

SPECIALITY CHEMICALS

ESTABLISHED 1981

MAGAZINE

JULY/AUGUST 2019



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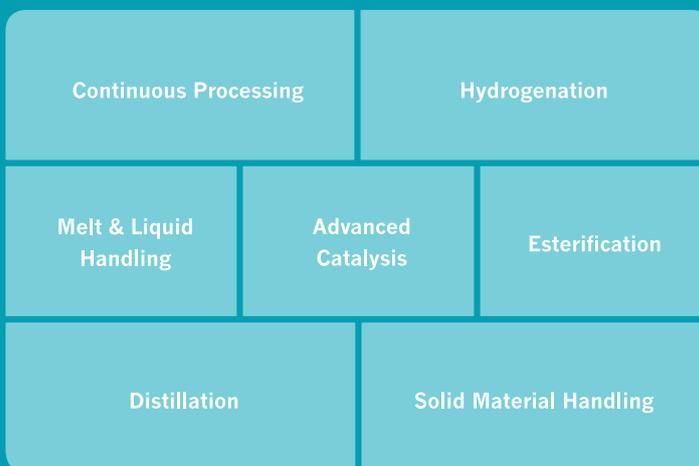
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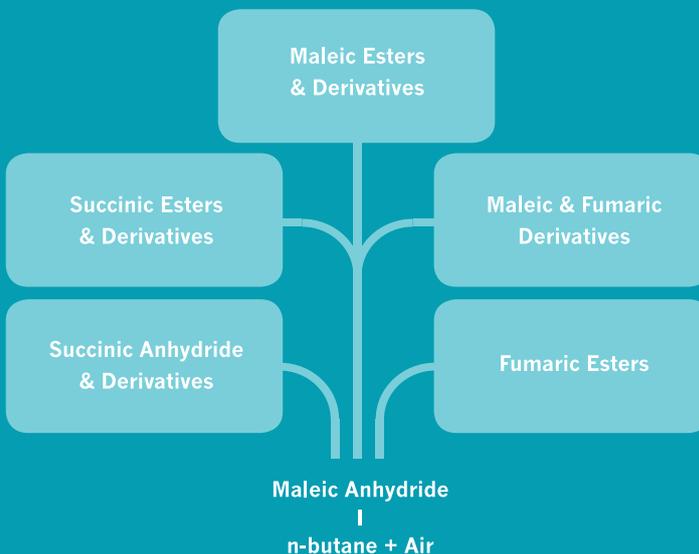
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SUBMISSION GUIDELINES

Speciality Chemicals Magazine welcomes contributions from academia and industry.

- **News and commentaries**, up to 200 words with one accompanying table or graphic;
- **Feature articles**, typically up to 800 words with two tables or graphics.

Submissions should be made by email to the editor (editor@specchemonline.com). We will let you know within three weeks if your contribution has been accepted for publication. All submissions are subject to review by the editor. If accepted, content may be edited and/or abridged, to ensure it is in line with the values, requirements and style of the magazine.

Articles not accepted for the magazine might be considered for online publication only. Online publications may also be included in our fortnightly newsletter.

Feature articles must have a technical (rather than marketing or promotional) focus. They may concentrate on a specific industry sector (for example, pharmaceuticals, agrichemicals, cosmetics and personal care) but should be understandable to experts in all fields. To this end, please start your main article with a brief explanation of the topic and define abbreviations that might not be widely known. Where appropriate, facts cited in your article should be referenced. Intelligent insights into the state and future of industry are encouraged.

Headings should be no longer than 12 words and a short stand-first is required, summarising the content of the article and giving the name and affiliation of the author, in under 30 words. Figures and tables should be numbered and each should be provided with a caption. Text should be submitted in Word format. Bar charts, line graphs and other graphical representations of data should be provided as separate files in an editable format (for example, xls). Chemical formulae should be provided in PDF format and photographs must have a minimum 300 dpi to enable colour printing.

New beginnings

Yes, it's that time of year again. For the last two Junes, it has felt strange not being at Chemspec Europe and it will be good to reconnect with industry friends and contacts in Basel again on 26-27 June. Please get in touch if you would like to arrange a meeting with me and/or the rest of the team – and see at the foot of this page for an important announcement on that subject.

This month we are focusing on contract and toll manufacturing, with a strong American flavour. There is an article from Kodak Specialty Chemicals (page 74) showing how domestic manufacturing has continued to enjoy a solid revival, sparked in large measure by supply issues in China. In another (page 80), three smaller US companies speak with one voice on the state of business in their field.

Of course, success brings its own challenges. One of them is an impending skills shortage as key employees retire and take their accumulated knowledge and wisdom with them, as Ryan Meany of Edgewater Capital shows on page 77. This also reminds us of the enduring need for soft skills, which are no less real because they cannot be put on a spreadsheet.

It's not all about the US, though. One interesting development, which we will surely hear more about in Basel, is the trans-Atlantic alliance of CABB Chemicals and Jayhawk, which will seek to bring the concept of outsourcing to the speciality chemicals industry (page 70). This is not entirely new – some of the others we spoke to in the US are doing it already – but there is no doubt that the speciality chemicals sector is far behind agro and pharma in this respect and there is huge potential for more.

And then there's the 'B' word. That a political decision made – but not yet implemented – by one country at the edge of Europe could have such far-reaching repercussions across the world is symptomatic of just how interconnected we have become. As I report from the first Chem UK show in Harrogate in May (page 65), it was Brexit that drew most people to the conference stands and the astonishing success of a purely national event in a relatively small national market is also symptomatic of the way Brexit has changed the way the industry is thinking. Though it would be remiss of me not to pay tribute to the excellent programme the organisers put on.

Enjoy reading and I look forward to seeing you in Basel.

Dr Andrew Warmington EDITOR



HARRIET GOULD has been named as the new global commercial manager for Speciality Chemicals Magazine, replacing Russell Priestley, who is returning to New Zealand for family reasons. She joins us on 24th June and will be coming out to Chemspec Europe to meet readers and clients. Harriet has had a career of 17 years to date in media sales and knows the industry well, having worked in event sales and partnerships at the UK's Royal Society of Chemistry since 2012. Harriet can be contacted on harriet@specchemonline.com



Cepsa presents 'unique' new LAB plant

Cepsa announced at the CESIO 2019 surfactant congress in Munich that it is upgrading its linear alkyl benzene (LAB) facility at Puente Mayorga, near Cadiz in Spain. The company is investing €100 million to replace hydrofluoric (HF) technology with the Detal Flex 2 Phenyl process using a fixed-bed Detal catalyst. This will be completed in 2020.

The new technology will enable Cepsa to produce both high and low 2-phenyl grades of LAB in the same plant, switching between them as demand dictates. LAB is the precursor to linear alkylbenzene sulfonate (LAS), the world's most widely used biodegradable surfactant in detergents. Cepsa, which has plants in six countries, is the global market leader in both LAB and cumene, and the second largest producer of phenol and acetone.

Detal will also make the plant more efficient and sustainable, Cepsa said, because it requires lower amounts of natural gas and electricity. Puente Mayorga – which was opened in 1969 and was the first to produce LAB using HF technology – will now become only the second plant in the world, after another of the company's sites in Canada, to use Detal technology and the first to use it in place of HF.

Cepsa is also installing the Yield, Energy & Throughput artificial intelligence system and applying Industry 4.0 technologies, such as machine learning, big data and advanced analytics, to increase the Puente Mayorga plant's capacity by about 50,000 tonnes/year, or 25%. This is being targeted mainly at the booming market in Africa.

In brief

Cambrex adds lab

Cambrex has completed a new, three-storey, 600 m² laboratory and a \$6 million, 3,000 m² logistics centre at its site in Karlskoga, Sweden. The lab will handle process technology, QC and analytical development. It also houses high-pressure reaction vessels and crystallisation equipment to optimise drug substance manufacturing, and can handle reactions from cryogenic to nearly 200°C. It will use computer modelling to optimise reactor set-ups and plant conditions.

Nouryon's new structure

Nouryon has announced a new organisational model, to come into effect from 1 January 2020. This will comprise a centralised operations and functional structure, with three market-focused businesses: Performance Formulations, including business lines where customer intimacy is needed, such as personal care and agriculture; the more product-focused Technology Solutions; and, Industrial Chemicals, in the salt-chlorine value chain.

Lonza to carve out LSI

Lonza has begun carving out its Specialty Ingredients segment (LSI), which is active in microbial control, by placing it under independent management, with increased control over operations and costs. This process should be completed by mid-2020. About 130 positions will become redundant, some 50 of them in Switzerland and 35 in the US. The company is working on transfers or early retirement offers for some of those affected.

Petronas into specialities

Petronas, the Malaysian petrochemicals giant, has made its first foray into speciality chemicals, buying the Netherlands-based Da Vinci Group from Bencis Capital and others for €163 million. Da Vinci makes silicones, lube oil additives and chemicals. CEO Datuk Sazali Hamzah said that this would make Petronas more competitive in markets like personal care, construction, paints and coatings, electronics, automotive and healthcare, particularly in the Asia-Pacific region.

Nippon Shokubai, Sanyo to merge

ⓘ Superabsorbent polymers are a key capability of both firms

Nippon Shokubai and Sanyo Chemical Industries of Japan have entered into a basic agreement on a merger of equals, which should be completed in around December. Financial details were not disclosed and a final agreement has yet to be signed, but the current plan is to form a holding company and centralise their corporate functions, while operations will continue independently.

Nippon Shokubai is mainly active in basic chemicals, such as acrylic acid and ethylene oxide, plus high-performance functional chemicals and environmental and catalyst products based on them. Sanyo is more focused on performance chemicals based on its surface activity control technology, supplying some 3,000 different products in all. They are both active in superabsorbent polymers (SAPs).

The two said that the agreement was driven by several factors, including the need for greater scale to address emerging markets and compete with larger European and American firms, especially in view of projected falling demand in Japan itself. In addition, the SAPs market is seeing reduced profitability despite growing demand, with many regional players emerging.

Both firms had already set out medium-term plans to address these issues and saw that they had a "mutual complementary relationship". Nippon Shokubai has a strong in-house value chain but is struggling to create new businesses to meet user needs; Sanyo, meanwhile, is good at manufacturing and marketing performance chemicals but very dependent on external raw materials suppliers, including Nippon Shokubai.

"With such recognition, the companies were exchanging opinions on various options including a business integration, and have reached an understanding that executing a business integration with each other is the best way to make use of the companies' strengths, solve the business challenges and create a synergy effect," they stated.

Expected business advantages include: a strong base through integrated technology and cost savings, particularly in SAPs, plus enhanced R&D capabilities; greater competitiveness and profitability through scale expansion; diversification of the portfolio; and faster development of new business. An enhanced ability to address the UN's 17 Sustainable Development Goals as a merged entity was also cited.

In brief

New owners for Momentive

A Korean investor group has acquired Momentive, the silicones and advanced materials company, in a \$32.50/share deal financed by a mixture of cash and new debt. The group comprises: KCC Corporation, a chemicals manufacturer specialising in paints, building materials and advanced materials, which also develops silicones for use in paints and precision chemical engineering; Wonik QnC, which mainly makes quartz and ceramics for use in semiconductor wafers; and private equity firm SJJ Partners.

Formacare agrees limits

In partnership with employers and trade unions, Formacare, the EU association of formaldehyde producers, has agreed pan-European occupational exposure limits for workers in the sector of 0.3 ppm for an eight-hour average and 0.6 ppm for short-term exposure. This came a few days before EU ministers agreed a revision of the EU Carcinogens & Mutagens Directive, which will come into place two years later, in mid-2021.

Biosynth, Carbosynth merge

Carbosynth, a UK-based carbohydrate chemistry specialist, and Swiss firm Biosynth, which supplies enzyme substrates and novel chemiluminescence-based compounds, are to merge "to form a leading player in the global fine chemicals market". Biosynth president Dr Urs Spitz said that they "have a complementary product offering and technical know-how, and have been successfully working together on joint projects", which made this a natural next step.

CodeEvolver deal

Codexis has licensed its CodeEvolver protein engineering platform technology to Novartis to develop novel performance enzymes for use in making drugs. The deal involves an upfront fee, milestone payments and fees for any APIs developed using it. After technology transfer, this will be located at a Novartis site. Novartis has already been a customer to Codexis for nearly a decade, noted president and CEO John Nicols. Further details were not disclosed.

China propionic acid plant starts



Production has begun at a second propionic acid plant at the BASF-YPC site in Nanjing, China. This has 30,000 tonnes/year of capacity, bringing the total at the site to 69,000. BASF-YPC is a joint venture between BASF and Sinopec. The expansion was driven by rising demand in China and the wider Asia-Pacific region.

Propionic acid is mainly used as a mould inhibitor for food and feed applications, where it is claimed to offer “strong economic and ecological benefits over preservation through drying or storage in air-tight silos”. However, it is also widely used in pharmaceuticals, crop protection agents, solvents and thermoplastics, and these also drove the expansion, according to Vasilios Galanos, senior vice-president of BASF Intermediates Asia Pacific.

Separately, BASF has announced the patenting of a carbon-neutral process for methanol production. If this can be implemented at an industrial scale, the company said, the entire production process will generate no CO₂ emissions. Methanol is widely used as a raw material for such key substances as formaldehyde, acetic acid and methylamines, plus methyl tert-butyl ether, methyl methacrylate, polyalcohols and silicones.

In the new technique, which has been validated in a study with Linde, the raw material syngas is made by partial oxidation of natural gas, rather than the established means that combines steam and autothermal reforming followed by catalysis. The subsequent synthesis and distillation steps to pure methanol are essentially unchanged.

The waste gas stream, which cannot be avoided, is incinerated with pure oxygen. The flue gas produced has a high CO₂ content. This is scrubbed using BASF’s OASE process and can be returned for use in producing methanol. BASF aims to make the additional hydrogen required at this point by techniques that also avoid CO₂ emissions.

In brief

Kao opens facility

PT Apical Kao Chemicals, a 35-65 joint venture between Japan’s Kao and the Apical Group, a Singaporean company focused on oils, fats and their derivatives, has opened its new, \$80 million, 44,000 m² fatty acids facility in Sumatra, Indonesia. With this, Kao said, it will “increase its production capacity, produce competitive oleochemical products and promote their stable supply, in order to expand the chemical business”.

Solugen gets funding

Houston-based Solugen has closed a \$32 million Series B funding round, following on from the first in October 2018 that raised \$13.5 million. It will use this to recruit more scientists and chemists and scale up its ‘mini-mill’ mobile manufacturing technologies. Solugen uses patented enzymatic technology to convert plant sugars into its BioSol and ScavSol brands of biobased hydrogen peroxide for multiple different applications.

Oxea expands isononanoic

Oxea has completed a major debottlenecking process at its isononanoic acid units at Oberhausen, Germany, and will use the extra capacity to supply growing demand in the synthetic lubricants market. The total extra volume and the amount invested were not disclosed. Other investments are also planned to increase carboxylic acids capacity in the short term, ahead of bringing a sixth world-scale plant onstream in 2021.

RoadToBio map

The EU’s two-year RoadToBio project, which was run by Dechema, Nova-Institut, BTG Biomass and E4tech (UK), has ended with the publication of a roadmap outlining how the share of biobased raw materials used in the European chemical industry could be increased from 10% in 2016 to 25% by 2030. Based on market analysis and stakeholder interviews, the report looks at wider issues affecting their development and makes recommendations for short-, mid- and long-term actions.

Third platform for Genomatica

Product platforms at Genomatica



Biobased chemicals player Genomatica has acquired some assets of the Life Sciences division of Renewable Energy Group (REG LS), which it will develop into a wider range of sustainable chemicals. These include technology and various novel and proprietary products in R&D. The core of the REG LS team will join Genomatica in San Diego. Financial terms were not disclosed.

This buy will enhance Genomatica's ability to make long-chain (C_8 to C_{18}) chemicals from renewable feedstocks, such as plant-based sugars or biomass, by fermentation. This, it believes, makes them a more sustainable and environmentally friendly alternative to oleochemicals from palm oil and other natural oils and petrochemical-based options.

This will be the firm's third major product platform, enabling it to move into household and industrial cleaning products, and flavours and fragrances, as well as clothing, packaging and personal care markets from its existing C_4 and C_6 platforms. It brings 550 active patents and applications to bring its portfolio to over 1,500. Genomatica will also continue to work on the research programme for advanced biofuels from biomass that REG LS had started with ExxonMobil and Clariant.

Arkema to buy US surfactants maker

France's Arkema has agreed to acquire ArrMaz, a US manufacturer of speciality surfactants for crop nutrition, mining and infrastructure applications. This is due to be completed in the summer, subject to regulatory approvals.

Arkema described ArrMaz as a "profitable, resilient and low capital-intensive business" and the deal as "another milestone in its journey of growth in specialties", which it aims at comprising 80% of its sales by 2023. The purchase price was based on an enterprise value of \$570 million, which corresponds to a 10.8 x EBITDA multiple.

ArrMaz will be integrated into the Performance Additives business within the High Performance Materials division of Arkema. It has nine sites in North and South America, Asia and in the Middle East and Africa, where it recently opened new facilities, employing about 400 people in total.

Arkema added that the two companies' shared formulation expertise and market positions have made them "highly complementary in terms of geography, as well as commercial and technological capabilities". In particular, ArrMaz's additives for enhanced fertiliser production, grade recovery and process performance in mining operations, and road repair, are all in sync with emerging sustainability needs.

As well as a good organic growth profile for ArrMaz, Arkema has identified about \$15 million in synergies, mostly related to purchasing and commercial complementarities. This is expected to make the deal accretive to earnings from the first year of integration and contribute to improving EBITDA over the course of four years.

In brief

Daicel centre opens

Daicel Chiral Technologies (India), the local subsidiary of the Japanese firm, has completed its new 'DCTI Knowledge Centre' and has now commenced operations. This is located in a three-storey building covering 4,600 m² at the IKP Knowledge Park in Hyderabad, housing up to 200 scientists. It will sell and give technical service for chiral columns, plus custom contract separation service, GMP analytical service and pharma standards, the company said.

New BioCampus on Tees

Biologics CDMO Fujifilm Diosynth Biotechnologies is creating a new, £12.6 million 'BioCampus' at its site in Billingham, UK, with grant funding of up to £3.625 million from the Tees Valley Combined Authority. The initial phase will be a 3,900 m² facility to house about 250 existing staff and add about 50 more over the next two years. This is part of an ongoing growth plan and follows the addition of 650 m² of laboratory space for cell culture process development earlier this year.

Cristal clear

Ineos Enterprises has completed the acquisition of the North American business of National Titanium Dioxide Company, or Cristal, from Tronox for \$700 million. This includes two plants located at Ashtabula, Ohio, which will now become fully integrated within Ineos and will trade as Ineos Pigments. This makes Ineos the US's second largest producer of TiO₂.

Amyris out of Vitamin E

Amyris has sold its Vitamin E royalty agreement to DSM for about \$57 million and agreed to have some products made at DSM's Brotas facility. This is expected to reduce the firm's cost of goods sold as well as giving it extra capacity, with an expected aggregate benefit of \$30-40 million over the next three years. Amyris is now fully focused on its targeted growth markets of flavour and fragrance ingredients, skincare, sweeteners and cannabinoids.

Kurita continues buying spree with Avista

Kurita Industries of Japan is to acquire Avista Technologies, including its UK arm, in a \$81.8 million deal. This continues a recent surge of acquisitions in water treatment that began with U.S. Water Services. Kurita said that this will expand its product range and improve its offer through shared technology and know-how.

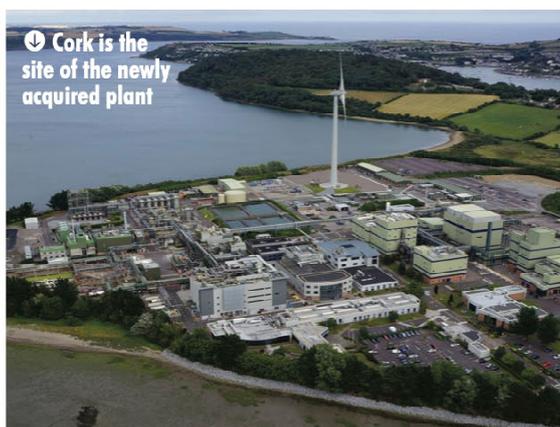
Avista specialises in chemicals used with reverse osmosis membranes, plus related cleaning services, for industries including mining, chemicals, oil, and food and beverages in the US and the Europe, Middle East and Africa region. The company was founded in California in 1999 and had sales of just over \$23 million in 2018. Its UK arm was established in 2001 and had sales of £4.45 million last year.

The much larger, \$270 million acquisition of Minnesota-based U.S. Water Services from Allete Enterprises had been completed on 26 March. This is

expected to increase Kurita's US sales fourfold. U.S. Water had sales of \$172 million last year in multiple industries, employing about 500 people. Kurita aims to expand its businesses globally by establishing platforms in Japan, Asia, Europe and the Americas.

Kurita has also recently raised its stake in Apana of Washington DC, in which it first invested in December 2018, to over 40%. Apana supplies water management systems based on Internet of Things technologies, notably the LoRa wireless communication technology for real-time monitoring of water consumption.

Kurita will be working to expand this business in the US and Japan, while seeking partners to promote it elsewhere. Finally, the company has also acquired 25% of Pentagon Technologies Group, a US precision tool cleaning business. This deal was announced in October 2018 and completed on 1 April 2019.



Thermo Fisher buys GSK Irish site

Thermo Fisher Scientific, owner of Patheon, has agreed to acquire a drug substance manufacturing site in Cork, Ireland, from GlaxoSmithKline

(GSK) for about €90 million. The deal should be completed by the end of 2019, subject to regulatory approvals and other customary closing conditions. It will then become part of Thermo Fisher's Laboratory Products & Services segment, within the Pharma Services business.

The Cork site employs over 400 and has 270 m³ of reactor capacity, spread across ten production buildings. It makes complex, speciality APIs for indications including childhood cancer, depression and Parkinson's disease. It also has an R&D pilot plant and lab infrastructure for the process development, scale-up and physical characterisation of APIs. Thermo Fisher plans to expand it.

"The GSK Cork site will enhance our API offering by expanding our development and commercial capabilities to provide much-needed capacity for APIs currently in development," said Michel Lagarde, senior vice president and president of Pharma Services. It will continue to produce APIs under a multi-year supply agreement for GSK, which has not commented on its own reasons for selling.

This is just the latest in a series of organic and acquisition-led investments by Thermo Fisher. Most recently, it acquired Brammer Bio in viral vector manufacturing. It is also investing \$150 million to expand its sterile three fill-finish sites in Italy and the US, and plans to complete the \$50 million expansion of its St Louis biologics facility later this year.



Kaman UK has opened and demonstrated a new £1 million+ chemical treatment line at its site in Darwen, which will deliver surface treatment techniques to the aerospace industry. The line is computer-controlled, with fully automated loading, immersion and transfer capabilities through three baths. Processes now available include chromic acid anodise, chemical conversion coating, acid pickle and clean of titanium, vac blast, zinc spray, welding and paint finishing. Kaman also plans to add tartaric/sulphuric anodising, so as to address REACH mandates to reduce hazardous materials in the working environment.

New medium-term plan for Ube

📍 Ube facility in Japan



The Ube Group has announced a new medium-term management plan that will affect its chemicals operations. 'Vision Ube 2025 – Prime Phase' covers the next three years through to fiscal 2021 and is the starting point for the company's strategic vision to 2025.

Among other things, the three internal companies and two divisions have been consolidated into three internal companies, which will all have greater independence in business operations and decision-making. These comprise chemicals, construction materials and machinery companies.

The chemicals company's stated remit is to "further stabilise revenues and drive the growth of the entire group". Ube said that it "will improve the revenue-generating capabilities of each of its businesses by pursuing further globalisation, strengthening its solutions-oriented business models, and developing and expanding its environmentally friendly technologies and products".

Like the others, the chemicals company has designated 'active growth' and 'platform' businesses. For the former,

including polyamides, fine chemicals, high-performance coatings, synthetic rubber, polyimides, separation membranes and separators, Ube will pursue accelerated growth "by prioritising the allocation of business resources to these businesses".

With the latter group, including caprolactam, industrial chemicals, electrolytes and pharmaceuticals, the company will seek to maintain stable revenues and expand them "by reducing costs and pursuing differentiation in target markets". The Tyranno fibre and lithium titanium oxide businesses are targets for particularly fast growth.

Overall, Ube aims to be part of the solution for global environmental issues, particularly greenhouse gas emissions, to grow through further globalisation and enhance its own governance. Key to these aims will be to expand its human management resources, use information and communication technology to increase the efficiency of facilities and raise labour productivity and add value in R&D. It plans to invest ¥160 billion over the next three years, while spending ¥45 billion on R&D.

Archroma opens dyeing centre

Archroma officially opened its new Global Competence Centre for Automotive & Synthetic Dyeing on 6 May. CEO Alexander Wessels and Mark Dohmen, former CEO of M. Dohmen, which is now part of Archroma Germany, and now head of the centre, were both present. Based at a former M. Dohmen site at Korschenbroich, Germany, the centre will be a "global hub for technical expertise, market knowledge, technology and creativity", Archroma said.

The centre will house an R&D laboratory and production dedicated to helping textile manufacturers "to optimise their productivity and create value in their markets". The Korschenbroich site will also continue to be a specialist production and laboratory facility for dyes and auxiliaries for synthetic fibres and wool, such as the Dorospers, Dorolan and Fadex ranges.

The centre was showcased nine days later at the Tectextil exhibition, as was Fadex AS New, the first innovation to be launched from it. This is described as a 'super UV protector' to make automotive and transport textiles more resistant to light. It is also said to offer reduced water and energy consumption, reduced CO₂ emissions, shorter process times, less rewinding and fibre breakage, low fogging and optimised processes at all stages.

Also on show was Appretan NTR, a new water-based textile coating binder based entirely on renewable polysaccharides sourced from around the production site at Lamotte, France. It does not contain biocides or alkylphenoethoxylates and does not release formaldehyde. It has also been designed to save energy by cutting out a high-temperature curing step. Applications are envisaged in hot liquid filtration, such as tea bags and coffee filters or capsules.



📍 Cutting the ribbon at the new competence centre

VECAP issues code of best practices

The Brussels-based Voluntary Emission Control Action Programme (VECAP) used the occasion of the 15th anniversary of its foundation by launching a new code of best practices for flame retardants. This will be disseminated and made available via sector associations representing compounders, masterbatch producers and polymer producers.

The code includes comprehensive guidance for industry on how to reduce emissions of flame retarding chemical additives, based on experience at production and downstream user installations since 2004. It has four main elements:

- Storage
- Opening & emptying bags & bulk containers
- Ventilation
- Operational process efficiency to reduce waste & emissions

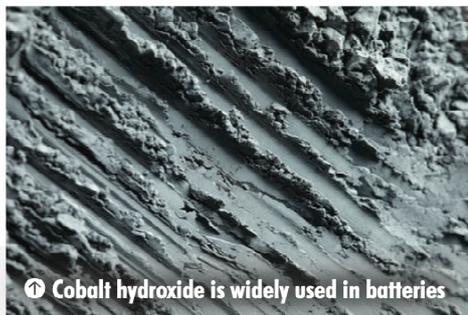
Although the code is voluntary, VECAP said, companies “will be encouraged to incorporate it

into their environmental management systems”, so that it “can be mainstreamed into company/facility operations”. ECHA already recognises the existing VECAP programme for best practice in handling and use and trade associations in the field recommend its use in downstream communications.

VECAP was founded in 2004 by three of the leading global producers of flame retardants and the UK textile finishers association. It is an industry product stewardship scheme that aims to reduce emissions of flame retardants by promoting environmental good practices among users and downstream users of polymer additives.

The association claims that its advice has helped to ensure that over 83% of all brominated flame retardants sold by members of the International Bromine Council were handled correctly. In less than a decade, it adds, potential emissions of TBBPA and HBCD have fallen to less than 0.001% of the volumes sold.

Umicore secures cobalt supply



④ Cobalt hydroxide is widely used in batteries

Umicore has agreed to acquire Freeport Cobalt’s cobalt refining and cathode precursor activities in Kokkola, Finland, in a move designed to secure its supply of materials for batteries. It has also concluded a deal with Glencore to source cobalt hydroxide raw materials that will supply this and other facilities.

The acquisition of the Kokkola site, Europe’s largest of its kind, will cost \$150 million, plus the value of the working capital to be taken over at closing, which

was about \$40 million at the end of March. Subject to customary closing conditions, including regulatory approvals, it should be finalised by the end of 2019. The 250 employees will all transfer.

Umicore said that this will be an important step in expanding its battery materials value chain, bringing in European R&D, refining, precursor production, cathode materials production and battery recycling operations. The buy does not include the cobalt fine powders, chemicals, catalysts, ceramics and pigments activities at the same site, which Freeport Cobalt is retaining.

Kokkola will supply precursors for cathode material production at the site in Nysa, Poland, which is due to start up in 2H 2020. It will be supplied only through long-term agreements with industrial-scale mining operations that operate in full conformity with Umicore’s sustainable procurement framework. This excludes, among other things, the products of child labour.

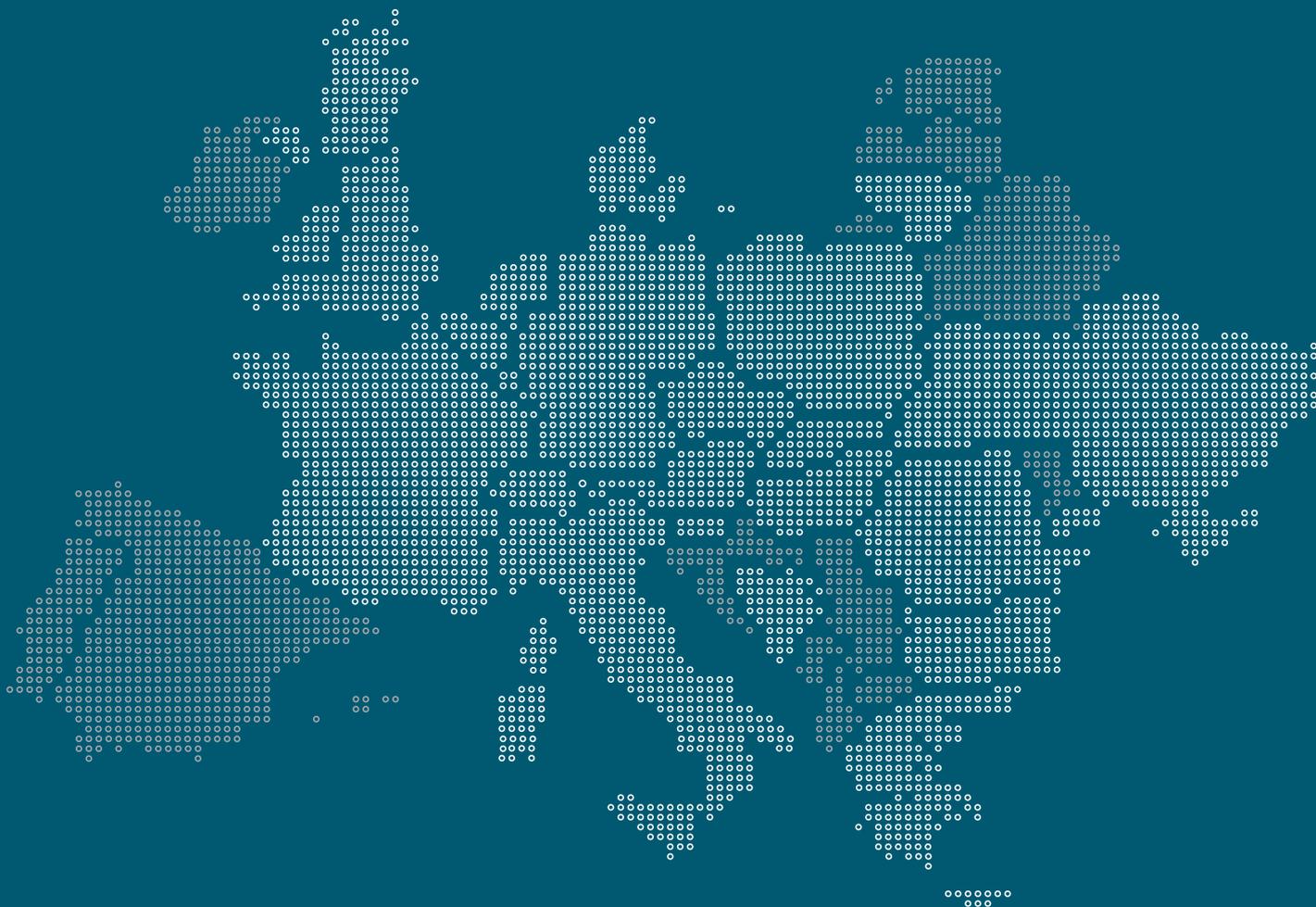
Among the suppliers will be Glencore’s two operations in the Democratic Republic of Congo, which have been assessed as fully compliant. The long-term revolving agreement with Glencore, Umicore said, “guarantees Umicore’s security of supply for a substantial part of its longer-term cobalt needs for its expanding global battery materials value chain”.



Clariant has officially launched a new facility in Guangzhou, following a €4.5 million investment. This includes a workshop and an upgraded advanced laboratory for developing customised products. It will make speciality black PET and PA masterbatches for the booming Greater China market, supplementing the fully utilised facility in Taipei. The company has been making masterbatch for fibres consumer goods and packaging at Guangzhou since 1995.

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GLOBAL VIEW
FROM THE US



Big firms burnish comprehensive development offerings

Against a backdrop of public policy debates, small molecule companies mull efficiency versus independence

INSIDE THE HANGAR-LIKE original lakeside building of Chicago's vast McCormick Center, delegates to CPhI North America 2019 contended with vastly different macro-and micro-economic themes. At the high level, continuing public-policy debates over drug pricing and supply chains made for anxious discussions, even after the keynote speaker, former US Senator Jeff Flake sought to bring some perspective to the topic.

At the more granular level, big companies and small were eagerly looking for partnerships and alliances. The stated goal for most firms was to reduce the number of suppliers, partners or service providers, but the methodology seemed more like speed dating. Despite the bear hugs being offered by big firms, some small companies remained adamantly independent.

"Healthcare has been a political issue ever since the Affordable

Care Act (ACA) was passed with only Democratic Party support in 2010," said Flake, who represented Arizona as a centrist Republican from 2013 to 2018. "Now we have this pattern of each party in power trying to undo what the last majority did. It's like playing ping-pong. That makes it very tough to find any consensus."

Despite efforts by Republican legislators to undo the ACA, or 'Obamacare' as it is commonly called, Flake said there is no plan to repeal and replace it, "especially now that the individual mandate has been repealed. Changes will be made at the margins, but in my view the basis will stay," he added.

In the current contentious environment, Flake suggested, "there could be bipartisan consensus on drug-pricing reform, especially on improving transparency". That said, he did reiterate the party line of supporting the current prohibition

on allowing government to negotiate drug prices, which "would remove the profit motive for companies to go out and develop wonder drugs".

While the keynote speaker focused on policy, the themes on the show floor were considerably more granular. "Pharma companies don't need a stable of suppliers," said David K. Lyon, senior research fellow at Lonza. "They need a company that can get their molecule to the need. They need a line of sight to commercial scale-up and industrial capacity. We call that a phase-appropriate combined offering. And by 'appropriate' we mean size and scale for the phase of development and potential."

As a brand, Lonza promoted its SimpliFIH, the acronym standing for 'first in humans'. This is described as a service package specifically designed for innovator companies that have solubility-challenged molecules and



⬇ Rousset – Cure Pharmaceutical will remain a vertically integrated supplier

content, even resolute, in handling their own drug delivery.

“We are vertically integrated, no CDMOs,” said Jessica Rousset, COO of Cure Pharmaceutical.

The company has expertise in oral thin films, which are mostly known to consumers as breath-freshener strips. The delivery medium is now being taken in many new directions. Among the first is a blue strip as an alternative means of treating erectile dysfunction. The company also has a sleep aid on the market.

“With oral thin films there is great ability for speed and control,” said Rousset. “We have been able to load 200-250 mg of actives on a strip versus the 20-30 that was previously possible.” Cure is now building a laboratory at its manufacturing site in Oxnard, California, that will be in compliance with GMP standards.

Just two weeks after the show in Chicago, Cure completed its previously announced acquisition of the prosaically named Chemistry Holdings, a formulation technology company that is developing innovative delivery systems for a variety of industries. This expands Cure’s stable of oral dosage forms to microemulsions, nanoemulsions, microcapsules, taste-masking and a novel chewable.

This was the third CPhI North America, once again taking place alongside the custom manufacturing show, InformEx. Next year’s event will return to the site of the first two, in Philadelphia. ●

require early-stage development. Simplified legal agreements are a key part of this. SimpliFIH is based on bioavailability enhancement technology from Lonza’s 25 years of experience in advancing molecules to Phase I, such as particle size reduction, solid dispersions and lipid-based formulations. Spray dry processing was also emphasised.

Similarly, Cambrex reintroduced itself as a full-line CDMO, after expanding many of its sites and integrating two newly acquired firms: Avista Pharma, which added capabilities in preclinical

and early clinical small-molecule therapeutics, and Halo Pharma in formulation and manufacturing. Company representatives stressed the growth from CMO to CDMO or ‘integrated service provider’ as being essential because formulators are rationalising their supplier bases.

Given the traffic at those big booths, there seemed to be plenty of interest in the big companies’ revamp of what used to be called a one-stop shop offering – though that term brought scowls the few times it was uttered. Even so, plenty of small operators are



GREGORY DL MORRIS
US Editor


 GLOBAL VIEW
FROM EUROPE

Nano is getting big

The nanomaterials market is booming, according to UNEP

THE UNITED NATIONS

Environment Programme (UNEP) released its long-awaited report, *Global Chemicals Outlook II*, in late April. The follow-up to its first *Global Chemicals Outlook* report, from 2013, offers, as the title suggests, an overview of chemical management issues around the world and some projections of what the future might have in store.

At 722 pages, this is a brick of a document, with plenty of interesting tidbits – such as the implications of Asia's rapidly increasing chemical market share, or the prediction that start-up companies will be playing an ever more important role in the chemical industry.

Another key observation is just how rapidly the relatively new nanomaterials market is expanding. UNEP expects the global nanotechnology market to grow from \$39.2 billion in 2016 to \$90.5 billion by 2021 and \$125 billion by 2024. However, it cautions that this will depend heavily on "concerns about impacts on human health and the environment during production, use and disposal

[of nanomaterials], as well as evolving government regulations."

This is an area to watch, as European research groups and authorities are once again fuelling discussion on how much we really know about nanomaterials. In May, Germany's Federal Institute for Risk Assessment (BfR) warned that nanotoxicology struggles with the "incredible complexity" of how nanomaterials interact with biological systems. The research community has to find better ways to predict the "unforeseen problems" and public health hazards "due to the burgeoning use of nanomaterial in consumer products", the BfR researchers said.

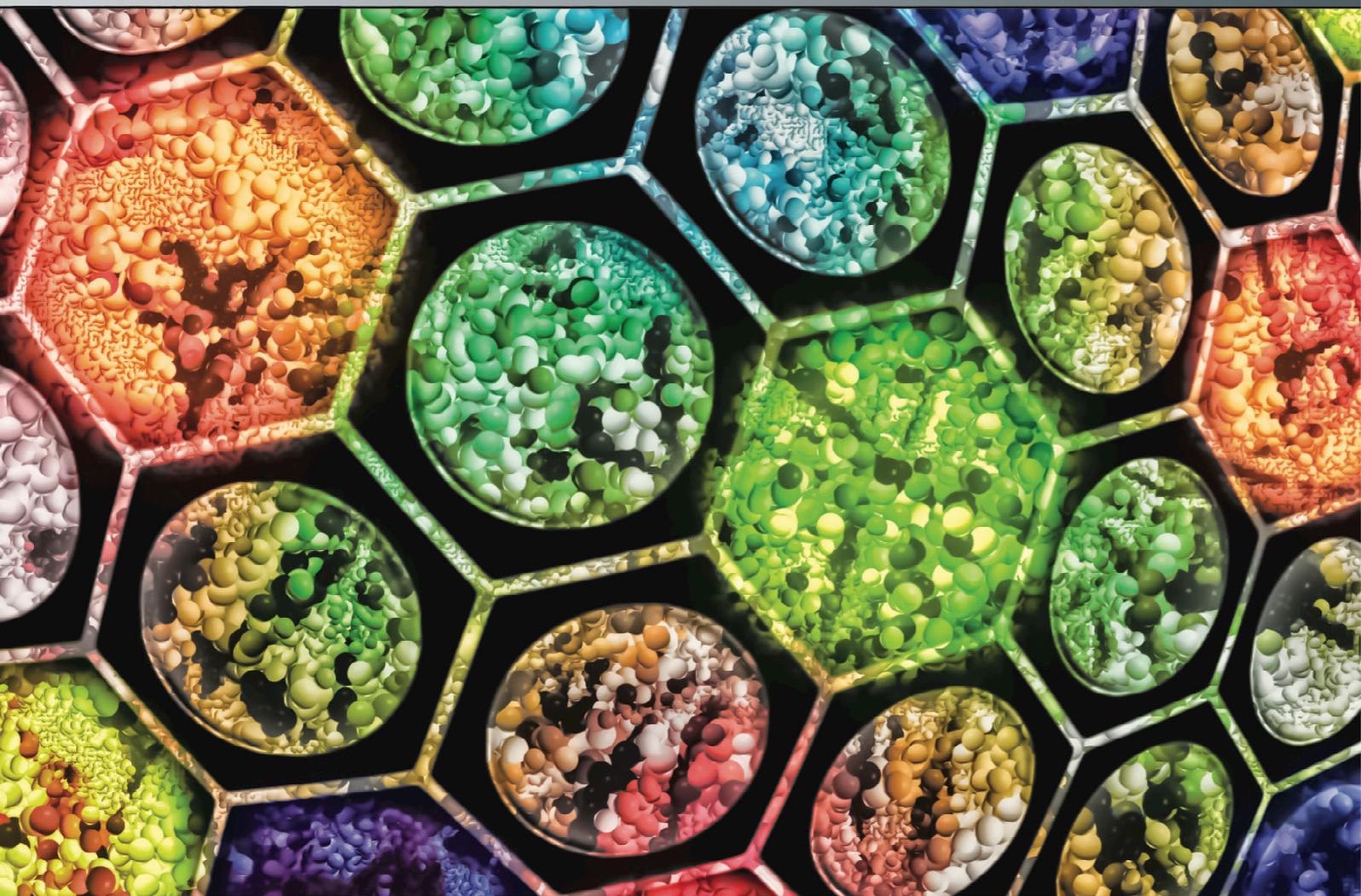
Amid growing concerns over the insect decline, nanosafety research group DaNa2.0 warned in March that exposure to nanomaterials in pesticides and fertilisers, through pollen, might be harming pollinators. If nanomaterials in pesticides are effective against target insects, such as mosquitoes and blowflies, then, the group said, "it is reasonable to assume that they would also affect non-target pollinating insects."

Meanwhile, the European Commission again postponed

the long-overdue revision of its Recommendation on a definition of nanomaterials. A proposal is not now envisaged before 2020. The definition has been delayed over and over again, and having to wait even longer has deepened the frustration of industry, member states and NGOs, which have for years called for more legal clarity on nanomaterials.

At the same time, we can find signs that research into nanomaterials is deepening, sometimes with encouraging results. In late May, an article in *Science* magazine painted an optimistic picture of how advanced analytical abilities have accelerated our understanding of how nanoparticles affect ecosystems.

"We are able to know where to look for different kinds of nanoparticles in the environment, we know how to more accurately measure them. And we can see how significant they are in controlling various natural processes," said Professor Paul Westerhoff of Arizona State University, one of the article's 15 authors. He also described how his own research has shifted,



from focusing on the risks that engineered nanomaterials can pose to their advantages and potential to spark the formulation of cleaner and safer industrial systems.

Together the authors – environmental and chemical engineers, geologists, oceanographers and soil chemists – concluded that “the amount of potentially harmful nanomaterials floating around the globe is relatively very small and the extent of the dangers they present is small ... If we better understand them, we can control the unique properties of nanomaterials and use them to make good things happen.”

Even better, then, that the BfR itself has just launched a project, called InnoMat.Life, to study the health and environmental risks of new nanomaterials over their entire life. The study will include hybrid materials and

nanoparticles of different shapes and sizes. It will cost €2 million.

Clearly, organisations like the BfR are investing so heavily in nano research because of the increasing presence of nanomaterials in commercial products and accompanying regulation. In the EU, regulations on medical devices, biocidal products, novel foods and cosmetic products specifically address nanomaterials and the same is expected under REACH from 1 January 2020, when revisions to the law’s annexes are adopted.

So what does the future of the nanomaterials market truly look like? Pretty rosy, I dare say. Because, despite increasingly stringent regulation and all the remaining safety concerns, it is far too ubiquitous and varied to be stopped.

UNEP’s report, for instance, points to nanoparticle-based sunscreen products, nano-

catalyst thin films for catalytic converters, thin film solar cells, nanolithographic tools, nanoscale electronic memories and the ever popular biocidal nanosilver. The largest end-use markets for nanotechnology in 2015 were environmental applications (38.8% of the total), electronics (22.4%) and consumer applications (21.1%), according to the report.

The nanomaterials market, and our understanding of it, is getting bigger. Keep up if you can. ●



VANESSA ZAINZINGER
Europe Editor

Events Calendar



Chemspec Europe 2019

26-27 June: Messe Basel, Switzerland

Europe's biggest exhibition for the fine and speciality chemicals industry returns for the 34th time, this year in Basel in the heart of Europe's fine chemicals sector. SCM will be present with its own stand and exclusive distribution to visitors at the entrance

www.chemspeceurope.com



In-Cosmetics Korea 2019

26-28 June: Hall C, Coex, Seoul, South Korea

The Korean version of the world's most important cosmetic show brings together over 250 exhibitors of ingredients, fragrances, lab equipment, testing and regulatory services, as well as over 7,000 cosmetic manufacturers. It showcases both local and global industry trends

<http://korea.in-cosmetics.com>



BIO World Congress on Industrial Biotechnology

8-11 July: Iowa Events Centre, Des Moines, Iowa, US

The Biotechnology Industry Organisation (BIO) World Congress features the latest in industrial biotechnology, including advanced biofuels, biobased materials, renewable chemicals and others, alongside the exhibition, the BIO One-On-One Partnering meetings and other networking opportunities

www.bio.org



ACA Leaders Forum 2019

24 July: Four Seasons Hotel, Singapore

Event for senior business, marketing and R&D leaders representing cosmetic ingredient suppliers and finished product manufacturers in the ASEAN region, whose themes include international trade developments, regulatory changes in Asia and emerging trends in consumer behaviour

www.aseancosmetics.org



Cosmoprof North America 2019

28-30 July: Mandalay Bay Convention Centre, Las Vegas, US

Cosmoprof North America claims to be the leading B2B beauty event in North America. This year sees the launch of Cosmopack North America, a 'show within a show' hosting companies' ingredients and raw materials, contract and private label manufacturing, machinery and packaging

www.cosmoprofnorthamerica.com



CPhI Korea 2019

21-23 August: Hall D, Coex, Seoul, South Korea

CPhI Korea is co-located with the ICSE, P-Mec, InnoPack and FDF shows. It showcases the whole pharma supply chain from ingredients and contract services to machinery and biopharmaceuticals, as well as hosting an extensive conference programme covering the latest trends and topics within the regional market

www.cphi.com/korea



Specialty & Agro Chemicals America

4-5 September: Belmond Charleston Place, Charleston, US

Based on the 'reshoring' trend and the advance of new applications at the higher-technology and higher-value end of the market, this event showcases the distinctive value of the US chemical industry, featuring only exhibitors who offer significant manufacturing, service or sales operations based within North America

www.chemicalsamerica.com



CPhI Middle East & Africa

16-18 September: ADNEC, Abu Dhabi, UAE

First launched in 2018, CPhI Middle East & Africa is claimed to be the region's most comprehensive pharmaceutical industry gathering. It is co-located with ICSE, P-MEC, InnoPack and FDF and is expected to attract nearly 5,000 suppliers and buyers this year

www.cphi.com/mea



PharmaChem Outsourcing

17-19 September: Hilton Hotel, Parsippany, New Jersey, US

The largest US-based API and pharmaceutical ingredients show, focusing on the API development supply chain from raw materials and registered intermediates to commercial manufacturing of small molecule APIs and drug product. There are usually over 130 exhibitors and 700-800 visitors

www.chemoutsourcing.com

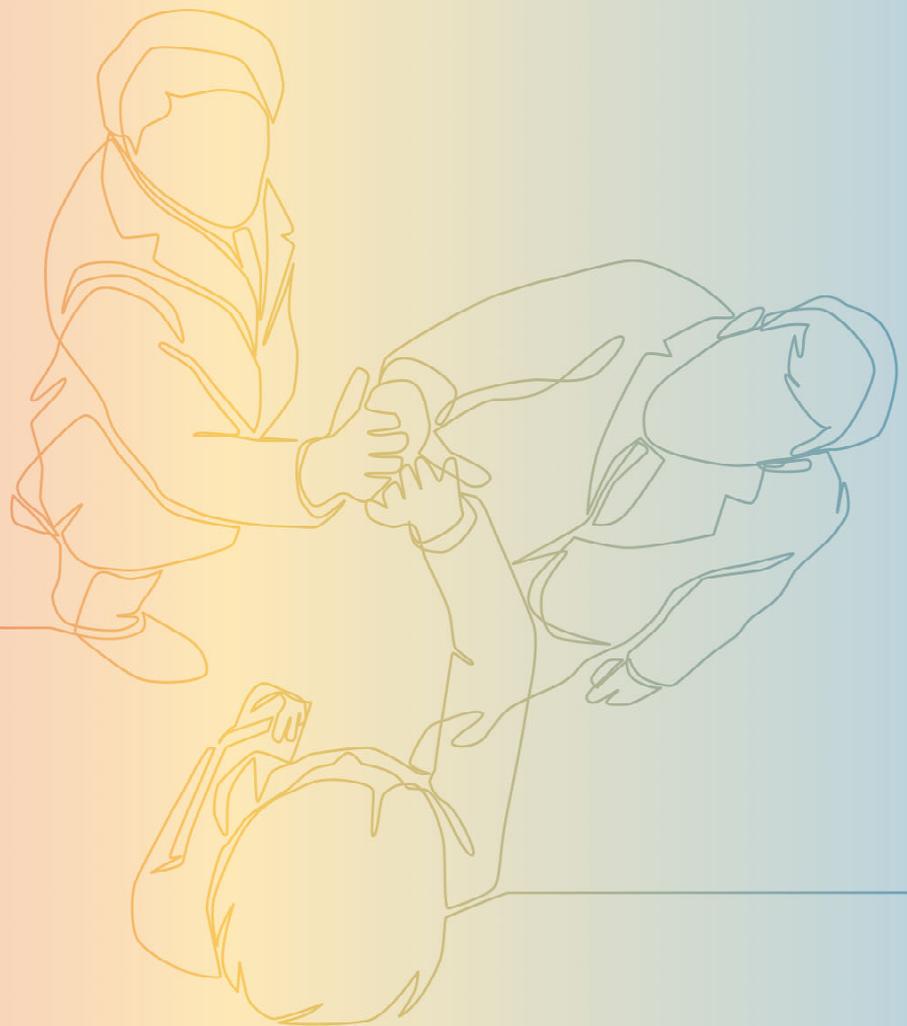


SCC Suppliers' Day California

2-3 October: Long Beach, California, US

A biennial event with thousands of the leading players present, this is also a showcase for the latest innovations of raw materials, packaging, equipment, testing laboratories and regulatory service providers

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Crossroads of nations

Chemspec Europe 2019 will gather an array of industry experts under one roof near where three European countries meet. We take a full look ahead

THE 34TH CHEMSPEC Europe takes place in Hall 1 of Messe Basel on 26-27 June and is open from 09.00 to 17.00 on both days. It is being organised for the fourth time by Mack Brooks, now a subsidiary of Reed Exhibitions. The Basel region is one of Europe's major fine and speciality chemical hubs, located close to the three-way border between Switzerland, France and Germany.

At press time, 378 exhibitors from 27 countries had booked space at individual or collective stands, covering about 6,300 m² of floor space. Germany, France, the UK, Switzerland, China, India and the US were among the most strongly represented countries.

Full and up-to-date details can be found on the dedicated website (www.chemspeceurope.com). Here you can also order a print copy of the visitor guide, which offers compact information on the exhibition, the latest exhibitor list, an overview of the conference programme and key visitor information, including opening hours, travel and accommodation. This is also the place to register to attend free of charge; on-site registration costs SF60.

Among the major companies there will be BASF, Lonza, Solvay, Saltigo, CABB, ESIM Chemicals, Siegfried, Vertellus, WeylChem, Mitsubishi, Johnson Matthey, Albemarle, Dottikon Exclusive Synthesis, AlzChem and Sumitomo Chemical Europe. SOCOMA, the UK Chemical Industries Association (CIA), Invest Saudi Arabia and others are hosting collective pavilions for member companies. The show also features a new 'NanoTech' area, which highlights companies and organisations from the nanotechnology industry.

Many SMEs from the fine and speciality chemicals industries will also be present, such as manufacturers, distributors, regulators, equipment suppliers, raw materials suppliers and traders. The industries represented will include, among others, pharmaceuticals, agrochemicals, polymers, food and feed ingredients, flavours and fragrances, pigments and dyes, paints and coatings, household and cleaning chemicals, adhesives and sealants, leather and textile chemicals, and electronic chemicals.

Also there, of course, will be *Speciality Chemicals Magazine* at its own stand, A301. We are a media partner of the show and enjoy exclusive distribution to attendees at the entrance. Present in Basel will be: editor Dr Andrew Warmington; global commercial manager Harriet Gould; Dan Grainger, advertising director; and our US and Japan agents, Ben Jones and Sadao Mizoguchi. You are very welcome to visit

us there and contact any of us directly by email to make an appointment.

The week of Chemspec Europe begins with exhibitor build-up on Monday 24 and Tuesday 25 June. The afternoon of Tuesday 25, between 14.00 and 17.30, also sees the annual **European Fine Chemicals Group (EFCG) Crop Protection & Fine Chemicals Forum**. This is free to attend but you must be registered in advance. The subjects and speakers are:

| | |
|-------|---|
| 14:10 | Healthy Food, Healthy Planet, Clara Serrano, Corteva |
| 14:45 | Global Crop Protection Market & Future Trends, Dr Bob Fairclough & Dr Puran Mal, Kleffmann Group |
| 15:40 | The Future of Problem Solving: A Journey Through the Past, Present & Future of Root Cause Analysis, Jonathan Batchelor, Soligic |
| 16:45 | Speakers' panel Q&A |

As ever, the Chemspec Europe exhibition itself has an accompanying series of workshops, seminars and conferences, which are open to all registered visitors to attend free of charge. All of these take place in dedicated theatres on the show floor. You can dip in and out of any of them as you wish, in between appointments.

The **Royal Society of Chemistry (RSC) Symposium**, a perennial feature of Chemspec Europe, has a programme of speakers, mostly from companies making advances in the science, understanding and development of new approaches to sustainability. Subjects, speakers and timings are as follows:

| WEDNESDAY 26 JUNE | |
|-------------------|---|
| 10:00 | Carbon Footprint of Recycled Chemicals: Sustainability in Action, Andrew Crowther, Tradebe |
| 10:45 | 'Citius, Altius, Fortius' – Challenging Process Design with a Proven Rationale Approach to Improve Sustainability, Marc-Olivier Simon, Ypso-Facto |
| 11:30 | High-Performing, Safe & Sustainable Chemicals from Waste Wood, Fabien Deswarte, Circa Sustainable Chemicals |

EVENTS

| | |
|-------|--|
| 12:15 | Micro Reaction Technology with Macro Process Efficiencies, Rafael Kuwertz, Ehrfeld Mikrotechnik |
| 13:00 | Introducing a Family of Sustainable High Performance Polyols, David Hess, Allessa |
| 13:45 | Sustainability in Chemical Packaging, Arash Hassanian, Hoover Ferguson Group |
| 14:30 | Squeezing More Than Just Orange Juice: Citrus Peel Valorisation, Avtar Matharu, University of York |
| 15:15 | Chemocatalysis: A Tool of Green Chemistry, Florian Bächle, Solvias |

THURSDAY 27 JUNE

| | |
|-------|---|
| 10:00 | Future of Biocatalysis – Enzymatic Reactions in Continuous Flow Processes, Vince Murphy, EnginZyme |
| 10:45 | Sustainable Biocatalytic Synthesis of β -Hydroxy- α -Amino Acids on an Industrial Scale, Grzegorz Kubik, Enzymaster Deutschland |
| 11:30 | New Microcapsule Technology: Enabling a Future of Safer Laundry Products & Cleaner Oceans, Jamie Walters, Calyxia |
| 12:15 | Membrane-Enhanced Chemical & Biochemical Processes: The Effect of Nanomodification of Membrane Surface on Process Efficiencies, Marzio Monagheddu, Vito |
| 13:45 | Membrane Emulsification versus Homogenisation: Benefits in Energy Usage & Process Efficiency, David Palmer, Micropore |
| 13:00 | GSK Carbon-Neutral Laboratory for Sustainable Chemistry, Nicholas Bennett, University of Nottingham |
| 13:45 | Membrane Emulsification versus Homogenisation: Benefits in Energy Usage & Process Efficiency, David Palmer, Micropore |
| 14:30 | Doing Business in China, Tina Li |

The **Pharma Lecture Theatre** is dedicated to the trends, challenges and outlook of the pharmaceutical industry. This is the venue for the annual **Abou-Gharbia Lecture**, given by Dr Magid Abou-Gharbia, head of the Moulder Centre for Drug Discovery Research at Temple University in Philadelphia, and the **Pharma Outsourcing Panel**, co-moderated by Dr Abou Gharbia and Dr Rudolf Hanko, a board member at Siegfried.

The panel will convene on both days – at 14.00 on Tuesday 26 and again at 11.00 on Wednesday 27 – to discuss approaches to developing global outsourcing strategies, identifying outsourcing partners and approaches to mitigate risks, and addressing challenges associated with outsourcing

and how to manage partnerships effectively. This year's panellists are:

- Dr Stephan Kutzer, CEO, Alcami
- Dr Susan Billings, VP of global business development, AMRI
- Dr Robert Waltermire, VP & head of chemical & synthetic development, global product development & supply, Bristol-Myers Squibb
- Dr Harry Rathor, CEO, Callery Chemical
- Rebecca Bishop, associate director – manufacturing procurement, Eli Lilly
- Dr Tom Scrase, assistant director – business development, Johnson Matthey
- Dr Prashant Savl, director of commercialisation & global procurement, Merck & Co.
- Marianne Späne, EVP of global business development, Siegfried

Both of these events last for one hour and they are interspersed with half-hour presentations from within the industry. Times, themes and speakers for all events at the Pharma Lecture Theatre are as follows:

WEDNESDAY 26 JUNE

| | |
|-------|--|
| 9:30 | Abou-Gharbia Lecture: Challenges Facing the Pharmaceutical Industry in Today's Environment, Dr Magid Abou-Gharbia, Moulder Centre for Drug Discovery Research |
| 10:45 | Homogeneous Catalysis for Ester Hydrogenation, Garazi Talavera, Johnson Matthey |
| 11:30 | Overview of Kodak Specialty Chemicals, Dr Rajiv Balasubramanian, Kodak Specialty Chemicals |
| 12:15 | Particle Properties & Particle Design from an API Supplier's View, Dr Michael Levis, Siegfried |
| 13:30 | Highly Potent APIs: Risk-Based Development & Manufacture, Dr David Molyneux, Alcami |
| 14:00 | Pharma Outsourcing Panel |
| 15:15 | Vertellus Life Science Overview, Dr Glenn Carroll, Vertellus |
| 16:00 | Single & Multi-Stage Extraction for Flow & Batch Chemistry Applications, Dr Andrea Adamo, Zaiput |
| 16:30 | Upgrading Production Capacity Through Inherently Safer Technology with Corning Advanced-Flow Reactors for Continuous Manufacturing, Dr Guillaume Gauron, Corning |

| THURSDAY 27 JUNE | |
|------------------|--|
| 9:30 | Biocatalysis for API and Chemicals Synthesis, Dr Audrey Robic, Protéus |
| 10:15 | The Use & Benefits of Nanomaterials in Dental Applications, Nora Reinhardt, Mathym |
| 11:00 | Pharma Outsourcing Panel |
| 12:15 | Catalyst for Enantioselective Synthesis, Dr Masahito Watanabe, Kanto Chemical |
| 13:00 | Handling Hazardous Reactions, Dr Jörg Jung, AMRI |
| 13:45 | Cost-Effective Tertiary Solution for the Removal of COD & APIs from Wastewater, Joseph Weston, Arvia Technology |
| 14:30 | Continuous Formation of Micro- & Nanocarriers with Controlled Properties Using Microreaction Technology, Dr Anna Musyanovych, Fraunhofer Institute |
| 15:15 | Highly Potent APIs: From Clinical to Commercial Manufacturing, Dr Nicola Glubellina, Dishman Europe |

The **Chemspec Agrochemical Outlook Conference**, sponsored by *Agrow* magazine, deals with the challenges and opportunities facing the agrochemical industry in 2019. Times, speakers and themes were as follows at press time, but more may have been added in since.

| WEDNESDAY 26 JUNE | |
|-------------------|--|
| 09:55 | Global Crop Protection Industry: Market, Corporate & Regulatory Round-up, Sanjiv Rana, <i>Agrow</i> |
| 10:30 | Vertellus in Crop Protection: Using a Market-Based Approach to Become a Better Solution Provider, Glenn Carroll, Vertellus |
| 11:05 | Simple and Targeted In-Process Waste Treatment towards Zero Industrial Waste, Vivek Nair, Econ Industries |
| 11:40 | Starting Materials Based on Maleic Acid Derivatives for Crop Protection, Dr Johann Hiebl, ESIM Chemicals |
| 12:15 | Transforming India: Megatrends in Chemical Industry, Deepthi Gupta, Invest India |



| THURSDAY 27 JUNE | |
|------------------|--|
| 10:00 | Specialty Chemicals: The Growth Target for Listed Chemical Companies, Chris Counihan, Credit Suisse |
| 10:35 | Co-formulants & Sustainability from a Regulatory Perspective, Dr Christopher Dobe, European Crop Protection Association |
| 11:10 | Digital Paradigms Driving Product Development Decisions in the Chemicals Industry, Dr Nina Kaun, Elsevier |
| 11:45 | Safe, Efficient & Cost-Effective Disposal of Waste Air & Wastewater Streams from Chemical & Pharmaceutical Processes, Dr Peter Börgardts, Eisenmann Anlagenbau |
| 12:20 | Emerging Trends: Pesticides Value Chain in Europe, Prasad Kulkarni, Aranca |

For the third time, the **Innovative Start-ups** programme takes place at Chemspec Europe, organised by European Chemistry Partnering. This consists mainly of short presentations by start-up companies who are developing and promoting technologies to fuel the circular bioeconomy and digitisation, and takes place in the Agrochemical Lecture Theatre on the afternoon of Wednesday 26 June.

After an initial presentation on the power of interdisciplinarity by Dr Holger Bengs of BCNP Consultants, the initiator of European Chemistry Partnering, at 14.00, Dr Marie Asano, investment manager of High-Tech Gründerfonds Management, will give the 'Impulse lecture' on the theme of 'Finance Trends in the European Start-up Scene'. →



EVENTS

➔ The selected start-ups will then give their presentations. Times, the contact person and the key themes are as follows:

| | |
|-------|--|
| 14:40 | Creaflow, Dr Hannes Gemoets (flow reactor, scalable photochemistry) |
| 14:48 | CF Plus Chemicals, Vaclav Matousek (small & large molecule functionalisation) |
| 14:56 | BioC3, Christopher (biotech fine chemicals) |
| 15:04 | MK2 Biotechnologies, Dr Konstantinos Antonopoulos (scalable synthesis of complex peptides) |
| 15:12 | HQS Quantum Simulations, Iris Schwenk (simulations, quantum computing) |
| 15:20 | Gemsotec, Geert Sergoyne (augmented applications) |
| 15:28 | Azhois, Tony Oehm (blockchain, supply chain finance) |
| 15:36 | Envirohemp, Manuel Román (activated & superactivated carbons) |
| 15:44 | BluCon Biotech, Albrecht Läufer (biodegradable plastics) |
| 15:52 | Avroxa, Victor de la Rosa (polyoxazoline biomaterials) |
| 16:00 | NP Life Science Technologies, Dr Klaus Rudolf Schröder (life science polymers) |
| 16:08 | Catalyco, Reinis Spunde (catalysts, advanced materials) |
| 16:16 | Inolytix, Ralf Dümpelmann (analytical services) |
| 16:24 | Haelixa, Gediminas Mikutis (supply chain complexity) |
| 16:32 | ChemSquare, Florian Hildebrand (digitisation, supplier audits) |
| 16:40 | Chembid, Christian Bürger (online platform) |
| 16:48 | Xenops Chemicals, Oliver Rode (critical raw materials) |

Another perennial feature, also in a dedicated theatre and within the Regulatory Services Corner area of the show, is the **Regulatory Services Conference**. Organised by REACHReady, this gives half-hour presentations from experts in exhibitor companies on regulatory and chemicals management issues. Times, speakers and subjects are:

| WEDNESDAY 26 JUNE | |
|-------------------|---|
| 10:30 | Poison Centres: Are You Ready for the Harmonised Notification Requirements?, Jennifer Butcher, REACHReady |
| 11:15 | Embattled Substances & REACH Authorisation & Restriction, Alan Ritchie & Stephen Bounds, WSP, UK |

| | |
|-------|--|
| 12:00 | ECHA Board of Appeal: Recent Trends on the REACH Regulation, Thomas Delille, Mayer Brown |
| 13:15 | Future of Chemicals Regulations: REACH, Brexit & Beyond, Nishma Patel, CIA |
| 14:00 | Sustainable Solutions: Responsible Chemical Transfer, Martin Willis, IPI Global |
| 14:45 | Regulation of Polymers: Developments with Europe, Dr Mark Pemberton, Global MSDS |
| 15:30 | A Change is REACHed for Nanomaterials, Dr Neil Hunt, Yordas Group |

THURSDAY 27 JUNE

| | |
|-------|--|
| 10:00 | Nano-Enabling Your Company: Managing Regulation for Product Success, Dr Claire Skentelbery, Nanotechnology Industries Association |
| 10:45 | Applying for Biocidal Product Authorisation, Elsa Casimiro, Infotox |
| 11:30 | Introduction of Korea REACH, Bryan Zhou, CIRS |
| 12:15 | The New Eurasia/Russia REACH, Olesia Pochapska, REACH Law |
| 13:30 | Updates on South Korea, Turkey & Other International Markets, Mathias Rietzel-Roehrdanz, SCC |
| 14:15 | Laypeople's Knowledge & Perceptions of Chemicals and Trust in Consumer Products Regulation, Rita Saleh, Swiss Federal Institute of Technology |
| 14:30 | Continuous Formation of Micro- & Nanocarriers with Controlled Properties Using Microreaction Technology, Dr Anna Musyanovych, Fraunhofer Institute |
| 15:15 | Highly Potent APIs: From Clinical to Commercial Manufacturing, Dr Nicola Glubellina, Dishman Europe |

Finally, the **Chemspec Careers Clinic**, organised by Chemical Search International, offers executives from the fine and speciality sectors at all levels the chance to discuss their career aspirations with a specialist professional search firm on a discreet and completely free basis. ●

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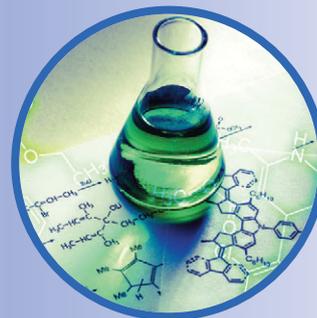
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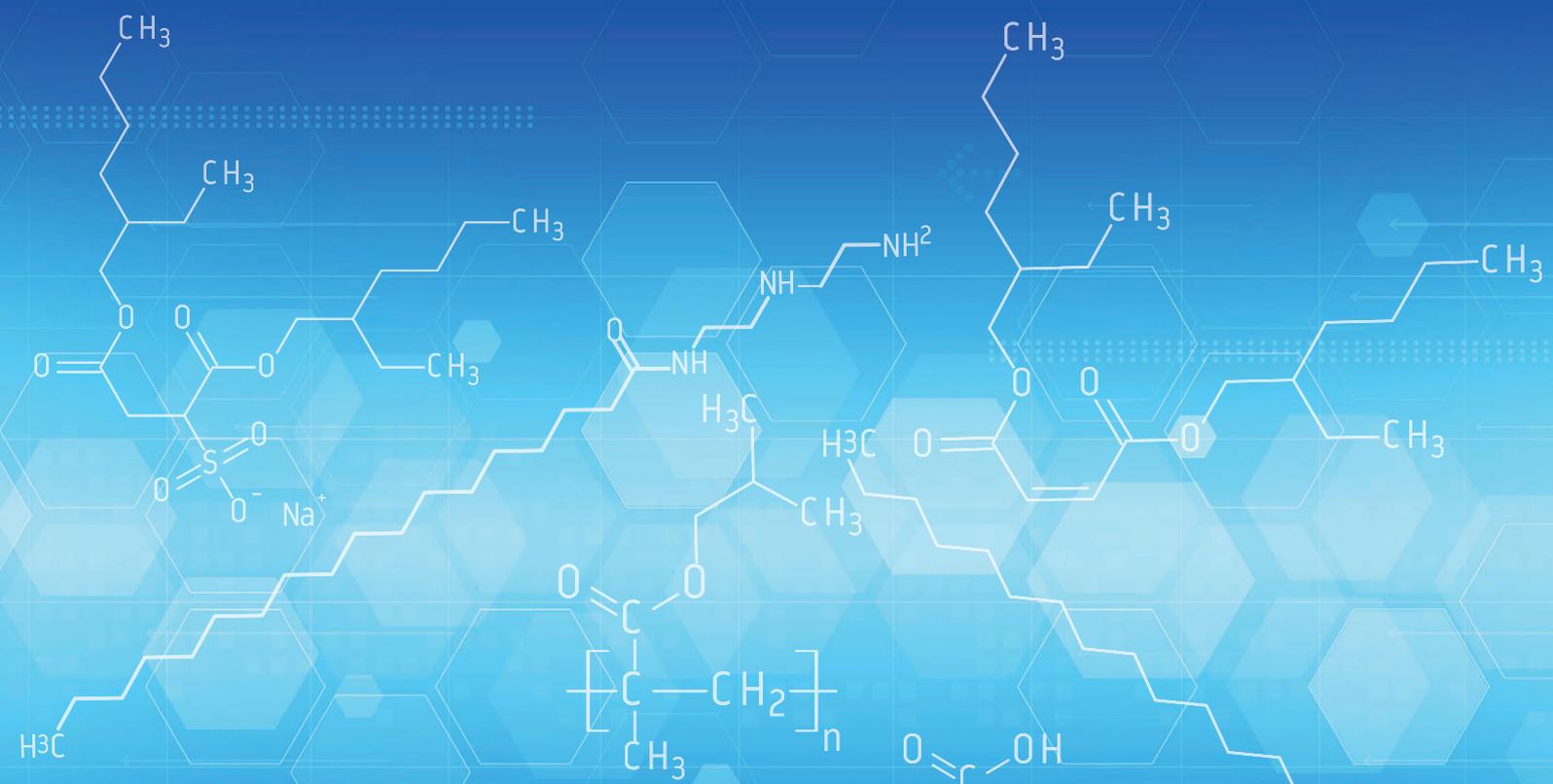
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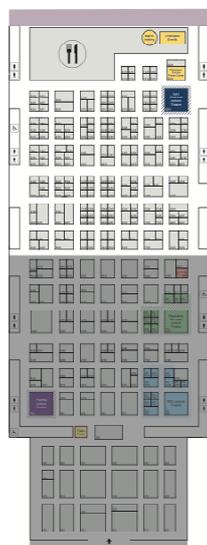
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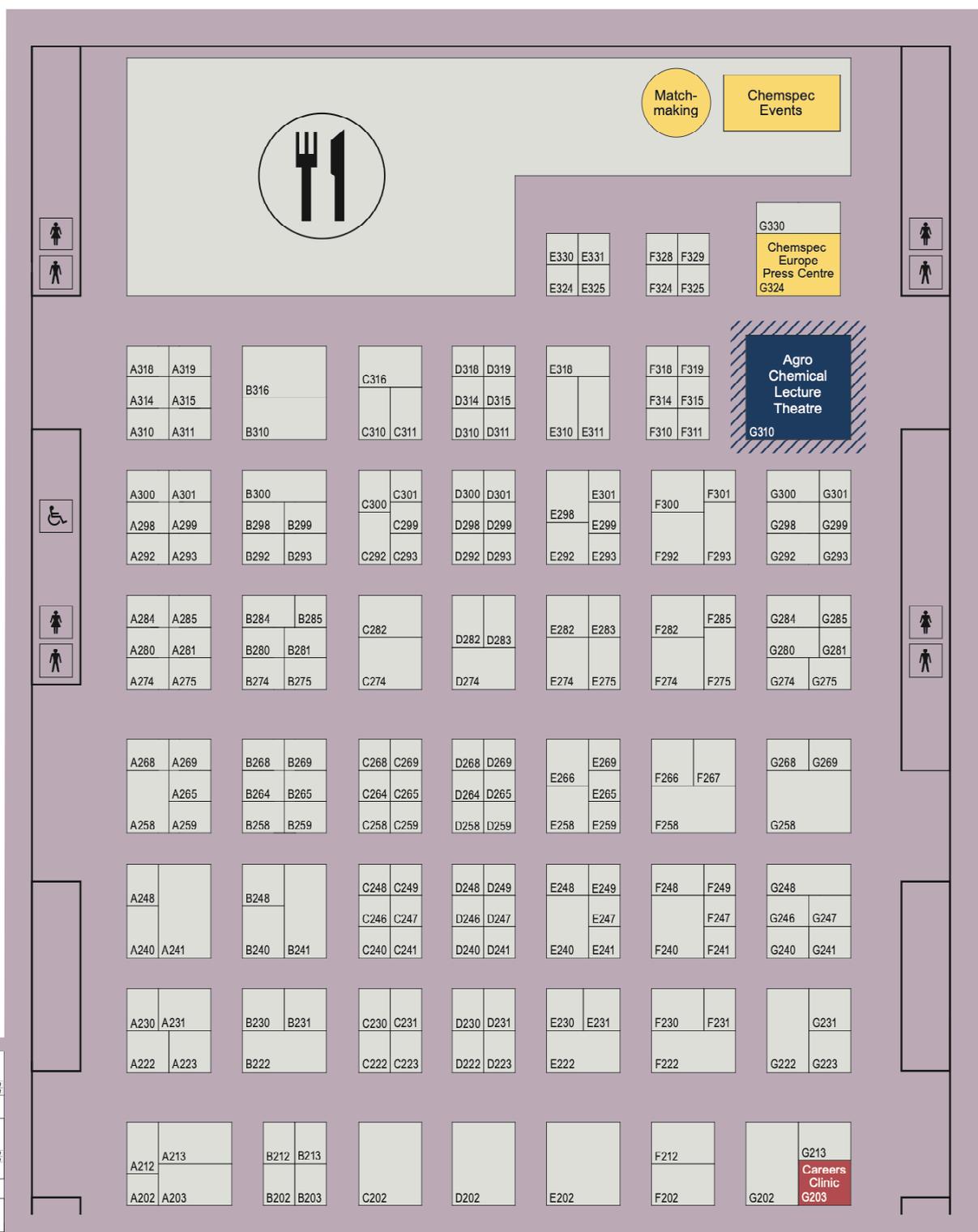
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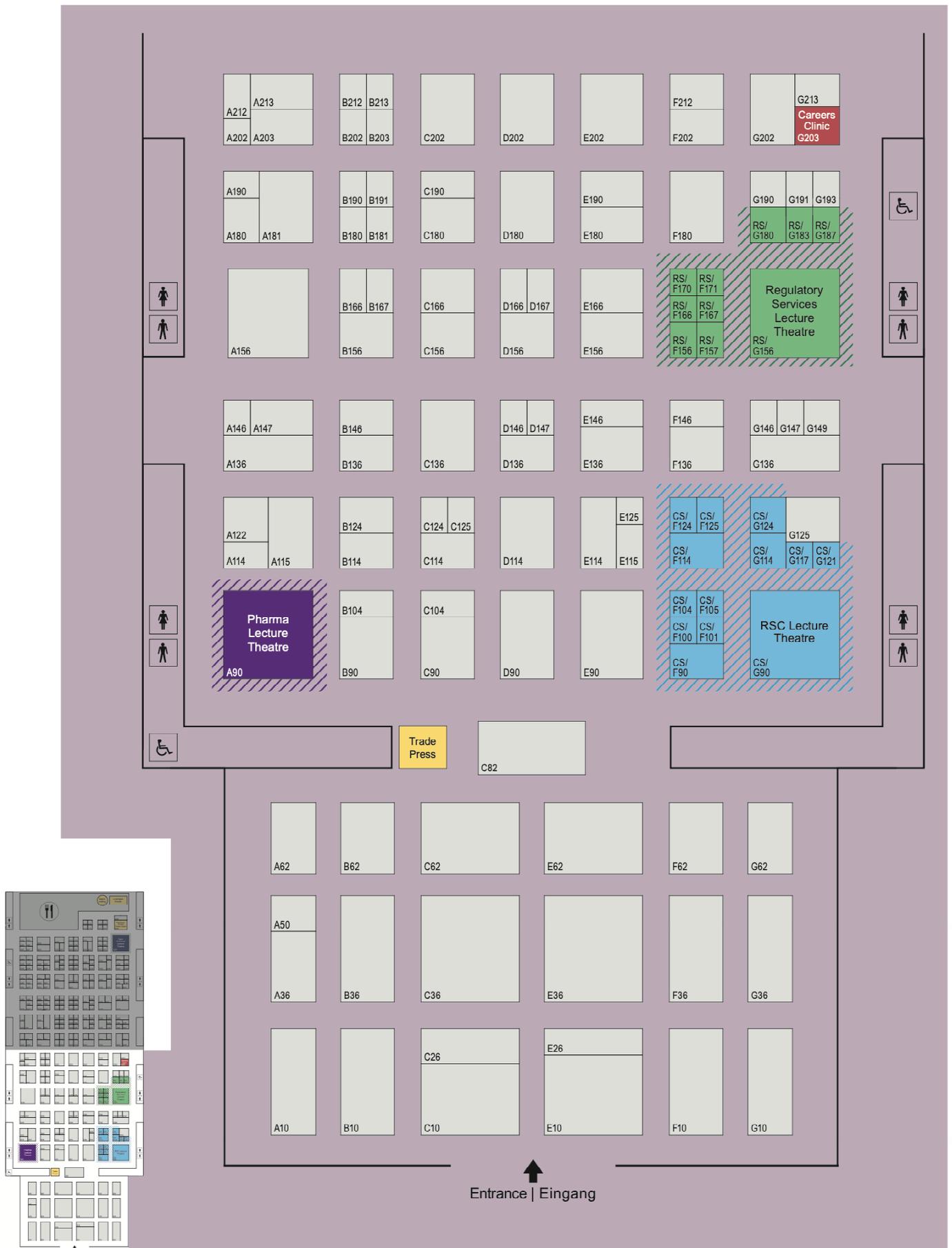
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Readers have been responding to our survey on the impact of digitisation on the sector. We take a look at the key findings

IN PARTNERSHIP WITH EY, a leading global professional services organisation serving the chemicals sector, SCM recently surveyed its readership about the impact digitisation has had on their companies and is expected to have in the immediate future. Many thanks from both of us to all of those who participated.

The aim of the Digitisation in Chemical Industry Survey was

to measure the benefits and current implementation status of digitisation in the industry. It focused largely on the projects planned, completed and underway, and their level of success, now and anticipated.

We wanted to look behind the hype and see what is really happening on the ground, as well as to see if the trends followed those EY had picked up in a previous survey in the Germany, Switzerland and Austria (GSA) region. Broadly speaking, the results were indeed similar and some general conclusions can be made.

A clear majority of companies have already felt an impact from digitisation and they expect this to both continue and accelerate in the next three years. The projects they are already spending money

on tend to be immediate ones, but value chain efficiency is seen as the most important driver going forward. And, most clearly of all, support from senior management is what will make or break these initiatives.

Survey base

The respondents were clearly representative of the SCM readership in every respect and also of the kind of people who will be making decisions on this topic on behalf of their companies in the sector. 35.9% of them said that the broad category that most characterised their business was speciality and industrial chemicals, while 21.1% said fine chemicals and 19.8% said distribution and services. The rest were spread among basic chemicals and petrochemicals, polymers and

plastics, and agricultural chemistry and seeds.

By job title, 44.8% of the respondents were top management, 23.7% were at divisional and business line management level, 12.9% were other senior executives and 9.1% were employees. Of those that indicated their company's location, 45.0% were in Europe, 34.0% in the Asia-Pacific region and 21.0% in North America. Most of the companies were relatively small, with 68.4% saying that revenue was under €100 million/year and a further 14.3% saying it was €100-500 million/year.

Current & future progress

Perhaps predictably, when asked what impact digitisation has had on their company so far, the majority (58.0%) said it was at an 'evolutionary' stage, where some basic impact has been seen and, typically, some process steps had moved from analogue to digital (Figure 1a).

A further 15.0% had seen a 'revolutionary' impact, in which new distribution channels and Internet of Things applications had been developed, while 9.0% had seen a 'disruptive' impact, in which there had been fundamental changes through digitisation and new business models had been created. Only 18.0% had seen no impact at all.

Over the next three years (Figure 1b), the vast majority of respondents thought that the continuing effect on their business would be either evolutionary (41.8%) or revolutionary (35.3%). A further 12.4% expect to see a disruptive effect, while the remaining 10.5% still do not believe it will have an impact at all.

The areas of business where they have made most progress towards digitisation, when marked subjectively from 1 (No progress) to 6 (Progressed significantly) were customer

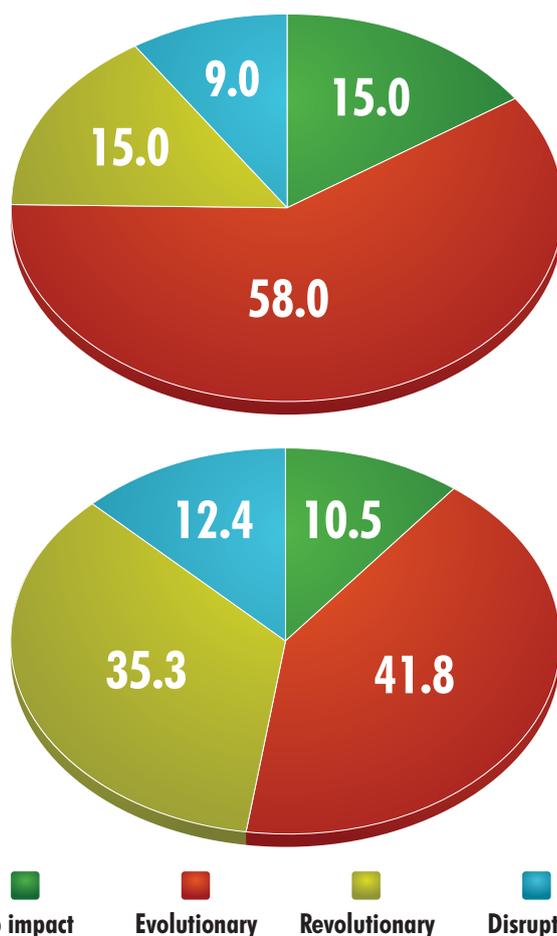


Figure 1 - Impact of digitisation on chemical industry companies now (a, above) & over next three years (b, below) (%)

interface, with an average score of 4.08, and administration and central functions (4.02). The least progress was in business models (3.61). That said, the differences are not huge.

For the next three years, the weighted average was 4.47 for process efficiency in the operational value chain, where all other functions were in a narrow band of 4.03-4.13. It is perhaps more significant, though, that the average mark rose significantly across the board, demonstrating that respondents expect to achieve significant progress in all areas.

The digitisation topics currently implemented in companies, when ranked on a similar scale of 1 (No projects started yet) to 4 (Digital transformation ongoing) showed a wider range of differences. The most widely implemented were digital security (2.55 average score), improvement and integration of data management

(2.53) and improved data analysis (2.38). Last came the most futuristic-sounding ones: automation (1.73) and blockchain applications (1.77).

The benefits of digitisation experienced already are similarly the 'everyday business' kind. Improved market and customer access was cited by 52.9% of respondents and cost reduction by 42.3% (multiple answers were allowed). This put both well ahead of faster turnaround times, increased customer centricity and new products and services, which all hovered around the 30% mark.

What matters most

By far the most important factor in ensuring the success of digitisation initiatives is support for them from the senior leadership team. Respondents were asked to choose up to three

and no fewer than 62.2% cited this. Six of the eight other options – a stable and secure digital platform, clear responsibility for digitisation, a culture of trial and error, having it as a cross-sectional function, a good interface with the internal IT team, and co-innovation and collaboration with the implementation partner – all scored between 28% and 34%.

There was far less accord on what the main technical barriers are. Asked, again, to choose up to three, the highest scoring were the technical infrastructure (44.4%), a lack of qualified personnel (also 44.4%) and the uncertain economic benefits (40.0%). The lack of standards (21.2%) and security concerns (23.3%) were thought the least likely to matter.

"Human nature, ergo unwillingness to change," one respondent said. That may well be the biggest barrier of all – and it would hardly be new. ●



Advancing in parallel

Mei Hao, vice president of quality assurance and EHS at STA Pharmaceutical, looks at the benefits of China's MAH pilot programme to biotechs and Chinese CDMOs

A KEY FOCUS point for any biotech is how quickly it can get through milestones and ultimately how it launches a product on the market. Indeed, for many US biotechs, securing FDA approval and access to the large US healthcare market has been the sole focus of their attention, with other approvals relegated to something that might be considered after commercial launch in the US.

Industry attitudes are now changing in response to a new opportunity that has opened up, thanks to the new Marketing Authorisation Holder (MAH) pilot programme for seeking drug approvals in China and the US at the same time. A significant number of large pharma companies with international regulatory networks already run fairly large parallel US and Chinese programmes for their pipeline. However, for biotechnology companies, the uptake has been very small for what is essentially a broader market and possibly an earlier launch opportunity.

To date, the usual approach for biotechs seeking drug approvals in China has been to develop and manufacture their product completely abroad, then have it registered post-launch as an imported drug. This is now changing, with some actively exploring the parallel development pathway route. For example, Fibrogen is a notable US biotech that received National Medical Products Administration (NMPA,

formerly CFDA) approval for its first commercial drug Roxadustat, ahead of US FDA approval.

The process has also recently been simplified into three steps: joining the MAH pilot programme; registering an office; and, instead of building a facility, finding a CDMO partner based in China to carry out the manufacturing, packaging and labelling functions. There could well be a significant acceleration of interest within the next year, as more biotechs become aware of regulatory reforms and the opportunities that abound.

There are, of course, some important details to consider before partnering, including seeing if the indication is appropriate for the population of all the targeted regions and whether there is demographic clinical data that can be considered for each of them. However, there are clear synergies in using the same qualified and experienced partner in developing and manufacturing a drug product for both China and Western markets, particularly for companies that already outsource their development work to a China-based CDMO.

It is important to look again at how many approvals a potential partner has gained in both the US and China. The advantages of parallel approvals will be limited if the partner slows regulatory approval in either market. A strong existing relationship with the NMPA is imperative, for understanding the processes of a regulatory agency. STA Pharmaceutical is one example, having been part of the launch of the first products approved using the MAH pilot, notably with Ascletris in securing approval for Ganovo in June 2018.

One of the advantages of running parallel approvals is the possibility of an expedited approval process in China, which makes it feasible for a drug to be approved in China prior to its approval in the

rest of the world. There are certain indications that are categorised as an 'unmet urgent need' in China and which obtain fast-track status. For example, some oncology indications have been approved on limited clinical data.

However, there is also a list of rare diseases in China that will be granted an 'accelerated pathway'. Gardasil NDA is an extreme example of this, receiving conditional approval in just nine days, based on international clinical data. CDMOs and the MAH pilot programme can speed the process up, although the timeline can still vary, depending on the specific product concerned.

China's ICH membership has brought with it the advantage of ensuring data will be more transferable than was the case in the past. This is a further recent development that has helped accelerate the parallel programme. Data generation in China is now closely aligned with international regulatory standards, so that when a Western licence holder brings or generates data for approval in China, this is far more likely to be compatible and be accepted by additional regulatory authorities.

Recently, the NMPA also announced regulations that allow for multicultural trial data to be submitted, meaning that, if the applicant includes data on ethnic factors demonstrating that the data is applicable to the Chinese population, it can be considered for use in an approval by the NMPA.

Currently, the MAH pilot programme is only available in ten Chinese provinces, with a national rollout starting in 2019 or 2020. It is anticipated that, for CDMOs with a large footprint in China, there will be many commercial products in need of such support.

As soon as the MAH is fully implemented, we anticipate that it will be the norm for US and European biotechs to seek parallel approvals. The programme is only in its infancy now, but clearly this approach represents a very sizable market for the future – not least due to the high level of cancer patients in China, the number of cancer drugs in development and increasing affluence.

The MAH was originally set up to help facilitate and open new markets for China-based biotechs. However, Western biotechs that would not have had the resources

to build their own facilities will continue to see the benefit of using a qualified CDMO based in China to reach their patients. We expect further increases in demand next year for MAH programmes. ●



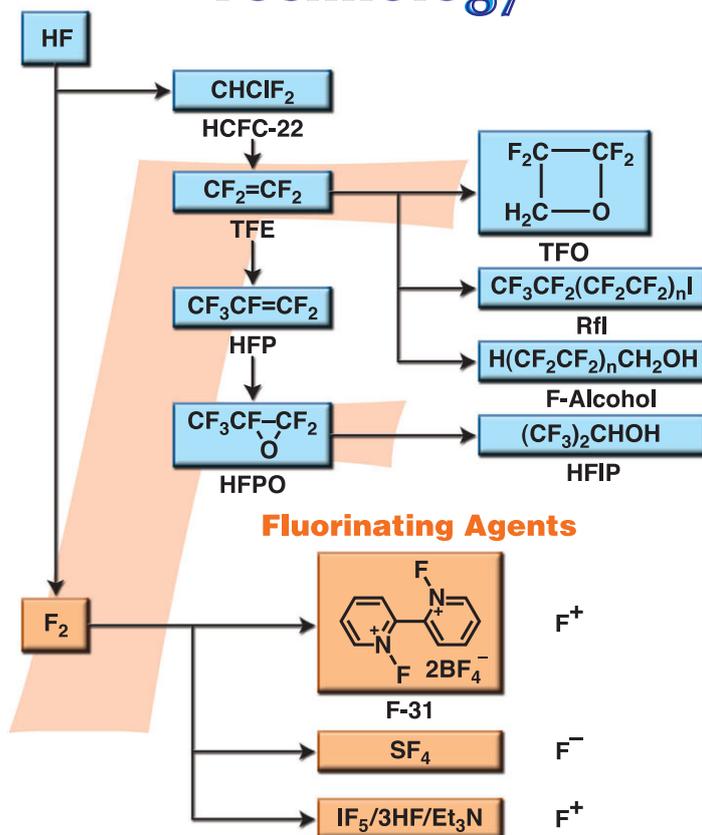
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A decade of growth



① Hanko – Siegfried has grown to be an international player

Dr Rudolf Hanko has stepped down as CEO of Siegfried after nearly ten years. We asked him a few questions looking back and ahead

In June 2018, the board of directors at the Switzerland-based pharmaceutical CDMO the Siegfried Group, announced that Dr Rudolf Hanko would step down as CEO on 31 December after nearly ten years in the role. During this time, the company and the industry both changed tremendously.

Chairman Andreas Casutt said at the time: "His term of office is characterised by the development of annual sales from SF 260 million to over SF 700 million and, especially, by the targeted expansion of our production sites and the consistent orientation of our company toward meeting the fast changing needs of pharmaceutical companies

with international operations."

A German citizen and the first non-Swiss CEO at Siegfried, Hanko took a PhD in chemistry at the University of Göttingen and carried out post-doctoral studies at the Max-Planck Institute. He had headed chemical research within the Pharmaceutical division of Bayer and was general manager of the fine chemicals division, prior to becoming head of the Exclusive Synthesis & Amino Acids business at Evonik and moving to Siegfried in 2009.

SCM: Congratulations on your retirement. Will you have any continuing role at Siegfried?

Hanko: I have joined Siegfried's supervisory board as vice-chairman.

SCM: What do you regard as the main transformations that were made at Siegfried in your time at the helm, and what do you think are the main ones still facing the company now?

Hanko: Since 2009, we have transformed Siegfried from a local player with an international appearance into a global player. In the meantime, consolidation has appeared as a driver within the CMO industry.

SCM: There are many companies now styling themselves 'CDMOs' and offering capabilities in both drug substance and drug product? How do you think Siegfried stands out?

Hanko: Siegfried has always focused on content rather than

style. In that regard, Siegfried is one of the few players to deliver on this promise.

SCM: How is business this year, for the pharmaceutical CDMO sector in general?

Hanko: I expect solid growth for the sector in 2019.

SCM: Do you see continued strong growth for this sector going forwards or are there any clouds on the horizon?

Hanko: The fundamental drivers behind the CDMO industry are two-fold. First is the capital markets, which trend to regard the pharmaceutical industry as a value – rather than growth – sector. Hence there has been a stable trend to reduce the amount of fixed assets in the balance sheet, which drives growth in the CDMO sector. The second is a sector rotation in the healthcare market, which is driving a fundamental shift of healthcare spend towards pharmaceuticals. For years, the overall healthcare market has shown lower growth rates compared with the pharmaceutical segment. This trend will accelerate, since new therapies will shorten the time of hospital stays, resulting in cost savings for the public healthcare sector. Both drivers are likely to continue at least until the middle of this century.

SCM: What will be the big emerging challenges and how should the CDMO sector address them?

Hanko: The fragmentation of the CDMO sector has been a challenge in the numerous attempts to create a level playing field on compliance and regulatory issues. In my mind, this is one of the key challenges that is going to be around for the time being. ●

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Agrochemical dispersants: One size doesn't fit all

With the increasing complexity of agrochemical formulations, James Flavell, technology specialist at Croda, discusses how the smart design of dispersants can play a vital role

DISPERSANTS ARE WIDELY exploited in aqueous formulations in different applications, including coatings, pharmaceuticals, inks, agrochemicals, ceramics, sun care and cosmetics. In these, they often encounter many challenging conditions, such as dispersing multiple components and functioning in the presence of high levels of electrolyte and varying pH.

Within the agrochemical sector, there are several such challenges, such as suspending multiple active ingredients, highly loaded formulations (typically >500 g/L) or ensuring that several different formulations remain compatible within a tank mixture-type system. Specifically designed dispersants are needed to achieve stable formulations in these challenging conditions. As well as a range of different products, a fit-for-purpose design approach and effective screening tools are needed.

Dispersant architecture

Polymeric dispersants can be separated into several categories, including block copolymers such as AB, ABA, random polymeric dispersants and COMB polymers. Each has its own pros and cons and is suited to different situations. Common to all of these are two fundamental building blocks for a

dispersant: an anchoring (or adsorbing) group and a stabilisation group.

The anchoring group adsorbs to cover the particle surface, so as not to be displaced by other formulation components, such as wetting agents or effect surfactants. Several anchoring mechanisms are available, with different affinities for various surfaces, notably surface charge, crystallinity, size and size distribution, shape and density.

Insoluble polymer blocks, like methyl methacrylate-based copolymers or silicone-based surfactants, with, for example, a polydimethylsiloxane backbone, are generally more effective for very non-polar organic surfaces, like carbon black or hydrophobic organic molecules. For more polar surfaces – for instance, inorganic particles, such as micronutrients and titanium dioxide – polar anchoring groups like styrene or carboxylates, such as methacrylic acid, are more effective.

Once the dispersant is anchored in place, it is very important that it remains there. This is especially the case for agrochemical formulations, which are often complex and contain free molecules like surfactants and adjuvants, which can compete at the particle surface interface.

Polymeric dispersants are designed to be large molecules with high molecular weights (MWs) and they have multiple large anchoring groups. This gives them an important advantage over their smaller monomeric counterparts, because, when a surfactant sits on a particle surface, a dynamic equilibrium is set up for each anchoring group adsorbing and desorbing from the particle surface.

Because a polymeric dispersant has multiple large anchoring groups, for each group which desorbs, several others are still adsorbed, enabling them to remain anchored to the particle surface, even in the face of challenging conditions. Polymeric dispersants are thus highly preferable for stabilising disperse systems.

Providing stabilisation

There are two main mechanisms for stabilising dispersed particles: steric and electrostatic (Figure 1). The former uses large, high molecular weight chains to prevent flocculation by blocking the dispersed particles from each other. A typical example of steric hindrance uses large ethylene oxide (EO) chains which hydrate in water, causing them to extend out and create a physical barrier between the dispersed particles.

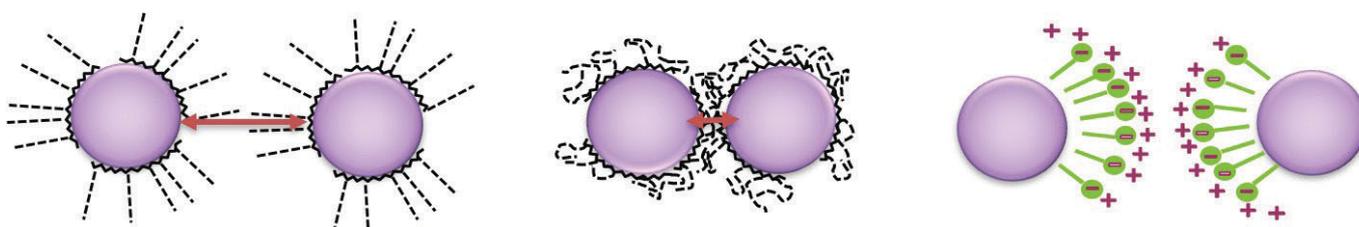


Figure 1 – Solid particles stabilised via steric (left) & electrostatic (right) mechanisms, with collapse of steric mechanism in the presence of electrolytes (middle)

A downside of steric stabilisation, particularly attributed to EO chains, is that in the presence of electrolytes, the ions cluster around the chains, displacing the water, which solvates them. This causes the chains to collapse, reducing the effective radius of the dispersed particle and thus allowing them to move closer together. This so-called attraction results in flocculation, aggregation and sedimentation of the particles.

Electrostatic stabilisation uses ionic groups contained within the polymer structure, such as acrylic acid, which is neutralised to give a negative charge. The charges create an electric double layer around the dispersed particle, which is repelled by the electric double layers of other approaching particles, thus preventing flocculation.

Ionic stabilisation is more resistant to the presence of electrolytes than steric stabilisation. However, ionically stabilised dispersions can still suffer from the effects of electrolytes.

In agrochemical formulations, sources of electrolytes include micronutrients and active ingredients. Dispersion selection in these challenging formulations is key to prevent particle flocculation and sedimentation.

Dispersant selection

Overcoming the effects of electrolytes in formulations can be achieved by informed dispersant design. The deliberate design of a polymer for dispersing micronutrients in high electrolyte systems demonstrates superior performance, even in challenging conditions. Figure 2 shows an example of this; moving from left to right the images show the progression as the formulation disperses throughout the system.

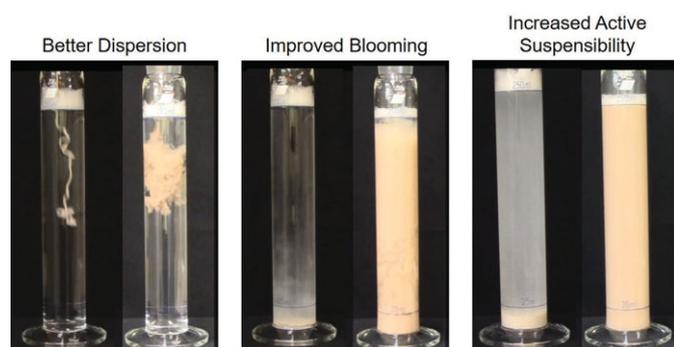


Figure 2 – Suspensibility testing for dilution of formulations containing a commercial dispersant (left) & with Atlox PN-100 (right) in a solution of a commercial glyphosate product

Incorporating specialised monomers, such as 2-acrylamido-2-methylpropane sulfonic acid (AMPS) can be used to enhance electrosteric stabilisation in products like Croda's Atlox* PN-100. This monomer acts as an ion sink, attracting the salts commonly contained in an agrochemical suspension concentrate, and prevents the collapse of the electric double layer, thus enabling a dispersant to perform in the most demanding conditions.

A second way of dispersing particles in the presence of electrolyte is by incorporating anionic and cationic monomers into the dispersant polymer. This creates an amphoteric material, allowing the dispersant to repel both cations and anions. Knowledge of these specialist monomers and combining them with anchoring groups is crucial to designing different dispersants for different types of materials, such as micronutrients, organic pesticides, carbon black and sunscreens, and allows them to carry on functioning in challenging conditions.

Formulation challenges in the agrochemical industry often arise from the combination of two or more actives, which may include electrolyte actives like glyphosate, and the inclusion of fertiliser within a formulation. Another common field where these challenges are encountered is tank-mixture, which consists of adding a component (typically an adjuvant, fertiliser and/or plant protection product) to the formulation once it has been diluted in the tank at the point of use.

Figure 3 shows the difference in performance between two tank-mix combination formulations consisting of an agrochemical suspension combined with a fertiliser. The choice of dispersant for the suspension is key in this scenario.

The left-hand image shows incompatibility between the two formulations causing crystallisation of the active and fertiliser. This is detrimental, as it can cause the spray nozzles to block and stop the spray application in the field. The use of a specialist fertiliser-tolerant dispersant prevents such incompatibility.



Figure 3 – Tank mix comparability of formulations with standard (left) & fertiliser tolerant dispersants (right)

Designing fit-for-purpose dispersants

As outlined, one dispersant does not necessarily work for all formulations. For complex agrochemical formulations that are difficult to stabilise, designing new dispersants with specific features can be very advantageous. Problematic active ingredients or particulates, reduced dispersant use rate and electrolyte tolerance are all key targets.

The choice of specialist monomers and anchoring sites is the first step towards an informed dispersant design. One means to achieve this is to combine steric and electrostatic stabilisation methods to create an electrosteric barrier. Other key parameters include MW variation, composition relative ratio and polymer build structure. Finally, the successful development of a new dispersant is

☞ wholly reliant on effective performance screening techniques.

With the many factors that can be manipulated, the space for development is vast and almost infinite. Simply changing the hydrophobicity of a dispersant has a big impact upon performance, meaning it can be fine-tuned to a specific active. Conversely, this also means that one product cannot be used in all formulations and that manipulating one specific aspect very quickly creates a matrix of dispersants that can be screened for performance.

The anchoring strength of a dispersant can be assessed indirectly using rheology. An oscillation test can evaluate the relative inter-molecular interactions within a suspension.

Conclusion

Dispersants are utilised for various types of applications. One type of dispersant does not suit this array of different particles, surfaces and conditions. Perfecting performance can better be achieved by selecting polymeric materials with design features for the formulation or application intended.

Having a set of screening tools that is able to provide a real measure of effective dispersion underpins the design approach of a dispersant. This will continue to drive innovation to meet the challenges of increasingly complex consumer and industrial products. ●

* - Atlox is a tradename of Croda

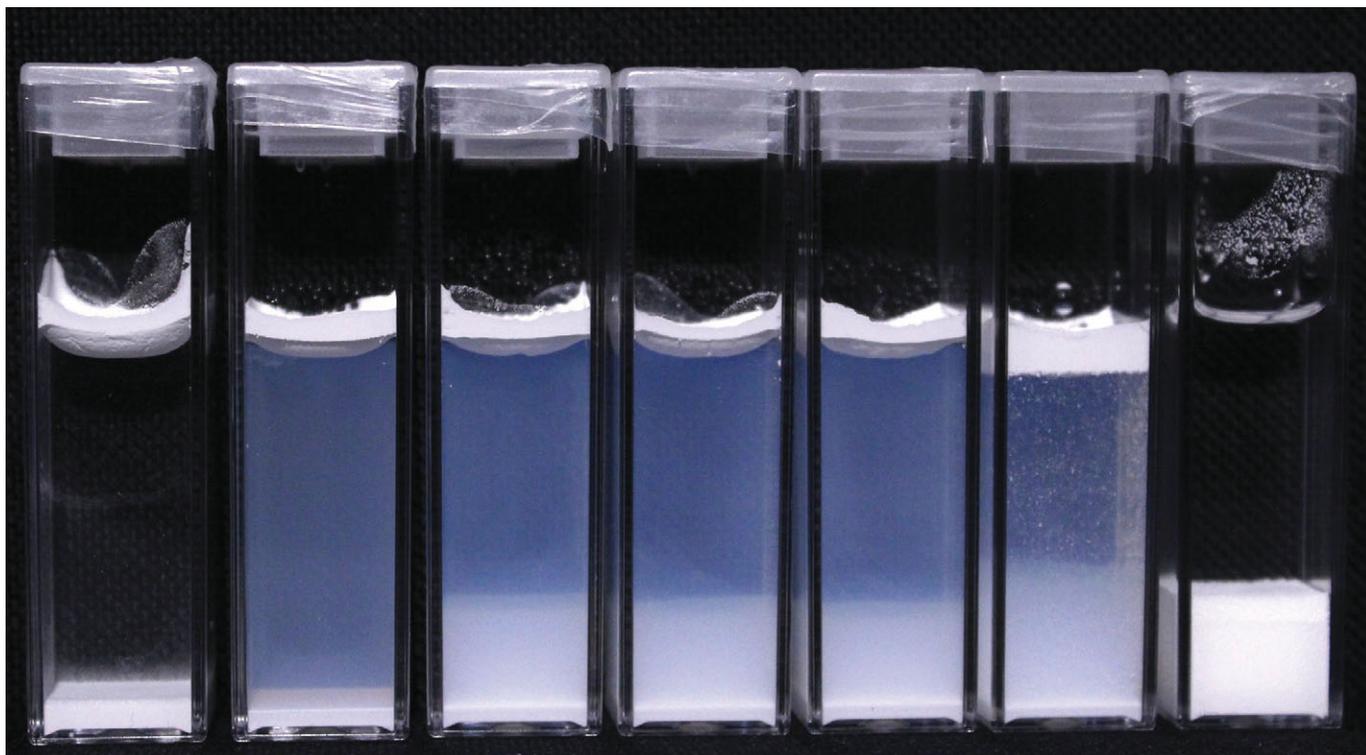


Figure 4 – Effects of increasing hydrophobicity of dispersant (left to right) on dispersancy of TiO₂

With an effective dispersant, the viscosity of the suspension is low, because all the solid particles are effectively screened from each other. Other screening tools for dispersant performance include sedimentation rate and visual assessment, plus more refined techniques such as nuclear magnetic resonance.

Figure 4 shows a snapshot from a time-lapse video of how a ladder series of changing hydrophobicity within a polymer can affect the dispersancy of titanium dioxide.

This simple change has a measurable impact upon performance and such screening techniques open the possibility of fine-tuning a dispersant. Having this level of control and understanding opens up the potential for tailored dispersants to suit any active ingredient and formulation challenge.



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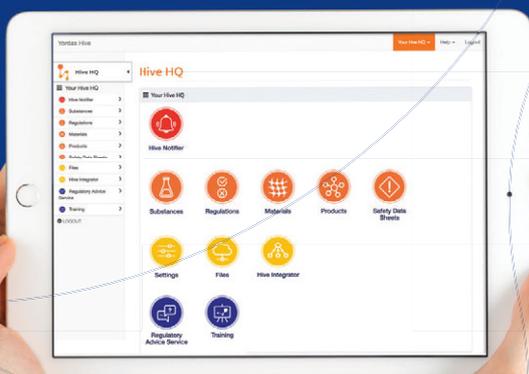
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Hybrids: The next generation of crop protection

Professor Moshe Reuveni, chief scientist at the STK Group, introduces Regev

THE GLOBAL SEARCH for environmentally safe and efficacious plant protection systems is driven by the need to supply food to the growing world population. The call for chemical load reduction is an important aspect of sustainable agriculture.

Years of farming and inbreeding have led to crops losing their natural immunity to fungal and bacterial pathogens. Despite the use of traditional chemical pesticides to combat this resistance, either by chemical rotation or mixtures of different chemicals, the result is highly toxic environments that are mostly effective in the short term.

Alternatives, which offer different and multiple modes of action (MoAs), have a lower risk of fungicide resistance, place a smaller chemical load on the environment and offer consistent disease control, are thus needed. Among the various naturally occurring biopesticides derived from materials such as plants, bacteria, viruses and minerals, botanicals are considered attractive for plant protection.

Tea tree oil (TTO) is a valuable essential oil extracted by steam distillation of *Melaleuca alternifolia* leaves. It contains many components, mostly terpenes and their alcohols, and is an effective antiseptic, fungicide and bactericide. STK has developed it for a broad spectrum of plant-pathogenic fungi with strong prophylactic and curative activities in many crops, including



➊ Infected plants of control untreated (right) & Regev-treated plants (left)

vegetables, herbs, grapevines, bananas, rice, coffee and tree fruit.

New hybrid systems are now combining biological and chemical crop protection active ingredients to offer long-term protection. Regev EC, by STK Bio-AG Technologies, is the first potent hybrid fungicide on the market. Its unique MoA means there is a very low probability of resistance or cross-resistance developing in plant pathogens.

The hybrid formulation contains 200 g/L difenoconazole + 400 g/L TTO extract. It is a bridge for growers who have never previously tried a biopesticide, as they can use it in exactly the same way as chemical pesticides, without mixing or rotation.

Regev lowers chemical residues, while improving resistance management and yield. It also provides various MoAs against plant pathogens and plant defence mechanisms, including systemic acquired resistance and induced systemic resistance, for improved efficacy in plant disease control.

Activity & MOA

At suitable concentrations, Regev significantly inhibits spore germination or lesion development on treated leaves and limits the expansion of lesions caused by various fungi. The diseases it effectively controls include powdery mildews, apple scab and Black Sigatoka in bananas, and

'Years of farming and inbreeding have led to crops losing their natural immunity to fungal and bacterial pathogens.'

species of *Alternaria*, *Cercospora*, *Botrytis*, *Rhizoctonia*, *Pyricularia*, *Helminthosporium* and *Sclerotium*.

The fungicidal and antimicrobial activities of TTO are derived from its ability to inhibit respiration and disrupt the permeability barrier presented by the membrane structures of living organisms.^{1,2,3} It disrupts the fungal cell membrane and cell wall in plant tissue infected with phytopathogenic fungi, even when the disease is already visible there.^{4,5}

Difenoconazole, meanwhile, affects this membrane by inhibiting the C₁₄ demethylation of lanosterol or 24-methylenedihydrolanosterol. This is a biosynthesis step that occurs during the conversion of lanosterol to ergosterol, the final product of fungal cell membrane sterol synthesis.⁶

The different MoAs of TTO and difenoconazole – a combination of a natural product with broad-spectrum activity and a traditional site-specific chemical – make Regev an effective tool for resistance management in integrated pest management programmes. This combination also results in a reduced synthetic chemical load on the environment compared to mixtures based on two traditional chemicals.

Other attributes

Because of all this, Regev could be an important tool in preventing the development of resistance during the growing season. Its application can be rotated with products that exhibit different MoAs and to which fungal pathogen populations have shown a loss of sensitivity, so that the population of individuals less sensitive to chemical products can be reduced. Studies have also shown that a combination of TTO with difenoconazole improves the efficacy of difenoconazole, including against fungal populations with a lower sensitivity to it.

Regev is already registered in Israel, Serbia, the Philippines and ten Latin American countries for various crops and diseases. Registration is ongoing in Brazil, the US and the EU. It is currently used to control a broad range of diseases on arable crops, cereals, fruits and

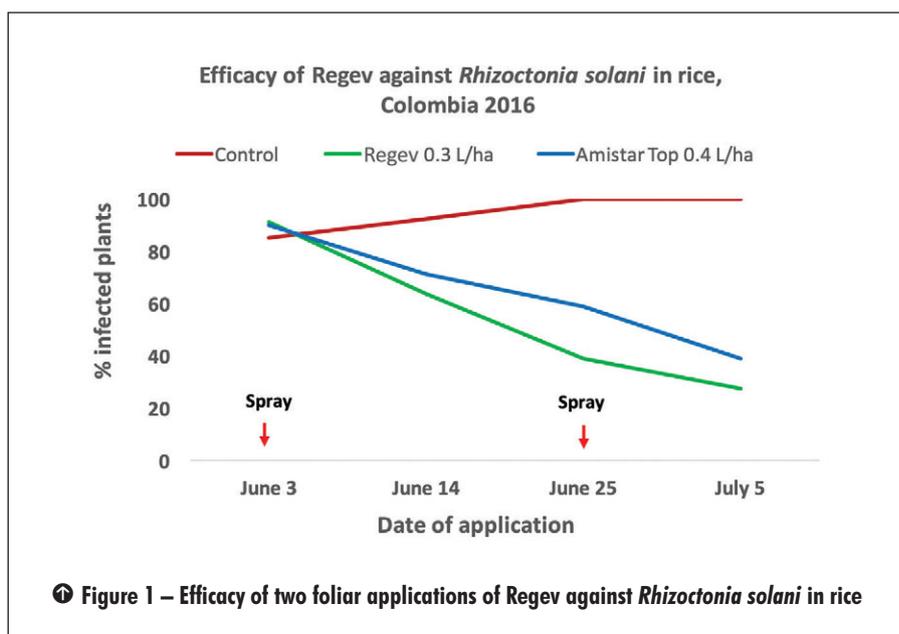


Figure 1 – Efficacy of two foliar applications of Regev against *Rhizoctonia solani* in rice

vegetables. Numerous trials have been conducted in recent years with various crops and pathogens and in different countries.

Figure 1 gives an example of its activity against *Rhizoctonia solani* in rice in a trial in Colombia in 2016 under high disease pressure. This included two foliar sprays of Regev or the ready-mixed fungicide Amistar Top (azoxystrobin plus difenoconazole) at the recommended rates. Both products effectively controlled *Rhizoctonia* and significantly reduced the number of infected plants compared to an untreated control. However, Regev provided better disease control.

Summary

Historically, biopesticides have been used largely on high-value crops, such as fruits and vegetables, but hybrids have proven to be a cost-effective approach for row crops, like soybeans, and field and broad acre crops, like corn.

Regev's preventive and curative activities, together with the indirect activity of the host plant either by systemic resistance or enhancing plant growth and hence yield, and the fact that it is reliable, leaves little residue and provides significant added value to growers, make it an important component in plant disease control.

Regev's activity has been shown on a wide range of plant diseases and can be an attractive alternative

for controlling various diseases. It promises successful yields without risking profit margins, while simultaneously upholding regulations and responding to consumer demands. It thus represents a new generation of crop protection. ●

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NYSCC: Simplest is best

'Clean beauty' and supply chain transparency were the dominant themes at NYSCC Suppliers' Day. Gregory Morris reports from New York

IN THE 1970S Chiffon ran TV ads touting the authentic taste of its margarine with the tag line 'It's not nice to fool Mother Nature'. Today the health, beauty and personal care mantra is the diametric opposite: Mother Nature is an ally and the fool is the supplier who does not offer simple and sustainable components.

That mandate was the clear and consistent theme from the smallest to the largest exhibitors at the 40th annual New York Society of Cosmetic Chemists (NYSCC) Suppliers' Day on 7-8 May. This is North America's largest show in the cosmetic ingredients field and drew 9,981 registrants, from 64 countries, to see 540 exhibitors.

Attendance was 5% up on 2018 and 25% up on figures before the move to New York in 2017.

"Consumers are much better informed, especially about ingredients," said Daan Thorn Leeson, global head of personal care technology for Lonza. "They are very aware of what their personal care formulations do to their bodies and to the environment."

That observation applies both back through the supply chain and afterwards in the waste stream. That has been a factor in personal care for several years, but it has now reached critical mass and is structurally altering the sector.

"Who is driving innovation now?" Leeson asked. "It is the smaller, agile players who can launch something new in six months." The big cosmetics and consumer goods players have caught on to this, "but

formulators still face a dilemma. Natural compounds often sacrifice effectiveness or aesthetics in return for mildness."

By way of response, Lonza has introduced its Syneth line of speciality esters. This is a range of non-ionic emulsifiers and surfactants based on 'customisable' polyglycerol esters derived from plant-based glycerol that can strike a balance between functionality, aesthetics and mildness. The seven individual molecules have hydrophilic-lipophilic balance values running from three to 15.

Mother Nature calls

If Mother Nature was invoked all around the show floor, she was manifest at the **Renmatix** booth, in the form of an actress portraying her. The point, said CEO Mike Hamilton, was to emphasise that his firm produces cellulose and lignin from "just water and plants."

More specifically, water is heated and pressurised to a supercritical state to extract the materials, thus avoiding using solvents. The process is branded **Plantrose**. Any biomass would suffice, but Renmatix has selected sustainably grown red maple. The lignin and cellulose arrange themselves into a material, branded **Celltice**, which is being sold as both an active ingredient and an excipient.

The company is based near Philadelphia and has a production unit at Kennesaw, Georgia. "We will soon have to build a commercial manufacturing facility, but we are not talking about \$500 million. More like an order of magnitude cheaper. There is a massive consumer trend for natural materials. We are selling **Celltice** and building a successful personal care ingredients business," Hamilton said.

It is possible that Renmatix could license out the **Plantrose** process, he added, "but I'm not waiting for that. We are going to market on our own. If you are waiting for a big company to come and make your product, they may not. We own the IP and our goal is to be a manufacturing supplier to formulators."



📍 New 75,000L reactor at MFG's site

Approaching 'natural' from a very different angle, **Vertellus** is marketing elemental sulfur as a keratolytic agent, an alternative to benzoyl peroxide for conditions such as acne and dandruff. To be sure the sulfur is mined on the US Gulf Coast, but there is nothing simpler than an elemental form.

"We are revamping sulfur," said Jessica Byrd, field marketing manager for performance materials at Vertellus. "We put the element into a colloid vehicle that feels like a silicone powder. It is biocompatible, with negligible odour. It is easy to emulsify for formulation. There are pharmaceutical applications as well. We have commercial-scale manufacturing at our site in Parsippany, New Jersey."

Fermentation route

A third approach is the direct replacement of petrochemicals with biochemicals. For example, **Genomatica**, based in San Diego, is producing butylene glycol by fermentation in place of the traditional petrochemical route using acetaldehyde.

"There is an important distinction between natural and naturally derived," said product manager Kyle Huston. "The sugars we use for our fermentation are derived from corn and wheat, but we have found in the literature that butylene glycol occurs naturally in coconuts and avocados."

Genomatica is also working to combat 'green-washing' in the personal care segment. "There is a lack of regulation in cosmetics" ➔

and that has driven some customers to doubt any claims," Huston said. The company expects to produce 2,000 tonnes this year, with 10,000 as the goal in the next few years.

BASF, the world's largest chemicals company and operator of the largest single-company petrochemicals site at Ludwigshafen, Germany, is also strongly invested in natural materials. It has, for instance, collaborations with local scientists, growers and processors in Morocco for compounds from the argan tree, and in Vietnam for materials from the rambutan tree (SCM, April 2019, pp 40-42).

"Consumers are pressing brands for supply chain transparency, and brands are pressing their suppliers," said Ido Kadman, marketing communications manager for home and personal care in North America.

Kadman was careful to stress 'clean beauty,' rather than simply natural or biological-based ingredients. "Clean beauty is mindful and does not have harmful ingredients. Synthetic compounds are OK, as long as they are clean." For example, no consumer today would choose a real tortoise-shell brush over one made of polymer.



➊ **Huston** – Lack of regulation causing consumer scepticism

The pressure from consumers on formulators and suppliers has been building for a decade but has reached critical mass in the last year or two. "Things really took off in 2017," Kadman noted. "Google tracked an increase of 85% in the use of the term 'clean beauty' that year."

The two newest big chemical companies were there too, following a four-year merger, realignment and re-separation process. **Dow** was serving popcorn as a way of introducing its new line of Maize Care corn-based hair care components, while **DuPont** offered a range of natural actives under the Genecare brand.

Stress on natural

Somewhere between the start-ups and the global petrochemical majors other well-known suppliers were burnishing their own natural bona fides. Among these, **Clariant** had just opened a new consumer care innovation centre in New Providence, New Jersey, which will be available to customers from August.

"There is a formulations lab and a salon for claims substantiation," said Michael Haspel, head of industrial and consumer specialities for North America. "We will be working on basic chemistry and formulation adjustment. Our customers ask for something and we can work on it collaboratively or just run with it ourselves."

This is part of a regional effort to develop local partnerships especially for sustainable sources, added Catherine Breffa, head of the personal care competence centre in global application development. Such partnerships are already under way in Java, Korea and Brazil, and around the Mediterranean.

Meanwhile, **Lubrizol** emphasised speed to market with new ingredients and formulations. The firm has manufacturing capabilities in skin care with a 'fully finished brand accelerator' with time to market as little as two months, and is developing something similar in hair care.



➋ **Leeson** – Smaller players are driving innovation

Echoing comments about balancing effectiveness with mildness, **Covestro** featured a working salon in its booth to demonstrate Baycusan, a biobased film-former. The first of the line is a polyurethane-93 hair fixative. Covestro claims this is "one of the most biodegradable synthetic film formers on the market, with 60% biodegradation in 28 days under the OECD 301 test".

Quite a few firms were new to Supplier Day, including **MFG Chemical**. Keith Arnold, president and CEO, said that he had attended because MFG had just completed a \$5 million+ upgrade at its site in Pasadena, Texas. This has given the company considerable new speciality and contract chemical manufacturing, including new reactors, one of which has a capacity of 75,000L.

MFG has also added staff in R&D, EHS and supply chain, including export. "I had heard this would be a good show for us," said Arnold, "and it exceeded our expectations. The energy level was high. I met with many current and potential new customers, and I look forward to returning next year." ●

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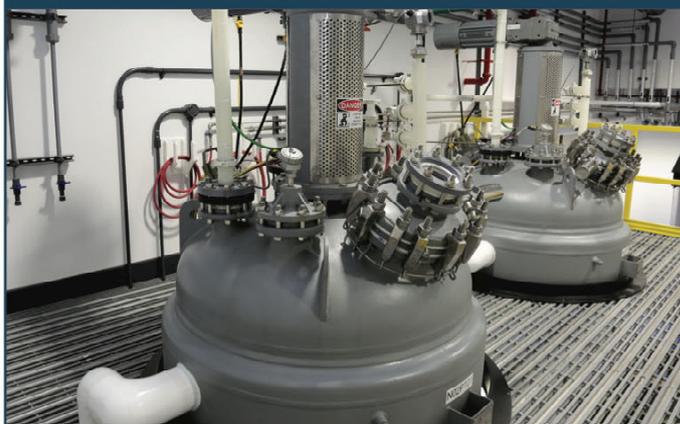


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Sheltering hair follicles and scalp from urban air pollution

Catherine Gondran and Anne Clay of Ashland share some results of tests with Procataline G2*

DURING THE LAST few years, airborne pollution has become a major concern for the environment and health, especially in large metropolitan areas. Exposing hair and scalp to air pollutants has been associated with a pro-oxidant effect, increased aryl hydrocarbon receptor (AhR) signalling and inflammation status, reduced microvasculature in the dermal papilla and decreased melanin synthesis in the hair bulb, as well as increased sebum secretion and scalp sensitivity.

Hair follicles and the scalp possess defence systems similar to those of the skin, including antioxidant and detoxification enzymes. The state of the cell can be assessed by evaluating the level of key biomarkers that are differentially expressed under stress.

Indeed, the inflammatory status of the cell can be evaluated by cytokine level, among them the interleukins, or their receptors, such as IL-1R1.¹ The expression of antioxidant enzymes, including catalase, is up-regulated by stress, as well as the detoxification system driven by the AhR signalling that controls the expression of several enzymes, among them CYP1A1 from the super-family of cytochrome P450s.²

Moreover, at the physiological level, airborne pollution can damage hair follicles. Such pollution has been reported to reduce microvasculature in the dermal papilla, as well as melanin content, and to increase cell apoptosis in the hair bulb.^{3,4}

Procataline G2 is a unique combination of a pea extract (*Pisum sativum*), which has previously been studied for its protective effect on hair follicles, and a chia extract (*Salvia hispanica*), which is referred to as 'supergrains' and known for its health enhancing properties. It contains peptides, amino acids, oligosaccharides, polyphenols and minerals.

Present study

The effects of Procataline G2 on the protection of hair follicles and the scalp were investigated. First, its chelation properties were evaluated on the most representative heavy metals present in air pollution. Then, a representative pollutant stress was generated by cigarette smoke (CS) which contains many harmful components found in atmospheric pollution and particulate matters (PMs), a noxious form of air pollution.^{4,5}

In particular, PM_{2.5}, which has an aerodynamic diameter of less than 2.5 μm , is known to exert negative biological effects on several major organs such as skin. Some of the main markers associated with the skin's defence system of hair follicles and scalp, like CYP1A1, were evaluated in *in vitro* studies. The cells' inflammatory status was monitored via IL-1R1 in *ex vivo* studies.

Furthermore, due to the importance of hair follicle micro-vascularisation to support hair nutrient supply, vascular

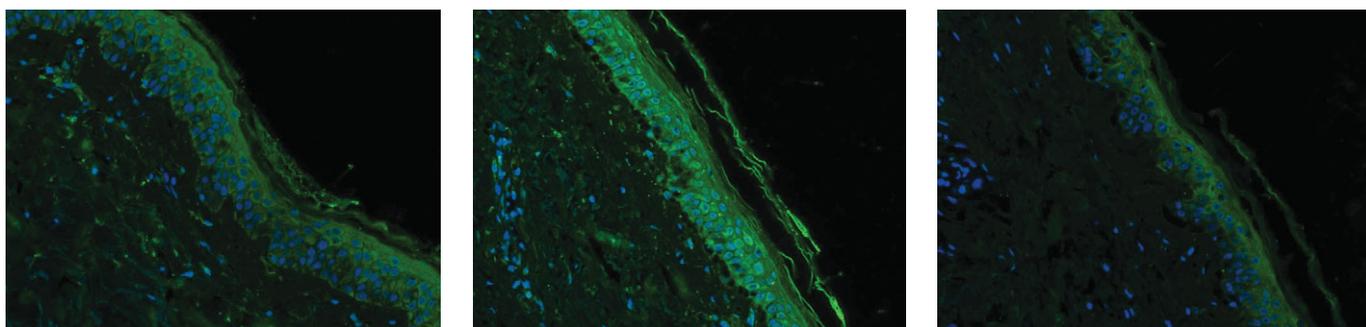


Figure 1 – IL-1R1 immunofluorescent staining in *ex vivo* scalp skin stressed with cigarette smoke: (L-R) Placebo; Placebo + CS stress, Placebo + CS Stress + Procataline G2

Note: 20x objective. IL-1R1 green staining, blue nuclear staining (mean \pm sem; n=3; *: significant, with Student's t test)

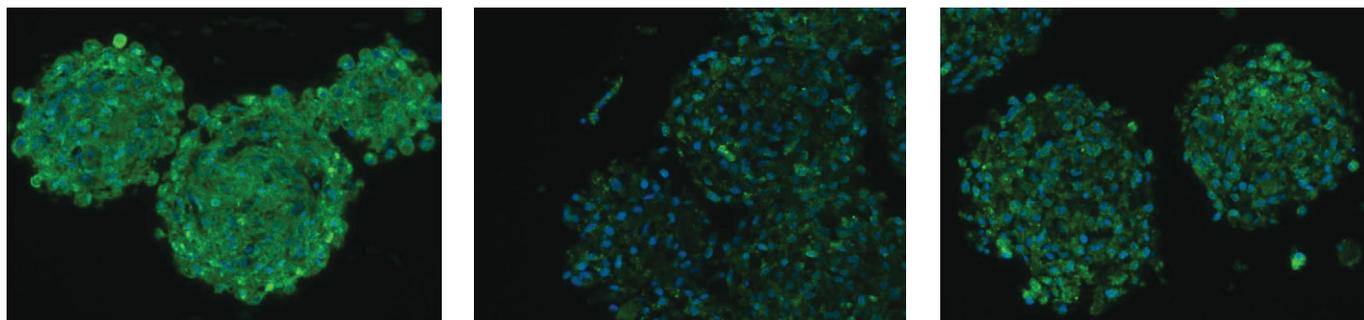


Figure 2 – VEGFA immunofluorescent staining in 3D-sphere of HDPC stressed with cigarette smoke: (L-R) Untreated; With CS; With CS + 1% Procataline G2

Note: 20x objective. VEGFA green staining, blue nuclear staining (mean \pm sem; n=3; ***: highly significant, with Student's t test)

endothelium growth factor A (VEGFA) was evaluated in a reconstructed 3D-model of human dermal papilla cells (HDPCs) exposed to pollutant stress. In addition, a clinical study including short- and long-term application was carried out, using Procataline G2 in a formula versus a placebo.

Results

To evaluate the chelation capacity of Procataline G2, a solution containing heavy metals present in ambient air pollution was brought into contact with it. This mixture caused the formation of a precipitate, due to the chelation reaction between the phytomolecules of the extract and the heavy metals.

Following filtration, the solution was analysed by inductively coupled plasma optical emission spectrometry (ICP-OES) to study the concentration of residual heavy metals after chelation. The results obtained highlight the capacity of Procataline G2 to chelate mainly iron and aluminium ions, the most commonly present metal atoms in atmospheric pollution. It achieved 88% and 20% chelation respectively with them, 25% with lead ions and 15% with copper ions.

The two main biomarkers associated with the effect of air pollution, CYP1A1 and IL-1R1, were evaluated on normal human keratinocytes (NHKs) isolated from scalp skin and on scalp skin biopsies, respectively. These models were pre-treated with 1% Procataline G2 for 24 hours, then stressed with PM2.5

or CS and treated again with 1% Procataline G2 for a further 24 hours.

The CYP1A1 mRNA level was strongly increased in NHKs from scalp skin when stressed with PM 2.5. However, the application of Procataline G2 on scalp NHKs led to a 30% decrease in CYP1A1, suggesting a preservation effect against this stress. Its application on scalp skin biopsies submitted to the smoke chamber was associated with a reduction in the IL-1R1 marker, which is linked to limiting scalp irritation caused by this pollution stress (Figure 1).

VEGFA was then studied as a consequence of exposure to pollution. Dermal papilla cells of the hair follicle express VEGFA, which plays a key role in hair micro-vascularisation and nutrient supply. HDPCs were used to re-create the dermal papilla environment by generating 3D-spheres, mimicking the dermal papilla. 3D-spheres of HDPC were pre-treated with 1% Procataline G2, then submitted to CS and treated with it again for 24 hours.

When the spheres were exposed to the pollutant stress, VEGFA decreased, whereas those treated with Procataline G2 showed a moderate decrease compared to the stressed condition. This indicates that Procataline G2 helped limit the impact of pollutant stress on this marker (Figure 2).

For the short-term clinical study, a hair serum containing 1% Procataline G2 or its placebo was applied on scalp volunteers who were then subjected to CS stress for five hours. Protein carbonylation

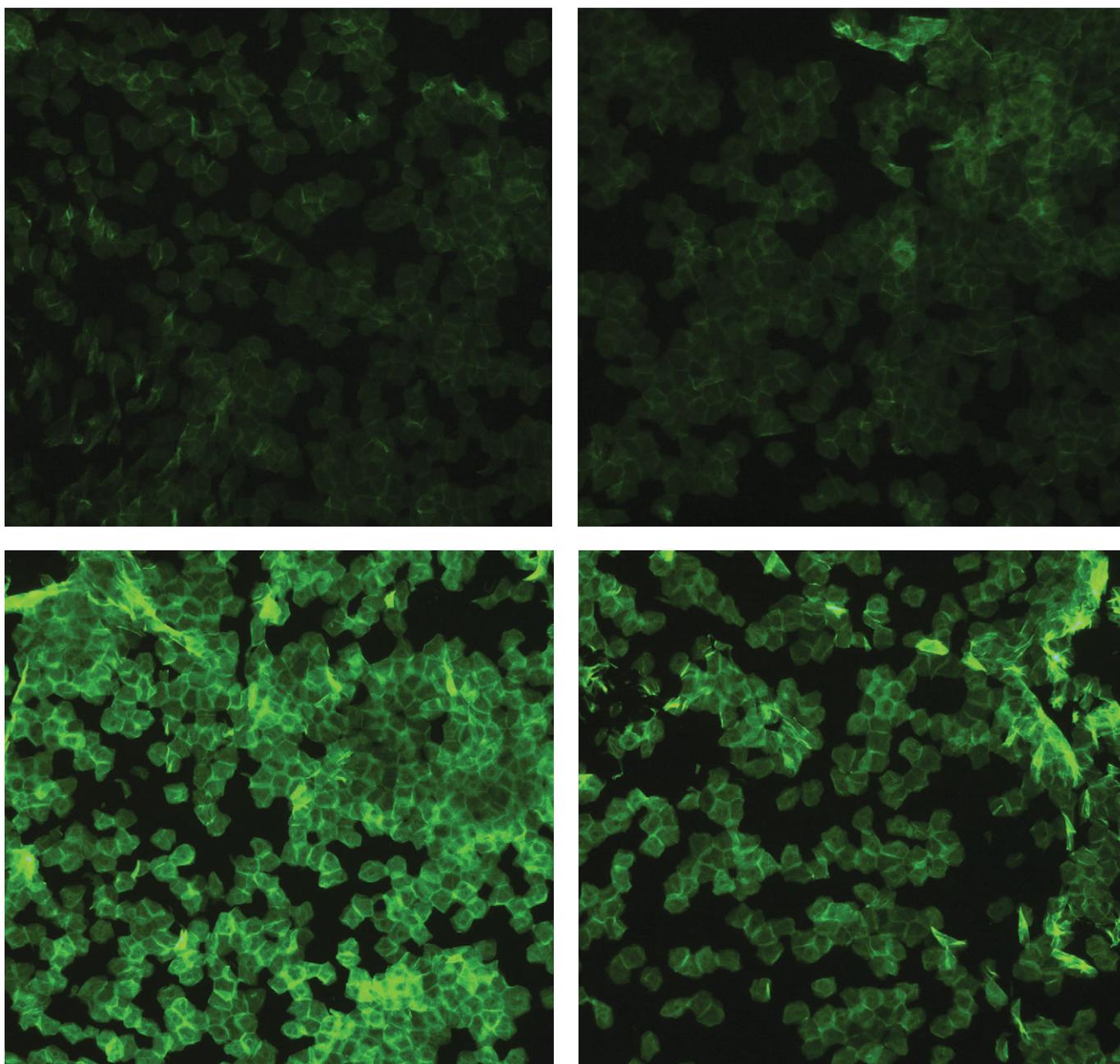
levels were evaluated as indicators of oxidative damage on tape strips made before and five hours after application of the CS stress (Figure 3). The results showed that applying 1% Procataline G2 helped reduce oxidative damage to the scalp stratum corneum, as evidenced by the 26% lower protein carbonylation level.

In a long-term study, 40 volunteers living in a large urban area applied a hair serum containing 1% Procataline G2, or a placebo, on the whole scalp for 42 days. Then scalp health and soothing effects were then evaluated by experts. Of the participants, 92% found the treatment with 1% Procataline G2 effective, against 60% for the placebo.

An 11% increase in scalp hydration was found in the group using 1% Procataline G2, as against a non-significant increase in the placebo group. Finally, scalp barrier improvements as measured by trans-epidermal water loss for the Procataline G2-treated group were 399% better than for the placebo group after 14 days, 134% better after 28 and 106% better after 42. Moreover, applying Procataline G2 helped to reduce the appearance of flakes and skin irritation.

Conclusion

This study focused on the effects of airborne pollution on hair and scalp, and the mitigation of the impacts of such pollution by a new botanical extract product based on a combination of pea and chia extracts.



① Figure 3 – Protein carbonylation of the stratum corneum on scalp stressed with cigarette smoke & treated for 5 hours: Top row – Placebo at 0 hours; With 1% Procataline G2 at 0 hours; Bottom row – Placebo after 5 hours; With 1% Procataline G2 after 5 hours

Note: n=9; **: very significant $p > 0.01$

➊ The application of this unique biofunctional combination on cells from the hair follicle and on scalp biopsies was associated with a reduction in the impacts of damage generated by an applied pollutant stress, as well as reduced inflammation status, as observed in ex vivo scalp biopsies. Moreover, both short- and long-term clinical results were associated with a soothing effect on the scalp and an improvement of scalp health, as evidenced by reduced flaking and redness. ●

* - Also contributing to this article were A. Perrin, C. Coquet, E. Oger, R. Zhao, X. Qu and K. Cucumel, all of Ashland

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The trends behind the trends



James Hodgkinson of Surfachem looks at the consumer-driven opportunities facing formulators in the cosmetic sector



IT IS NO longer enough for cosmetic formulators to make formulations to order for brand owners. Nowadays, they too must understand what the consumer wants – or will want – and respond accordingly.

Surfachem has for some years been working to that end, identifying not just trends in beauty and personal care but also the societal trends behind them. Product concept formulations to meet these demands are developed at Surfachem laboratories in Huddersfield, UK. Three that have been developed recently are entitled For Everyone, Zones and Chillax.

For Everyone

'For Everyone' reflects the reality that stereotypes based on simple characteristics like age, gender, location and socio-demographics are losing their meaning. This is

exemplified in how the use of the term 'unisex', as shown by Google searches, has fallen away dramatically since 2006-8, while 'non-binary' and 'gender-neutral' have shot up in popularity in the last two years.

To address this trend is to embrace the diversity that millennials and Generation X-ers see as positive. Brands that do so, like Context and Sam Farmer, can reposition themselves to reflect acceptance, unity and equality. Surfachem has developed five formulations within the 'For Everyone' concept to address this trend, each with its own strapline:

- For Everywhere: Everyday cleaning to make your uniqueness shine through
- For Style: Define yourself with multi-faceted texture
- For Hydration: For universal, youthful moisturisation

- For Restoration: Condition your hair from the outside to restore the individual within

- For Aura: Rebalance your individual scent

One of the first formulations developed in the For Everywhere concept is based on three key ingredients. The first, Merquat 2003 PR (INCI: Polyquaternium-53), is a conditioning agent which provides a dense creamy foam with improved stability and improves the softness and smoothness of hair while enhancing colour protection (Figure 1).

The other two are an anionic and a nonionic surfactant, both from Stepan and used at 30% and 1% respectively. Stepan-Mild LSB (INCI: Disodium Laureth Sulfo succinate; Sodium Lauryl Sulfoacetate) is milder than the more widely used SLS and SLES, whilst also being biodegradable

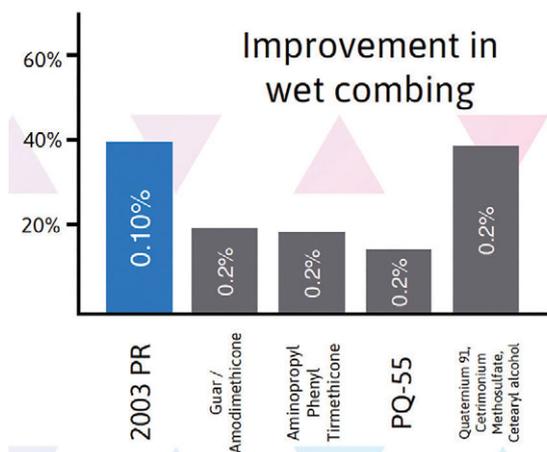


Figure 1 – Improvement in wet combing: Merquat 2003 PR v alternatives

and sulphate-free and generating a rich, creamy foam.

Ninol CAA (INCI: Dimethyl Lauramide/Myristamide) offers foam-boosting and fragrance solubilisation while also enhancing both viscosity and mildness. It has been shown to outperform PEG 40 HCO in viscosity-building.

- Zone T: Send acne down a black hole with a charcoal-infused T-zone mask

- Zone S: Highlight your dull day with a shimmer-brightening S-zone mask

- Zone Digit-all: A hand and feet treatment

One particular formulation we developed contains 0.25% of Lubrizol's Carbopol Ultrez 30 (INCI: Carbomer) as the rheology modifier.

This offers a cushioned and rich skin feel, excellent aesthetics, easy dispersion, good electrolyte tolerance and excellent tolerance at low pH. Another key ingredient is 4.5% gold mica (INCI: Mica) from Sandream Impact. Sandream's pigments are available in a wide range of substrates and coatings, and in this formulation the pigment supports skin radiance and glow.

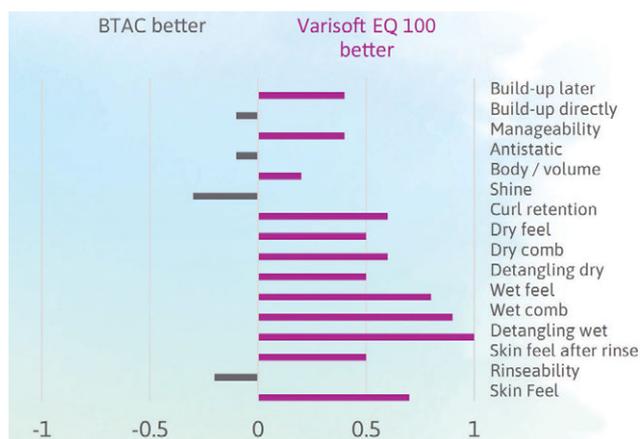


Figure 2 – Varisoft EG 100 v. BTAC in hair conditioning

Zones

The popularity of masks in the cosmetics market has grown rapidly in Europe, from about 100 new product launches in 2016 to about 350 in 2018. France and Germany have led the way.

While masks can be used in many different applications, face and neck care account for 76% of the total. Surfachem has taken a four-pronged approach to developing new mask formulations, each of which is used to treat different areas of the face or body:

- Zone I: Open your eyes to youthful skin

Chillax

'Chillax' is a widely used term, from the words 'chill' and 'relax'. Surfachem has utilised it in a formulation concept that analyses the trend towards spa type luxury for at home use.

According

to Mintel GNPD, new product launches grew from about 20/year in the early 2000s, steadily growing to 160 in 2011, then fell back down to 70 in 2016, only to rise by 136% to around 160 again in 2017. Elemis and CND Spa are among the many brands active here.

These products are quite diverse, with body care, shower products, bath additives and nail and hand care accounting for about 75% of all product launches within 2017. The claims made for these launches were equally diverse, including botanical or herbal (26%), moisturising and hydrating (16%), ethical and non-animal (15%) and paraben-free (also 15%).

Surfachem has, again, developed five formulations for this concept based around different parts of the body to be treated:

- Head: Rich, kind care for your scalp and for your comfort

- Face: Indulge your skin with a calming coco chill-out cleanse

- Hands: Treat dry cuticles with a healthy hemp butter

- Feet: A rich feel cream for luxury relaxation

- Body: Rub away your stresses and release your free spirit with the relaxing power of hemp oil

Hemp oil, a product whose use in new product launches grew by 173% between 2016 and 2018, is a crucial element here. One notable head care formulation that Surfachem developed included 1% hemp oil (INCI: *Cannabis Sativa* Seed Oil) from Aldivia for conditioning, with regenerating and anti-inflammatory attributes.

The other key ingredients, both from Evonik and also used at 1%, are Varisoft EQ-100 (INCI: Bis-(Isostearoyl/Oleoyl Isopropyl) Dimonium Methosulfate) and the bio-inspired ceramide HairFlux (INCI: Ceramide NG; *Olea Europaea* Fruit Oil; *Ricinus Communis* Seed Oil) for scalp health.

The former is a conditioning agent with improved sustainability, offering excellent conditioning on both wet and dry hair, and superior manageability, lubricity and softness. It outperforms BTAC on 12 of the 16 key attributes (Figure 2). HairFlux, meanwhile, improves overall scalp health by reducing itching, dryness and erythema, and gives outstanding repair efficacy on chemically treated hair. ●

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Silicone polymers: The spice of cosmetic formulations

Tony O’Lenick, president of Siltech, looks at the formulator’s options for using silicone in personal care formulations

THE TERM ‘SILICONE polymers’ encompasses a diverse group of materials that find uses in the formulation of personal care products. They are chosen to provide specific properties to formulations that cannot be obtained with carbon-based properties, including:

- Lowering surface tension in both water (PEG/PPG dimethicone) and oil (alkyl dimethicone)
 - Producing a dry powdery feel in formulation (silicone elastomers)
 - Providing breathable films
 - Foaming non-traditional (for example, hydro-alcoholic) formulations
 - Minimising syneresis in pigmented products
 - Providing outstanding emulsions (in particular invert (W/O)) products
 - Providing outstanding spread and wetting on hair and skin
- Obviously, no one polymer provides all of these properties. The selection of the correct silicone is a challenge to the formulator.

This short article will present the basics of what the formulator needs to know when using either polyethylene or polypropylene glycol (PEG/PPG) dimethicone or alkyl dimethicone.

We all are aware of the old saying ‘Oil and water don’t mix’. Mineral oil, water and dimethicone also do not mix. This fact allows us to make surface-active silicone polymers in a single molecule with two or all of these groups. The ratio of these groups to each other determines the properties of the silicone polymer and offers the best possibility of maximising function and minimising cost.

Increased hydrophilicity

The inclusion of water-soluble groups into organofunctional groups results in improved water-solubility (Figure 1a). Depending upon the molecular weight (MW), the polymer will be water-soluble, -insoluble or -dispersible. These factors will also determine if the polymer is

a wetting agent, a water-based conditioner or an emulsifier. The structure is absolutely critical to the function. This class of polymers is simply more water-soluble than dimethicone.

Generally, it takes around 50% PEG in the molecule to obtain water-solubility. If the amount is less than 50%, the product will be water-dispersible or -insoluble. If the number of moles of PEG and PPG added together is over 15, the surface tension of the resulting polymer will be close to 30 dynes/cm. If the MW is above 1,500, the product will have limited or no wetting properties but could be a conditioner for hair, improving wet comb. The best wetting agents are between 600 and 1,500 MW.

Increased oleophilicity

Depending upon the MW, and the values of a, b, and m (Table 1) of the polymers studied, the polymer will be either oil-soluble, -insoluble or -dispersible. These factors also determine if the polymer is an oil-wetting agent or an oil surface tension modifier. Again, structure is absolutely critical to function. Figure 1b shows the structure of alkyl dimethicone polymers.

As Table 2 shows, the solubilities of the polymers studied at 1 wt% and 10 wt% vary as the values of a, b and m are changed. The melting point is also changed by

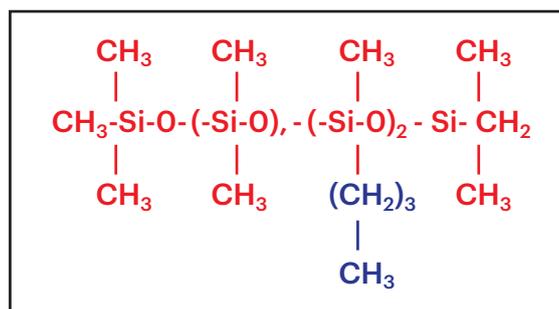
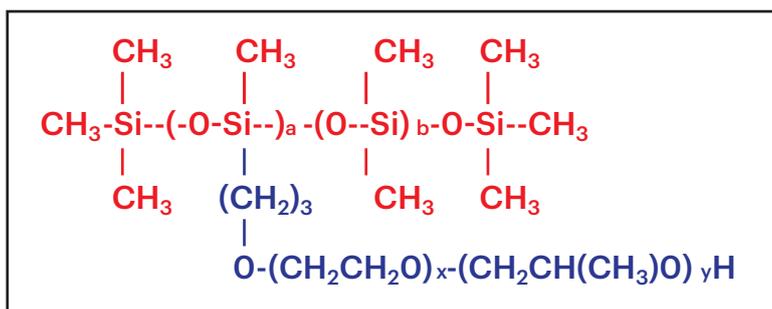


Figure 1 – PEG/PPG dimethicone (a) & alkyl dimethicone (b)

| Product | 'a' D units | 'b' D* units | 'm' Alkyl |
|-----------|----------------|-----------------|--------------|
| Alkyl 2-1 | 0 | 4 | 25 |
| Alkyl 2-2 | 32 | 8 | 17 |
| Alkyl 2-3 | 12 | 12 | 17 |
| Alkyl 2-4 | 20 | 10 | 25 |

Table 1 – Alkyl dimethicone polymers studied

altering the number of carbon atoms in the hydrophobe. The hardness of the polymer decreases for a given number of carbon atoms in the alkyl group as the percentage of silicone in the polymer increases (Table 3).

Conclusion

Silicone polymers are a very broad class of compounds that provide a wide range of solubilities and properties, not only in homopolymers, but more importantly, when

| Product | Water | Mineral Oil | Mineral Spirits | Propylene Glycol | D5 | Silicone Fluid 350 cps | IPA | Aromatic Hisol 15 |
|-----------|-------|-------------|-----------------|------------------|-----|------------------------|-----|-------------------|
| Alkyl 2-1 | I/I | S/S | D/D | I/I | I/D | I/D | I/I | S/D |
| Alkyl 2-2 | I/I | S/S | S/S | I/I | S/S | D/D | I/I | S/S |
| Alkyl 2-3 | I/I | S/S | S/S | I/I | I/D | I/D | I/I | S/S |
| Alkyl 2-4 | I/I | S/S | D/D | I/I | I/I | I/I | I/I | S/S |

Table 2 – Solubility of 1 wt% & 10 wt% alkyl dimethicone

| Product | State RT | % Sil | % Alk | MP |
|---------------------|------------|-------|-------|----|
| Cetyl dimethicone | Liquid | 50.2 | 49.8 | – |
| Behenyl dimethicone | Solid | 68.0 | 32.0 | 46 |
| Behenyl dimethicone | Soft Solid | 45.0 | 55.0 | 37 |
| C26 dimethicone | Solid | 41.0 | 59.0 | 47 |
| C26 dimethicone | Solid | 69.0 | 31.0 | 43 |
| C26 dimethicone | Solid | 81.0 | 19.0 | 37 |
| C26 dimethicone | Hard Solid | 64.0 | 36.0 | 60 |

Table 3 – Alkyl dimethicone melt point

modified to be surface-active by including additional groups that are insoluble in silicone in pure form. These include both oleophilic and hydrophilic groups.

The properties that can be altered include surface tension, solubility and melting point. The changes are predictable and effective at low concentration and these properties make them highly desirable in formulation of personal care products. ●

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ECHA focuses on REACH compliance for 2019



Dr Thomas Berbner of Knoell Germany looks at the actions needed to meet tightening REACH dossier update requirements

THE FINAL REACH registration deadline for phase-in substances passed on 31 May 2018. At first glance, it might have appeared that the main part of REACH was over then. However, although this was the biggest single effort that industry had to put into REACH, the reality is quite different.

So far, data have been collected and evaluated with regard to the hazards and risks of chemical substances used in Europe. This resulted in one of the world's largest databases of information on chemicals, including their physical and chemical properties, their toxicological and ecotoxicological impact and their uses.

The introduction of extended safety data sheets, a new way of communicating about the safe use of a chemical substance, adds valuable information about substances and especially their safe use in the supply chains. In short, today we know more than ever before about chemicals and how they are used in Europe.

The chemicals market is not and has never been in a steady state. Every year, new ones enter the market, while others leave it. Their market shares, production volumes and manufacturing processes can change. New uses are introduced or new scientific knowledge about a substance might become available.

Keeping up to date

Whereas manufacturers and importers of new substances are generally aware about the registration obligations they have to fulfil to place a substance on the market legally, awareness of the importance of keeping substance information up to date

is lower. Article 22 of REACH requires a registration to be updated without undue delay if there are any change(s) in: the status of the registrant; the composition of the substance; the annual or total quantities manufactured or imported; or, its classification and labelling.

The introduction of new uses – and uses advised against – or the identification of new risks to human health or the environment all require an update to the registration dossier and the chemical safety report (CSR)

Updates are also required if there are amendments or updates to the CSR or Annex VI, Section 5, and in cases where a test for which a testing proposal is necessary must be performed, or where changes in data access are granted. Finally, ECHA may also request updates for various reasons, such as decisions on a completeness check.

At ECHA's Safer Chemicals Conference in Helsinki on 22 May, the authorities made it clear that

the compliance of REACH dossiers has to improve. An implementation regulation that requests registrants to update a dossier is currently in preparation.

The regulation will clarify some terms like 'undue delay'. This might be defined as over three months for a dossier update in cases of changes in substance identity, tonnage band or new uses, or 12 months where an updated CSR becomes available or new scientific data is found with regard to intrinsic properties and risks of a substance.

Keeping substance-related information up-to-date is a key element of the sound management of chemicals and their safe use. Hence, there are many reasons why companies should review their registrations regularly, even if there has not been a change. Performing a literature search for new information regularly is also highly recommended.

Another key issue, often highlighted by the press and NGOs, is that many companies

do not comply with the legal requirements for substance registration. According to the first report from a recently completed REACH compliance project by the German Federal Institute for Risk Assessment, only 31% of the dossiers for substances at >1,000 tonnes/year and 44% of those at 100-1,000 tonnes/year are compliant.

Why is data missing?

For the rest of the dossiers, data were considered to be missing. Why is this? Since the authorities perform a technical completeness check for every registration, for every required data endpoint there has to be some information available – otherwise a registration number cannot be granted.

To understand the background better, it might be helpful to take a look back in time before 2009, when the first registration deadline was still in the future. Chemicals management in the European Economic Area based

on REACH was completely new, ECHA was very young and guidance documents still had to be developed or published.

Therefore, registration dossiers were submitted that had been generated to the best of the ability of all stakeholders at the time. They were happy to have overcome the registration burden and kept products on the market, and they considered registrations to be in a steady state. Some of the older dossiers might have been high quality when they were prepared but now they fall short of today's expectations of sound chemicals management.

After REACH entered into force, all stakeholders had to learn its requirements and the required study data was clearly missing for many intrinsic substance properties. Registrants often deviated from standard data requirements towards the optional use of alternative approaches like read-across or quantitative structure-activity relationships (QSARs). However, the





➔ justifications for using these are not considered sufficient when applying today's standards, which in turn leads to the impression of missing data and non-compliance. There are also cases where the robust study summaries lack a sufficient level of detail and hinder an independent assessment.

ECHA stated that REACH was built in a way such that industry does its job and the agency checks the results. Wherever data is missing, industry is encouraged to avoid animal testing and use alternative methods. Developing such methods proceeded too slowly and created a problematic situation.

New action plan

Industry addressed this problem by using the aforementioned options, like read-across, but did so to a far higher degree than ECHA expected. The pressure to use such approaches may, however, leave uncertainty about the hazard and thus the risk of a chemical substance. Hence, there is no other way than to tackle such uncertainties.

To improve the quality of registration dossiers in the future, ECHA is developing an action plan. This will address all substances and improve the clarity

of legal provisions. Reaction times have to improve. By the end of 2020, all registered substances at above 100 tonnes/year will be assigned to regulatory pools with different objectives and priorities. We also expect the compliance check target to increase from 5% of the dossiers to 20%.

A substance for which the registration dossier is non-compliant by today's standards does not necessarily pose a hazard or risk to human health and/or the environment, but there are worries, because one simply does not know for sure. Therefore, you should take Article 22 of REACH seriously and keep your dossier up to date.

Check the basic data about volumes and uses (and also uses advised against): are they still accurate? Remove uses that are not active any more. Keep an eye on the scientific data: is there something new with regard to hazards to humans and/or the environment? Check your justifications for read-across or QSAR data. Do they sufficiently and reliably explain why you chose this approach?

One final point about why it is so important to keep a registration up to date is the prioritisation of dossiers for further evaluation by

the authorities. They will probably be inclined to tackle hazardous substances that are produced in high volumes and have dispersive uses. Therefore, check these points in your dossier. Is the classification of the substance accurate and are the volumes still in the registered range? Check also whether the uses are all correct.

In the near future, the chance of receiving a compliance check decision from ECHA is likely to increase, so be prepared. Once you receive such a decision, your only options left are to react and fulfil the requested actions within a fixed period. Therefore, be proactive and develop your own time schedule and strategy for keeping your registration data accurate and up to date. ●

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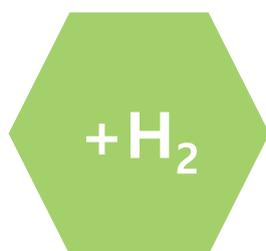
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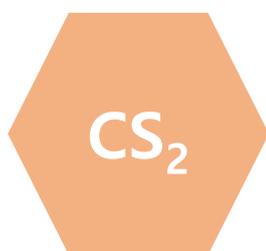
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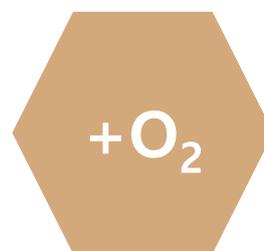
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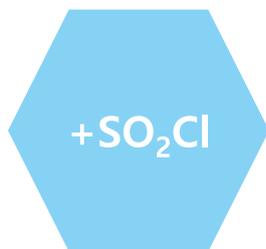
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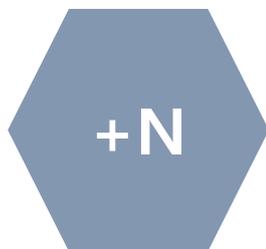
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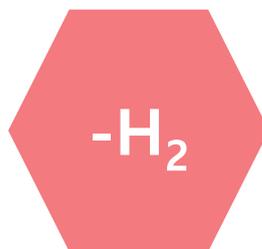
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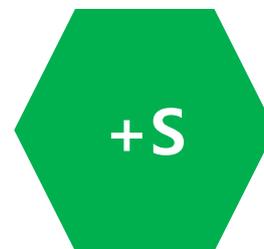
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The 'B' word

Brexit was high on delegates' minds at a newly launched UK chemicals show

IT IS AN ironic tribute to the uncertainty surrounding the UK's proposed exit from the EU and the possibility of having to look for more business at home that a UK-specific chemical industry show should have had such a flying start, with about 1,800 visitors present on the first day. The inaugural Chemical UK Expo, held in Harrogate on 1-2 May, saw such demand for stands that the organisers had already decided to move next year's event to a larger venue in Manchester.

It was standing room only at the open sessions that touched on what many speakers sardonically referred to as 'the B word'. A stand at which government departments gave out information about the process and what to do in the eventuality of the UK leaving without an agreement – a 'no-deal' or 'hard' Brexit – was also busy.

At the time, there was a possibility of an exit being agreed in time to leave on 31 May. This, to no-one's surprise, did not happen and the European Parliament elections resolved nothing, with the newly launched Brexit party and explicitly anti-Brexit parties trouncing both the governing Conservatives and the main opposition party, Labour. All of

the issues discussed in Harrogate will thus remain relevant at least until the new departure date of 31 October.

The key problem where Brexit collides with REACH is that only companies based in the EU can register chemical substances with the European Chemicals Agency (ECHA). If the UK leaves, it will become a 'third country' and any UK companies obtaining substances or mixtures from EU or EEA suppliers would be redefined as importers. The 5,000 or so REACH registrations they now hold would become invalid and would have to be transferred to an entity based in the EU27. This process is already taking place.

What if there is no deal?

If no deal is agreed, the government plans to bring EU REACH into UK law via the European Union (Withdrawal) Act of 2018 and use that as the basis of a UK system. EU REACH registrations would thus automatically be included in this new 'UK REACH', said Caroline Raine of the National Chemical Emergency Centre (NCEC).

Strictly speaking, she noted, this is not 'grandfathering' as generally understood; they will

have to be registered again, albeit in a basic format, and a lot of work will still need to be done. Importers into the UK will have 180 days after the withdrawal to notify themselves via a parallel REACH-IT system on the Gov.UK website. There will then be two years to register the substance under UK REACH, paying a fee to the Health & Safety Executive (HSE) to do so.

Others, notably Peter Newport, chief executive of the Chemical Business Alliance (CBA), which represents chemical distributors, warned that copying and pasting EU REACH into a different UK system will be neither simple nor cheap. The CBA has identified some major stumbling blocks, beginning with cost. UK industry, which has already paid some £600 million to register substances under REACH, will now have to register some or all of them all over again and pay similar fees.

The second issue, Newport said, is timescale. The CBA believes that plans to have a UK REACH up and running two years after a hard Brexit are "extremely unrealistic", when REACH took ten years and three stages to implement. Companies first have to make a commercial



📍 The aisles were often packed at Chem UK in Harrogate

➡ decision to register before they test substances. Some testing protocols take 12 months from initiation to completion, a further three are needed for the test report to be evaluated, then it has to be incorporated into a full data submission to the HSE.

Finally, said Newport, "the largest bugbear is around data". The Department for Food, the Environment & Rural Affairs (DEFRA) and ministers seem to think that UK companies will have continuing access to data, despite being told repeatedly that "this is categorically not the case", since EU27 companies actually own about 75% of the data.

The Chemical Industries Association (CIA) and CEFIC have recommended that EU companies should consider making data freely available to those UK companies who contributed to generating it, but they have no powers to enforce this. UK companies therefore, may have to choose between paying whatever the data owners ask for access or do all the testing over again and slaughter millions of

animals in the process, which REACH was meant to avoid. "Shame on us," Newport said.

Less stringent – or more

One potential advantage of a hard Brexit, Raine observed, is that the UK would not have to implement all of ECHA's decisions. It could have a lighter regulatory system or, indeed, a more stringent one. The government's highly ambitious 25-year environment plan, published in January 2018, aims to achieve just that, noted David Hill, director of environmental quality at DEFRA. "The government has set out its vision of a Green Brexit in which environmental standards are not only maintained but enhanced," Hill said.

The first parts of the Environment Bill were published in December 2018, including those most closely related to EU withdrawal. They include: draft provisions to set up a new, independent Office for Environmental Protection that can hold the government and public bodies to account, thus filling some of the space the European

Commission will vacate; a statutory framework for environmental principles such as 'the polluter pays'; and putting the 25-year plan into law. The final clauses should be introduced later this year.

Among the plan's many goals is managing exposure to harmful chemicals and "significantly" reducing the level entering the environment, noted David Wright of the UK Lubricants Association. It also talks about a more effective method of tracking chemicals across the supply chain, and adopting the precautionary principle enshrined in REACH, including an early warning system, increased recycling and nurturing the circular economy. Working strategically with international partners is a necessary part of this, Wright added, and the plan specifically builds on existing approaches, most of which came from the EU.

Prior to the referendum, Steve Elliott, president of the CIA, had stated that there was "no appetite" for an exit from the EU from an industry that is Britain's largest exporter and which sends about

60% of its exports to the EU. Having invested to comply with REACH, UK firms do not want a different regulatory system in the UK and would need to remain EU REACH-compliant in any case.

Since then, the CIA has advocated a negotiated exit deal that keeps Britain as close as possible to REACH and ideally within the framework of ECHA. (The concept of 'associate membership' has been mentioned repeatedly, though at present there is no such thing in EU law.) Elliott continued that theme at Harrogate, stressing that 'no deal' would have serious negative impacts for the chemical industry.

Speaking out

Some have argued that the industry should come out unequivocally for remaining in the EU, but most companies and associations are reluctant to be seen as interfering in the democratic process. "We took a decision early on to avoid the toxic politics of Brexit and restrict ourselves to trying to

articulate what the industry is saying," Newport remarked.

Collectively, then, the industry has been cautious but some individuals have been more outspoken. Dr Dani Loughran, managing director of **Aston Chemicals**, a distributor of speciality chemicals mainly to the personal care sector, won plaudits when she spoke from the audience of the BBC's *Question Time* and said that a no-deal Brexit would be "catastrophic" for the company and the country in general. Indeed, the results are being felt already.

"Over the past 30 years we've grown from nothing to a medium-sized company employing people here, bringing products from around the world and selling them in the UK and in Europe," she said. "Because of the trade barriers that are being put up by Brexit, the duplicated regulations, and the massively increased costs we are now having to bypass the UK for half of our business."

Having a separate UK regulatory system will mean more bureaucracy, not less, Loughran continued. It will be a highly complex operation and nowhere near enough money has been set aside to manage it. Moreover, many companies will simply not think it worth the cost of registering their products again just for the UK market. Thus there is a risk of some products becoming unavailable in the UK or not being made here any more.

Separate regime

In the event of a no-deal, Raine noted in Harrogate, ECHA's responsibility for the Classification, Labelling & Packaging, Biocidal Products and Prior Informed Consent Regulations and the fees aspect of the Plant Protection Products Regulation will fall to the HSE. DEFRA will pick up almost everything else, including REACH, the rest of the PPPR (PPPR) and the Persistent Organic Pollutants Regulation. →





📍 Open sessions were a key part of the event

📍 “DEFRA and the HSE will be working much closer together than they ever have done in reality and we have seen them doing that already in the past few months,” said Raine. Technical papers have been published and are available on the HSE website, spelling out what will happen in a no-deal scenario.

This “unprecedented” situation, said Newport, has greatly increased the importance of trade associations, particularly regarding the post-Brexit regulatory framework. It has strained the technical resources of already lean associations like the CBA, and its members, who have to attend ever more meetings with government and tell it the same things over and over again, and absorb a proverbial avalanche of updated advice and information.

“Brexit brings a seismic shift in the chemical industry’s trading programmes with the EU and potentially represents unwarranted extra cost,” Newport said. “Firstly, if you want to access particular markets, you have to comply with that market’s conditions. For

chemicals, that means REACH. If you don’t comply, there’s no market access.”

Preparing ahead

Chemicals now move back and forth across the English Channel, he continued. Imposing tariffs on those movements will make them unsustainable and/or prohibitively costly. The UK has also been aligned with REACH and other EU chemical regulations for ten years and more. “That’s what we’re playing with. It begs the question of whether the UK will have frictionless trade with the EU post-Brexit,” said Newport. As yet, no-one knows the answer.

The scale of this challenge has impelled UK chemicals and downstream associations, including the CIA and the CBA, to come together within the ‘Alliance of Chemical Associations’. They have now reached many joint policy positions, albeit sometimes with different orders of priority, and have spoken to government with a common and cohesive voice.

CBA members want the UK to retain membership of the Single

Market and remain aligned with EU regulatory requirements as needed to achieve that, Newport observed. “However, given the state of Brexit negotiations and the failure of the Commons to pass a withdrawal agreement, achieving a Brexit result that delivers a sustainable outcome still appears some way off.”

Raine advised UK companies to keep up to date with the Brexit negotiations – which is hard not to do, given the media coverage. They should also communicate with suppliers and understand what their plans and needs. Many, she noted, are currently stockpiling in case of a no-deal Brexit and there are probably more chemicals in UK warehouses now than at any point in the past.

Preparedness for the eventuality of a no-deal is critical, Raine said. “You need to understand your supply chain. Consider all the options, such as taking advantage of the Brexit window to set up a EU27 operation or taking to third parties; allocate a budget and be ready to initiate your plan – indeed, it may be best to have more than one,” she concluded. ●



➤ Chemical distributors were among the exhibitors

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A new frontier in outsourcing

CABB Chemicals and Jayhawk are coming together to offer contract manufacturing to a wider speciality chemicals market

A NEW PLAYER has entered the stage, with a specific focus on the outsourcing of speciality chemical manufacturing and a presence on both sides of the Atlantic. This process began in August 2018, when Evonik sold its Jayhawk subsidiary in Galena, Kansas, to the private equity firm Permira, which already owned CABB Chemicals, for a sum said to be in “the high double-digit million dollar range”.

Jayhawk focused on fine chemical custom manufacturing of active ingredients and intermediates for agriculture, electronics and specialities. Evonik did not see it as a strategic growth business but Permira thought otherwise. At the time of the deal, Sebastian Hoffmann, a member of Permira's Industrials team, commented: “A strategic cooperation between Jayhawk and CABB will create a seamless

trans-Atlantic product and service offering, from which existing and new customers of both companies will benefit.”

Based at Sulzbach-am-Taunus, Germany, CABB turns over about €450 million/year. It makes precursors, intermediates and active substances for fine chemicals in its custom manufacturing business unit, at the former SF-Chem at Pratteln, near Basel, Switzerland, and a former KemFine site at Kokkola, Finland. The Acetyls business unit makes monochloroacetic acid and its derivatives at three sites.

“What we are doing now is expanding on the existing capabilities we have at our facility, which are complementary to CABB’s in terms of assets, technology, equipment, expertise and customer-centric relationships,” says Jeff Black, president of Jayhawk.

Holistic approach

The two firms say they will offer a holistic approach, based on decades of experience in custom manufacturing, potentially taking over all the steps between R&D into a specific molecule and marketing the final product. This would normally include: determining the optimal synthesis process; developing a reliable supply chain; production, including scale-up to commercial volumes; implementation, based on specific competence, assets, processes and resources; and project management.

The ultimate aim is to extend their operation to wider platforms in speciality chemicals. This term covers a vast potential range of end use markets, of course, and is notoriously hard to define, but there is no specific target industry within it for the partners.

Rather, says Thomas Eizenhöfer, head of the custom manufacturing business unit at CABB, “Adding to our strong customer base in agrochemicals, we’re now going to address segments in the fine chemicals industry with a need for outsourcing and which fit our technology and assets”.



Black – Combined entity can offer more complex operations

📍 Eizenhöfer – Alliance will build on strong customer base in agro



decision makers, in R&D, new business development, production and technical sourcing, often feel insecure with regards to related opportunities and risks, cost and operational handling.

CABB and Jayhawk are addressing this partly by publicising their capabilities through the media in order to make them better known to the speciality market, and using each other's sales and technology platforms. They have also been attending trade events together, like Specialty & Custom Chemicals America in Fort Worth in Texas, and will also be at Chemspec Europe in Basel on 26-27 June.

"Our partially complementary capabilities extend also to engineering, equipment and assets, both industrial and lab-scale," says Black. "That can include materials of construction, unit operations and an extended set of services. It is extremely important to have a group of individuals who are well versed in regulatory requirements, validation and all of the things you normally need from a regulatory body."

Global compliance challenge

While regulations are still region-specific, Black adds, the trend is towards them becoming more universal, in particular in terms of corporate governance. Process safety management is increasingly a global expectation; even if →

CABB and Jayhawk see huge opportunities in speciality chemicals. This is driven by demand for innovative and more complex molecules as a result of new chemical and functional requirements in growth segments like e-mobility, healthcare and personal care, increasing demands on sustainability, increasingly stringent regulation, cost pressure and the stress of competition, all exacerbated by the unstable supply situation in China.

At the same time, the industry is facing ever-growing competition from low-cost countries, mostly in Asia, as well as more complex customer demands. In order to differentiate themselves via innovation, speciality chemicals companies have a delicate juggling act to master. They must become more flexible and agile and make effective use of their own existing resources, but must also shorten times to market and deliver on multiple demands with regards to aspects like functionality and sustainability.

Outsourcing beyond agro

In this context, the targeted outsourcing of process steps is a promising approach, the partners believe. It can contribute to bringing new products to the

market faster and more flexibly and can provide immediate access to relevant process and technology competence, production assets and infrastructure, and personnel resources. It also avoids or reduces the need to acquire and learn new technologies and to invest in new assets.

Selling outsourcing to the speciality chemicals market will be quite a challenge, the two companies recognise. Unlike in agrochemicals, speciality chemicals companies often have limited experience of custom manufacturing and the key



📍 Production facility at a CABB site

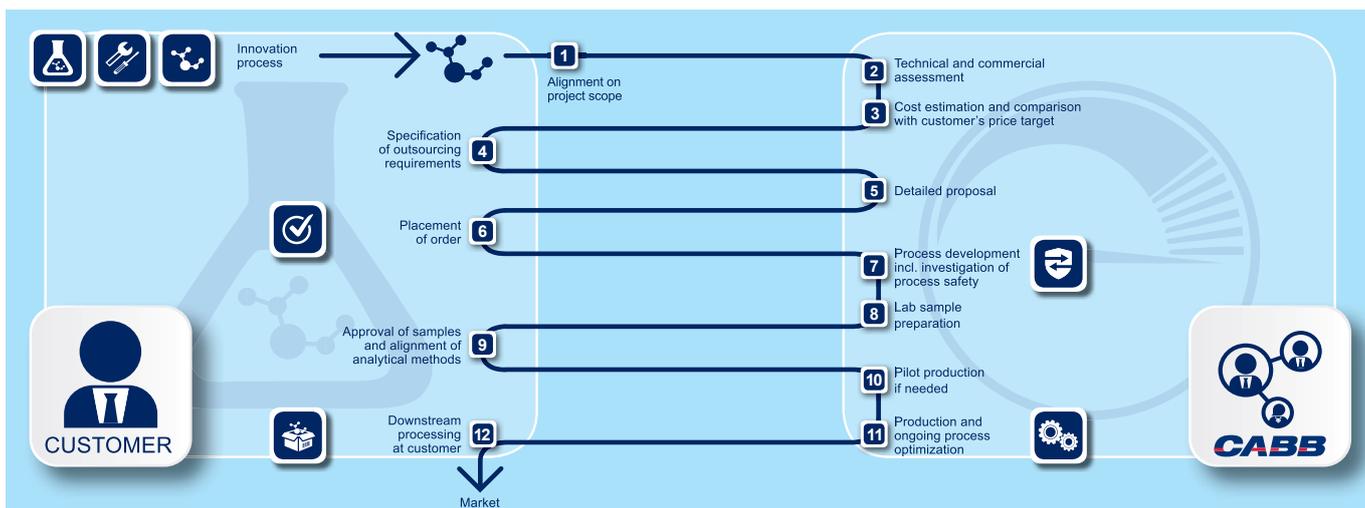


Figure 1 – Outsourcing process at CABB

→ it is implemented differently from one region to another, the principles are very much the same.

The advantage they offer, says Eizenhöfer, lies in the fact that the combination is more than the sum of the parts. “When we come together, we can also share and enlarge our customer base, moving into markets where we have suitable chemistries but did not have the scale to be present before,” he says.

“We can also offer more complex operations than before,” Black says. “For example, between us we can offer Suzuki couplings and high-volume Grignards. Alone, these are perhaps not so interesting but when you combine them, they are. Or, if you have a complex synthesis requiring, say, 12 steps, we could do some at Jayhawk and some at CABB or vice-versa.”

Both companies, he adds, have already been working with customers for years to gain insights into their needs and have already established relationships that have led to multiple projects. In that respect, he believes, they are already ahead of the curve.

As well as the established commercial capabilities across both companies, adds Eizenhöfer, both also have pilot plants, which will enable them to step in at the early stage of customer projects and scale them up. And, Black notes, the multi-regional presence gives other advantages when it is necessary to qualify a particular



molecule in a particular country for the sake of speed or compliance.

“We believe that speciality chemicals companies need to focus their resources more on finding new molecules. They will continue to carry out some manufacture in-house, but when it comes to technologies they don’t have in-house, they should consider outsourcing more, like pharma and agro have done in the past,” he says.

“They need a partner who is really reliable, who understands the technical aspects of outsourcing, who has the right assets and the right technology,

who is able to protect their IP and can also manage the supply chain from raw materials through to logistics and this is something both of us can offer.” ●

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Operations at Kodak's Rochester site

New opportunities in the West

Supply disruptions, IP theft and regulatory crackdowns have created opportunity for US and European chemical manufacturers, says John Harty, director of business development at Kodak Specialty Chemicals

ON 21 MARCH, 78 people were killed and over 600 more injured in a blast at the Chenjiagang Chemical Industry Park in Xiangshu. This is just the single most deadly of several recent disasters at Chinese chemical sites. China has spent the past 20 years aggressively taking over global manufacturing in many areas, including chemicals, but has done this at the cost of safety, the environment and potentially even client product quality.

Many Chinese factories do not even come close to meeting regulatory requirements. So why do so many companies (still) use them? Let's face it, they have been much less expensive. And for any manufacturer, every ingredient in the product adds to the cost of that product. If they can get some of it cheaper, they will.

Changing landscape

However, China's price advantage has hit some major stumbling blocks over the past couple of years. President Xi Jinping has been enforcing existing Chinese environmental laws by shutting down plants and jailing bosses who were not complying. Since the shutdowns take place immediately after an inspection, customer delivery dates have been impacted and prices have risen.

Price had been China's chief attraction for global customers. Getting plants up to code is not cheap. The main components that drive pricing for chemicals are labour, fixed costs in plant and infrastructure, raw materials and costs to comply with environmental, regulatory and safety standards.

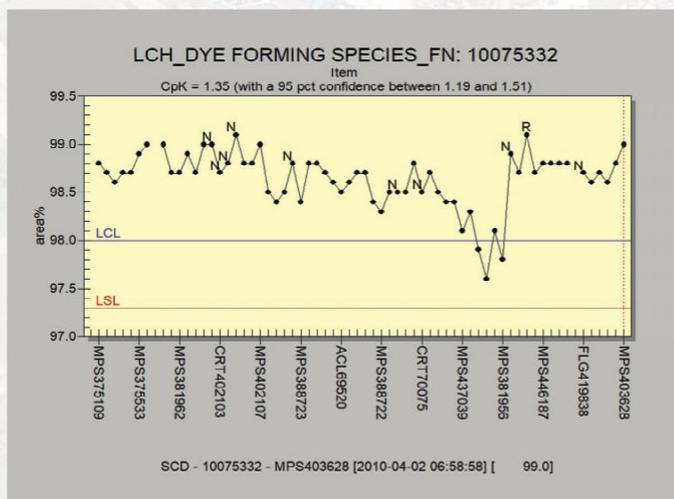
China clearly has the advantage when it comes to labour rates and

that will probably not level out in the near future. However, right now, plants across China are re-tooling and re-building their plants to comply with environmental, regulatory and safety standards. To do this, they have to raise prices.

IP theft

It is now clear that companies using Chinese factories risk their IP rights, because many Chinese companies simply do not respect these rights. And any company using a Chinese factory needs to be aware of that.

A report from the Commission on the Theft of American Intellectual Property in 2017, for instance, cites losses to US companies in the hundreds of billions of dollars. A US trade representative, quoted in a CNN Business report on 23 March 2018, said that Chinese theft of American IP currently costs \$225-600 billion/year. And, in a 1 March 2019 report in *Fortune* magazine, a CNBC poll is cited as finding that one in five corporations said that China has stolen their IP within the last year.



Analytics are a key capability in a contract manufacturer

China has been under heavy fire from many countries around theft and/or arm-twisting tactics around IP. It sometimes even seems to be 'on the up-and-up': you ask them to do business with you and they make you turn over your IP as a condition of doing business, known as forced technology transfers. Or, as many have found, you cannot even do business with a company in China without setting up mandatory joint ventures, where they are entitled to the IP as part owner.

In other words, China cornered the market through unfair business practices and low-cost manufacturing. Things are changing, however, and those changes represent an unprecedented opportunity for US and European chemical companies.

With the current risks in purchasing chemicals from Chinese companies, companies looking for chemical manufacturers would do well to look closer to home. US and European companies not only represent a safer business partner from an IP perspective, they also tend to be in compliance with all of the regulatory, environmental and safety guidelines.

What to look for

For any US company looking to partner with a chemical toll manufacturer, supply assurance, regulatory compliance and IP protection are very important considerations. For those in the pharmaceutical industry, they are critical.

Find more at www.specchemonline.com

So, what does an ideal toll manufacturing partner look like? If you are looking for a partner that is more likely to be reliable, safe, environmentally friendly and cost-effective, you should have the following qualifications in mind:

- **World-class facilities:** Does the supplier have flexible batch manufacturing facilities that can accommodate kilo-scale manufacturing up to tonne-scale? Sometimes it is a matter of the size of the project, sometimes it is a trust issue: start small, make sure it all goes well, then ramp from there
- **History & experience:** Does the manufacturer have: a history of technological innovation, including: the use of lean methodologies; experience of working in different toll manufacturing industries, understanding the rules of each; and tenured employees who know how to produce quality output project after project?
- **Accreditations & certifications:** Is the manufacturer ISO-certified? Does it have regulatory compliance permits and certifications? Even more important, does it have a culture of safety and compliance, ensuring that every employee complies with all protocols?
- **Manufacturing excellence:** What systems and processes does the manufacturer have in place, notably to protect customer IP? Does it have a history of reliable manufacturing and knowledgeable and experienced talent? For instance, Kodak has a database of over 100,000 molecules and over 1,500 approved processes, enabling it to meet a wide range of customer requests

- **World-class purchasing & supply chain:** Does it have a reliable source of raw materials? Can it adjust if there is a disruption in the supply chain?
- **Analytics:** Does it use technology to benefit itself and customers, such as statistical process control and other quality tools, and to ensure control of all operations in the factory? Kodak has onsite analytics for every project, with secure access for customers, who can access an online quality dashboard portal at any time, from anywhere, to monitor their project in real time

Conclusion

China has had its way for a long time, but there is a window now for US manufacturers. With the headlines coming out of China now, customers may want to look closer to home for safe, reliable, clean and green toll manufacturing partners. If they ensure the one they find can effectively answer the above questions, they will probably have an ideal partner. ●



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A storm is brewing

Ryan Meany of Edgewater Capital Partners looks at how chemical contract and toll manufacturers can address a looming shortage of skilled operators

OVER THE PAST 20 years, private equity firm Edgewater Capital Partners has focused on investing in lower to middle-market businesses, particularly niche manufacturers of speciality chemicals, pharmaceutical ingredients, engineered components and advanced materials. During that time, we have always collaborated with our senior management teams on current issues, challenges and concerns.

Most of the concerns, historically, revolved around economic cycles, foreign and domestic competition, and raw material pricing and supply. These challenges remain but one new risk has crept quickly into the boardroom. Toll and

custom chemical manufacturers are struggling to maintain the ranks of their skilled operators, which is causing productivity and quality challenges.

Hiring and recruiting skilled labour has not, historically, been difficult for senior managers in the US chemicals industry. According to the Department of Labor, during the period 2000-2007, when overall unemployment in the US averaged 5%, chemical companies' employment grew by 2%/year. This rate was very manageable.

However, during and immediately after the recession, many chemical companies reduced their skilled operator headcount and payroll to compensate for

decreased production. In response to reduced job opportunities and concerns over job security, workers put off their retirement. This trend went relatively unnoticed until now and for most, was a way to recoup lost savings and refill depleted retirement accounts.

Companies, for the most part, were thrilled to maintain dedicated and highly trained employees as we grew out of the recession. What many failed to foresee was the culmination of a perfect storm for the chemical industry, in the form of accelerated rates of retirement during a period of increased manufacturing demand.

As Figure 1 shows, a gradual reduction in operators has occurred over the past decade. This trend is not necessarily unique to chemical manufacturers; Edgewater has seen it across its entire manufacturing portfolio. However, the problem is further exacerbated within chemicals because of the general nature of chemical manufacturing in the US: mainly rural, highly technical and hazardous.

Chemical manufacturers are frequently located in rural areas and the companies are often large employers in their regions. They have historically relied on skilled training and mentorship as a means of knowledge transfer from senior workers to newer recruits.

Chemical Plant and System Operators

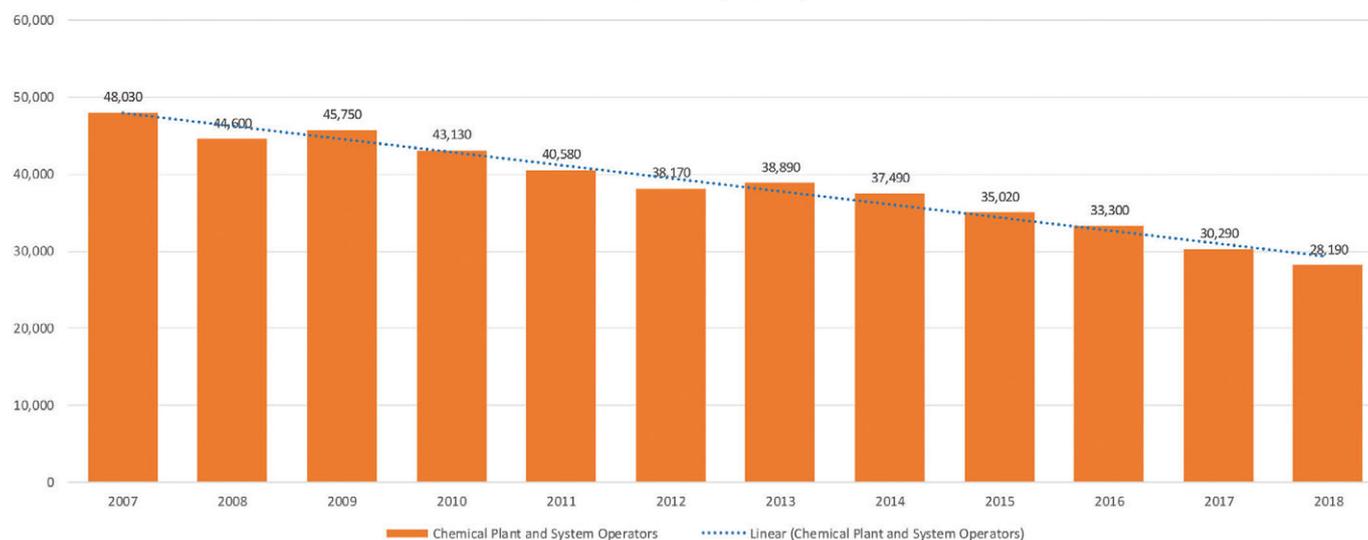


Figure 1 – Chemical plant & system operators employed in the US, 2007-2018
Sources: US Dept of Labor, Bureau of Labor & Statistics

➡ Chemical operators develop a wealth of knowledge over their many years of service. In fact, many chemical manufacturers rely on 'black art' in their manufacturing processes developed over years of tweaking and perfecting.

Companies are now facing the retirement of their most skilled employees, without proper recruits or time to transfer the knowledge. If this 'black art' is not taught and handed down methodically, it could be lost, and it will be costly and time-consuming to regain.

At best, this causes disruption and increased quality flaws for companies as they struggle to meet customer demands. At worst, companies could begin to lose business over time as product quality suffers or safety becomes a significant problem, due to untrained operators.

Robust US economic growth has caused labour markets to tighten significantly. The impending problem of skilled workforce retirement has increased substantially as a result. It also does not appear to be region- or industry-specific. One of the first signs within Edgewater was the fact that we were seeing this trend across the entire portfolio with locations across the US.

Companies are experiencing robust growth, but their ability to fill ranks with skilled operators has waned. This has significant long-term implications to tollers and custom chemical manufacturers. There are few substitutes for an experienced and trained workforce when it comes to maintaining product quality.

Scale-up and production techniques will probably be lost with retiring operators who have developed this expertise over a long career. More importantly, safe manufacturing techniques may be lost if they are not codified by companies. Ultimately, the lifeblood of developing and manufacturing quality products will be at risk for many firms.

So, this leads to the obvious question, what can industry participants do to minimise the

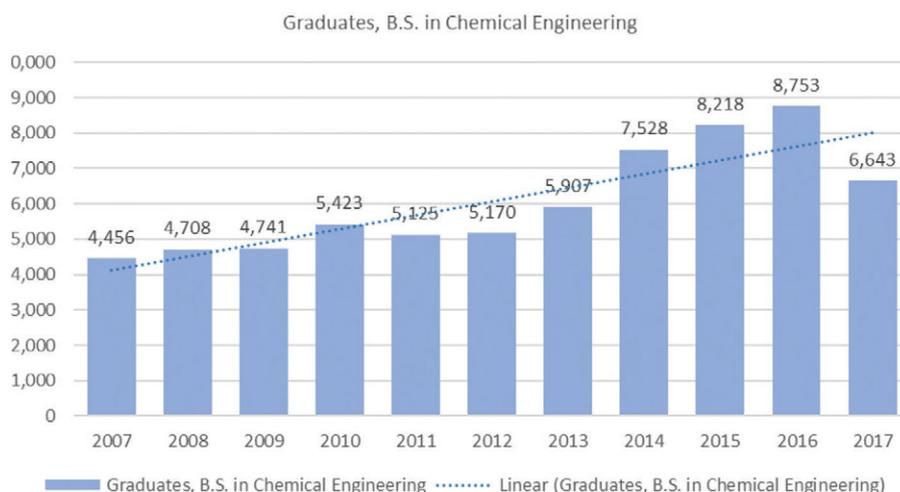


Figure 2 – BSc graduates in chemical engineering in the US, 2007-2018
Source: American Chemical Society

impact of increased retiring chemical operators? Edgewater and its portfolio companies are taking a proactive approach to this issue. Our senior leadership teams are engaging directly with operators to understand their personal retirement goals and developing succession plans to support operators and the business.

This gives us clarity on our operators' timetable and goals, which allows our companies to plan and stage new hires. While the labour pool is tight (Figure 2), Edgewater believes there are qualified chemical operators coming out of school. However, these newer recruits require proactive training and mentorship from senior operators to succeed. We estimate the average training period to take six to 12 months before an operator is truly prepared to work unsupervised.

Cross-training is another great exercise for companies to implement. By teaching operators several different roles, companies can minimise individual gaps in expertise. The real benefit to these types of activities is that they engage operators and bring them closer to management. Finally, our leadership teams are meticulously recording standard operating procedures, batch records and product modifications to institutionalise manufacturing processes.

The double whammy of increased retirement rates and rapid economic growth has put a significant strain on toll and custom chemical

manufacturers. Companies are well served to begin to develop strategies to minimise the disruption that retirement of a key employee may create. Wages play an important part in recruiting and retention but developing open communication and strong relationships with employees will ensure the safe keeping of a company's manufacturing prowess. ●



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Full steam ahead

The growth in domestic contract and toll manufacturing in the US shows no signs of stopping. We spoke with Baze Chemical, CJB Industries and WeylChem US

THE BOOM IN demand for US-based contract and toll manufacturing services has continued into 2019 and even accelerated, according to a selection of companies active in the sector. Naturally their perspectives vary, depending on which sectors they are active in, but in broad terms, they are all on the same page.

"US toll and contract manufacturing continues to be in demand and this has continued into 2019. There are ups and downs in any market, but the long-term trend will continue," says Clinton Beeland, owner and CEO of **CJB Industries**. "Our business is up 10% over last year. We expect that to be maintained over this year – however, the uncertainties in supply, particularly from China, certainly can play a role in this outlook."

CJB is a contract and toll manufacturer for the industrial and agricultural markets with a significant focus on EPA-registered materials under the Federal Insecticide, Fungicide & Rodenticide Act. The company has three facilities in Valdosta, Georgia, covering about 28,000 m². It mainly handles formulated products for B2B but also some consumer products, producing liquid and solid formulations in a wide range of volumes.

"We have seen increased demand for custom manufacturing services over the past two years but in 2019 that demand has grown significantly," says Rob Harpum, commercial director at **WeylChem US**. He expects that trend to continue for the rest of the year and beyond.

Adds Harpum: "We face the enjoyable challenge of launching several new custom manufacturing products in our site within the calendar year, while expanding capacities for existing products. Our existing custom manufacturing projects and products continue to grow and the outlook for 2020 and beyond is also very positive."

WeylChem US's ISO 9001:2015-accredited site at Elgin, South Carolina, dates back 50 years and has a wide array of relevant capabilities, Harpum says. It can produce at ranges from 1 to 5,000 tonnes/year in stainless steel, glass and Hastelloy reactors of many sizes and has expertise in multiple chemistries.

A relative newcomer to this business is **Baze Chemical**.



📍 Beeland – CJB expects continued double-digit growth this year

The firm is still mainly focused on products for the oil and gas sector, but its custom and toll manufacturing business "is steadily growing ... and for several years now, we have been building a name for ourselves," according to Janna Baze, sales and marketing coordinator.

"Our business to supply intermediates and contract and toll manufacturing has grown so much with in the last couple of years, and I do not see it slowing down any time soon," she says. We are getting approached with opportunities in the agrochemicals, HI&I, paint, pulp and paper markets, and any other that requires specialty surfactants."

Baze Chemical has two sites in Texas, at Liberty and Palestine. Its capabilities include surfactants, speciality products, polyols, and ethylene oxide (EO) and propylene oxide (PO) derivatives. Key chemistries include methyl



chloride, HCl-catalysed synthesis of aminophosphonate, phosphate esters, condensation reactions, alternative and free radical polymerisation, Novolacs phenolic resin chemistry, imidazoline ring creation and dithiocarbamic acid chemistry.

What has been and is driving the growth in demand for toll and contract manufacturing services for them and in general? All agree that there are multiple factors.

Harpum says: "Certainly customers are increasingly looking to bring toll production back

to the USA, as a result of the ongoing situation in China and US government tariffs." WeylChem US's own efforts to position itself in many market segments over the past three to four years have also paid dividends.

The main driver depends on the industry, in Beeland's view. Thus, "industries that have high energy demand and the resultant cheaper feedstocks are benefitting from the windfall in domestic sources". China and other emerging countries dealing with their past lack of regulation and resulting pollution issues are also driving supply issues, and this will continue.

"There is also a short supply of experience and knowledge so the efficiency of shared resources, both people and equipment, is also driving the growth and demand," Beeland adds. "This is particularly true in the specialty market."

While not downplaying the China factor, including higher US tariff ➔



📍 Filling line at CJB site



↑ WeylChem US's site at Elgin

➔ and increased environmental protection cost, Dr Nan, R&D chemist at Baze Chemical, says that the major drivers are "short lead times and higher quality of finished products ... for most products it is due to domestic factors, including cheaper feedstocks, better quality and reliable supply." As a smaller company, Janna Baze adds, Baze Chemical can offer lead times as short as two to four weeks.

Naturally, too, all three have invested to address the going demand. For Baze Chemical, this has mainly been in alkoxylation at Palestine, where demand has driven an increase in capacity from about 1,800 to over 4,000 tonnes/month. It has installed two 40,000L stainless steel reactors, another cooling tower and extra storage room. In addition, it has added methyl chloride capabilities to EO and PO, something Janna Baze claims makes the site unique.

CJB Industries, Beeland says, invests 15-20% of its sales in equipment and facilities to support current and future customers. "We just completed the transition to a new ERP system and are beginning to take advantage of the processes resulting from this investment."

Another investment has been a sister company, CJB Applied Technologies, which handles contract development services and product enhancement and has piloting facilities, among other capabilities.

WeylChem US has invested over \$15 million at Elgin since 2016, Harpum says, and will spend \$3-4 million more this year. "Part of this has been investment in specific customer-driven projects and production units. There has also been significant investment in upgrading existing equipment to ensure reliable and continued safe operation, as well as to enable additional tolling activities to be taken on at the site."

All three similarly see opportunities in speciality fields away from pharmaceuticals and agrochemicals, where outsourcing is well established already because of the low volumes and high complexity of manufacturing. Both WeylChem and CJB are active in the latter field, while WeylChem US is also in the former and offers a line of Grignard reagents for both; Baze Chemical is coming at it from a different angle.

"The specialty market as a whole has a lot of opportunity, notably in the construction, maintenance, personal care and electronics markets," Beeland says. "Enhanced formulations of materials to improve longevity and performance or to reduce long-term environmental impact will grow in demand. Many of these materials are of smaller quantities or very special in nature, and the best way to move forward is often through shared assets, knowledge and experience."

"One of our key focus activities over the past four years has been to move into additional market segments and this has proven very successful," says Harpum. "We have significant activities in fuel and lubricant additives, polymers, polymer additives and other specialty chemical sectors. We anticipate continued and accelerating growth in all of these sectors as well as serving our traditional agrochemical sector."

Generally, observes Dr Nan, "specialty chemicals have higher volumes and are less likely to have multi-step manufacturing, so there will be more room for growth in toll and contract manufacturing services in US markets. In my opinion, surfactants for HI&I, metalworking, agricultural and oilfield applications will have more promise ... Our future projection is to be as successful in other industry sectors that require specialty chemicals as we are in the oil and gas sector." ●

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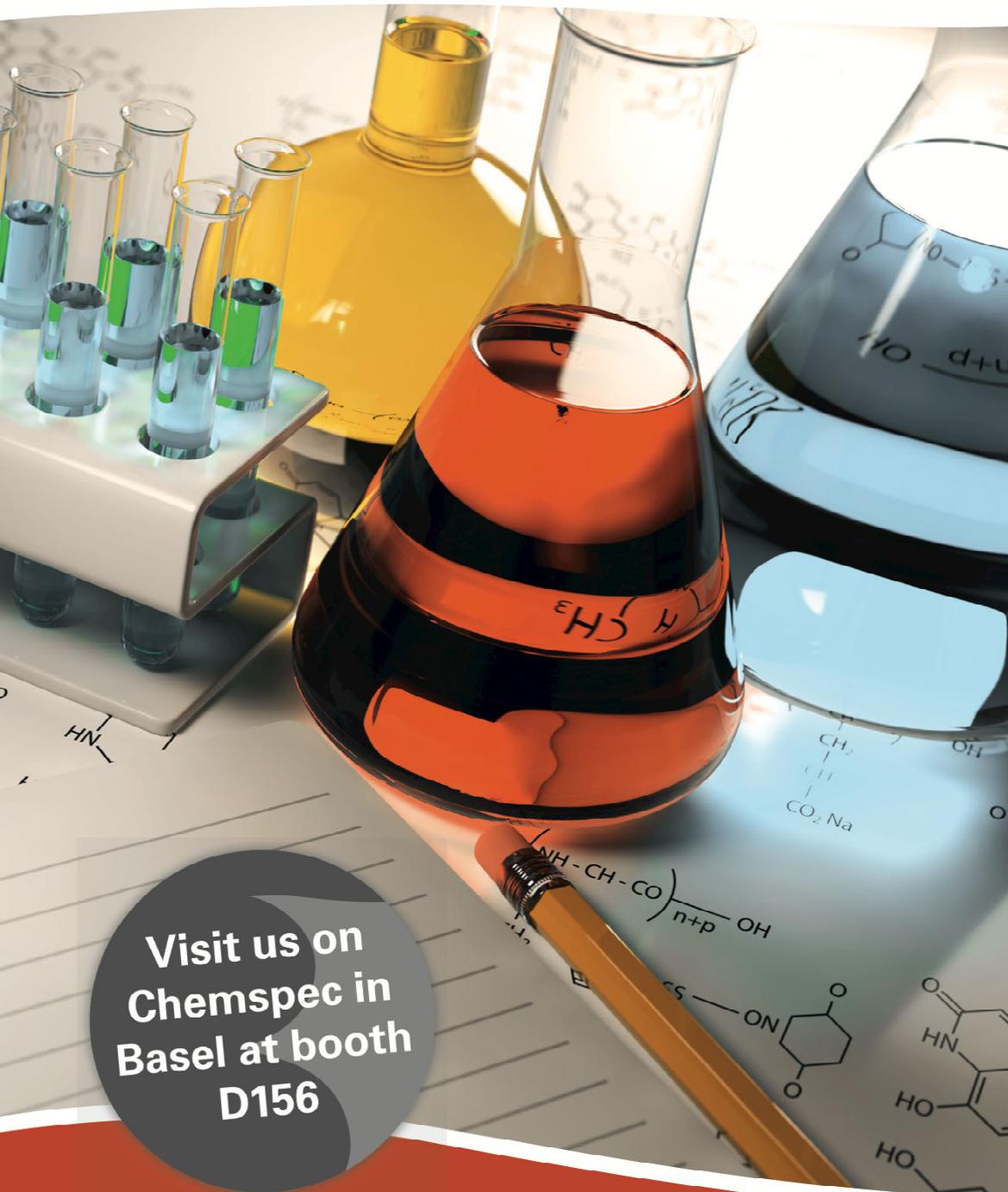
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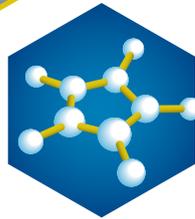
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150 years of enterprise

Robinson Brothers' facility at West Bromwich, UK

UK firm Robinson Brothers is marking a major anniversary this year. SCM spoke to managing director Adrian Hanrahan



Hanrahan – Booming business causing capacity constraints

IN A WORLD of endless mergers, acquisitions and rebranding, Robinson Brothers is a bit of a throwback. While constantly investing and adapting to a changing market, it has remained where it began, in West Bromwich, near Birmingham, UK, and kept the name of the three brothers who founded it. And this year, it is marking 150 years of business, which it will celebrate at its usual

stand at Chemspec Europe in Basel on 26-27 June.

In 1869, explains managing director Adrian Hanrahan, the Robinsons started to distil coal tar. Later, they sold the tar distillation business to a local competitor but returned with the manufacture under licence of Tarvia, the original form of tar-based road surfacing. This product, because of its connections to the automotive industry, impelled the firm into vulcanised rubber, developing the Robac rubber accelerator based on CS_2 chemistry. Robac is still a major brand for Robinson Brothers. This line of business, in turn, brought the firm into contact with hydrogenation and the manufacture of piperidine.

"The brothers were extremely entrepreneurial and as a result they came close more than once to going under," Hanrahan says. "The flip side is that they were able to watch what was going on the market and develop products accordingly. And, with the development of the automobile

industry, they were in the right place at the right time."

In the early days, he adds, Robinson Brothers was like an engineering company with a chemistry side attached. The firm got into agriculture originally by building horticultural equipment, which almost brought it down in the 1930s. At length, it managed to sell this and focus on the chemicals side that was making money. Speciality rubber and latex chemicals remain a large part of the portfolio, but the agrochemical, pharmaceutical, flavours and fragrances sectors all play a significant role as well.

The Robinson family is still the owner and holds the vast majority of voting shares. Family members from the ages of nearly 90 to under one hold stakes and two of them are non-executive board members. The others, while not involved from day to day, meet Hanrahan and the board for a presentation on the progress of the business every year in April at the AGM. ↻



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better wear and tear and so on. In the balloons market, regulations, like those on eliminating nitrosamines, are playing a key part and helping the Robinson Brothers products gain market share.

The flavours and fragrances market, Hanrahan says, is booming. Again, the China effect is causing that to a degree, but there has also been a global rise in demand as ever more diverse flavours are used in snacks and beverages that had been rather generic until quite recently. To address this, the former Endeavour Speciality Chemicals site in Daventry has gone over to a two-cycle shift and is heading towards three at the end of the year, something that "was unheard of two years ago".



Flavours, pharmaceuticals and sports shoes are among the key markets for Robinson Brothers

➔ Push for growth

And how is business? "Business is excellent, really – we're struggling with capacity and that's one of our biggest challenges," Hanrahan says. Many things are driving this, he notes, but a key one is the 'China effect', with the lack of raw materials bringing some customers back to Robinson Brothers for certain intermediates, both agrochemical and pharmaceutical. Another is customer stocking because of the uncertainty over Brexit; he believes that this accounted for 15-20% of its increased sales in a "fantastic" Q1.

"We're getting a lot of traction in the sporting goods arena," says Hanrahan. Robinson Brothers works with a global sporting goods manufacturer, who uses it as a development arm for the rubber parts of its shoes, improving the processing of the shoe for better performance,





➔ In pharma and agro, Robinson Brothers is also expanding, with a 10-15% increase in capacity for high-pressure hydrogenation, while drying capacity is increasing by 12-14%, at a cost of £1.2 million and £2 million respectively. These are not small sums for a company of its size. The investment is not linked to specific customers, says Hanrahan.

"The number of projects we are taking on is increasing and we are having to give long lead times, which is unacceptable. In the short term we have to live with this, but we must invest for the future."

There is an inherent risk in doing this, he admits, since it typically takes a year to install the new capacity and a lot can happen in this time – "but we are still confident that we will need it". Robinson Brothers is also coping with capacity constraints through process efficiencies. It applies Britest tools to get more out of existing processes.

Dealing with Brexit

The obvious cloud on the horizon is Brexit. Robinson Brothers is anticipating a 'no deal' scenario and planning accordingly. The

stocking-up process among customers worried about supply disruption has already been felt in Q1; this was positive for sales, of course, but also had an impact on cash flow as the company had to buy in additional raw materials to cope and bridge the gap until the revenues came in. This will not be repeated in October.

"We have appointed an Only Representative (OR) in Ireland so that at one minute past midnight on the day of exit, all our REACH registrations go across to this company," Hanrahan says. "We looked at setting up a subsidiary but knowledge and understanding of regulatory compliance was needed, so the OR was the most sensible route."

Either way, though, it is a cost. An annual management fee has to be paid, currently £1,000/product but there is always a danger of the price going up when the customer is a captive audience; originally, says Hanrahan, Robinson Brothers was looking at having to pay £5,000/product and make some difficult decisions about its portfolio. Moreover, this will have to be paid every year, in addition to re-registering all of its products under the new 'UK REACH'.

"That is beginning to push our own costs up. We are trying to get some of that back from the marketplace by increasing our prices, but if our competitors don't have that pressure within the EU, we are at a competitive disadvantage," he says.

Ingenuity will be needed to navigate through this challenge but then the original Robinson brothers and their successors had enough of this to see themselves through far more than that over the last 150 years. ●

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Borkowsky to Lanxess board

Anno Borkowsky has been appointed to Lanxess's board of management as of 1 June. As a result, he has been moved from the Additives business unit to head the Specialty Additives segment, which was formerly the direct responsibility of board chairman Matthias Zachert. Borkowsky, who is a PhD chemist by background, joined Bayer in 1990, worked for them in the US, then became managing director of Rhein Chemie Rheinau. From 2004 to 2017, he headed Lanxess's Rhein Chemie business unit.



New-look board at BASF

The new supervisory board of BASF has confirmed former CEO Dr Jürgen Hambrecht as its chairman, with Franz Fehrenbach and Sinischa Horvat as vice chairmen. Four others were elected to the board at the annual shareholders' meeting, including two newcomers in Professor Thomas Carell of Ludwig Maximilian University in Munich and Dr Alexander C. Karp, CEO of Palantir Technologies, who will cover the competence area of digitalisation and IT. All of these appointments are valid until the 2024 meeting.



Sterling names Minardi in US

Following the acquisition of CiVentiChem's US facility in North Carolina, UK CDMO Sterling Pharma Solutions has appointed Dr Mathew Minardi as its president of US operations, a market that already accounts for 70% of its customer base. He will be based at the North Carolina site. Minardi is a PhD in organic chemistry and has experience from previous roles at Accord Healthcare, Johnson and Johnson's Noramco subsidiary and Ampac Fine Chemicals.

Swan appoints Fahmy



Following the retirement of Chuck Van Fleet, Ray Fahmy is the new president of Swan Chemical, the US subsidiary of UK speciality chemical firm Thomas Swan. He will take charge of business throughout the Americas. Fahmy has more than 30 years of experience in the specialty chemical industry, notably in the biocides and preservatives market. He had previously headed Lonza's global hygiene and preservation business.



FECC welcomes Arns

The European Association of Chemical Distributors (FECC) has named Dorothee Arns as its new director general, succeeding interim director general Cathy Demeestere. A German national and a public affairs professional, Arns had worked

with BASF, then joined CEFIC as director general of the European Solvents Industry Group from 2006 to 2011 and later served as executive director of Petrochemicals Europe.

Ratnakar joins new DuPont

Raj Ratnakar was named chief strategy officer for the new DuPont – formerly the Specialty Products division of DowDuPont – a month before it became an independent company on 1 June. Previously he had been with Danaher spin-off Fortive, where he played a key role in the separation and oversaw strategic planning. He had also had senior strategy roles at Danaher and TE Connectivity, and with McKinsey in consulting for large corporate and private equity clients.

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