipated to grow from \$416.8 million to \$453.6 million by 2015 in South Africa and from \$62.6 million to \$75.1 million in Kenya, with the bulk of these chemicals being coatings (Fig. 1).

Other sectors driven by mega trends that represent growth opportunities in Africa are mining and agriculture. Revenues from mining chemicals are forecast to grow at a compound annual growth rate (CAGR) of 4%, and agrichemicals are expected to increase in value from \$1.1 billion to more than \$5 billion by 2020.

Economic Growth on the Continent

Much of Africa's growth has been dependent on resource extraction and, in particular, oil exports. This trend is expected to continue over the medium term. However, during the long term, many African countries are likely to become more diversified, with growth expected in the manufacturing, agricultural and services sectors. Diversification is the key to unlocking Africa's

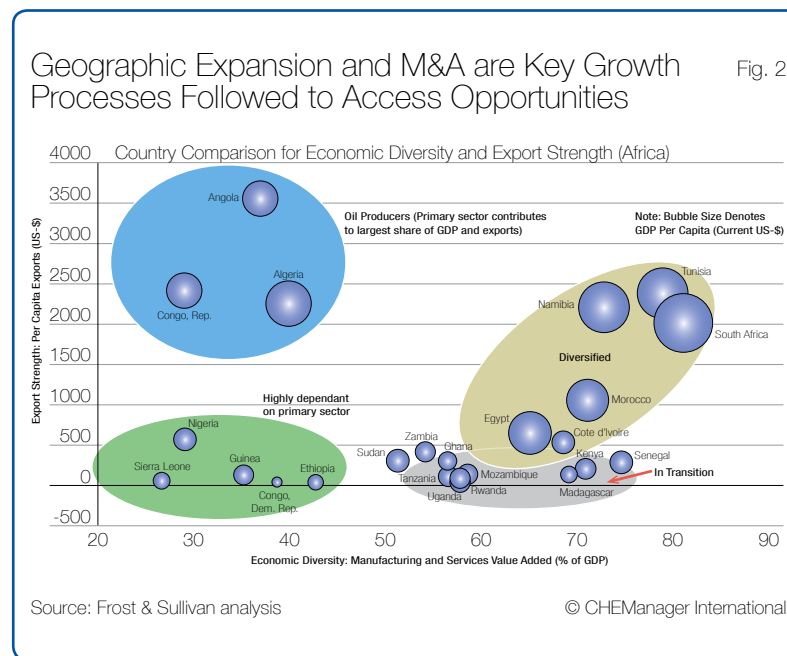
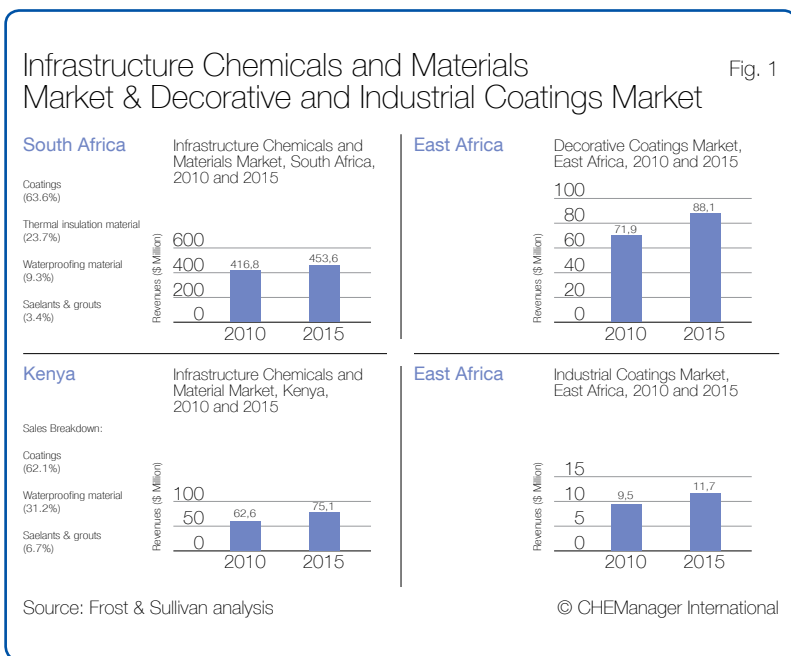


potential and growing middle class. Per capita incomes have grown substantially in the last 10 years, but this growth is expected to be insignificant compared with the growth that is predicted over the next 10 years due to beneficiation activities and the diversification of economic activities.

Some of the most diversified economies in Africa are in northern and southern Africa, including Egypt, South Africa and Namibia (Fig. 2). A number of countries, such as Kenya, Mozambique, Madagascar and Rwanda, are transitioning into more diversified economies and growing GDP per capita, thus representing attractive expansion and investment destinations in Africa.

Africa is not without challenges — such as crime and corruption, lack of skills and some difficult business environments. However, companies have managed to overcome the risks by tailoring their strategies and adapting their business models to successfully tap into the unique market environment.

Companies wishing to enter the African market in key industry sectors, such as mining and agriculture, need to tailor their strategies accordingly to best drive growth through geographical expansion and mergers and acquisitions.



Contact:
Samantha James
Corporate Communications Africa
Frost & Sullivan
Tel.: +27 21 680 3574
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Azerbaijan's Petrochemical Industry

Investment Opportunities at the Crossroads between Europe and Asia

Making Inroads — Located at the crossroads between Europe and Asia, Azerbaijan is working hard to become a serious player in the global petrochemical market. The former Soviet country has huge resources of oil and natural gas, which makes it appealing both up- and downstream businesses. CHEManager International asked Zaur Mammadov, Deputy CEO, Sumgait Chemical Industrial Park in Azerbaijan, about the company's initiatives in the chemical industry and its ever-increasing involvement in petrochemicals.



Zaur Mammadov, Deputy CEO, Sumgait Chemical Industrial Park

CHEManager International: Azerbaijan is known for its huge oil and gas industry. The increased engagement in the petrochemical sector seems to be a logical step.

Z. Mammadov: Yes absolutely. The economic policy of Azerbaijan's government is directed at solving the most important and acute problems of the Republic and take the country forward on a path towards prosperity. The main target is to ensure economic growth, the development of the non-oil sector, macroeconomic diversification, socio-economic growth of regions, the establishment of a competitive economy and the integration in the world economy.

Countries with huge resources of oil and natural gas should take advantage of their access to feedstock — and that is no different in Azerbaijan. We have a long history in that industry: In 1994, Azerbaijan opened up to foreign investors in the upstream business. In the last years, we have strengthened our midstream operations, e.g. with the planned pipelines to deliver Caspian gas to Europe. Now Azerbaijan is fostering the downstream business. We are getting closer to our goal of becoming the chief petrochemical industry center of the Caucasus and Middle East region and a seri-

ous player in the global petrochemical market.

CHEManager International: Why do you see the chemical industry as a promising market for Azerbaijan?

Z. Mammadov: The expansion of the petrochemical sector is one part of Azerbaijan's greater energy plan. Innovative and modern oil and gas processing plants enable an increased added value in Azerbaijan's raw materials business as well as broader access to the world market.

At the same time, the petrochemical industry is of major importance for our country's overall economy, which is still diversifying. It is one of the most important basic industries of any modern economy. By providing crucial linkages to several downstream industries like engineering, automotive, consumer durables, or food processing, it is key to the economic development of a country and offers enormous potential.

CHEManager International: Which projects in Azerbaijan are interesting for the international petrochemical industry?

Z. Mammadov: There are a number of very interesting projects. One is the Oil & Gas Processing and Pet-

rochemical Complex (OGPC). The complex is located on 1,500 hectares, including a refinery and a gas processing plant as well as a petrochemical complex.

The gas processing plant has the purpose of treating the raw natural gas and separating it into ethane, propane, butane and methane. According to the State Oil Fund, starting in 2018, the production capacity of the refinery plant will consist of 10 million tons, the gas processing plant of 10 billion m³ and the petrochemical complex of about 1.8 million tons.

The plant will work as a provider for the new petrochemical plant that will mainly produce polyethylene and polypropylene. Additionally, the OGPC will contain an ethane cracker to produce olefins and polyolefins as well as a crude oil refinery.

CHEManager International: Which are key factors of success for the development of Azerbaijan's chemical industry?

Z. Mammadov: First of all, Azerbaijan is one of the leading countries globally in terms of economy growth rates and well-known as an energy carrier today. Furthermore, the availability of cheap raw materials is one of the most important points especially for starting a chemical related business.

Finally, the location of the country on the crossroads of Europe and Asia as well as the well-developed highways, railroads, international airports and a sea port make it easy to access regional markets such as Europe, CIS, Central Asia and the Middle East.

CHEManager International: What needs to be done to further expand Azerbaijan's chemical industry?

Z. Mammadov: In a nutshell, there are three major steps that are largely taking place simultaneously: First, we will need to install modern plants complying with the highest technological standards. This will be accomplished with the support of foreign investors. Our objective is to



gradually establish a modern chemical industry and to attract private enterprises to the area.

Secondly, the obsolete plants, mostly from the Soviet era, will need to be dismantled. Thirdly, we will need to manufacture a broader range of products from local raw materials. This will help us to be more competitive and to advance the opening of our market.

CHEManager International: What projects are planned in Sumgait, the center of Azerbaijan's chemical industry?

Z. Mammadov: There is a great variety of different projects. Let me just point out one of the biggest projects in Sumgait: the Sumgait Chemical Industrial Park, short SCIP. A urea, polypropylene and high density polyethylene plant will also be built in Sumgait in the next few years.

CHEManager International: For which branches of the chemical industry is SCIP relevant?

Z. Mammadov: At the initial stage having access of 167,66 hectares of land, SCIP has the space to be open to different branches of the chemical industry, e.g. for polymers, intermediates used in the manufacture of polymers, manufactured plastic products, pharmaceutical products, specialty chemicals, etc.

CHEManager International: Why should corporations invest in SCIP?

Z. Mammadov: Azerbaijan, and Sumgait in particular, offer a number of advantages given its favorable location, such as the closeness to raw materials, a direct transport connection — a freeway access, a railway station, and a seaport are close by — energy availability at low cost and the connection to modern electricity and gas grids as well as to water and sewage networks. In addition, the political and economic stability of Azerbaijan and a highly qualified workforce facilitate low risk investments.

Other important factors are the incentives that will be provided to

SCIP's residents: foreign investors, for instance, will benefit from a seven-year exemption from VAT on imported equipment and technology as well as from corporate income, property and land taxes.

CHEManager International: How would you sum up the situation in Azerbaijan for investors now?

Z. Mammadov: The situation is in some ways similar with the one two decades ago. Foreign corporations that invested in the upstream business at that time benefitted from the country's oil boom. Most of them have stayed in the country and have increased their commitment. Now we have the same situation in the downstream business providing great opportunities — and today investments are even more secure. The current situation in the petrochemical industry in Azerbaijan is open to all: who comes first, gets the best piece of the cake.

► www.scip.az

AMEC Makes Definitive Offer for Foster Wheeler

ENGINEERING Shale Gas Said to Be Drawing Card for Takeover

In a combined share and cash deal, U.K. Engineering group AMEC has signed a definitive agreement to take over Swiss-based competitor Foster Wheeler. The transaction is due to close in the second half of 2014.

U.K./Switzerland — The AMEC offer is calculated to be worth US-\$3.3 billion, slightly higher than the non-binding offer initially floated. A successful takeover could create a chemical and energy engineering giant with revenues of up to US-\$10 billion and an order backlog of similar scale. Foster Wheeler shareholders

stand to own about 23% of the combined company.

AMEC is said to be particularly interested in Foster Wheeler's regional presence in South America and the Middle East as well as Australia, a geographical spread that would complement the British group's strengths in Europe and North America.

Foster Wheeler, with operational headquarters at Reading, UK, and roots in the U.S., is specialized in mid- and downstream chemical and petrochemical projects. One drawing card is said to be AMEC's desire to become more involved in the shale gas sector.

Presenting details of the proposed deal, the UK group identified potential cost savings of around US-\$75 million from the operations merger, but did not detail where this would come from.

The merged company could be expected to have a strong position in the offshore and onshore oil and gas sector, as well as in gas monetization, refining and chemicals, minerals and metals, power and clean energy, environment & infrastructure and pharmaceuticals.

On a pro forma basis, the workforce would total more than 40,000, although analysts say that there are likely to be redundancies. (dw) ■

Repsol Board Approves \$5 Billion YPF Settlement

PETROCHEMICALS Deal Ends Two-year Compensation Battle

The supervisory board of Spanish oil and petrochemicals giant Repsol has approved a US-\$5 billion settlement from Argentina over assets seized in 2012.

Spain — This settlement draws a line under a two-year battle for compensation after President Cristina Fernandez de Kirchner's government seized 51% of YPF in April 2012, charging Repsol had not invested enough.

Although the compensation is half of the US-\$10.5 billion Repsol initially demanded, the company is known to be eager to avoid a protracted legal fight. Under the agree-

ment, the Spanish group will receive a package of three dollar-denominated Argentine sovereign bonds with a nominal value of US-\$5 billion. It will also receive additional bonds for a maximum face value of up to \$1 billion to compensate for the market discount on the first group of bonds.

Argentine sovereign bonds mostly trade at a steep discount since the country defaulted on international debt in 2002.

The total market value of the combined packages will be at least US-\$4.67 billion, which reports said could be supplemented by US-\$500 million in back interest payments on one of the bonds. Repsol can sell the bonds whenever it wants, although

the final proceeds cannot exceed US-\$5 billion after expenses and interest. As part of the deal, which follows nearly three months of negotiations and requires approval from the Spanish group's shareholders and the Argentine Congress, Repsol will drop all lawsuits against Argentina and waive any future legal claims.

Ending the dispute may help attract investors to the country to develop some of the world's largest shale fields, observers said. Repsol still has a 12% stake in YPF. "There should be a new dynamic now in the board. We should be able to leave this dispute in the past and focus on a more constructive future," said CEO Miguel Galuccio. (dw) ■

U.S. Shale Gas-Linked Chemical Projects Top \$100 Billion

U.S. — The chemical industry investment projects in the U.S. related to shale gas have now exceeded a value of US-\$100 billion, according to the industry association American Chemistry Council (ACC).

As per the beginning of February, ACC said 148 projects worth US-\$100.2 billion had been announced, including new plant, expansion of existing facility and process changes to increase capacity. The momentum can be expected to lead to US-\$81 billion per year in industry output

and 637,000 new jobs by 2023, it said. Significantly, over half of the investments are being made by companies based outside the U.S., as overseas competitors rush to take advantage of the cheap feedstock.

Up to 2023, the increased capital spending can be expected to create some 55,000 new permanent jobs in the industry itself, 314,000 jobs in supplier industries and 267,000 jobs in the communities where the project workers spend their wages, the council added in a forward-looking

analysis. The analysis is also said to show that an additional temporary jobs will be created during the capital investment phase, which peaks in 2016. Thanks to the shale gas production boom, ACC president and CEO Cal Dooley said the U.S. "is the most attractive place in the world to invest in chemicals and plastics manufacturing. It's an astonishing gain in competitiveness."

The association praised U.S. president Barack Obama for his willingness to approve shale gas-related projects promptly. (dw) ■

Ineos Secures Second U.S. Shale Gas Supply Contract

Switzerland — Ineos has secured a second shale gas supply contract, with Consor Energy of the U.S., to feed its European crackers in Norway, the U.K., France and Germany from 2015.

For shipping, the ethane will be transported through the Mariner East pipeline from gas fields in the U.S. Appalachian basin and landed at the group's new 1 million t/y terminal at Zwijndrecht, The Netherlands. Ineos is the only company so

far to establish seaborne intercontinental ethane transportation.

In September 2012, it had signed a contract with Sunoco Logistics for capacity in the pipeline, with Range Resources for purchase of ethane, with Evergas for construction of customized vessels and with TGE Engineering for construction of a new tank at Rafnes

Ineos is also pursuing plans for a second ethane terminal at Grangemouth, Scotland, benefiting from

loans and grants guaranteed by the U.K. government and the Scottish regional government after a recent labor dispute. The £300 million terminal to start up in 2016 would be similar to the Dutch facility.

The petrochemical giant said "advantageously priced" U.S. ethane will allow it to continue to consolidate the competitiveness of ethylene production in Europe. (dw) ■



Green Chemistry

Measuring the greenness of chemical processes and developing an integrated metric.

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Regulation

Update of chemical legislation in Taiwan determines changes to companies.

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Biocatalysis

Advantages of using natural catalysts in production of APIs and intermediates.

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In Perfect Harmony

Three Swiss Companies Work Together for Faster Scale-up to Production

Better Together — Systag, Büchi Glas, and Dottikon, all of Swiss origin and each consistently pursuing a one-site strategy, unify 220 years of corporate scale-up experience from process development, automation, pilot plant and reactor systems and large-scale chemical manufacturing. The strategy for future success lies in rediscovering the value generation by invention of new products and rocket-launch them to market, as the party of value growth from global economy of scales and specialization is over. Coined by this environment, the three CEOs share one vision: faster scale-up to production.

Editor in Chief Brandi Schuster of CHEManager International asked the three CEOs Dr. Markus Blocher of Dottikon Exclusive Synthesis, Mike Mandlehr of Systag System Technik and Hermann Büchi of Büchi Glas Uster about their collaboration.

CHEManager International: How does the one-site strategy work for each of your companies?

M. Blocher: The one-site strategy allows reduced decision and communication pathways, ensures rapid and efficient project development, timely decision making as well as clear and transparent communication with customers. Over all, this results in short realization and implementation times and, in combination with a distinct technology portfolio, superior cost-effectiveness and high reliability.

H. Büchi: Being able to satisfy the demand of our customers with high-quality high-pressure reactor and plant systems is a game changer for our customers and is essential for the success of their end products.

M. Mandlehr: In the today's ever-faster moving environment, time is indeed money. Effective process development to cost-efficient chemical processes has to be achieved by simultaneous conduction of several activities to shorten lead times. For instance, modularly customized controlled lab reactors enable project-specific multi-parameter variation parallel testing. To set up and test such high-end equipment, an interdisciplinary and highly skilled team at one site is a prerequisite.

M. Blocher: We see time and again that our geographically diversified competitors are outpaced in the realization of complex chemical development and manufacturing projects.

How do the three companies work together?

M. Blocher: At the technological forefront of effective chemical manufacturing, there is no room for compromise in equipment quality and set-up, automation systems or process safety. The attitude of performance and technology leadership made Dottikon approach Systag and Büchi Glas.

M. Mandlehr: For example, in safe and reliable scale-up to production, thermal process safety data by reaction calorimetry are essential. We have experienced this with many pharma customers or in our close collaboration with the strategic development and manufacturing partner Dottikon, which has been using our



From left to right: Mike Mandlehr (Systag System Technik), Hermann Büchi (Büchi Glas Uster), and Dr. Markus Blocher (Dottikon Exclusive Synthesis)

equipment routinely with great success over many years. The open information exchange about needs and experience continuously supports us in enhancing the equipment.

H. Büchi: Automation and plant system engineering are of great importance in chemical process control for safe high-quality production. That's why Systag was chosen as our preferred partner when it comes to automation of our high-quality lab reactors and high-pressure pilot plant systems.

M. Mandlehr: The common mindset of performance leadership and cutting-edge technology aspiration — each of us are leaders in sepa-

rate but interlinked value segments — unifies us and makes us natural collaboration partners.

Can you give some examples of successful joint projects?

H. Büchi: In the past, we realized several state-of-the-art high-pressure reactor systems and pilot plants together.

M. Mandlehr: The latest product of this three-company collaboration is the co-developed parallel pressure reactor system that was launched at the Informex 2014 in Miami.

M. Blocher: This is a good example how the combined spirit of entrepre-

neurship and passion for technology results in product innovation.

What challenges have you encountered in working closely together and how were they overcome?

M. Blocher: Ménages à trois are known to be challenging. But we have learned that the collaboration works best when one of us acts as business sponsor, the second party fulfills the lead supplier role, managing the third party as technology partner.

H. Büchi: These roles may be exchanged project by project. This assures checks and balances and clarifies competence and responsibility.

When working together on a project, what do you do as a collective to remain both versatile and innovative?

M. Mandlehr: Whenever starting a joint project, we always evaluate outside collaboration alternatives at arm's length to challenge and stimulate each other's technology leadership position and innovation drive. Nevertheless, the collaboration of our three companies repeatedly proves to be the most promising and effective constellation.

What are the advantages to be had in being a member of such a joint initiative?

H. Büchi: The main advantage is the holistic approach that is taken. Let's look at the parallel pressure reactor, for instance. Büchi brings in the high-pressure equipment manufacturing experience, Systag engineering and automation and Dottikon process development, scale-up and manufacturing experience.

M. Blocher: Having the same mindset and speaking the same language allows us to interdisciplinary exploit this wide experience platform and implement the essence of it in the final solution.

M. Mandlehr: In short, such a joint initiative brings the solution closer to market and practice.

What are the advantages for your customers?

M. Blocher: This unique collaboration of the three companies, each of us a leader in our area of expertise is game-changing the scale-up to production in bringing innovative products faster to market for our customers.

BASF Sells Liquid Masterbatch Business to Audia

Germany/France — BASF has announced plans to sell its liquid masterbatch activities to Audia International. The German chemical producer said the niche business based at Clermont de l'Oise, France, is not strategic to its focus.

The sale for an undisclosed sum is expected to close in mid-2014. In future, BASF said it intends to

concentrate on its solid and powder masterbatch portfolio, which is headquartered at Cologne, Germany.

Audia, a privately owned holding for companies active in the polyolefins and color masterbatch sector, described the acquired portfolio as "very strategic." It will manage the business through its subsidiary Uniform Color, based at Holland, Michi-

gan, in the U.S. Other U.S. companies belonging to Audia include Washington Penn Plastic, and Pennsylvania & Southern Polymer. Audia operates 10 production sites in North America and Europe. Neither BASF nor Audia is among the top players in color masterbatches. The market leaders include A. Schulman, Ampacet, PolyOne and Clariant. (dw) ■

Toray Buys Land for U.S. Advanced Materials Base

Japan/U.S. — Toray Industries has purchased 400 acres of commercial land in Spartanburg County, South Carolina, to build up a U.S. base for advanced materials. The company said it planned to invest US-\$983 million at the site up to 2020. The high-tech fibers specialist said the

land acquisition is part of a medium-term (up to 2016) management program to expand in growth fields and growth regions it will launch in April of this year. The scheme complements and widens an existing expansion project for Asia and emerging countries. Although South

Carolina is a traditional site for man-made fibers production, Toray said its decision to invest in the U.S. was based on the chance to benefit from low energy costs. Proximity to South American markets was also a factor. Toray already has production facilities in the state of Alabama. (dw) ■

Ashland to Sell Water Unit for \$1.8 billion

U.S. — Chemical producer Ashland has agreed to sell its water technologies unit for about US-\$1.8 billion to a fund managed by Clayton, Dubilier & Rice. The water treatment unit, which generates annual sales of US-\$1.7 billion and employs about

3,000 people worldwide, supplies specialty chemicals and services to the pulp and paper and industrial water markets. It also makes biocides, coagulants and wood adhesives.

Ashland said it plans to use net proceeds of \$1.4 billion from the deal,

which is expected to close by the end of its fiscal year on Sept. 30, to fund a US-\$1.35 billion share buyback program. The repurchase program would replace the company's previous US-\$600 million buyback program that expires at the end of 2015. (dw) ■

Ineos Expands Zwijndrecht ENB Plant

Belgium — Through debottlenecking, Ineos has increased its capacity for ethylene norbonene (ENB) at Zwijndrecht, Belgium, to 28,000 t/y. The company said the plant is now the largest of its kind in the world.

Hans Casier, CEO of Ineos Oxide said ongoing global growth and demand from new ENB customers,

especially producers of ethylene-propylene-diene (EPDM) rubber, requires new capacity. The expansion at the site near Antwerp will provide sufficient output for the next two to three years, he said.

Products are sold to the automotive, white goods and construction industries. With facilities in

Antwerp, as well as Cologne, Germany, Lavera France, Plaquemine, Louisiana, and Hull in the UK, Ineos Oxide is also a leading producer of ethylene oxide and derivatives. The portfolio also includes propylene oxide and derivatives, in addition to solvents and specialty chemicals. (dw) ■

Clariant Said to Plan Exit from ASK JV With Ashland

Switzerland/Germany — Clariant is seeking to unload its stake in ASK Chemicals, a 50:50 joint venture with U.S.-based chemical producer Ashland based at Hilden, Germany. People familiar with the transaction

told the news agency Reuters that several companies are interested, including private equity investor Sun Capital. ASK produces binding agents and additives for the foundry sector. Analysts said ASK could

be valued at six to seven times the expected 2013 EBITDA of US-€40 million, which would give the chemical producer an enterprise value of US-€240-280 million. (dw) ■

SGL Closing Italian Graphite Electrodes Plant

Germany/Italy — SGL Group is closing its graphite electrodes plant at Narni, Italy, with immediate effect. The German carbon company said the closure is part of its SGL2015 cost-cutting scheme designed to

save US-€150 million up to the end of 2015.

SGL said the market for graphite electrodes, used in recycling of used steel, has come under price pressure due to weak demand. Some 120

jobs will be lost in the shutdown. The company has already closed its 30,000 t/y graphite electrodes plant in Lachute, Canada, with the loss of 110 jobs. (dw) ■

Waste Not

Green Chemistry Metrics for the Fine Chemical, Pharmaceutical and Related Industries



At The Source — Waste has been an issue in the chemical industry for many years, but the approach to waste has changed significantly over that period. Twenty-five to 30 years ago the focus was on end-of-pipe solutions to reduce the pollution characteristics of the waste generated. In recent years the emphasis has shifted to reducing waste at the source by designing processes and syntheses that produce minimal waste.

One of the key factors in this change was Roger Sheldon's 1992 article in

Chem. Ind. on the E Factor (kilogram of waste produced per kilogram of product), where he divided the chemical industry into four main sectors (see table 1) and looked at the amount of kilograms of waste generated per kilogram of product for each sector.

This was a real wake-up call for the pharmaceutical and fine chemical sectors to take urgent action. It resulted in the development of a whole series of metrics to get a handle on how much waste was being generated and be able to show improvements over time. Green chemistry metrics are mainly based on mass, but some are based on energy usage, environmental toxicity

and ozone depletion potential, for example. However, the metrics most commonly quoted in the literature are based on mass, solvent usage and energy, according to "Green Chemistry Metrics: Measuring and Monitoring Sustainable Processes," A. Lapkin and D.J. Constable (Eds), and "Green Chemistry in the Pharmaceutical Industry," P.J. Dunn, A.S. Wells and M.T. Williams. This has arisen because of the need to develop metrics that are simple to measure, easy to use, and easy to sell to senior management, with this last point being particularly important.

The two main metrics based on mass are the E Factor and process mass intensity (PMI, mass of all materials used in the product/mass of product, as described by W.J. Watson in Green Chem. in 2012). The difference between the E Factor and PMI is subtle, and in mathematical terms the relationship is: E Factor = PMI - 1.

The main difference is that producing less waste reduces the

E Factor, whereas using less raw material reduces PMI, but this also leads to a reduction in the amount of waste generated. The two advantages of PMI are that it is easy to sell to senior management — we will reduce our raw material usage, which saves costs — and it is very simple to use. Every chemist should note down the materials used in a given chemical preparation and the amount of product produced, the two figures needed to calculate PMI. (This is available automatically in some electronic lab notebooks.) The E Factor requires the measurement of the amount of waste produced. The ongoing discussion as to whether water should be included in the calculations is common to both E Factor and PMI.

Typically in fine chemicals and pharmaceuticals the main component in any synthesis is the solvent, and so not surprisingly solvent usage and the number of solvents required are commonly used metrics. Solvent recycling can reduce

the amount of solvent that must be purchased by more than 50%, but this normally requires distillation to purify the waste solvent before reuse. We are also encouraged to reduce energy usage by avoiding high and very low temperatures. Metrics related to energy usage are difficult to measure or calculate directly because most chemical manufacturing sites contain a large number of multipurpose plant vessels, as well as laboratories and offices. It is rare that the measuring equipment is in place such that individual unit operations can be measured. Software packages such as Batch Plus can calculate energy usage, however some unit operations are bound to be more energy-intensive than others, such as heating at reflux and distillation, which requires energy for heat of vaporization as well as cooling the vapors. So simple metrics such as the number and length of reflux operations, the number of distillations and the amount of time can be used as an indirect measure of energy usage.

One of the problems we sometimes face is balancing different aspects of our process, such as energy usage versus waste generation, for two process options. In some cases, as with the biocatalytic process for manufacturing pregabalin, the answer is straightforward (see Scheme 1). The energy usage for the version of the process where the unwanted enantiomer is recycled is higher than the version without recycle, but this is outweighed by the reduced requirement for the starting cyano-diester (4) and the cost of disposing of (R)-4.

In other cases the decision usually comes down to cost, for exam-

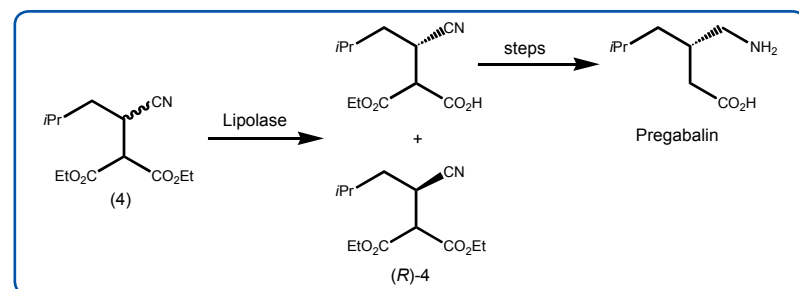
ple when comparing processes for amide formation (see Scheme 2) carried out at CABB AG.

A comparison of the energy usage and waste generation for the two routes is given in Table 2.

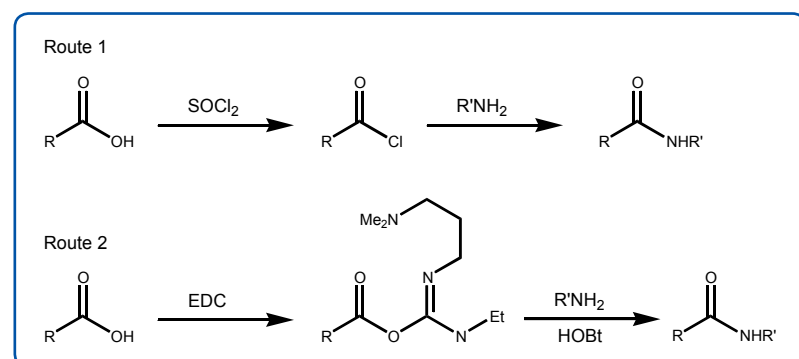
Route 1 is more energy-intensive than route 2, but route 1 is chemically more efficient as measured by atom efficiency, PMI and E Factor — particularly as the SO₂ and HCl byproducts from acid chloride formation are recycled.

We really need a metric that measures or compares overall process efficiency, which will include not only PMI, E Factor, waste generation and energy usage but will also include a comparison of how a given process operates in different types of reactors. A number of green chemistry metrics can be easily collected and used to assess individual process steps or the overall synthesis of a given product or even the whole portfolio of a company's product — as well as measuring progress over time in terms of a company's "green performance." However, the challenge now is to measure the greenness of the engineering aspects of chemical processes and develop an integrated metric to cover chemistry and engineering.

Will Watson, Technical Director, Scientific Update



Scheme 1: Biocatalytic route to pregabalin (from "Green Chemistry in The Pharmaceutical Industry," P.J. Dunn, A.S. Wells and M.T. Williams [eds], Wiley-VCH, 2010)



Scheme 2: Options for amide formation (from J. Schrikel, presentation at Hazardous Chemistry for Streamlined Large Scale Synthesis conference, Cologne, in November)

Table 1: Waste generation in the chemical industry

Industry sector	Product tonnage	E Factor (kg waste per kg product)
Oil refining	10 ⁶ -10 ⁸	~0.1
Bulk chemicals	10 ⁴ -10 ⁶	<1-5
Fine chemicals	10 ² -10 ⁴	5-50
Pharmaceuticals	10 ¹ -10 ³	25-100+

Table 2: Comparison of waste generation and utility requirements for amide formation processes

Metric	Route 1	Route 2
Electricity	100%	75%
Steam	100%	71%
Atom efficiency	53.1%	45.3%
PMI	4.3	12.2
E Factor	2.2	11.3

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BASF launches R&D Center for Battery Chemicals in Japan

Japan — BASF has inaugurated a new R&D and application center for battery chemicals at Amagasaki, Japan. It is BASF's first combined facility in Asia-Pacific.

The Japanese laboratory, which will focus on developing electrolytes and electrode materials for high-performance lithium ion batteries, will run joint development programs for local customers.

In 2013, BASF said, its battery materials lab was chosen by Japan's ministry of economy, trade and industry as a project promoting Asian site location in Japan, toward supporting local companies' high-value business locations.

The group's total investment, covering new offices and laboratories at a 600-square meter site, totals "several million euros," said Joerg-

Christian Steck, representative director and president of BASF Japan.

Steck said the lab will combine organic and inorganic synthesis, analytics and electrochemical testing within one group. This, he said, facilitates understanding of how different materials interact in battery applications. BASF additionally will benefit from increased synergies with group units researching chemicals for use in organic photovoltaic cells and electronic materials.

In its battery materials segment, the Ludwigshafen-based group operates six production plants and pilot plants at its German headquarters as well as four in the U.S. and one in China, as well as six R&D sites in Germany, the U.S., China and the new Japanese site. (dw)

Get Ready For Revisions

Latest Chemical Regulatory Updates in Taiwan

Registration And Safety — Revision of the Toxic Chemical Substance Control Act (TCSCA) in Taiwan has attracted attention from the chemical industry recently because a new REACH-like plan is expected to be introduced to another big chemical market in Asia soon.

In addition to the TCSCA amendment, Taiwan's Labor Safety and Health Act (LSHA) has also been revised this year, bringing changes to chemical companies in Taiwan. This article focuses on recent updates of the amendment of TCSCA and LSHA and analyzes their potential effect on chemical companies doing business in or with Taiwan.

Background and Updates of TCSCA Amendment

TCSCA was issued in 1986 and has gone through five revisions, the latest in 2007. It is the main legislation for industrial chemicals in Taiwan. Its primary focus is the control of toxic chemical substances, requiring business operators to apply for handling permits for designated substances from the Environmental Protection Administration (EPA).

The main reason for amendment is the lack of a chemical registration scheme in Taiwan. After so many countries (Korea, China, Japan) have implemented REACH-like chemical legislation and required risk assessment of chemical substances, Taiwan may become a test ground for new substances without a chemical registration scheme in place. In addition, the food plasticizer contamination incident in 2011 made authorities

realize they do not have sufficient power under current TCSCA (i.e., request for toxicology data or requiring license) to control chemical substances for which there is concern of environmental pollution or endangerment of human health (Class 4 toxic chemical substances).

An internal government meeting in March reached consensus regarding the following two main revisions in the draft amendment of TCSCA proposed and published in November 2012:

Establishment of chemical registration scheme for new substances and designated existing substances with concern.

Amendment of provisions related to Class 4 toxic chemical substances to strengthen their management.

Details of Two Major Changes

Chemical Registration and Existing Substance Inventory: Article 7(1) of the draft amendment of TCSCA stipulates that domestic enterprises manufacturing or importing a given quantity of chemical substances designated by the central competent authority shall register the manufacturing or importing details; the physical, chemical and toxicology data; and the exposure and hazard assessment data before manufacturing or importing.

Taiwan's chemical registration scheme is expected to be similar to Korea's, focusing on the registration of new chemical substances and designated existing substances with concerns. For new substances, there would be standard registration, simplified registration and notice. The standard registration of new substances and designated existing substances with concerns

would be similar to EU REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) with tiered data requirements for different volume bands. Joint submission is also mandatory according to article 7(2) in the draft amended TCSCA. However, there is no concept of only representative in the draft amended TCSCA, which means that registration obligations may only fall on domestic manufacturers or importers.

Companies can now go to the website of the National Chemical Register (NCSR) Office to search Taiwan's existing substance inventory which has been finalized and released after supplementary nomination ended last year. There are around 79,000 substances (including polymers) in the inventory; about 40% are produced or imported with volume above 1 ton per year.

Strengthened Management of Class 4 Toxic Chemical Substances: Many articles related to Class 4 toxic chemical substances have been revised. Enterprises would be required to declare relevant toxicological information and obtain approval from competent authorities prior to handling, as well as being subject to management measures concerning toxicity labeling, pollution control and safety data sheets.

New Occupational Health and Safety Act (OSHA)

The Labor Safety and Health Act (LSHA) has been renamed the Occupational Health and Safety Act (OSHA), which was officially promulgated and published on July 3. The new OSHA stipulates obligations of chemical operators to register new substances; and label, provide SDS and obtain handling permits for hazardous



chemical substances. Yet the implementation date has not been decided by the Executive Yuan, the top legislative body in Taiwan. More implementation details are not available.

What You Need to Know

Although the new OSHA requiring new substance notifications has been issued and Taiwan's existing substance inventory has been finalized, enterprises do not need to submit new substance notifications at the moment.

The next step is to take the amended TCSCA to the Executive Yuan for final approval. It was originally scheduled for September, but it did not get prioritized. It is expected to be taken up again early next year. Once approved, the provisions related to chemical registrations and Class 4 toxic chemical substances in amended TCSCA would come into force one year after the date of promulgation. Meanwhile, detailed guidance documents on chemical substance registrations will be published, which might be more important than the amended TCSCA itself.

Companies shall closely monitor the promulgation date of the amended TCSCA and more guidance documents on chemical substance registrations and the implementation details of the new OSHA.

Yunbo Shi, Managing Director and principal consultant, CIRS

Contact:

Yunbo Shi
Chemical Inspection and Regulation Service (CIRS)
Hangzhou, China
Tel.: +86 571 8720 6555
yunbo.shi@cirs-reach.com
www.cirs-reach.com



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Styron Buys German S-SBR Capacity from JSR

INVESTMENTS Japan Synthetic Rubber (JSR) Obtained the Production Capacity Rights in 2007

Germany — Styrenics producer Styron has bought the 50% production capacity rights held by Japanese producer Japan Synthetic Rubber (JSR) in one of the Swiss-based company's eight production trains for styrene butadiene rubber (SBR) trains at Schkopau, Germany.

The deal, which adds 25,000 t/y of capacity for the rubber specialty solution styrene butadiene rubber (S-SBR) sold to the global tire industry, will effectively double capacity of one of the trains with effect from April. Total SBR capability at the former Dow Chemical complex in eastern Germany is 350,000 t/y.

Building on the success of the third S-SBR train in Schkopau it brought online in 2012, Styron said it is "uniquely positioned to capitalize on this expansion opportunity, which is strongly in line with its rubber

business growth strategy and is a cost-effective solution to meeting customer demand."

Styron's business director for rubber, Francesca Reverberi, said the buyout of the Japanese partner will allow it to react faster to customers' needs while at the same time leveraging the production line to produce next-generation grades.

JSR obtained the rights to 30,000 t/y of S-SBR from Styron Europe (for-

merly Dow Europe) in 2007 and began selling products made in Japan as well as at Schkopau to the European tire market. In November 2013, it established an S-SBR manufacturing joint venture in Hungary with oil and gas giant Mol. Because of this, the company said it has decided that the "most appropriate course of action" would be to consolidate its European production capacity within the new partnership. (dw)



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Givaudan Set to Acquire Cosmetics Producer Soliance

M&A Soliance is Currently Owned by France-based Agro-Industrie Recherches et Developpements

Switzerland/France — Swiss flavors and fragrances producer Givaudan said it is in exclusive talks about acquiring French cosmetics ingredients manufacturer Soliance.

With two sites in France and 77 employees, the company uses vegetables, micro-organisms and micro-algae to make ingredients for cosmetics, including self-tanning lotions and skin creams.

Soliance is currently owned by France-based Agro-Industrie Recherches et Developpements

(ARD). The deal expected to close in the second quarter of this year would be Givaudan's first acquisition since 2007, when it bought

flavours and fragrances business Quest from British chemical group ICI.

The French company's portfolio of active cosmetic ingredients, strong process development and research capabilities fit well into the five strategic pillars of Givaudan," said CEO Gilles Andrier.

Givaudan did not disclose a bargaining figure. It did say that Soliance's would add about 25 million Swiss francs to its revenue, based on 2013 figures. The company will fund the transaction from its cash flow.



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Pure Savings

Employing Biocatalysis to Refine the Chemical Synthesis of Duloxetine

Competing With Generics

With product innovation falling and drugs going off patent, the generic pharmaceutical market is becoming more predominant. It is expected that generics will be adopted in almost all major pharmaceutical markets before 2020. India and China are especially promising, because of their ability to undertake cost-effective active pharmaceutical ingredient (API) and pharmaceutical intermediate manufacturing. Manufacturers of patent-protected therapies must therefore increasingly compete with generics manufacturers.

This increased competition over products has put cost reduction at the forefront of manufacturers' minds.

A Change In Thinking

Pharmaceutical innovators can compete with generic manufacturers by using more effective manufacturing processes. Conventionally, cost reduction measures have taken place in the later stages of clinical development, but as pressure to save money has grown, innovators have increasingly employed them earlier.

Investing in new technologies can improve the productivity and efficiency of manufacturing intermediates and APIs. Biocatalysis reduces costs while still providing a sustainable process and improving API quality. By utilizing this type of method earlier, innovators can better protect themselves against future generic manufacturers and remain aligned with regulatory demands.

Employment Of Biocatalysis

Biocatalysis is the use of natural catalysts (e.g., enzymes), in place of chemical catalysts in synthetic processes. This enables new, sustainable routes of production for intermediates and APIs. It is an important tool for medicinal, process and polymer chemists, allowing the development of efficient and highly



attractive organic synthetic processes on an industrial scale.

One advantage of enzymes in organic synthesis is their unique selective properties, which give a number of commercial benefits, such as better production of single stereoisomers, fewer side reactions, fewer reprocessing/purification steps and easier product separation.

Developing Duloxetine

Duloxetine is a serotonin-norepinephrine re-uptake inhibitor used to treat a wide range of conditions, including major depressive disorder and chronic musculoskeletal pain. The main brand of Duloxetine, Cymbalta, went off patent in December, making it a candidate for cost reduction.

This article will outline the specific disadvantages of chemical catalysis and the benefits of using biocatalysis enzymes during the manufacture of Duloxetine APIs and intermediates. It will demonstrate how cost savings and improved end products are achieved through improved API quality, updated synthe-

sis routes, process sustainability and technical benefits.

Chemical Synthesis Of Duloxetine

The chemical synthesis of Duloxetine is shown in the scheme. Initially, racemic 3-(N,N-Dimethylamino)-1-(2-thienyl)propan-1-ol is formed. The mixture then undertakes resolution to form (S)-N,N-Dimethyl-N-[3-hydroxy-3-(2-thienyl)propyl] ammonium (S)-Mandelate, which is converted to (S)-Duloxetine Hydrochloride.

This method for creating Duloxetine has several disadvantages. For instance, many chemical steps are included, increasing manufacturing cost. Extra steps are also added for the recycling of the resolving agent and isomer-recycling, which takes place by heating of the (R) isomer with hydrochloric acid. This forms impurities, which may affect the end product.

Furthermore, the final yield of this process is restricted to around 10–12% of the starting material. A key factor in this high loss of yield is the chemical resolution of

3-(N,N-Dimethylamino)-1-(2-thienyl)propan-1-ol and the removal of one or two methyl groups of the dimethyl amino side chain. This elimination entails extra treatment of (S)-3-(N,N-Dimethylamino)-1-(2-thienyl)propan-1-ol with corrosive reagents, such as phenyl or ethyl chloroformate, and basic hydrolysis before condensation with 1-Fluoronaphthalene.

Importantly, the resolution step creates a low enantiomeric excess, reducing the purity of the final product. Chemical resolution of key intermediate formation also requires the use of costly (S)-Mandelic acid in half molar quantities.

To create a more cost-efficient and sustainable manufacturing process, other methods should be considered, such as the use of biocatalysis enzymes.

Enzymatic Synthesis Of Duloxetine

The enzymatic routes for the synthesis of Duloxetine (Table) show notable improvements on the chemical synthesis route.

Cost Reduction

Costs of manufacture are reduced through various methods using biocatalysis. Formulators can use enzymes to resolve an existing racemic

mixture, create new chiral centers or deliver a chirally pure compound. This improves the production of single stereoisomers, creates fewer side reactions, allows easier separation of products and reduces waste. Because of the efficiency of the technique, the total cost of applying biocatalysis in drug manufacture is fairly low.

The synthesis of Duloxetine through biocatalysis is vastly cost-efficient because of the reduction in raw material input and consumption — the required components are reduced by as much as 15%. There is also a drop in overhead costs due to fewer process steps, and a reduction of up to 15% in equipment, labor and energy costs — all resulting in higher throughput and financial savings.

Sustainability

Because of the high selectivity of biocatalysis enzymes, the number of stages used during product synthesis is reduced, which in turn decreases waste production. The biocatalysis enzymes themselves can be created from renewable sources and mostly operate in water, eliminating the need for organic solvents and hazardous chemicals. Overall, the entire manufacturing process becomes more sustainable and environmentally friendly.

A Purer Product

The enzymatic process for Duloxetine synthesis uses an immobilized enzyme, providing enhanced stability and allowing convenient handling. Importantly, these can also be recycled and reused, decreasing the overall cost and improving efficiency. If required, the enzymatic synthesis route can be converted into a continuous packed column/membrane-based process.

These advances have an inevitable influence on the final product. It has been noted that biocatalysis creates more linear synthesis routes with fewer intermediates. In addition to improving productivity, this creates a better quality of API or intermediate.

The biocatalysis method creates fewer opportunities for intermediates to be passed on to the final API, making a purer product. In addition, the chiral resolution itself is very clean, so the risk of carryover of chiral impurities is small. Finally, reducing the use of solvents in the process reduces the chance of contamination.

Conclusion

Within API and intermediates manufacture, demand is rising to improve operating margins while still generating a pure final product. Manufacturers are keen to include these measures earlier in the product life cycle. As shown by the effective execution of biocatalysis in the synthesis of Duloxetine, organic enzymes can greatly benefit both final drug products and manufacturing processes.

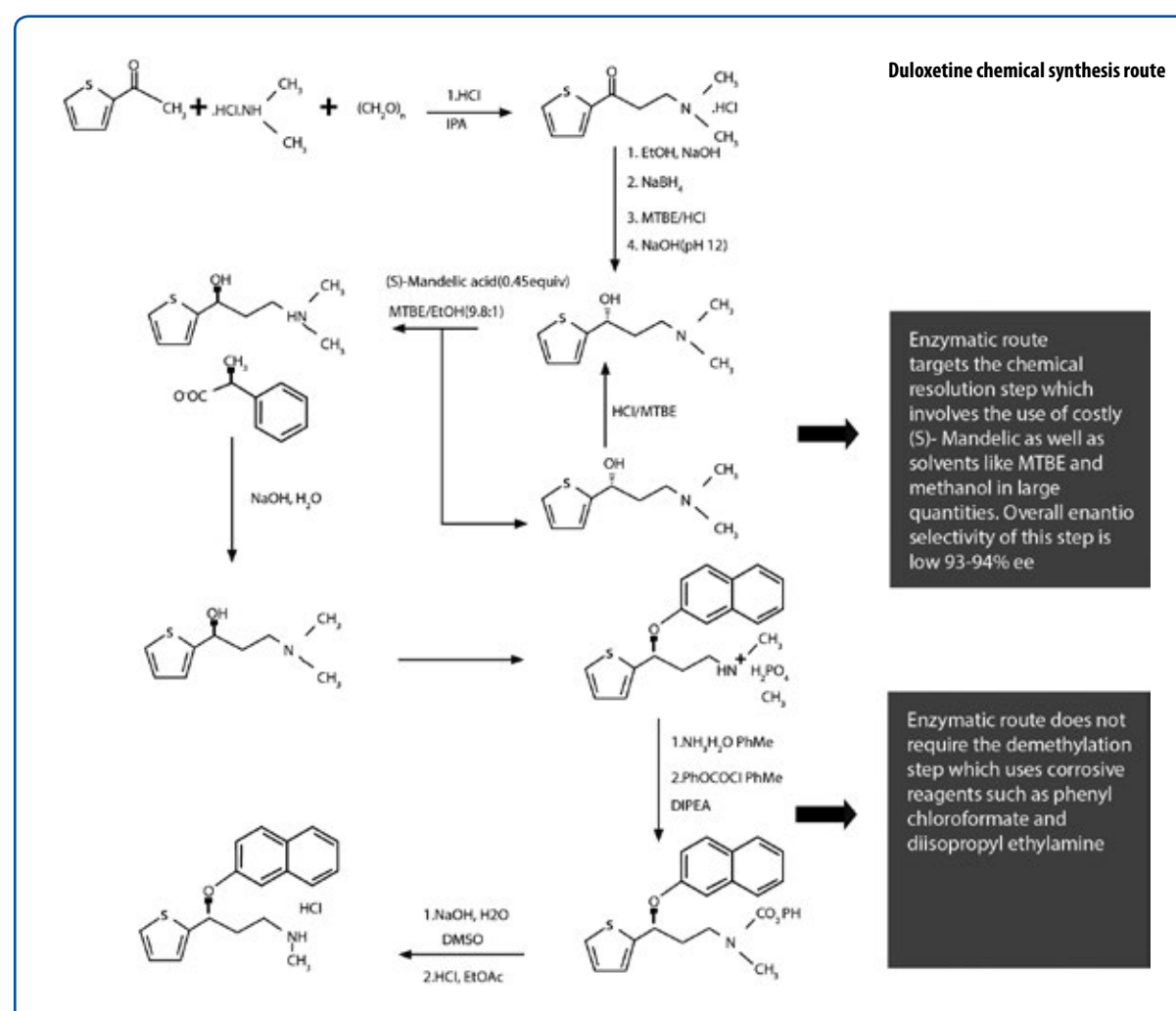
An alternative method enables manufacturing procedures to become more streamlined and cost-efficient. Biocatalysis can create a route for companies seeking to boost sustainability, improve performance and cut costs. In this way, manufacturers are better placed to contend with generic products in this increasingly competitive marketplace.

Rose A. Lance, Senior Marketing Manager, Novozymes Biopharma

Contact:
Rose A. Lance
Senior Marketing Manager
Novozymes Biopharma
Tel.: +1 617 401 2500
raln@novozymes.com
www.novozymes.com

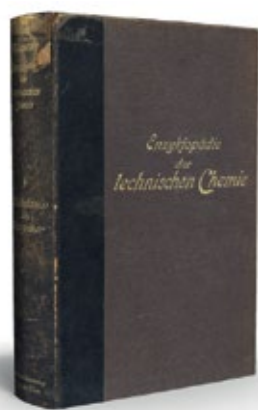
Enzymatic routes for production of Duloxetine

	(S)-3-chloro-1-(thiophen-2-yl)propan-1-ol	(S)-ethyl 3-hydroxy-3-(thiophen-2-yl)propanoate	(S)-3-hydroxy-3-(thiophen-2-yl)propanenitrile	
				Kinetic
				Dynamic
Substrate concentration	100g/L	100g/L	100g/L	100g/L
Enzyme dosage	50% wt/wt wrt to substrate can be optimized to <5-10% dosage wt/wt	50% wt/wt wrt to substrate can be optimized to <5-10% dosage wt/wt	50% wt/wt wrt to substrate can be optimized to <5-10% dosage wt/wt	50% wt/wt wrt to substrate can be optimized to <5-10% dosage wt/wt
Selectivity	87.96% ee	94.7% ee	92% ee	85.42% ee
Conversion to (R)-acetyl by HPLC	45.31% (by area)	34% (by area)	52% (by area)	98% (by area) (2.0% unconverted starting substrate alcohol)
Conversion to S-Duloxetine	<ul style="list-style-type: none"> (S)-Chloro to N-methyl intermediate Condensation of N-Methyl intermediate with Fluoronaphthalene to give duloxetine & corresponding hydrochloride 	<ul style="list-style-type: none"> Ester to N-methyl amide (chemical or enzymatic) Reduction of N-methyl amide by Borane/THF & formation of duloxetine hydrochloride 	<ul style="list-style-type: none"> Reduction of (S)-Cyano to amine intermediate Conversion of amine to N-methyl amine intermediate Condensation of N-Methyl intermediate with Fluoronaphthalene to give duloxetine & corresponding hydrochloride 	<ul style="list-style-type: none"> R-Cyano is obtained as the product in excess instead of (S)-Cyano Flipping of configuration of (R)-Cyano to (S)-Cyano intermediate during condensation reaction with alpha-naphthol Reduction of cyano to amino & N-methylation & salt formation.
Improvements	<ul style="list-style-type: none"> Solvent engineering – trying out different solvents, trying out neat reactions in absence of solvent Temperature – reaction can be tried out at lower temperatures for higher selectivity Vinyl acetate concentration can be reduced below 5.0 equivalents. 	<ul style="list-style-type: none"> Solvent engineering – trying out different solvents, trying out neat reactions in absence of solvent Temperature – reaction can be tried out at lower temperatures for higher selectivity Vinyl acetate concentration can be reduced below 5.0 equivalents 	<ul style="list-style-type: none"> Solvent engineering – trying out different solvents, trying out neat reactions in absence of solvent Temperature – reaction can be tried out at lower temperatures for higher selectivity Vinyl acetate concentration can be reduced below 5.0 equivalents 	<ul style="list-style-type: none"> Solvent engineering – trying out solvents other than toluene, trying out neat reactions in absence of solvent Temperature – reaction can be tried out at lower temperatures for higher selectivity Vinyl acetate concentration can be reduced below 3.0 equivalents. Ruthenium catalyst can be reduced to <0.05 equivalents



A Pioneer Through the Years

Ullmann's Encyclopaedia of Industrial Chemistry turns 100 Years



The original Ullmann's from 1914.

Chemical Technology — The year 1914 saw the outbreak of the First World War, which changed the face of the world with lasting effect. But other events of that fateful year, if less well known, have also left their mark on the present. For one, the Urban and Schwarzenberg publishing house released the first two volumes of a 12-volume reference work by Professor Fritz Ullmann of the Berlin University of Technology: the Encyclopaedia of Industrial Chemistry. The price of the first edition — half-bound in leather, with gold-embossed lettering — has been lost in the mists of time, as has the number printed, but the work was a success, with the publishers issuing another edition and then a reprint soon after the first sold out. Since then, Ullmann's has been a must-read for every industrial chemist.

As Ullmann's turns 100, browsing the first edition transports us back to the start of the 20th century. The illustrations in this article, all taken from the original Ullmann's, give an impression of the world of chemistry at the time. Some things appear antiquated, such as carbonizing brown coal to produce paraffin. Some seem progressive, such as the industrial-scale production of milk powder in drum driers. And some create a feeling of déjà-vu, such as extracting bituminous shale as an alternative to crude oil, the recoverable reserves of which were thought to be running out — a perennial concern, it turns out.

A Major Reference Work Makes the Leap to the Internet

When Ullmann's came to German Chemistry Publisher Verlag Chemie (VCH) at the start of the 1970s, it was the first work there to have an in-house editing team, at times numbering more than half a dozen. As the final volumes of the fourth edition were published, the team had already begun work on the fifth, translated for the first time into English and released between 1985 and 1996 with the help of hundreds of newly recruited authors from around the world. In 1997 Ullmann's was digitalized and sold on CD for installation on local networks. Three years later, it became the first Wiley-VCH major reference work to make

the leap to the Internet, its primary home (with regular updating) ever since, supplemented by new print editions in 2002 and 2011.

What may read like a well-planned success story in fact required frequent navigation into uncharted waters, demanding creativity, steady nerves, and a willingness to take economic risks. That pioneering spirit set a standard, and Ullmann's still leads the field in introducing forward-looking technologies. It is now among the first encyclopaedias to use the newly developed Smart Article technology, allowing substances to be found, compared, and placed in relation to one another based on their chemical structure alone.

Kirk-Othmer: Counterpart, Potential Adversary, Companion

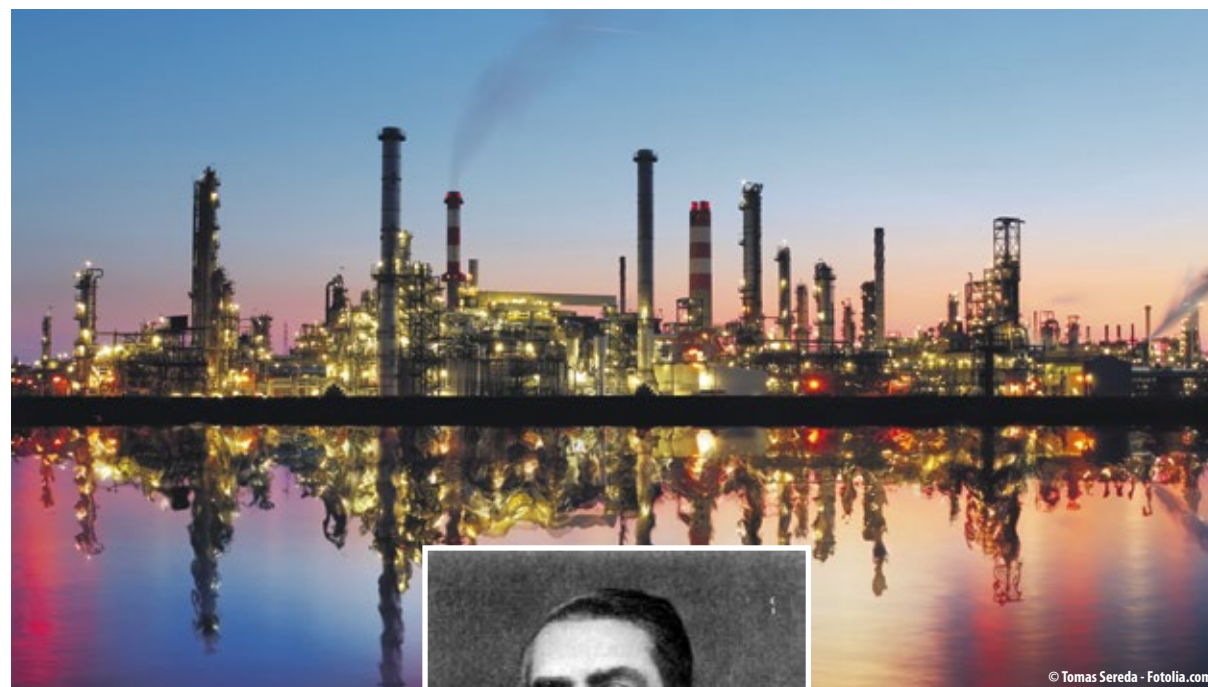
As popular as it was, the original Ullmann's did have one key flaw: you had to know German to read it. In the 1940s, Donald Othmer and Raymond Kirk of New York University started compiling an English-language counterpart, and The Encyclopedia of Chemical Technology, now known as Kirk-Othmer, was published from 1947 on in five editions by America's most important chemistry publisher, John Wiley & Sons. The 1996 VCH acquisition brought Ullmann's (by then in English) and its American counterpart into the hands of the same publisher,

where what could have been a battle of the giants became one of the most successful product families. Together, the two works are unbeatable, with combined knowledge that can answer almost any question arising in the context of chemical products and processes.

Fritz Ullmann's Prescience

If the content, language, and means of circulation have changed, the idea behind Ullmann's has nonetheless remained the same, as revealed in Fritz Ullmann's 1914 preface:

The main purpose of this work is to provide a clear and precise study of current technical operating principles. [...] The encyclopaedic nature of the work requires its contents to be in alphabetical order. In the interest of clarity and to avoid repetition, however, it appears expedient to place fields with closely interrelated content in equally close physical proximity. For example, "soda" is dealt with under "sodium compounds" and, similarly, descriptions of inorganic salts and oxides always follow the element in question. [...] In this manner, the backbone of the work is made up of long articles combining information, interspersed with numerous shorter treatises and references to main articles, where appropriate. Each of these self-contained articles, some of which deal with processes which have until now been kept secret, comprises



Prof. Fritz Ullmann (*1875, †1939)

a historical introduction, then a short description of older working methods, followed by a detailed description of current approaches. In the case of the more important products, particularly close attention has been paid to secondary and waste products, analysis, use and economic factors (pricing and statistics). Throughout the works, great importance is attached to providing a most detailed list of sources, and a critical glance is cast at the patent literature in the field.

The prescience of his vision is evident in today's Ullmann's, still modelled successfully on this description.

Others have continued his legacy through the years. Since 1987, Ullmann's has born the stamp of Barbara Elvers, first as an editor and since 2008 as Editor-in-Chief, supported by an editorial advisory board of 22 experts, half from the industry and half from academia. And where it took 150 authors to write the first edition, there are now 3,000, many from countries that did not even exist 100 years ago.

100 and Still Number One

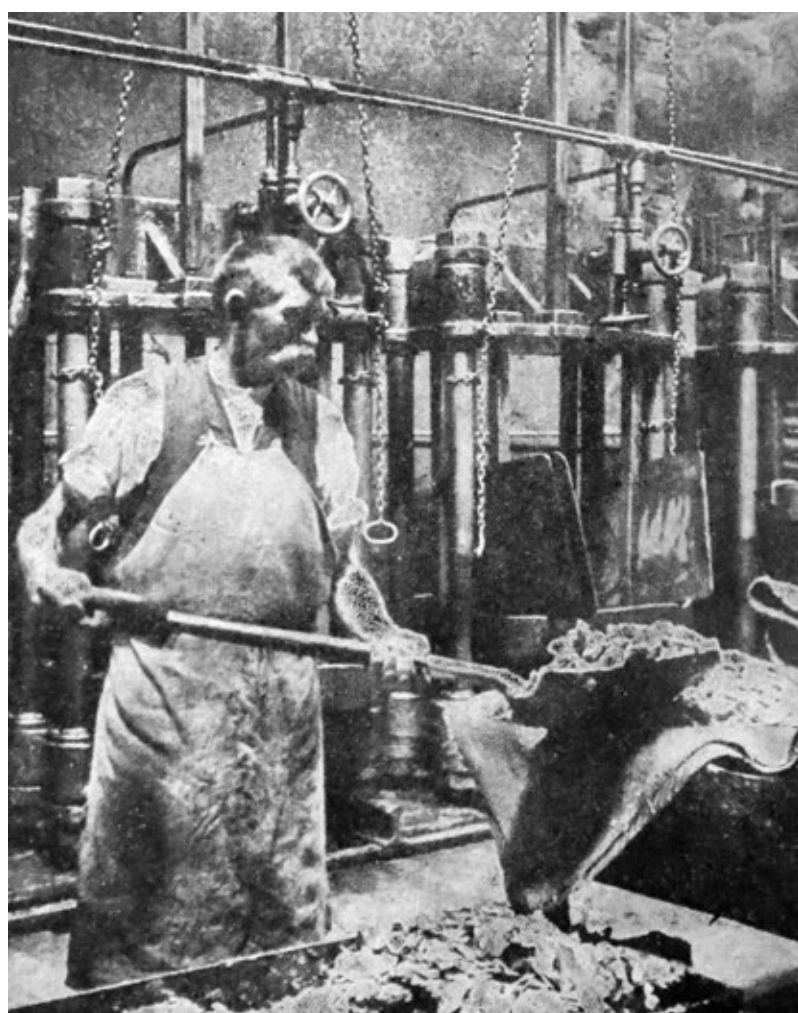
With more than 30,000 pages, Ullmann's is the most comprehen-

sive Wiley-VCH encyclopaedia, and also the most heavily used. Its online access metrics have led the field by a wide margin for years, and few other reference works are cited as frequently. It has become a global brand for reliable specialist information across more than 130 countries, from Alaska to New Zealand, from South Africa to Korea. Its retention of content from earlier days is a plus as well; routine technical processes that are largely absent from the current specialist literature are here side by side with the latest procedures, helping plant operators choose when and how to reorganize a process, and patent lawyers decide to what extent a new process is ahead of the latest technology. With

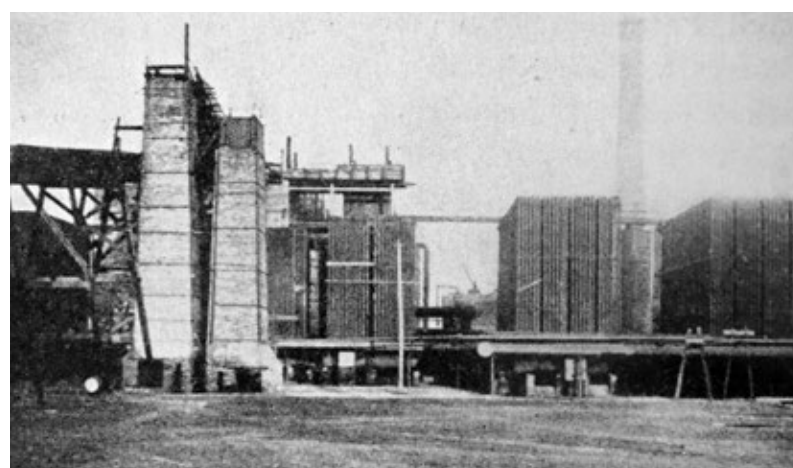
a practically inexhaustible range of data and information, Ullmann's is a reliable companion throughout careers and lifetimes.

We are marking the anniversary year in several ways, looking back with excerpts from the 1914 edition posted on ChemistryViews and with a series of articles in CHEManager and CHEManager International in which Ullmann's authors trace the industry's last 100 years through selected products and processes. And we will look forward, too, making Ullmann's massive store of knowledge even more accessible in a new series of articles titled Ullmann's Academy and offering short presentations of concepts and methods, accessible free of charge and linked to corresponding Ullmann's articles. In taking these steps, we honor the spirit of Fritz Ullmann, whose life's work went into processing and spreading knowledge, and whose name is today a synonym for comprehensive, reliable, specialist information.

Dr. Frank Weinreich, Associate Publisher, Wiley VCH — Weinheim, Germany; John Lehmann-Haupt, Editor, Wiley, Hoboken, USA



Lignite coal tar was an important source of paraffin in Germany which had large and easily accessible deposits of "brown coal". Paraffin could be crystallized out of the buttery tar fraction at ambient temperatures of -10°C or less. Where no active cooling was possible, paraffin harvesting had to await the arrival of the winter frosts.



To replace crude oil, reserves of which seemed to be dwindling, bituminous shale was distilled on a huge scale to produce petroleum and coal tar, as at the Pumpherston Oil Company works near Glasgow.



Hypochlorite bleach, a common household product at the time, was made by electrolysis of sodium chloride solutions, with anode and cathode in the same compartment. The more efficient chlor-alkali electrolysis with its separate anodic and cathodic cells had only recently been introduced.

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Breakthrough to Excellence

Global Users Exchange with Focus on Technologies, Solutions and Networking

Schlagwort — Emerson Process Management brings with its “Global Users Exchange” again leading representatives of the industry and process automation technology together to share experiences and present proven solutions. Two years ago this conference for technology and management was first held on European soil - then in Düsseldorf. Now there is again a European event: from April 1 to 3, 2014 in Stuttgart. CHEManager spoke in advance of the event with Roel Van Doren, President, Emerson Process Management, Europe, about current trends in process automation. The interview was conducted by Dr. Volker Oestreich of CHEManager.



Roel van Doren,
President,
Emerson Process Management, Europe

CHEManager: Mr. Van Doren, terms such as *Cyber Physical Systems, Smart Grids Industry 4.0* or *missing today on any event in which it comes to industrial production and processing. What do you see as the current challenges of the process engineering industry?*

R. v. Doren: The lifecycle of a process plant from conceptual design through to decommissioning involves many engineering disciplines and systems, and goes through a number of stages. As a process automation innovator Emerson plays an important role in several of these stages.

Over the years we have seen a gradual increase in the degree of integration between the disciplines and systems that our customers wish to implement. However, as is often the case, adoption lags well behind what is technically feasible. For example, CAE tools used to design processes and plants can flow data through into the automation and asset management systems; once the appropriate interface is in place.

These interfaces are not standardised so must be engineered for each project. Such project-specific work increases time to market and also makes it difficult for the operating company to have data integrity over the whole lifecycle.

What does Emerson Process Management do to close these gaps for their customers?

R. v. Doren: I believe that the adoption of data and communication standards will lead the way to leverage the potential of the available tools. Our engagement with bodies such as Namur will ensure that we are aware of requirements and ready, as ever, to lead with the development of these standards.

I do see one area where the game is changing and companies are realising big benefits in a different way. People are still key here; not everything will be solved by interfaces and automatic data exchange. The challenges faced by our customers change and they need the flexibility to react. Customers are approaching Emerson looking for a solution to a growing challenge: creating a more agile, effective organization with faster, better decision making and better alignment of key functional

disciplines. This is sometimes called Integrated Operations.

What role has the upcoming „Emerson Global Users Exchange“ in the process of „Closing the Gaps“?

R. v. Doren: I believe our conference in Stuttgart will help our users to close these gaps in two ways: First, a delegate attending presentations



The primary function of Emerson Exchange is to enable users to help users.

and solutions exhibition will gain insight into how end users and Emerson are solving tough problems together. Second, after many years of Emerson Exchange we have grown a community of end users and Emerson staff who are engaged throughout the year, not just during the three day conference. Emerson Exchange 365, our online community, is a busy place even during the



Today the functions of a control system are augmented by the functionality of asset monitoring and maintenance systems.

conference when those users who are unable to attend can follow events in Stuttgart on line.

The primary function of Emerson Exchange is to enable users to help helping users – there will be 130 presentations, mostly from users who will relate their personal experiences in solving their toughest problems. There can be no greater example of credible real-world experiences than those presentations.

Also, returning to your previous question: in Stuttgart we will have an iOps (Integrated Operations) Centre right in the middle of the Solutions Exhibition where delegates can learn about the possibilities for themselves.

Can you be more specific, for example, on the topic “I & C” - which is today not only regulate the process safe and control, but also contribute to the efficient use of resources - often in combination with MES or PLM systems.

R. v. Doren: To answer that question one must first specify the “boundaries” of a “control system”. Today the functions of a control system are augmented by the functionality of asset monitoring and maintenance systems. These typically interface to MES systems to automate the replacement of a part that may be close to failure. Often procedures must be checked or verified

in order to make sure that a process can proceed in an orderly fashion. If one considers the asset management systems as part of the “control system,” then the linkages between the control system and MES system are clear. Additionally, for those systems that have routine changes in products, product grades or formulations, MES systems typically interface to the control system to manage

product campaigns including automating complete product change overs and changes to routings and processing of the materials used.

Regulation takes over a significant role in a number of areas in process industry – e. g. in Pharma and Food. How do you meet this additional complexity related to it?

R. v. Doren: Many of Emerson’s solutions actually help our customers to meet many regulatory requirements. For example, managing change with audit trail capabilities, ensuring security is in place for specific actions, and complying with requirements for electronic records/signatures are all things that our solutions help to enforce. In the pharmaceutical industry, in particular, we need to be able to enforce that the right steps are performed in the right order - whether manual or automated -, the right amount of the

right materials in the right state are added to the right batch using the right equipment in the right state. It is a lot of “rights” to get right! In addition mechanisms to minimize product variability, the capability of understanding when a complex multivariate process is out of control, and predictions of critical quality attribute in real time are pertinent to meeting the demands of complicated processes in a regulated industry. Finally, the ability to collect and easily retrieve batch context sensitive process data is important for evaluating and managing changes in a regulated environment.

In my final conclusion I would like to come back to my initial question and the related topic of the increasing horizontal and vertical integration of all operational areas. How do plant operators keep Cyber Security under control?

R. v. Doren: In the future operators will control cyber security through collaboration between the operators control system security experts and the business IT security organizations to provide security solutions that meet both the process uptime requirements of the Operators and the IT organizational security requirements.

These two security communities have different experience, expertise and objectives. At first sight their objectives seem to conflict but once they understand each other’s worlds they are able to work together. Emerson security consultants bring deep understanding of the control system world together with experience of working with business IT teams on customer sites.

At Exchange we have several presentations on Cyber Security and Meet the Experts session which I suspect will be one of the best attended sessions during the conference!

Mr van Doren, thank you very much for the interview. I wish you every success for the upcoming „Emerson Global Users Exchange“!

Read the complete interview on www.chemanager-online.com/en/topics/control-automation.

Contact: www.emersonexchange.org/emea
www.emersonprocess.com

UNDER CONSTRUCTION



BASF and Sinopec Break Ground on INA Plant in China

BASF and Sinopec have broken ground for the world-scale isonanonol (INA) plant the two groups are building at Maoming, China and scheduled for start-up in 2015. The facility, which will be operated in a 50:50 joint venture, MPCC Company Limited, will supply starting materials for next-generation plasticizers. Capacity details have not been provided. The project is being billed as the first of its kind to bring BASF’s advanced INA technology into China and also fills the country’s production gap, said Yu Xizhi, president of Sinopec Corp Maoming Company.

INA is used as a feedstock for plasticizers such as diisononyl phthalate (DINP) and non-phthalate plasticizer Hexamoll DINCH. The former is used in industrial applications such as automotive, wires, building and construction, while the latter is BASF’s non-phthalate plasticizer for sensitive applications such as toys, food contact and medical applications. (dw)

Solvay Expands U.S. Soda Ash Plant, Shuts Portugal Unit

Solvay will increase capacity of its Green River natural soda ash plant in the U.S. state of Wyoming by 150,000 t/y to meet growing demand. Construction already has begun on the capacity expansion at Green River, the Belgian chemical producer’s largest U.S. site where it has more than 400 employees and capacity to produce more than 2 million t/y of soda ash. “This capacity expansion is an important step in Solvay’s three-year action plan to reinforce its global leadership in soda ash by addressing different regional market dynamics,” said Christophe Clemente, president of the Soda Ash & Derivatives business unit. The company is gradually expanding its U.S. production capacity by around 12%, he added. The Solvay business has 12 industrial sites worldwide and more than 4,000 employees supplying 90 countries.

Meanwhile, Solvay has confirmed that it closed its electrolysis and soda ash facility at Povoia, Portugal, at the end of January as part of a cost-cutting plan also aimed at addressing structural overcapacity in the Mediterranean region. The company said it would supply Portuguese customers for soda ash from its site in Torrelavea, Spain, and caustic soda customers from a storage facility in Portugal administrated by the Spanish plant. (dw)

Evonik Expanding MMAT Plant in Alabama by 2015

Germany’s Evonik has begun expanding its MMA transesterification (MMAT) plant at Mobile, Alabama, in response to what it said is increasing demand. Without disclosing an investment value, the group said the project will cost in the “multi-million-dollar range.” It also did not disclose capacity, saying only that its capacity would “rise significantly” at start-up in late 2014.

The expansion reflects the strength of the markets supplied by the MMAT plant and a continued confidence in the ability of Evonik’s Mobile site to deliver impressive results to its performance polymers business, the group’s North American subsidiary said. (dw)

Linde Wins Hydrogen Contract from Tatarstan Refinery

Gases and engineering group Linde has been tapped by oil refinery group PSC TAIF-NK to provide engineering and procurement services for two hydrogen plants it is building at Nizhnekamsk in the Russian Republic of Tatarstan. The contract worth €120 million covers two plants with a capacity for around 110,000 normal cubic meters per hour (Nm³/h) of high purity hydrogen to feed the refinery’s new heavy residue conversion starting at the end of 2015.

PSC TAIF-NK operates the largest refinery in Tatarstan, which also includes a gasoline plant and gas condensation plant. Linde managing board member Aldo Belloni said the company is “confident that this agreement will lead to further key contracts for our gases and engineering business in this important eastern European growth market.” (dw)

Saudi Arabia to Build \$6.4 million Solar Panels Unit

Saudi Arabia has signed an agreement with SunEdison of Belmont, California, to explore building a \$6.4 billion solar panel plant at Wa’ad Al Shammal, in the northern part of the kingdom. According to U.S. press reports, the facility would produce enough photovoltaic solar modules annually to generate three gigawatts of electricity annually, equivalent to the output of three nuclear reactors.

SunEdison CEO Ahmad Chatila said in a statement that the project will support the expected substantial growth in solar photovoltaics within the kingdom and the region. Government investment agencies are reportedly footing the bill.

With oil resources no longer expected to be a ticket to long-term wealth, Saudi Arabia and its companies are increasingly seeking other opportunities for growth. Sabc CEO Mohammed Al Mady last year said his company was interested in becoming involved in a U.S. shale gas project.

The Saudi government also has set ambitious targets for renewable energy. About a third of the country’s energy output is targeted to come from renewables by 2032. The government of the United Arab Emirates is building an entire community, Masdar City, planned to run solely on renewable energy. Energy consultants noted that while Saudi Arabia has the right climatic conditions for solar power, it has some way to go before developing the market. (dw)

Linde and Nynas Sign On-site Gas Deal in Hamburg

Linde has signed a long-term contract with Sweden-based world leader in specialty oils (NSP) and bitumen, Nynas, covering on-site supply of hydrogen at Nynas’ refinery in Hamburg, Germany. Linde’s engineering division will build a state-of-the-art steam methane reformer plant worth €30 million in total.

The project is part of a major restructuring of the Hamburg refinery, which over the next two years is planned to be converted into a specialized NSP production site. Here, Nynas will increase capacity by 40%.

The hydrogen facility, with a capacity of 400,000 m³ per day, is due on stream in Q4 2015 and will be operated by Linde’s gases division. The Munich-based group said the plant also will be able to supply other customers in the Hamburg-Harburg harbour area. “Nynas and Linde already look back on a long and successful relationship, especially in Sweden,” said Linde managing board member Aldo Belloni. Linde supplies Nynas with natural gas from its terminal near Stockholm. (dw)

Agrium: Texas Nitrogen Expansion

Canada — fertilizer giant Agrium will proceed with plans for a US-\$ 720 million expansion of a nitrogen plant at Borger, Texas. Plans include a new urea production facility with a capacity of 610,000 t/y, scheduled to go on stream in the second half of 2015.

Around 100,000 of the total output is planned to be fuel-grade urea

that can be used to reduce nitrogen oxide emissions of motor vehicles. At the same time, ammonia output will be increased by 145,000 t/y to around 635,000 t/y.

Agrium CEO Chuck Magro said the project “will ensure the facility’s future longevity, while using the latest in environmental control technology.” (dw)

Styron Expands Latex Capacity

China — Styron announced plans to expand its latex capacity with a new reactor at its Zhangjiagang, China, production facility.

The new reactor, expected to commence production in the second quarter of 2015, will be Styron’s fourth unit of its kind at Zhangjiagang. It will serve mainly the paper and paperboard and also carpet in-

dustries, and complement Styron’s other latex production facilities in the Asia Pacific region in Korea and Indonesia. “The paper and paperboard industries have been using Styron’s latex chemistries for innovative binder coatings for more than 60 years,” said James Mingyu Ni, Styron Latex Business Director for Asia Pacific. (dw)

EVENTS

FECC Regulatory Compliance and Quality Standards Symposium, 26 March 2014, Brussels, Belgium

At the symposium organized by the European Association of Chemical Distributors (FECC) speakers from the European Commission, European associations and law firms, as well as company executives will present and discuss a wide array of issues pertaining to Regulation, Safety and Quality standards in the fields of pharmaceuticals & excipients, food & feed additives and cosmetics. The sessions will provide regulatory updates and insights on the impact of new regulations for suppliers and distributors of pharmaceuticals & excipients, food & feed additives, and cosmetic chemicals.

► www.fecc.org

Global Supply Chain Workshop, 11 – 12 March 2014, Brussels, Belgium

The Chemical Watch workshop provides an opportunity to participate in a program that brings together over 25 experts from industry, trade associations and government from around the world. Through presentations, Q&As, panel discussions and break-out sessions, delegates will hear about topics such as global supply chain chemical risk management, supply chain communication, and a series of different industry sector perspectives as well as the latest supply chain challenges facing organizations — including those supplying the chemical industry, those in the chemical industry together with downstream users.

► www.chemicalwatch.com/regulatory-summit

EPLA Plastics and Rubber Fair 2014, 26 – 28 March 2014, Poznan, Poland

Over 3,100 professional visitors and more than 130 exhibitors gathered at last year's edition of Poland's annual plastics and rubber exhibition. The event is becoming more popular among visitors from the polymer and rubber industry each year. In 2013, a salon devoted to composites and another one dedicated to rubber and plastics machinery were novelties of the fair, which regularly consists of a Rubber salon, a Thermoforming salon, and an Injection salon. The 2014 edition of EPLA will again be more than just a presentation of the exhibitors' offer but a place where professionals meet, exchange experiences and discuss business opportunities.

► www.epla.pl/en

In-Cosmetics 2014, 1 – 3 April 2014, Hamburg, Germany

The global business platform for personal care ingredients brings together the world's leading personal care ingredients suppliers, formulators, R&D and marketing specialists and showcases the most diverse range of innovative cosmetics ingredients and technologies. The 2014 edition will feature a country focus on Brazil, a pre-show workshop on Perspectives on Nanotechnology, more Innovation Seminars, and a multitude of new products in the Innovation Zone.

► www.in-cosmetics.com

American Coatings Conference 2014, 7 – 9 April 2014, Atlanta, USA

The forum for the paint and coatings industry, jointly hosted by American Coatings Association and Vincentz Network presents most recent research results and industrial developments covering the full range of processes and raw materials. At the main conference approximately 96 selected papers in 16 sessions will present scientific and technical insights on how to address today's challenges of increasing customer and regulatory demands for both enhanced coatings performance and greater environmental benefit.

► www.american-coatings-show.com

Chemspec India, 10 – 11 April 2014, Mumbai, India

2014 marks the 10th anniversary of Chemspec India, the dedicated event in India for the Fine and Speciality Chemicals Industry. More than 250 of the world's largest suppliers of fine and speciality chemicals and associated products and services such as contract & toll manufacturing will exhibit making the event a perfect opportunity to connect with customers and business partners. Markets covered include biotechnology, crop protection, agro chemicals, pharmaceuticals, water treatment, coatings, cosmetic chemicals, and surfactants. Concurrently, the 5th edition of Chemprotech India, an international event on chemical process equipment & technology will be held.

► www.chemspecindia.com

SynGas 2014, 28 – 30 April 2014, Tulsa, USA

The SynGas Association will host the decennial SynGas 2014 event at the Tulsa Marriott Southern Hills Hotel in Tulsa, Oklahoma. The leading show and comprehensive learning opportunity in the SynGas industry will attract industry producer and supplier professionals and top notch speakers. Attendees will experience exceptional education and networking events and a unique trade show that showcases new products for the synthetic gas industry.

► www.syngasassociation.com

FCE Pharma & Powtech Arena, 12 – 14 May 2014, Sao Paulo, Brazil

FCE Pharma, the international exhibition of technology for the pharmaceutical industry in Brazil focuses on the production chain in the pharmaceutical sector, especially the phases of manufacture, supply and distribution of products and services. The event attracts a qualified public of professionals associated with the pharmaceutical industry, suppliers, distributors and dealers of the country. The 19th edition of FCE Pharma comes up with the first edition of the "Powtech Arena". Under the motto "solutions for fine particles and dry solids", the pavilion within the FCE Pharma will bring together leading professionals and companies working with powders and granules.

► www.fcepharma.com.br

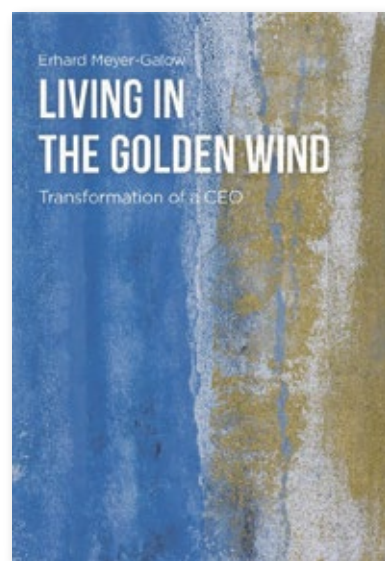
Chemspec Europe 2014, 18 – 19 June 2014, Budapest, Hungary

The annual European fine and speciality chemicals trade show organized by Quartz Chemicals and supported by the European Fine Chemicals Group (EFCG) will take place in Budapest for the first time showcasing a series of free-to-attend conferences, seminars and workshops for both exhibitors and visitors to attend. They include the RSC Speciality Chemicals Symposium, a Pharma Outsourcing Panel Discussion, an Agrochemical Intermediates Conference, the Regulatory Services Zone, and Pharma as well as Green Chemistry Workshops.

► www.chemspecurope.com

Living in the Golden Wind

A CEO'S Process of Maturation and Transformation – this subtitle describes how Erhard Meyer-Galow



has found an optimum balance between work and recreation in mastering various challenges of private and business life. In his fascinating biography, the former top manager in the German chemical industry and president of the German Chemical Society writes about the necessary change from outer to inner growth. This book, which combines reflections from business reality and spiritual guidance, invites readers to share the author's process of maturation and transformation, learn how to identify positive aspects of life's crises and to accept them as an opportunity for rewarding growth.

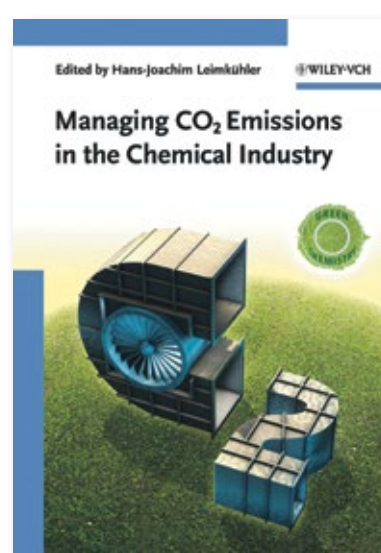
► **Living in the Golden Wind**

Erhard Meyer-Galow
Frieling
Price: \$ 10,42 (ebook)
ASIN: B00IG3P4IG

Managing CO₂ Emissions in the Chemical Industry

The reference book on this hot topic covers the technical and administrative aspects of CO₂ emissions, with special reference to the chemical and petrochemical industry. It also discusses energy efficient design, cultural aspects and future developments, answering such questions along the way as how can I measure and demonstrate the CO₂ emissions linked to my production, how can I benefit from CO₂ neutral investments using the UNFCCC frame, how can I reduce or avoid CO₂ emissions by technical measures and new processes or what are the upcoming technical developments regarding CO₂ reduction? It also describes technically and economically feasible methods for the capture and storage of CO₂.

A highly useful, practical and essential information source on one of the most pressing environmental topics of our time.

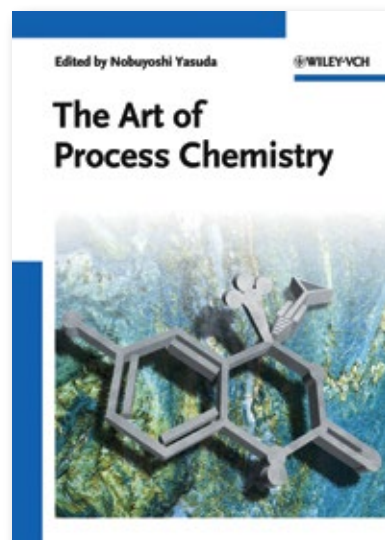


► **Managing CO₂ Emissions in the Chemical Industry**

Hans-Joachim Leimkuhler
Wiley-VCH
Price: € 139,00
ISBN 13: 978-3527326594

The Art of Process Chemistry

Providing must-have knowledge for the pharmaceutical industry and process chemists in industry,



this ready reference offers solutions for saving time and money and supplying – in a sustainable way – valuable products. Application-oriented and well structured, each chapter presents successful strategies for the latest modern drugs, showing how to provide very fast bulk quantities of drug candidates. Throughout, the text illustrates how all the key factors are interwoven and dependent on one another in creating optimized methods for optimal products.

► **The Art of Process Chemistry**

Nobuyoshi Yasuda
Wiley-VCH
Price: € 119,00
ISBN 13: 978-3527324705

Egnaton Notes plus

Sustainability in research laboratories is influenced by a huge variety of single parameters and interdisciplinary workflows. Due to the perception that single organizations or persons are unable to perform the expertise in all necessary disciplines the eJournal Egnaton Notes plus is published to describe the variety of sustainability. All sustainability topics are handled by the work groups in a holistic way and good results may be expected in order to improve research laboratories. Against the background of further individual properties of research buildings and the technological advance there is no end of sustainability generating design processes in sight. The articles are the result of working groups within Egnaton as well as case studies of single members. They must be understood as depiction of special conditions but also as suggestions for



the experienced reader with regard to feasible strategies.

► www.egnaton.com

PEOPLE

Stephen Cornell has joined Sasol as Executive Vice President: International Operations with effect from 1 February 2014. He is based in Houston, Texas, USA and reports directly to Sasol's CEO David Constable. In this role Cornell is accountable for the group's operations outside of Southern Africa, including Sasol's US mega-projects in Lake Charles, Louisiana. Previously, Cornell was Chief Operating Officer for US Fuels and Global Head of Major Projects at BP. He has extensive US domestic and international experience in petrochemicals, refining and logistics, having worked in the industry in the U.S., Europe, the Middle East and Asia.

Mark P. Vergnano has been named as CEO of the independent company DuPont is creating through the carve-out of the Performance Chemicals division. Vergnano has headed the \$7 billion division, including the titanium dioxide and the chemicals and fluoroproducts businesses that is being spun off by the second quarter of 2015 since 2008. Vergnano joined DuPont in 1980 and held a variety of manufacturing, technical and business assignments throughout his career. He received his Bachelor of Science degree in chemical engineering from the University of Connecticut and a master's degree in business administration from Virginia Commonwealth University.

Anthony Gerace has been promoted to Managing Director Mergers & Acquisitions for the Brenntag Group, effective March 1, 2014. In this new position Gerace will lead the M&A team of the global market leader in chemical distribution to focus on further expansion. He reports to CEO Steven Holland. Gerace joined Brenntag in 1993. During his tenure with the company he has accumulated significant expertise in successfully managing operating companies in addition to directing strategic Mergers & Acquisitions projects for Brenntag in North America.

Dr. Greg Hughes has been appointed as Vice President, Strategic Alliance & Product Development at Codexis. Prior to joining Codexis, Dr. Hughes worked at Merck & Co. beginning in 2002 in a variety of roles, most recently as Executive Director, Enabling Technologies in the Process Chemistry department. His responsibilities at Merck & Co. were focused on process chemistry and in particular on the application of biocatalysis technology within Merck's research and development and manufacturing groups. Hughes holds a Ph.D. in Organic Chemistry from the University of Toronto and a B.S. in Chemistry from the University of New Brunswick.



Jérôme Gandon

Jérôme Gandon has been appointed Global Counsel for Arkema. He reports to CFO Thierry Lémonnier and oversees all legal aspects at the Group level. Before joining the French chemicals producer at the beginning of January, Gandon (45) was Chief Counsel for the Europe, Middle East and Africa region of the Aluminium Branch of the Rio Tinto Group. He also held the position of Managing Attorney, overseeing the Rio Tinto Group's legal teams worldwide. A lawyer by training, he also has experience of over 12 years, including 2 years in the United States, in the law firms Jeantet Associés and Dentons (ex Salans).

Dr. Heinz Sieger has been appointed as President of the Board of EFCC - the European Fine Chemicals Group. Dr. Sieger is Chairman of CU Chemie Uetikon and has been a member of the EFCC Board since 2004. He replaces **Dr. Brian Murphy** of Robinson Brothers as President. In addition, **Roger LaForce** has been named as Vice President and **Dr. Hubert Stueckler** as Sector Group Manager, all with effect from January 1, 2014. LaForce is CEO of Zach System and is a past-Chairman of the EFCC Pharmaceuticals Business Committee. Until recently, Dr. Stueckler has been the President of the Actives Division and Head of Global Operations of Siegfried and was formerly a senior executive of DSM. Dr. Tony Scott will continue in his role as EFCC's Adviser until May 2014.



Alan Kennedy

Alan Kennedy has been appointed as new Commercial Director for the Specialty Polymers division of Scott Bader. Kennedy, a Chemistry graduate from St Andrews University in Scotland, joins Scott Bader from Invista Textiles, a division of Koch Industries. At Invista he was European Business Director for three years, having earlier spent 22 years with National Starch in a variety of executive roles, and then five years as Managing Director of St Regis Paper. Kennedy replaces the former Specialty Polymers Commercial Director, **John Kemp**, who has moved to Dubai and is now CEO of Scott Bader Middle East and Africa.

Dr. Alex Tretyakov has joined Cedarburg Hauser Pharmaceuticals as director of process development. In his new role, Dr. Tretyakov who has 25 plus years of industry experience will lead the company's process and analytical development groups and will, furthermore, join CSO John Lynch in serving as the technical face of the company and contributing his insight into customer projects. Tretyakov holds a Ph.D. in organic chemistry from the University of Oklahoma, and completed his M.S. in organic chemistry and B.S. in Chemical Engineering at the Leningrad Chemical Pharmaceutical Institute.

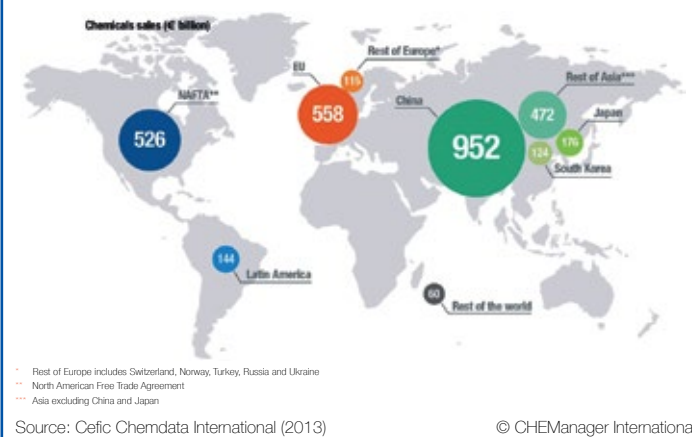
Claudette Kile has been appointed as Vice President of Quality & Regulatory at Gallus BioPharmaceuticals, a pure-play biologics contract manufacturing organization. Kile will be responsible for the planning, implementation and daily operations of the Quality & Regulatory organization at the Gallus HQ in St. Louis and the Princeton, New Jersey facility. She brings 27 years of industry experience in medical devices, biologics, and pharmaceuticals, with specialized expertise in building global compliant quality systems. Most recently, Kile was Senior Director of Quality at Jazz Pharmaceuticals. Previous roles included Director, Quality Assurance at Emergent Biosolutions and positions at Abbott Labs (now part of Covidien) and Guidant.

The EU Chemical Industry in a Global Context

World chemicals sales: geographic breakdown

World chemical sales in 2012 are valued at €3,127 billion. The European Union accounts for 17.8% of the total.

Fig. 1

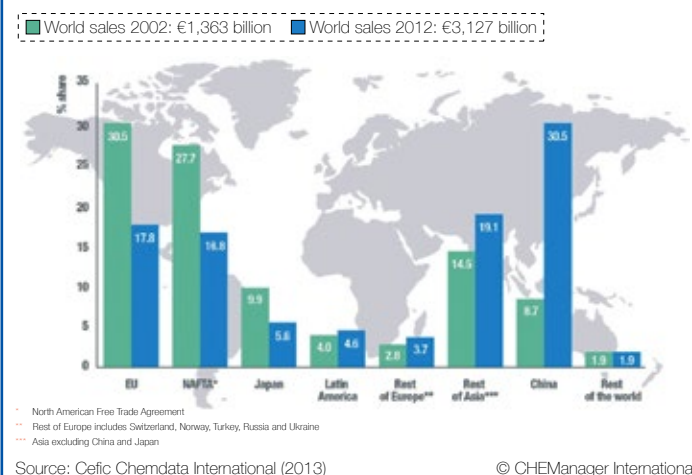


EU Chemical Sales

Last month, CEFIC released its latest Facts and Figures report providing the most up-to-date information about the EU chemicals sector. The report gives the newest full-year data available (2012) and analyzes the long-term development. EU chemicals sales continued to rise in 2012, climbing to €558 billion (Fig. 1). Despite the increase, the world chemicals market has expanded faster during the last two decades than in the EU, leading to a further decrease in the EU share of global chemicals output, standing at 17.8% in 2012. China clearly holds the top spot in world chemicals production, with sales in Asia dwarfing other regions.

World chemicals sales by region

Fig. 2

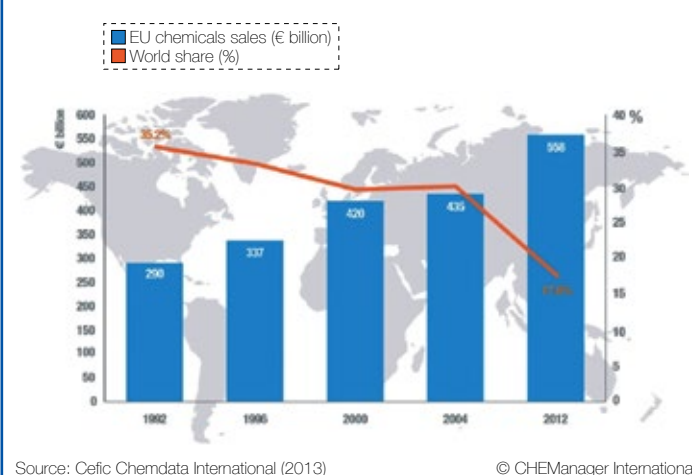


World Chemicals Output

World chemicals turnover was valued at €3,127 billion in 2012. This marks a significant recovery of the chemical industry compared with the previous years. Global sales went up by 12.8% in 2012 compared with 2011. Within the decade from 2002 to 2012 world chemicals sales increased by 2.3 times in value terms. During the past ten years the EU gradually lost its top spot in world chemicals sales to China and the rest of Asia (excluding Japan), although the total value of sales in the European Union has actually been continuously growing. China reached 30.5% of world chemicals sales market share in 2012 – the same share the EU chemical industry held in 2002 (Fig. 2).

EU share in the global chemicals market

Fig. 3

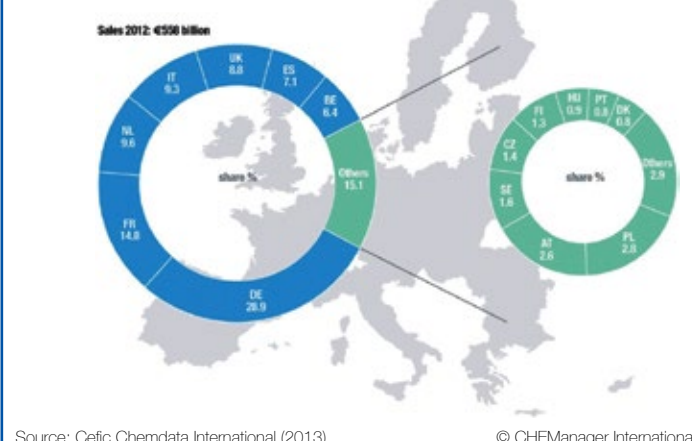


EU World Market Share

Developments during the last 20 years from 1992 to 2012 indicate that the EU was in a much stronger position than today. In 1992, the EU posted sales of €290 billion, which made up 35.2% of world chemicals sales. From then on, chemicals sales have been growing continuously, reaching an overall increase of 92% in value terms to €558 billion in 2012. When including non-EU countries, total sales for the region were €673 billion in 2012. However, world chemicals sales have increased at a much faster pace. Global sales quadrupled from €290 billion in 1992 to €3,127 billion in 2012. As a consequence, the EU chemicals market share has halved from 1992 to 2012 (Fig. 3).

EU chemical industry sales by geographic breakdown

Fig. 4



Share of European Countries

Germany is the largest chemicals producer in Europe, followed by France, the Netherlands and Italy. Together these four countries generated 62.6% of EU chemicals sales in 2012, valued at €349 billion. The share rises to nearly 87.7%, or €489 billion, when including the United Kingdom, Spain, Belgium and Poland. The other 19 EU countries generated 12.3% of EU chemicals sales in 2012, valued at €51.7 billion, nearly half of which was attributed to four of these countries – Austria, Sweden, Czech Republic and Finland (Fig. 4). Despite losing the top spot in world chemicals production, the EU chemical industry still holds the world top ranking in total trade.

The Pharmaceutical Industry and the VUCA Challenges

Increasing price pressures on established pharmaceutical markets are requiring extensive adjustments to pharmaceutical business models and the growth rates of most emerging market economies are declining — with unpredictable consequences for the national healthcare systems. Camelot Management Consultants resumes its Pharma Management Radar survey to investigate the most important business climate indicators on the one hand and delve into another current management trend in the global pharmaceutical industry on the other hand. In times of rising volatility the consultancy has chosen "Supply Chain Planning in a VUCA World" as focus topic for its next Pharma Management Radar survey — featuring one of the buzzwords of the hour.



VUCA — volatility, uncertainty, complexity and ambiguity — is an acronym that originated in the military back in the late 1990s and was quickly adapted to the business environment. It describes precisely

the conditions of increasing variability and uncertainty of demand, and the complexity and ambiguity of product portfolios and supply chain networks in which global pharmaceutical companies are forced to operate today. Thus, many global supply chains in the pharmaceutical industry are neither equipped nor orchestrated to cope effectively with the new VUCA challenges the pharmaceutical industry is facing.

What are the biggest threats to pharmaceutical supply chains caused by today's VUCA world and

what countermeasures are available to prepare them for their challenges? The new round of Camelot's Pharma Management Radar survey is meant to give answers to these questions.

All supply chain executives from global pharmaceutical companies are welcome to participate in the survey in order to gain significant insights. New members can register to participate in the Pharma Management Radar. The survey period will end on 14 March 2014. The delivered information will be treated strictly confidential and will not be passed on. All panel members will receive an exclusive documentation of the results on the publication date of the Pharma Management Radar, either as a PDF by e-mail or as a hard copy by mail.

The general trends of the survey will be presented by Camelot in the June issue of CHEManager International.

▶ www.pharmamanagementradar.com



Cobalt Blue – For the year of 2013, Cobalt Blue was the most popular color according to Color Solutions International (CSI), a division of Dystar. CSI works with many major brands and, therefore, is able to track color usage, monitor trends and identify patterns that customers value during their color selection process. With this information, CSI defines the top colors of every season. Colors live in palettes and not many things are made solely of one color, however, in any given season, there are stand out colors that are the most popular. Top colors of the previous years were Fuchsia, Cranberry, Teal, Pink Peony, and Pistachio, respectively. In addition to monitoring current color trends, CSI produces Seasonal Inspirations to inspire designers. Hence, the most popular colors for the 2014 spring/summer season range from soft cosmetic tones to deep ocean blues.

Coming Up in the April issue of CHEManager International

- Interview with Martin Bruder Müller, Vice Chairman of the Board of Executive Directors of BASF
- Economic Outlook and a Discussion of Challenges for the European Plastics Industry by Patrick Thomas, PlasticsEurope
- Oilfield Chemical Suppliers Experience an Increasingly Profitable Market for Oil and Gas Production by Sean Milmo
- In Search of a Safer, Greener Firework by Alana Collis, Institution of Chemical Engineers (IChemE)
- Water – Fuel for Processes and Products by Jean-Marc Vesselle, Lanxess
- Effective Planning Of Chemical Plants Through Optimized Engineering by Ingo Kaiser, Siemens
- And much more!

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Geschäftsführer
Dr. Jon Walmsley
Bijan Ghawami

Director
Roy Oppe

Product Management
Dr. Michael Reubold (mr)
Tel.: +49 6201 606 745
michael.reubold@wiley.com

Editor-in-Chief
Brandi Schuster (bhs)
Tel.: +49 6201 606 755
brandi.schuster@wiley.com

Editor
Dr. Roy Fox (rf)
Tel.: +49 6201 606 714
roy.fox@wiley.com

Media Consultants
Corinna Matz-Grund
Tel.: +49 6201 606 735
corinna.matz-grund@wiley.com

Thorsten Kritzer
Tel.: +49 6201 606 730
thorsten.kritzer@wiley.com

Jan Kaepler
Tel.: +49 6201 606 522
jan.kaepler@wiley.com

Roland Thomé
Tel.: +49 6201 606 757
roland.thome@wiley.com

Marion Schulz
Tel.: +49 6201 606 565
marion.schulz@wiley.com

Team Assistants
Beate Zimmermann
Tel.: +49 6201 606 764
beate.zimmermann@wiley.com

Freelancers
Dr. Sonja Andres
Dede Williams (dw)
Miranda Kennedy
Dr. Volker Oestreich
Sean Milmo (sm)

Production Managers
Christiane Pothast
Claudia Vogel (Advertising)
Ramona Kreimes (Litho)

Reprints
Dr. Katja Habermüller
Tel.: +49 6201 606 719
katja-carola.habermueller@wiley.com

Subscription/Reader Service:
Silvia Amend
Fax: +49 6201 606 100
silvia.amend@wiley.com

Bank Account
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