MFG Chemical is growing fast. Founded in 1979 in Dalton, GA, we now operate 3 plants in North Georgia and a 25 acre plant in Pasadena, Texas.

Specialty chemical products include Amides, Esters, Imidazolines, Water Soluble Polymers, Rheology Modifiers, Specialty Anhydrides and Diocyl Sodium Sulfo succinates.

End-user market applications include agriculture, paints & coatings, lubricants, mining, oilfield, personal care, pulp & paper, and water treatment among others.

Operating 31 stainless steel, glass-lined and Hastelloy reactors ranging in size from 1,000 to 20,000 gallons, MFG offers a fully equipped pilot testing facility, and world class laboratory for collaborative development work. We are ISO 9001:2015 and ChemStewards EHS&S Certified. Safety and customer confidentiality are our core values.

Contact Jack Drawdy
VP Sales & Business Development
jdrawdy@mfgchemical.com
Welcome to the first magazine of 2019, which is partnered with top events like the SOCMA/Specialty & Custom Chemicals America Show, European Biopolymer Summit, and European Coatings Show.

We are celebrating a great start to 2019 at Chemicals Knowledge, as we welcome Dr Sarah Harding as our new Editorial Director. Sarah is well known in the industry and is already a familiar face for many of you. Look out for us at our partnered events and, if you see us, stop us and say hello!

Overall, 2019 is predicted to be a reasonably good year. The American Chemistry Council (ACC) forecasts 3.6% growth in US chemical production, while the European Chemical Industry Council (Cefic) expects modest growth of 1.5% in Europe. As we go to press, Brexit is still a factor for uncertainty. We are watching.

Meanwhile, happy new year from everyone at Chemicals Knowledge!
Built on the pillars of technology and innovation

“We cannot solve our problems with the same thinking we used when we created them”

(Albert Einstein).

It’s a delight to join the Chemicals Knowledge team, and what a great issue to join with! I have long said that the speciality chemicals industry – not always viewed positively by the general public – has a vital role to play in fixing many of the problems we face today.

The time for debating whether climate change is taking place has passed. The evidence is on the table and, to most people, it’s pretty clear. But we can still avoid environmental catastrophe by implementing new and developing technological solutions.

Oil and gas companies have been investing heavily in renewable and low-carbon energy production, with ‘supermajors’ and smaller entities alike growing their portfolios of solar, wind, geothermal and hydro projects. As we see later in this magazine, worldwide biofuel production is also on the rise, with the International Energy Agency (IEA) declaring a goal for biofuels to meet more than a quarter of world demand for transportation fuels, including heavy vehicles and aeroplanes, by 2050.

Improved energy storage technologies are enabling the broader application of renewable energy projects, which were previously limited by the challenge of energy storage. For example, solar energy is clean and abundant, but an obstacle has been efficient energy storage for later use, when the sun has stopped shining. Just last year, researchers from the University of Oxford in the UK found a solution to this challenge in the form of a new class of materials called halide double perovskites. These materials split water into hydrogen and oxygen atoms, which are stored and then recombined to release the energy at a later time.

Similarly, the efficient, cost-effective storage of electrical energy in batteries is critical to the commercial success of electric cars. The continuous development of advanced emission control technologies, and increasing demand for electric powered cars, will help reduce emissions and increase air quality on a global scale. New battery technologies that combine lithium with oxygen or sulphur, or even bypass lithium and use carbon ion cells instead, are paving the way for the next generation of electric vehicles.

Of course, energy – while being an important environmental, economic and political issue – is not the only environmental challenge that the world is having to deal with. Our ‘throw-away society’ has been blamed for the plastic pollution that is poisoning our planet, but the suggestion that we might live without our modern appliances and products is not one likely to be favoured by any but the most die-hard green warriors. After all, even environmentalists love their i-phones (and who doesn’t need the latest model?)

Fortunately, innovators all over the world, in all industry sectors, are developing renewable alternatives for the most remarkable ingredients and materials. In this magazine, an article by our editorial team highlights the growing market for bioplastics, expected to increase by around 20% over the next 5 years. Sustainable coating technologies are also on the rise, with innovative speciality liquid and powder coating resins shaping the future in decorative paints, high-end flooring, industrial wood, graphic arts and numerous metal applications, ranging from architectural and automotive use to domestic appliances, and more. Natural cosmetics have been a driving trend for the personal care industry for a number of years. Now, more than ever before, these renewables are easier to apply, healthier to the people who use them and friendlier for the environment.

Clearly, as well as helping to save us from pollution and climate catastrophe, these developments are creating significant economic opportunities. General opinion – clearly reflected in the activities of major oil and gas players – is that there has never been a better time to invest in renewable energies, but companies moving into bioplastics and other renewable materials may find themselves in an even more favourable situation. While renewable energy options such as solar and wind power require a change in infrastructure technologies, materials such as bioplastics are being developed to make use of existing injection moulding equipment and other apparatus that have been used for decades to manufacture end products.

Furthermore, in November 2018, the Centre for Sustainability and Excellence (CSE) released the findings of research linking financial and corporate sustainability performance. Focussing on companies and organizations based in the US and Canada (N = 642), the research identified a strong correlation between sustainability performance and financial results.

Therefore, the shift to renewable materials and sustainable practices makes economic as well as environmental sense, and any associated challenges can surely be no barrier for an industry that has been built on the pillars of technology and innovation. Speciality chemicals is emerging as one of your favourite movie villains who’s turned out to be quite nice, actually. Like the Terminator who returned to protect John Connor, the industry once blamed for polluting the world is now finding the solutions that will help to save it.
Forthcoming Events

Maximizing Propylene Yields 2019
23–24 January 2019
Barcelona, Spain
www.wplgroup.com/aci/event/maximising-propylene-yields

Future of Surfactants Summit
6–7 February 2019
Madrid, Spain
www.wplgroup.com/aci/event/surfactants-summit

Middle East Specialty Chemicals Show
26–28 February 2019
Dubai, UAE
www.coatings-group.com/specialitychemicals

Pharma Synergy Conference
11–12 March 2019
Berlin, Germany
pharma-synergy-conference.com

Biological Products Industry Alliance (BPIA) Annual Meeting and Symposium
11–15 March 2019
Portland, OR, USA
www.bpia.org/events

European Coatings Show 2019
19–21 March 2019
Nuremberg, Germany
www.european-coatings-show.com

World Elastomer Summit
27–28 March 2019
Lyon, France
www.wplgroup.com/aci/event/elastomers-conference

in-cosmetics Global
2–4 April 2019
Paris, France
www.in-cosmetics.com/global

CPhI North America
30 April–2 May 2019
Chicago, IL, USA
cphinorthamerica.com

Bio Integrates
22 May 2019
London, UK
www.lifescienceintegrates.com/bio-integrates

For more information about these and other events in the speciality chemicals industry, visit www.chemicalsknowledgehub.com/events
Texas plays host to SOCMA/Chemicals America’s inaugural event

A preview of Speciality & Custom Chemicals America, taking place in partnership with SOCMA, in Fort Worth, Texas, from 11th to 14th February 2019.

Chemicals America and the Society of Chemical Manufacturers & Affiliates (SOCMA) are partnering to bring you Specialty & Custom Chemicals America this February in Fort Worth, Texas. The new event is an extension of the popular Specialty & Agro Chemicals America show held each September in Charleston, South Carolina, organized by Tom Leahy, a long-time trade show executive.

The goal is to combine each organization’s expertise in order to provide the specialty, fine and industrial chemical industry with a focused meeting forum at the start of the calendar year. The partnership will deliver even greater business networking benefits for SOCMA members and their customers, and it will complement the value that Chemicals America shows offer to the specialty chemicals industry.

“I am excited to be aligning the new Texas show with SOCMA, a valued brand within the specialty, fine and custom chemicals industry,” said Leahy. “SOCMA member companies were among the first to support our September trade show back when it started in 2012, and member representatives have continued to be key ‘sounding board’ advisors as that show has grown. Our company’s recent decision to join SOCMA as an affiliate member has been one tangible way of returning this industry support. I believe partnering together on this inaugural February event will provide an even greater platform for offering fellow member companies the business networking forum they have been missing, plus offer the broader specialty and industrial chemical industry a focused meeting forum at the start of the calendar year, to complement the value our current show brings to the specialty and agrochemical markets each September.”

As a first tangible step in this partnership, SOCMA will host a ‘Cowboys & Chemicals’ Texas-Style Networking Event on the evening of Monday 11th February, for all attendees. Join your colleagues for an authentic western experience at River Ranch, located in the Fort Worth Stockyards historic district. The evening will be a casual affair, featuring cuisine from various food stations, open bar, whiskey tastings and other Texas-style additions. The dinner rate will also include a keynote breakfast on Tuesday 12th February prior to the trade show’s start at 11:00 am.

The mission of Specialty & Custom Chemicals America is to showcase the distinctive value of the American chemical industry. The event welcomes global participants, while exclusively featuring exhibitors that offer significant manufacturing, service or sales operations based within North America. The conference programme includes sessions on Challenges Posed by Trends in Chemical Industry Sustainability, Best Practices in Sourcing Custom & Toll Chemical Manufacturing, Emerging Leaders in Specialty Chemicals & A View to the Future, and a number of exhibitor showcase presentations.

There is already a buzz within the industry about the Texas show. Based on the strengths of the partnering organizations, the show’s history in Charleston, and the proximity of Fort Worth to a core of the chemical manufacturing industry in Texas and neighbouring states, the inaugural show is already set to be a highlight of the year.

We look forward to seeing you in Forth Worth. Don’t forget to pick up your copy of Chemicals Knowledge while you’re there!

For further information, visit http://chemicalsamerica.com
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Maximize opportunities for biopolymer products!

The 6th edition of the European Biopolymer Summit will be taking place on 13th–14th February in Ghent, Belgium

The two-day event is designed to bring together senior executives, key industry experts, researchers and bioplastic manufacturers. Participants exchange and share their experiences and research results on all aspects of bioenvironmental polymer engineering, recent innovations, trends and concerns, as well as solutions adopted in the sector.

This event also provides a platform to meet experts from other industries such food & beverages, product & packaging and automotive, to discuss the latest strategies on commercialization, application and market access of biopolymer products. Strategies for overcoming market challenges and maximizing opportunities will be discussed.

Previous Summits brought together industry professionals from companies such as FORD, LEGO, Novamont, BASF, Biotec, Nature Work, BIO Amber, Braskem, DuPont, Kaneka, Nestlé, Danone, Nippon Gohsei Europe, Corbion, FkuR Kunststoff and many more…

Site Visit: Bio Base Europe pilot plant

During the afternoon of Tuesday 12th February, a limited number of conference attendees will receive a unique opportunity to visit the Bio Base Europe pilot plant in Ghent. There is no extra charge to attend the site visit, but spaces are limited and allocated on a ‘first come, first served’ basis. Please register your attendance when booking for the conference.

Key Topics
- Evaluating current environmental projects and regulations within the biopolymer industry
- Assessing the feedstock’s landscape for biopolymer production
- Focusing on biopolymers in the circular economy
- Elaborating on the application of biopolymers from people’s and the planet’s perspective
- Introducing new technologies in processing new bio-based materials
- Brand owners’ perspective on the use and application of biopolymers
- Focusing on the basic understanding of biodegradability
- Assessing the biobased new content
- Analysing the impact of biobased plastics on CO₂ reduction
- Changing consumer preference towards eco-friendly packaging

More information about the event can be found at www.wplgroup.com/ac/1/evi/biopolymer-conference-europe

Visit www.scientificupdate.com, email sciup@scientificupdate.com, or phone +44 1435 873062
The industry-leading trade fair for paints and coatings

A preview of the European Coatings Show and Conference, taking place in Nuremberg, Germany, from 18th to 21st March 2019.

Since its premiere under the name of Farbe und Lack in 1991, the European Coatings Show has developed into today’s biggest and most important event in the world for the coatings industry. Every two years, formulators, producers, industrial processors and representatives from science and research discuss the latest developments in the coatings industry.

The product spectrum at the European Coatings Show, which takes place on 19–21 March at the Exhibition Centre Nuremberg in Germany, reflects global innovations in paints and coatings. Products on display include raw materials for paints and coatings, printing inks and adhesives, construction chemical precursors, laboratory and production technology, testing and measuring technology, application technology, environmental protection and occupational safety and services. The event set new records in 2017 with more than 30,000 visitors and 1,135 exhibitors. An on-line exhibitor director, now available as iOS or Android app for smartphones and tablets, will help you navigate the show: download it from www.european-coatings-show.com/ecs-navigator.

A survey of 2017 exhibitors and visitors showed that:
- 95% of exhibitors reached their most important target groups
- 94% of exhibitors made new business connections, with 87% expecting noticeable follow-up business
- 54% of visitors came from the European Union, 16% from the rest of Europe, 2% from Australia/Oceania, Asia and Africa, and 8% from America.

The event also offers an educational conference programme, which takes place on 18–19 March. In 2017, with more than 840 participants, the European Coatings Show Conference was even more heavily attended than in previous years. This year, more than 150 specialized presentations by internationally-renowned speakers will explore the production of paints, sealing compounds, construction chemical materials and adhesives. The European Coatings Show Conference is preceded by a series of pre-conference tutorials on 17th March. The two-day conference programme then begins on 18th March, with cutting-edge presentations that cover the latest research and trends in the paints and coatings industry. Expert speakers will be offering specialized knowledge and insights for current challenges in product research and development, manufacturing, regulatory matters and sustainability. The full conference programme can be found on-line.

The European Coatings Show 2019 promises to be even bigger and better than ever before. We look forward to seeing you in Nuremberg. Don’t forget to pick up your copy of Chemicals Knowledge while you’re there!

For further information, visit www.european-coatings.com/conference
Advancing sustainability through biological solutions

The Biological Products Industry Alliance (BPIA) will hold its 2019 Annual Meeting and Symposium in Portland, Oregon, on 11th–15th March 2019.

The global biological crop protection market, which began at a rather modest size in the 1990s, has grown to become a multibillion dollar business that is growing at a much faster rate than the conventional crop protection industry.

The inherent safety of biological agents means that they have lower regulatory hurdles to cross, and this means lower regulatory costs. Their low toxicity means that worker safety is enhanced, often offering greater flexibility in the field. Additionally, when used alongside conventional products, the risk of pests developing resistance may be minimized, and synthetic residues on crops can be reduced. As a result of these benefits, biological products are being used to manage plant pests and diseases across a range of settings, from row crops, fruits and vegetables, greenhouses, nurseries and turf.

The Biological Products Industry Alliance’s (BPIA's) mission is to advance sustainability through biological solutions. The Alliance includes several committees that bring together the resources and the focus necessary to achieve the organization’s many objectives. The BPIA routinely engages with key regulators at USEPA, USDA, Canada’s PMRA, and the states including the California DPR; individual members officially represent BPIA on the PRIA Coalition and EPA’s Pesticide Program Dialogue Committee (PPDC); other members cover key stakeholder meetings and often provide comments on behalf of the industry.

Interactions with the regulators are utilized to raise and resolve issues, comment constructively on emerging policies and regulations, and learn how registrants can improve their submissions. The BPIA disseminates its findings to the membership via website postings, email updates, and reports at membership meetings.

The BPIA will hold its 2019 Annual Meeting and Symposium this March in Portland, Oregon, immediately followed by the Biocontrols USA West 2019 Conference & Expo, which is organized to educate growers about biological products including biopesticides and biostimulants.

More information about the event can be found at www.bpia.org/events.
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Mergers & Acquisitions

Japanese drugs giant Takeda has acquired Irish pharmaceuticals firm Shire for $59 billion. The deal is part of Takeda’s strategy to become a global pharmaceutical company.

Cambrex Corporation, a leading manufacturer of active pharmaceutical ingredients (APIs) and finished dosage forms, has acquired Avista Pharma Solutions for approximately $252 million.

Kingchem Life Science has acquired Apiscient Laboratories and is creating a new subsidiary, Kingchem Laboratories, which will offer R&D and GMP-manufacturing capabilities in the US.

LANXESS has completed the sale of its remaining 50% interest in the rubber company ARLANXEO to Saudi Aramco.

Azelis is stepping up its pharma presence in Italy through the acquisition of Deafarma.

Brenntag has strengthened its footprint in the Canadian Life Science markets by acquiring Pacchem Distribution, distributors of specialty chemicals and ingredients to the personal care, pharmaceutical and cleaning markets.

Roquette, a global leader in plant-based ingredients for food, nutrition and health, has acquired a majority stake in Crest Cellulose, a major pharma packaging company in India.

GlaxoSmithKline has entered into a definitive agreement to acquire TESARO, an oncology-focused company based in Massachusetts, USA, for approximately $5.1 billion.

Bristol-Myers Squibb and Celgene have entered into a definitive agreement under which BMS will acquire Celgene in a cash and stock transaction valued at approximately $74 billion.

UPL has signed a definite agreement to acquire Industrias Bioquim Centroamericana (IBC) and the Bioquim Group, involved in producing and marketing agrochemicals across the Caribbean and Central America.

HIG Capital’s portfolio company, Vantage Specialty Chemicals Holdings, a provider of naturally derived ingredients, is acquiring LEUNA-Tenside, a German manufacturer of surfactants.

Cambrex expands and acquires

Cambrex Corporation has invested $1 million at its High Point, NC (USA) site to fit out 1,300 sq. ft. of analytical laboratory space. This investment follows the new $3.2 million, 11,000 sq. ft. laboratory completed in April last year.

At the facility, Cambrex produces complex APIs and intermediates requiring multi-step synthetic processes in batch sizes from milligrams to 100kg to support clinical trials. The site is licensed with the US Drug Enforcement Administration (DEA) to manufacture Schedule II-V controlled substances.

“Cambrex is seeing a significant increase in new projects, resulting in increased demand for analytical development capabilities,” commented Brian Swierenga, Vice President, Operations and Site Director for Cambrex High Point. “This further expansion will not only increase Cambrex’s internal analytical capabilities and capacity, but will assist in getting new products to commercial launch faster.”

The investment also complements Cambrex’s recent acquisitions, which include Avista Pharma Solutions (announced in January), and Halo Pharma (September 2018). Cambrex now operates 12 facilities around the globe and employs approximately 2,000 people.

SEQENS – a new name in the CDMO space

Novacap has combined its CDMO subsidiaries – PCI Synthesis, PCAS, Uetikon and Proteus – into a new entity known as SEQENS. The name change is being rolled out during the first quarter of 2019 at each of SEQENS’ 24 manufacturing plants and three R&D centres in Europe, North America and Asia.

The company says that the move positions SEQENS as an integrated global leader in pharmaceutical synthesis and specialty ingredients, delivering outstanding performance, unrivalled market responsiveness and tailor-made solutions. By consolidating its service offerings, SEQENS intends to better serve its customers with global access to its 3,200 employees, including more than 300 scientists, engineers and experts, and ensure that products are successfully transferred into production.

Catalent expands biologics packaging

Catalent has commenced a $200 million capital investment in its Biologics business to expand drug substance manufacturing capacity and drug product fill/finish capacity due to projected growth among existing and future customers. The investments, phased over a three-year program, will be undertaken at the company’s biologics manufacturing sites in Madison, Wisconsin and Bloomington, Indiana (USA). This follows a recent announcement to invest $14 million in packaging capabilities at the Bloomington site.

Mammalian cell culture capacity will be increased at Madison with two new suites, each with a 2 x 2,000L single-use bioreactor system, providing additional clinical and commercial production capacity. Work is expected to be completed by mid-2021 and will more than double Catalent’s commercial biomanufacturing capacity.

Fill/finish capacity at the Bloomington site will be expanded with both GMP and non-GMP capabilities. A high-speed flexible vial line, utilizing both ready-to-use (RTU) components and bulk filling, will be installed along with a high-speed flexible syringe/cartridge line, and a fully automated vial inspection machine.

The expanded biologics packaging capabilities in Bloomington will include five new packaging suites and a new quality control laboratory, and is due to be completed in February 2019.

Barry Littlejohns, President, Catalent Biologics and Specialty Drug Delivery, commented “Catalent’s continued investments in innovative technologies and flexible capacity allow us to offer the most comprehensive solutions to bring important and innovative treatments to market faster.”
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PCI extends cold-chain support

PCI Pharma Services is expanding its Clinical site at Rockford, IL (USA). This is the latest in a series of strategic investments across the US, Europe and Asia Pacific. The expanded facility is expected to open in late 2019, providing 30,000 sq. ft. of additional space for packaging and labeling for investigational medicinal products, including a 2-8°C cold chain packaging suite.

Brian Keesee, PCI’s Vice President and General Manager, said “Particularly with the market growth in biologics and biosimilars, the need for temperature-controlled therapies continues to increase.”

PCI offers specialized capability in supporting temperature-sensitive therapies, including cold chain, ultra cold chain and cryogenic storage.

Ground-breaking for the expanded PCI site at Rockford, IL, USA

WuXi boosts R&D in California

WuXi AppTec has expanded its facilities in San Diego, CA (USA) to establish a centre of excellence in screening, discovery biology, pharmacology and small molecule process R&D, including Phase I GMP manufacturing. The expansion provides key elements of WuXi’s small molecule capability and technology platform under one roof, enhancing its services to the pharmaceutical and biotech industries.

“The San Diego life science community continues to thrive with the commitments and investments made by leading international powerhouses like WuXi AppTec,” said Joe Panetta, President and CEO of Biocom, the largest advocate for California’s life science sector. “Biocom applauds the positive impact they’ve had on the region’s economic growth and innovative healthcare products.”

FDA and EMA release reports on 2018 new drug approvals

The US FDA has released Advancing Health through Innovation: 2018 New Drug Therapy Approvals, a summary of the Center for Drug Evaluation and Research’s (CDER’s) important new drug approvals that serve to bring innovative new drug therapies that are safe and effective to patients in need. CDER approved 59 novel drugs in 2018, more than in any prior year, as well as new uses, new formulations, and new dosage forms for many already FDA-approved drugs that will help to advance patient care.

The European Medicines Agency (EMA) has also published an overview of its key recommendations of 2018 on the authorization and safety monitoring of medicines for human use. In 2018, EMA recommended 84 medicines for marketing authorization. Of these, 42 had a new active substance which has never been authorized in the EU before. Many of these medicines represent a significant improvement in their therapeutic areas; they include medicines for children, for rare diseases and advanced therapies.

New medicines are essential for public health as they can improve the treatment of diseases. The reports reflect the industry’s ongoing commitment to innovation, and to improving and saving patients’ lives.

Almac flows into continuous technology

Almac Sciences, a member of the Almac Group, has expanded its technology capabilities within its active pharmaceutical ingredients (API) services and chemical development portfolio with the implementation of continuous flow expertise at its global headquarters in Craigavon, UK, with further plans to introduce flow capacity within Arran Chemical Company (Athlone, Ireland).

Almac Sciences has a 4-year strategy to develop Flow Assisted Synthesis Technology (FAST) focusing on high pressure hydrogenations, high energy chemistry, oxidation and photo-redox LED mediated chemistries. To support this, Almac Sciences has been awarded a Knowledge Transfer Partnership from Innovate UK for the development of novel routes to chiral amines using flow technology. Almac will develop highly flexible, robust, efficient flow technology platforms for continuous manufacture for the benefit of its clients who seek high quality and best-in-class pharmaceutical synthesis.

EMA launches 6-month public consultation

The EMA has published its draft Regulatory Science to 2025 strategy for a 6-month public consultation.

Guido Rasi, the EMA’s Executive Director, said “The strategy includes developments and challenges in medicines development that we, together with the Commission and National Competent Authorities’ experts, have identified in a thorough process of mapping and selection. Now we want to hear from our stakeholders whether they consider this strategy is ambitious enough.”

Stakeholders are invited to send comments via an online questionnaire by 30th June, and are encouraged to join the discussion on Twitter using hashtag #RegScience2025.
Industry News

People

Chemicals Knowledge welcomes Dr Sarah Harding as our new Editorial Director!

CropLife Asia will have a new Board of Directors following the organization’s AGM in 1Q19, including Bethwyn Todd (FMC Corporation) as President, Gustavo Palerosi Carneiro (BASF) as Vice-President, Jens Hartmann (Bayer Crop Science) as Treasurer, and Alexander Berkovsky (Syngenta) as Secretary.

AgroSavfe, a Belgium-based Agro-Biotech company, has appointed Dr Adrian Percy as new Board Member to its Board of Directors.

Airedale Chemical has announced a new appointment to its Board of Directors. Dan Marr takes on the role of Commercial Director and will oversee the technical, compliance and marketing departments.

The Society of Chemical Manufacturers & Affiliates (SOCMA) has named Gene Williams, President of Optima Chemical Group, as Chairman of its Board of Governors.

SOCMA also bestowed Shaun Clancy the 2018 Distinguished Service Award for his exceptional contributions to industry. Clancy, who retired in 2018, served as Director of Product & Regulatory Services at Evonik, and he was a member of SOCMA’s Board of Governors.

Andy Harris has joined Vantage Specialties as CEO.

The CABB Group has appointed Markus Schürholz as its new CFO.

Former CEO of STK Guy Elitzur has joined Ecolibrium Biologicals as Chairman of the Advisory Board.

IMCD has appointed Haiko Zuidhoff as Vice President – APAC, affirming the company’s commitment to growth in the Asia-Pacific region.

MFG Chemical has promoted Safety (EHS&S) Director Barry Lassiter to VP Operations.

Nanoform, a drug enabling nanotechnology company, has appointed Dr Gonçalo Rebelo de Andrade as Chief of Business Operations.

Galen, the Northern Ireland based pharmaceutical company, has announced the appointment of Dr Dennise Broderick as its new Managing Director and President. She will report to Alan Armstrong, CEO and Chairman, Almac Group, the parent company of Galen.

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CPL Aromas announces post-Brexit policy

CPL Aromas, whose headquarters are in the UK, has announced measures to ensure a smooth flow of business post-Brexit. Nick Pickthall, CPL's COO, is positive about the measures put in place, saying “With robust systems in place and the continued successful integration of CPL Spain, we feel we are in a strong position to weather the potential storm.”

If the UK leaves the EU with no transition arrangements in place, the UK will be treated as a ‘third country’. However, CPL is working with suppliers to confirm that raw materials within existing REACH registrations are automatically ‘grandfathered’ into the UK regime (i.e. granted the same rights and restrictions). They are also working to ensure that materials produced and registered in the UK continue to be REACH compliant.

Furthermore, although only 10% of its raw materials come from continental Europe, CPL is taking steps to mitigate potential delays at customs borders. CPL (or its agents) will build up stock levels as a contingency. Meanwhile, the company has created a new manufacturing base in Spain, to help avoid disruption.
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Industry News

Corbion joins Sustainable Palm Oil Network

Corbion has signed on as a member of the North American Sustainable Palm Oil Network (NASPON), through which major industry players are collaborating to create a greener palm oil supply chain.

NASPON was launched in 2017 by the Roundtable on Sustainable Palm Oil (RSPO) to assist North American companies in their commitments to source sustainable palm oil. Corbion, which has been an RSPO member since 2005, has made significant progress in converting its portfolio of palm-derived products to Mass Balance (MB) certification.

By 2020, all four of its North American production sites will be RSPO MB-certified.

According to Diana Visser, Senior Director of Sustainability, “Corbion brings the ability to provide certified-sustainable emulsifiers, helping companies who depend on these ingredients to meet their own sourcing targets.”

Positive evolution of pesticide products since 1960

Investment from the crop protection industry has led to continual improvement in the effectiveness and safety profiles of pesticides, according to a new report commissioned by CropLife International, an organization that represents the plant science industry.

The Evolution of the Crop Protection Industry Since 1960 charts how technological advances have helped industry meet increasing regulatory requirements, and societal expectations, while helping farmers meet growing demand for food. The report notes a 95% reduction in the application rate of pesticide per hectare since 1950, and a 40% reduction in acute toxicity since the 1960s.

Howard Minigh, President of CropLife International, said “The industry must continue to push the boundaries for ever-safer products. We must also continue to research and develop new products to help farmers meet the immense challenges ahead...”

Bionema receives Innovate UK grant

Bionema, a biotech company based at Swansea University (UK), has received a £765,000 grant award from Innovate UK to fund part of a collaborative project with the University of Birmingham, APIS (Applied Insect Science), Silsoe Spray Applications Unit, AgroSmart and QI3.

Bionema is engaged in the R&D of products that use natural microorganisms (nematodes, fungi, bacteria) for the control of insect pests. The funding will be used to develop and commercialize a microencapsulation-based formulation for the control of Western Flower Thrip and Black Vine Weevil, both of which are challenging to control with synthetic insecticides due to the development of resistance and regulatory pressures to remove effective chemicals from the market. Bionema's novel microencapsulation technology is intended to offer dramatically improved efficacy over existing biopesticides.

Dr Minshad Ali Ansari, Founder and CEO of Bionema, said “We believe this ground-breaking technology will empower the global biocontrol community.”

STK offers solutions to French wine growers

STK bio-ag technologies has hosted a group of 13 top wine growers and crop protection experts from France to learn about botanical-based and hybrid technologies for sustainable grape growing. Since last September, neonicotinoid pesticides have been banned in France, following concerns over their effects on bee populations. Consequently, wine growers in France are in search of new tools for crop protection.

STK Vice President for R&D and business development Shay Shanan commented, “STK’s botanical-based biopesticides and hybrid products are currently providing sustainable solutions for growers in over 30 countries, and there is no doubt these technologies can help growers in France to comply with the new regulatory environment and continue to provide their customers with the highest quality wines, with less chemical residues. For new users of biological products, Timorex Gold and REGEV are highly recommended, especially for wine grapes, for the control of Botrytis and Powdery Mildew.”

Sabin Metal launches platinum catalyst systems

Sabin Metal Corporation has announced its first successful installation of its new line of SCS Catalyst System for the production of nitric acid and related chemicals. Nitric acid and its derivates are the most commonly used fertilizer intermediates.

The launch of SCS Catalyst System completes Sabin’s portfolio of products and services for the nitric acid industry, which already includes SRS platinum recovery systems, cleaning services and a range of metal recovery and refining services, from filters and sludges to metal refining from demolished plants.
Bayer posts glyphosate data online

Bayer is making more than 300 glyphosate safety study summaries available on its dedicated transparency platform.

“As one of the leaders in agriculture, we have been working diligently to make studies on crop protection substances available beyond regulatory requirements,” said Liam Condon, member of the Board of Management of Bayer AG and President of the Crop Science Division. “Improving access to the science behind our products is a key part of our Transparency Initiative.”

Bayer is focusing on safety studies submitted under the EU substance authorization process for plant protection products. Access to the more extensive underlying safety study reports will be enabled later this year.

BASF makes blockbuster fungicide in US

BASF has started production of its fungicide Revysol in Hannibal, Missouri (USA). Revysol is expected to become BASF’s new blockbuster fungicide, with the potential of reaching sales above €1 billion. It is the first fungicide to be produced at the site in Hannibal.

“We are pleased with the successful start of production in Hannibal,” said Markus Heldt, President of BASF’s Agricultural Solutions division. “BASF has enhanced an existing manufacturing system to produce the new active ingredient.”

Locating the world’s first production site for Revysol in the US emphasizes the strategic importance of this new fungicide to North American markets. BASF has applied for registration of Revysol in 60 countries for more than 40 crops. Pending regulatory approval, first market introductions are expected for the 2019/2020 season.

Circa gets green light for biobased solvent

Biotechnology company Circa Group has received authorization from the European Chemicals Agency (ECHA) to manufacture or import up to 100 tonnes/year of its bio-based solvent Cyrene in the EU, after receiving REACH Annex VIII approval.

A chiral dipolar aprotic solvent, Cyrene was developed in conjunction with the Green Chemistry Centre of Excellence at the University of York (UK). Cyrene is a two-step conversion of waste biomass that provides a safer alternative to polar aprotic solvents facing regulatory pressures worldwide.

Tony Duncan, CEO and co-founder of Circa, said “Annex VIII authorization is a major milestone for Cyrene. Safer solvents are urgently required and with Cyrene, we are also offering a bio-based solution with a unique property set, including viscosity, surface tension and polarities – making it an exciting new prospect for advanced materials.”

Clariant and Eastman in agrochemical collaboration

Clariant and Eastman Chemical Company have entered into an agreement for the distribution of Eastman’s Tamisolve NxG solvent – a low-toxicity, highly effective solvent developed for use in plant growth regulators, biological control agents, herbicides, fungicides and insecticides. Clariant will globally market and sell TamiSolve NxG under the trade name Genagen NBP.

Ralf Zerrer, Global Head Innovation and Strategic Marketing at Clariant’s Industrial & Consumer Specialties Business Unit, said “[Our] collaboration with Eastman is testament to our capabilities to support the agrochemical industry in terms of developing highly effective formulations that are safer for the environment and those involved in their handling.”

MFG Chemical upgrades Texan plant

MFG Chemical, a global leader in specialty and custom chemical manufacturing, is upgrading its Pasadena, Texas plant, which the company acquired in March 2018. The improvements, which include debottlenecking and new capacity additions (including two new reactors), are scheduled for completion by the end of 1Q19.

Keith Arnold, CEO of MFG Chemical and Member of the SOCMA Board of Governors, commented, “MFG is increasing its capacity to meet its customers’ growing needs for custom and specialty chemistries. Our significant capital investments in our Pasadena, Texas, plant as well as our three other world-class ISO 9001:2015 Certified manufacturing plants in Dalton, Georgia, reflect our ongoing effort to deepen our manufacturing and formulating partnerships with our valued customers.”

The investment closely follows MFG Chemical receiving an Award for Safety Performance Improvement from SOCMA at the trade association’s 96th Annual Dinner.

On receiving the Arnold commented, “We are happy to receive this industry recognition for our continuous improvements in plant safety, and even more pleased that we have achieved and are maintaining a safe work environment, with a strong EHS&S program.”
Ecovia’s AzuraGel earns biobased label

Ecovia Renewables’ AzuraGel 100 has earned the US Department of Agriculture (USDA) Certified Biobased Product Label for 100% biobased content. AzuraGel is based on a water-swellable and water-dispersible cross-linked biopolymer that forms biobased and biodegradable hydrogels.

This is the first Ecovia biopolymer product to receive USDA biobased certification. Its properties make it well suited for a range of applications, including personal care product components, chemical intermediates, thickeners, texturizers and soil amendments for water retention.

Biobased materials are seeing rapid adoption across the world. According to Inkwood Research, the market for biobased chemicals is expected to grow to $24 billion by 2025 (16.2% CAGR).

Clariant offers a new perspective

Under the theme ‘Think.Do.Paint! For a new perspective’, Clariant invites this year’s European Coatings Show visitors to discover colours and additives developed to help decorative, industrial and automotive coatings make a sustainable difference to the urbanization megatrend.

For the construction industry, Clariant will exhibit its new sustainable 2-in-1 dispersion additive for biocide-free formulations, and its new dispersant additive for waterborne organic and selective inorganic pigment and carbon black concentrates. Its sustainable wax additive is based on 100% renewable resources, while EcoTain-certified light stabilizers bring sustainability and performance together. Clariant’s non-halogenated flame retardants meet stringent fire regulations.

For ‘lifestyle’ consumer goods, equipment and vehicles, the company offers sustainable high-performance DPP (diketopyrrolopyrrol) brilliant pigments with high resistance to heat and UV weathering, as well as ready-to-use ‘super transparent’ preparations based on non-halogenated pigments for fast creation of designer colours, metallic and mineral effects.

Brenntag partners Infineum in LatAm

Brenntag has been appointed as sole distributor for Infineum, a UK-headquartered petroleum additives enterprise, in Colombia, Ecuador, Peru, Bolivia and Brazil. Having worked with Infineum since 1990, this latest appointment extends the relationship between the parties beyond their existing arrangements in Europe and the Middle East. The extended relationship will help to support customers and suppliers in the region, with tailor-made distribution solutions for Infineum products.

Fabian Devita, Americas Sales Director at Infineum, commented on the appointment, saying “We want to expand our collaboration with Brenntag based on the knowledge, experience and a robust working relationship we have successfully developed with Brenntag in other regions. This appointment is an important strategic decision to catalyse growth in the region.”

Germán Torres, CEO Brenntag Latin America, added “We are very excited about this next step in our relationship with Infineum and look forward to connecting customers to Infineum through value-adding partnerships in this region.”

Wacker—Dynaplak hybrid binders

Wacker and Dynaplak are developing hybrid binders based on starch and polymers, in response to growing demand for sustainable binders in the paint and coatings industry. Dynaplak’s biobased technology, together with Wacker’s experience in manufacturing polymer-based binders, uses starch that is a side-stream product from potato processing. In an emulsified form, starch helps to tie together components of a paint, such as pigments and fillers. The first products will be presented at the European Coatings Show 2019.

“Our partnership with Dynaplak lays the foundations for increasing our contribution to more sustainability in the binders market,” explained Dominique Nely, who manages Wacker’s binders in western Europe. “In the first phase, we will focus on interior paints – where demand for ecological alternatives to petroleum-based binders is growing strongly.”

BASF: new coatings solutions

At the 2019 European Coatings Show, BASF will present new materials for the coatings, paint and construction industries, including dispersions, resins, additives, light stabilizers, antioxidants, pigments, hardeners, cross-linking agents, reactive diluents and solvents.

BASF’s solutions include more durable waterborne coatings for white pigmented furniture, non-reactive but highly protective industrial floor coatings and classical ternary self-levelling underlayments. The company will demonstrate adhesion performance on various substrates, low solvent demand, formulation robustness, and functionalities such as durability and ease-to-clean.

“Our customers in the coatings sector are facing diverse challenges resulting from ever-changing overall conditions such as new consumer requirements and environmental standards. The ECS trade fair is a welcome opportunity for us to continue the close ongoing dialogue with our customers on market needs and drive innovations,” said Christoph Hansen, Head of Dispersions & Resins Europe.

Yordas opens new office in North America

Yordas Group, a global leader in scientific, environmental, human health, global regulatory, sustainability and product stewardship solutions, is launching a new office in North America. The expansion responds to growing demand for Yordas’ services in the region. The new office will be located in Hamilton, Ontario.

“The decision to expand our presence in North America was a logical step in our business growth strategy,” said Jonathan Lutwyche, CEO of Yordas Group. “We see great opportunities in the North American market. The new office will allow us to serve our existing clients better and opens up new sectors.”

Yordas has a significant presence in North America, serving multiple sectors, including advanced manufacturing, automotive, industrial and specialty chemicals, cosmetics and personal care and consumer products. With representation in Europe, the Americas and Asia Pacific, Yordas enables clients to access new markets, navigate international regulations and do business responsibly and sustainably.
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A green solution to plastic pollution

Rising concerns about the environmental impact of petrochemical-derived plastics have driven the search for substitutes. Biopolymers offer one solution to this challenge.

Biopolymers – polymers produced by living organisms – consist of long chains made of repeating, covalently bonded units, such as nucleotides, amino acids or monosaccharides. Typically originating from plant materials (non-food crops) or microorganisms, biopolymers are biodegradable, renewable and sustainable.

Some biopolymers can be used as plastics (Table 1). Currently, bioplastics represent about 1% of the 320 million tonnes of plastic produced annually, but the market for bioplastics is growing with the emergence of more sophisticated biopolymers, applications and products. According to the latest data compiled by European Bioplastics in cooperation with nova-Institute, global bioplastics production capacity is set to increase from around 2.05 million tonnes in 2017 to approximately 2.44 million tonnes by 2022.

Braskem is currently the world’s largest biopolymer producer, memorably hitting the news last year when they signed a deal with the LEGO Group to supply I’m green™ polyethylene, a plastic made from sugarcane, for the iconic toys. Today, Braskem’s green plastic is present in more than 150 brands across the world, being used in anything from food packaging to personal care products, as well as durable goods such as chairs and vases. Since the CO₂ released at their degradation can be readSORBED by the organisms grown to replace them, biopolymers are generally accepted as being close to carbon neutral – going further than this, in 2018, the Carbon Trust endorsed Braskem’s carbon-negative claims for its bio-based polyethylene.

As well as environmental benefits associated with these materials, it is useful to note that there is little variation between biopolymers of a given type. As synthesis is controlled by a template-directed process (replication within a living cell), biopolymers possess monodispersity, in contrast to the polydispersity that is typically encountered in synthetic polymers. This is relevant because the number and length of branches in a polymer affect rheological properties and crystallization behaviour. As well as offering greater control and predictability over these properties, monodispersity offers advantages, for example, in the generation of homogenous particles for the delivery of drugs.

The main challenge of biopolymers has always been the expense of manufacturing them. Indeed, ICI developed PHB to pilot plant stage in the 1980s, but interest faded when the cost was too high, and its properties could not match those of polypropylene (PP) in terms of physical, chemical and mechanical resistance.

However, in June 2005, US company Metabolix received the Presidential Green Chemistry Challenge Award for developing a cost-effective method for manufacturing polyhydroxyalkanoates (PHAs), including PHB. Further innovation is also solving challenges with physical properties. For example, WACKER Chemie’s VINNEX, a polyvinyl acetate based binder system, enhances the physical properties of PLA and PHB, making them easier to process. Similarly, the poor low-impact strength of PHB can be solved by the incorporation of hydroxyvalerate monomers to produce polyhydroxybutyrate-co-valerate (PHBV).

With these advances removing barriers to profitability and utility, more companies are moving into biopolymers. For example, Mango Materials produces a naturally occurring biopolymer from waste biogas (methylene), Xylophane offers a unique renewable barrier material for packaging, and dozens of other companies are active specifically in this space – many (if not most) founded since 2010.

Established big players are also maximizing on natural opportunities. In 2013, BASF launched Ecovio, a biodegradable polymer that contains 45% PLA blended with a biodegradable polyester that is derived from petrochemicals. In 2018, Evonik launched a line of thermoplastic semi-crystalline polyamides, derived from castor bean plants, that can be used for fibres and films, including high-performance materials for sportswear. Also last year, Neste received the 2018 Americas Coating Award for engineering a family of polysaccharides for use in coating applications. More recently, Clariant signed an agreement with Neste, the world’s leading provider of sustainable renewable diesel – using Neste’s renewable hydrocarbons in its product development. Clariant is increasing the number of products in its portfolio that are derived from renewable raw materials, including adhesives, plastics and coatings.

A future without plastics is unthinkable. The hope, clearly, is that these innovations will permit society’s continued dependence on plastics, but in a sustainable manner with minimal impact on the environment.

### Table 1. Some biopolymers can be used as plastics.

<table>
<thead>
<tr>
<th>Biopolymer</th>
<th>Type</th>
<th>Source</th>
<th>Example uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyactic acid</td>
<td>Thermoplastic</td>
<td>Corn, cassava, sugarcane</td>
<td>• Loose-fill packaging, compost bags, food packaging, disposable tableware</td>
</tr>
<tr>
<td>(PLA)</td>
<td>polyester</td>
<td></td>
<td>• In the form of fibres: upholstery, clothing fabric, feminine hygiene</td>
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<td></td>
<td></td>
<td></td>
<td>products and diapers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Thanks to its biocompatibility and biodegradability: medical implants and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>drug delivery</td>
</tr>
<tr>
<td>Polyhydroxybutyrate</td>
<td>Thermoplastic</td>
<td>Microorganisms (e.g. Cupriavidus necator, Methyllobacterium rhodesianum, Bacillus megaterium)</td>
<td>• Rubbish bags, food packaging (PHB possesses better physical properties</td>
</tr>
<tr>
<td>(PHB)</td>
<td>polyester</td>
<td></td>
<td>than polypropylene [PP] for food packaging and is non-toxic), disposable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>tableware, disposable razors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Medical applications (e.g. biocompatible stitches that dissolve)</td>
</tr>
<tr>
<td>Zein</td>
<td>Prolamine protein</td>
<td>Corn</td>
<td>• Coatings for paper cups, bottle cap linings, clothing fabric, buttons,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>adhesives, coatings and binders</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Can be further processed into resins and other bioplastic polymers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Coatings for encapsulated foods and drugs</td>
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THE EUROPEAN BIOPOLYMER SUMMIT 2019
13th & 14th February 2019 // Ghent, Belgium

KEY TOPICS
- Evaluating Current Environmental Projects And Regulations Within The Biopolymer Industry
- Assessing The Feedstock's Landscape For The Biopolymers' Production
- Focusing On Biopolymers In The Circular Economy
- Elaborating On The Application Of Biopolymers From Peoples' And Planet's Perspective
- Introducing New Technologies In Processing New Bio-Based Materials
- Brand Owners Perspective On The Use And Application Of Biopolymers
- Focusing On The Basic Understanding Of Biodegradability
- Assessing The Biobased New Content
- Analysing The Impact Of Biobased Plastics On The CO2 Reduction
- Changing Consumer Preference Towards Eco-Friendly Packaging
- Assessing The End-Of-Life Materials Through The Life Cycle Assessment

SITE VISIT
During the afternoon of Tuesday, February 12th, a limited number of conference attendees will receive a unique opportunity to visit Bio Base Europe Pilot Plant In Ghent. There is no extra charge to attend the site visit, but spaces are limited and allocated on a first come - first served basis. Please register your attendance when booking for the conference.

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Email: mahsan@acieu.net  Phone: +44 (0) 203 141 0606
Despite the progress our industry has made in reducing the use of toxic materials, the reality is that, today, paint, coatings and adhesives are responsible for some 30% of all the world’s volatile organic compounds (VOCs). Various regulators around the world are taking steps to reduce the use of harmful materials but in the end, it is up to all of us to make it happen.

This is why product stewardship is a major part of our health and sustainability agenda at DSM. In the case of coating resins, this means striving to reduce the risk of human exposure to hazardous substances — not just VOCs, but also heavy metals and other substances all along the supply chain, including formulators, coaters, brands and consumers.

Low-to-zero VOC plant-based paint resins

The Decovery plant-based range is a coating resin solution with maximum performance and minimal impact on the planet. The Decovery range makes it possible to produce an eco-friendly, low-toxin paint made from plants that performs as well as crude oil-based paint. The range was specifically designed to transform the coatings market, moving towards a more bio-based future beyond waterborne-alkyds.

Currently, we use corn and corn stover to create the required polymer building blocks. Based on these new bio building blocks we are able to prepare high performing resins with a 50% bio-based content and we are developing the next generations with contents of up to 70% and even 90%.

Performance comes first

Moving to a bio-based product without performance is neither durable nor sustainable. In our approach, bio-based solutions need to be at least as good as the products we aim to replace, always striving for better and tailored towards specific applications. Functionality we need to take into account include ease of formulation, no odour, longer open time, improved scratch resistance and many other effects depending on the composition of choice.

The Decovery portfolio is not linked to one specific technology, so there are no limitations to its applications. As DSM Resins and Functional Materials, we have many technologies such as acrylics, wb alkyds, WB urethanes, polyesters, UV and even starch resins in our portfolio. One of our strengths is that we are able to combine technologies (sometimes we use as many as three, our so called tribrids) to create a resin with the desired property profile. Bio-based and recycled building blocks are, and will be, used for all technologies so there are plenty of opportunities for decorative and architectural applications such as walls, ceilings, flooring and joinery, as well as for furniture and kitchen cabinets.
The Waterborne China Platform

A great example of how industry can work together is the Waterborne China Platform (WBCP). This initiative was co-founded nearly a decade ago by DSM, together with other coatings players in China. Its objective was to help the Chinese government reduce VOC emissions in the booming industrial container industry.

Around 97% of all the industrial transportation containers in the world are manufactured in China. Every year, around three million twenty-foot equivalent units (TEUs) need coating, and until very recently this was achieved with solvent-borne technologies. The only problem: these coatings contained an estimated 50% VOCs.

Over a number of years, the WBCP organized a series of meetings, seminars and workshops aimed at educating everyone in the value chain on the benefits of moving to a waterborne coating technology. This included the body that represents the global container industry, the Container Owner Association (COA). There was much debate and discussion, as well as the occasional disagreement. And eventually, the industry came around to using a technology that emits eight times fewer VOCs than traditional solvent-borne coatings.

After years of painstaking work, the project, chaired by DSM, is now bearing fruit — following the migration of the entire industry from solvent-borne to waterborne coating technology. Today, some 90% of all industrial containers are now based on waterborne coatings, from primers to topcoats.

The result is impressive: the industry has reduced its VOC emissions from 160,000 tons per year to just 15,000 tons. By taking a leadership position in solvent reduction, the Chinese container industry has proven that it really is possible to combine sustainability with commercial viability.

The challenge now is to extend innovations such as these into new industries and applications. We are setting the bar high, but nothing is impossible if we do this together as an industry. Sure, it will take a lot of work and co-operation. We cannot do it alone — so let’s do it together.
Enabling IPX level 7/8 waterproof protection

Andres Hanau, Eric Hanson and Edward Hughes of Aculon describe R&D in the chemistry of conformal coatings, leading to the development of an encapsulant technology capable of forming a hydro/oleophobic coating for consumer electronics.

According to research firm IDC, nearly 900,000 smartphones are damaged by liquids every day, with an estimated impact of $96.7 billion a year. The demand for smart phone waterproofing is driving an industry standard which will likely create competition based on levels of protection. This challenges manufacturers to find economical and high-performance materials for IPX7 and IPX8 ratings:

- IPX7: full water immersion for 30 minutes while powered ‘on’ at one-metre depth
- IPX8: immersion in over one metre of water.

Manufacturers turned to conformal coatings, normally used to protect circuitry from contaminants like dust, but with conformal solution-based and vacuum-deposited coatings protect circuitry from contamination and humidity, neither is capable of waterproofing electronics produced in mass manufacturing environments. It would take 10 or more successive applications to get protection from liquid – a process not feasible for high-volume manufacturing.

Introducing a ‘true’ conformal coating

As a result of extensive R&D, Aculon has developed a no mask hydro/oleophobic encapsulant technology capable of forming a ‘true’ conformal coating. It maintains a consistent thickness across complex components, which provides a high degree of water resistance. While previous chemistries required masking of connector hubs so other parts could be electrically connected after coating, this new surface treatment is applied directly to connectors, which prevents the points from becoming a point of failure upon water immersion.

The new class of coating chemistry achieves IPX7 and IPX8 protection, while providing a water and oil repellent surface to circuitry, even within the tight constraints imposed by high-volume manufacturing lines. It can be readily applied by high speed jetting or dispense equipment to sensitive component areas, eliminating the need to mask or dam to fill with the treatment. It also contains no volatile organic compounds (VOCs), so it is highly desirable in regions where tight atmospheric controls are in place.

Using the fundamentals of molecular self-assembly, these novel coatings are economical and can be applied in-line via straightforward processes at the manufacturer. They eliminate the need for costly capital investments, and mitigate the bottleneeking batch process of vacuum-based manufacturing or masking operations.

Tested against conventional coatings

NanoProof coatings were tested against two traditional conformal coatings: acrylic-based Humiseal 1B315, and polyurethane-based Conathane CE-1164. IPX7 and IPX8 qualification of devices coated with Aculon NanoProof 7.0 and 8.4 were evaluated. The devices were also tested for moisture and insulation resistance.

General IPX7 immersion testing standards call for the immersion of finished devices in regular water for 30 minutes. Aculon’s IPX8 modified testing was more strenuous in that an exposed board was directly submerged and polarized in salt water with 18 volts of direct current over 60 minutes.

- Compared to an uncoated IPC board, the leakage current seen with NanoProof 7.0 was scaled down by a factor of nearly one hundred thousand.
- With NanoProof 8.4, there was a decrease in leakage current by a factor of forty thousand.
- Superficially, indicators show that two-dimensional test circuitry of the four tested coatings (Humiseal, Conathane, NanoProof 7.0 and NanoProof 8.4) demonstrated similar circuit protection from water.
- However, when functional 3-D circuitry devices were tested with HumiSeal and Conathane coatings, they exhibited corrosion and device failure in under 60 minutes of saltwater immersion, while devices coated with NanoProof 7.0 and 8.4 did not (Figure 1).
- NanoProof 7.0 and 8.4 also exceeded the criteria for moisture and insulation resistance.

Conclusion

These novel coating chemistries create an insulation barrier for electronics, protecting them from liquid-induced damage during operation. In today’s competitive marketplace, a lack of water resistance is becoming a serious problem for device designers and manufacturers. Application of the latest generation of hydro/oleophobic coatings may provide longevity to devices under ‘real-use’ circumstances when exposed to liquids.

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T: +1 585 350 9499
E: info@aculon.com
www.aculon.com

Pre-immersion Post-immersion

<table>
<thead>
<tr>
<th></th>
<th>Uncoated</th>
<th>Coated with Conathane</th>
<th>Coated with HumiSeal</th>
<th>Coated with NanoProof 7.0</th>
<th>Coated with NanoProof 8.4</th>
</tr>
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<tbody>
<tr>
<td>NanoProof 7.0</td>
<td></td>
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<tr>
<td>NanoProof 8.4</td>
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Bringing polyurethane nanocoatings to market

Theresa Hendrick, Technical Research Analyst at Cerion Advanced Materials, explains how Cerion is incorporating nanoparticles for high-performance coatings.

Coatings provide two primary functions – decoration and protection – and they are becoming increasingly advanced. Consumers and manufacturers are driving demand for advanced coatings that provide protection from a variety of elements, including corrosion, scratches, fingerprints, bacteria, light and moisture. This demand has led to efforts to create high-performing coatings that are integral to virtually any product on the market today.

Incorporating nanomaterials into coatings results in superior characteristics that typically cannot be achieved in traditional coatings. Nanoparticles have at least one dimension less than 100 nm, and their large surface area allows for enhanced reactivity, transparency and exceptional properties even when incorporated at low concentrations. Industry is creating more sophisticated nanocoatings to better address fundamental problems that impact many industries, such as antimicrobial protection, corrosion resistance, easy-to-clean, flame retardancy, scratch and abrasion resistance, strength and UV protection. There is also great interest in creating multifunctional nanocoatings that have more than one performance attribute or benefit.

Polyurethane (PU) coatings, which are are an organic polymer-based coating made up of repeating urethane units, were first developed and commercialized in the early-mid 1900s to provide a higher level of versatility at a time when protective coatings were much more limited and not multifunctional. Today, PU coatings are applied to a variety of substrates (metals, plastics, concrete). PU coatings can be formulated as solvent-borne, water-borne, high solids or powder PU coatings. They provide effective chemical resistance, corrosion protection, scratch and abrasion resistance, UV resistance and weathering resistance, and they find application in a range of industries, including automotive, construction, electronics, furniture, marine, textile and transportation.

When inorganic nanoparticles are incorporated into coatings, there is a beneficial synergistic effect. Inorganic–organic hybrid materials possess the properties of both components. The properties of hybrid materials can be controlled and tailored by adjusting the type of organic material, the type and size of inorganic nanoparticle, and ratios. By adding nanotechnology to coatings, PU coating manufacturers are adding value and revolutionizing the coating industry.

Small particles that make a huge impact

A range of nanoparticles offer positive and exciting properties when incorporated into coatings. Some results are promising enough to lead certain nanocoatings to be commercialized, such as those containing silicon dioxide, silver, titanium dioxide, zinc oxide or zirconium dioxide. They impart a broad variety of performance enhancements to substrates including self-cleaning, antimicrobial, UV protecting, scratch resistance, corrosion resistance and conductive properties.

Silicon dioxide (SiO2) nanomaterials enhance coatings with a range of beneficial properties, including scratch, abrasion and corrosion resistance, self- and easy-cleaning, antireflective and anti-fog. For easy to clean and anti-fogging, hydrophilic SiO2 nanoparticles impart functional characteristics to the substrate that make it high-performing yet transparent so it does not impact the appearance of the substrate. In creating optical coatings for scratch and wear resistance, SiO2 nanoparticles result in coatings that are anti-reflective due to their low refractive index. SiO2 nanoparticles added to polymers have been commercialized to create hydrophilic and dirt repelling nanocoatings, as well as PU nanocoatings with increased weathering resistance and improved thermal and mechanical properties.

Nanoscale silver (Ag) has unique conductive and antimicrobial properties and is incorporated into coatings for hospitals, food processing plants and textiles. Silver ions, as nanoparticles and salts, are effective against a range of bacteria, including strains that are antibiotic resistant. Coatings that contain nano-Ag kill bacteria associated with body odour and prevent the spread of infections. In the biomedical space, Ag is used for coating polymers used in catheters. It is also used in anti fouling coatings for ships, and in coatings for wood preservation. In electronics, Ag nanowires have superb electrical conductivity for transparent conductive coatings and flexible electronics. Nanosilver coatings are commercialized for use in public spaces, on household surfaces, and textiles for antimicrobial protection, as well as for touchscreen applications.

Titanium dioxide (TiO2) nanoparticles are known for their photocatalytic properties, and can be used in coatings for self-cleaning, air-cleaning, antibacterial protection and UV absorption. When exposed to UV light TiO2 is activated and reacts with water to form reactive oxygen species which decompose organic matter. Nano TiO2 can be found in paints to remove volatile organic compounds from ambient air, for self-cleaning and for UV absorption. TiO2 nanocoatings have also proven to be an effective and long-lasting antibacterial agent. Its low toxicity and cost have contributed to TiO2 polymer nanocoatings being commercialized for a range of substrates.

Zinc oxide (ZnO) nanoparticles are used in UV protecting, corrosion resistant and antibacterial coatings. As coating manufacturers steer away from organic UV absorbers, they’re turning to ZnO for its superb absorption of UVA and UVB rays. The design of ZnO nanomaterials for UV resistance, however, calls for careful and precise design. Larger particles are more effective at UV protection, but they need to be small enough to be transparent. There is also interest in nano-ZnO for its antibacterial properties against Gram-positive and Gram-negative bacteria. This lends itself to use in healthcare where there is an industry-wide need for more effective antibacterial coatings to help prevent the spread of infections.

Zirconium dioxide (ZrO2) nanoparticles are showing promise in the optical coatings market. It is a well-known high refractive index (RI) nanoparticle which can increase the RI of optical coating formulations applied to displays and other optical surfaces. They are incorporated into polymers to produce high RI coatings that outperform traditional polymers used for optical coatings that have low RIs and are not ideal for certain optical applications.
The art of nanomaterial engineering

A hurdle to incorporating advanced materials into coatings is poor dispersibility. Despite high availability of nanopowders, the presence of aggregates and the lack of tailorability makes their incorporation into coatings, processability, and successful performance challenging. The solution lies in finding polymer-nanoparticle dispersions that can be utilized in the current coating processes, for a new generation of coating materials.

Incompatibility between inorganic nanoparticles and coating formulations causes particle agglomeration, which negatively impacts the transparency and end properties of coatings. Skilful nanomaterial engineers can surface functionalize or cap the surface of nanoparticles for preferable particle-formulation interactions and compatibility. For this technology to reach its full potential, nanomaterial providers will have to create highly uniform, cost-effective nanoparticles that are sustainable and optimized so they can be incorporated into the coating formulation.

Cerion Advanced Materials has overcome these challenges by synthesizing and surface functionalizing a range of inorganic nanoparticles and by developing a system that can increase their production. While fulfilling requests from prominent coating manufacturers, Cerion has capped various inorganic nanoparticles synthesized in aqueous and nonaqueous solvents with a range of capping agents, and then shifted them into a variety of organic systems. With three facilities dedicated to the research, development and manufacturing of inorganic advanced and nano-sized materials, the company implements a ‘Design for Manufacture’ methodology. Along with a pilot-scale line, full production line, and a 150 metric ton per year capacity, this allows for seamless transition from the lab bench to cost-effective manufacturing in the shortest possible timeframe.

Cerion works extensively in the PU nanocoating space and has synthesized and dispersed nanoparticles of SiO₂, and ZnO into polyurethanes. The company’s chemists prepared 120 nm SiO₂ nanoparticles by the general Stober method, and 6 nm ZnO nanoparticles by a precipitation method (Figure 1). Both nanoparticle samples were dispersed in ethanol to a concentration of 10 wt%.

General resin formulations were prepared by heating a high viscosity urethane monomer to 50°C, and stirring in an additional low viscosity urethane monomer along with a photoinitiator for 15 min. The 10 wt% nanoparticle solutions were dispersed 1:1 by volume with the prepared resin, and this was mixed to produce transparent and colourless dispersions (Figure 2). Thin films of the nanoparticle loaded polyurethanes were prepared on glass slides (Figure 3) by spin coating at 1000 rpm, heating to 100°C for 5 min, and exposing to UV light for 1 h. Once cured, both films were transparent and colourless, with the SiO₂ loaded resin demonstrating a slightly higher haze due to the larger particle size.

Meeting the needs of the polyurethane coating industry

Polyurethane manufacturers are focused on developing functional coatings with enhanced value and performance through the addition of nanoparticles. The push to improve PU coatings has led to the search for nanomaterials that can be incorporated to add innovative properties, but the key to market penetration is the ability to appropriately scale nanomaterials to accommodate industry needs while not impacting desirable PU coating properties. The collaboration between polyurethane coating manufacturers and specialty nano-sized material providers will facilitate the development of PU coatings incorporating nanoparticles optimally designed for compatibility with coating formulations, processing methods and applications. The influence of these different types of nanoparticles with enhanced properties and performance will be the catalyst for commercialization and industry disruption.

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Game-changing technology for bio-based production

Ken Richards, Managing Director at Leaf Resources, discusses the advantages of Glycell, a novel technology that produces higher yields of high-purity, low-cost cellulosic sugars for bio-based production from lignocellulosic biomass.

Replacing petroleum-based manufacturing with bio-based production from renewable feedstocks can help us address global challenges like climate change and resource scarcity. Lignocellulosic biomass is abundant. Today, there is enough to produce $750 billion worth of cellulosic sugars per year and replace petroleum in thousands of every day products.

Breaking plant biomass down into its constituent polymers cellulose, hemicellulose and lignin is costly. Existing pre-treatment technologies like alkaline, dilute acid or steam explosion require large amounts of energy and chemicals, making it difficult for cellulosic sugars to compete with petroleum-based feedstock for chemical production.

**Leaf Resources**, a global leader empowering the growth of green chemistry, has developed the Glycell process, a technology proven to produce higher yields of high-purity sugars, more quickly and using less energy than rival processes.

**Glycerol chemistry and rapid biomass conversion**

Pre-treatment is an essential step for the conversion of most lignocellulosic materials. The Glycell pre-treatment process uses waste glycerol from biodiesel production as the main reagent to pre-treat plant waste. A unique combination of engineering and chemistry speeds up the biomass conversion process and decreases the severity of the conditions required to produce cellulosic sugars (e.g. using lower temperature and pressure).

The glycerol biomass slurry is pressed to produce liquid and solid fractions:

- Cellulose in the solid fraction is converted to C6 sugars and native form lignin using industrially-tailored enzymes from Novozymes.
- A simulated Moving Bed Chromatography (SMBC) unit is used to separate C5 sugars and the refined glycerol in the liquid fraction.

According to independent testing at the Bioprocess Pilot Facility (BPF) in Delft, the Netherlands, Glycell produces 25% more sugars at a faster rate than rival approaches. The technology has been proven to produce cellulosic sugars from a range of feedstocks, including Tasmanian blue gum (*Eucalyptus globulus*), poplarwood chips, sugar cane bagasse, palm empty fruit bunch, wheat straw, rice husk and corn stover.

**Co-products and applications**

The waste glycerol used in the Glycell process is refined from 80 to 95% purity. Purer form glycerol can be sold to the pharmaceutical, cosmetics, animal feed and lubricants industries to generate additional revenue. For the supply of raw glycerol and sale of refined glycerol, **Leaf** has signed an exclusive agreement with **HB international**.

Glycell also produces native form lignin, which can be converted to high-value applications. Unlike other biomass pre-treatment methods which produce lignosulfates and kraft lignin, Glycell does not alter lignin’s molecular structure, allowing for the development of higher-value compounds.

In addition, **Leaf** has licensed LeafCOAT, a bio-based coating made using Glycell co-products, lignin and refined glycerol, creating further potential economic benefits. Developed at the Queensland University of Technology, LeafCOAT, is a waterproof, renewable, biodegradable coating for linerboard and containerboard that can be recycled in paper and cardboard recycling streams. This means the bio-based coating has the potential to reduce the amount of mixed material packaging sent to landfill.

**First Glycell biorefinery**

**Leaf Resources** has set up a Malaysian Subsidiary, **Leaf Malaysia**, through a joint venture with world-class bioeconomy project developer **Claeris. Leaf Malaysia** will build the first commercial biorefinery using Glycell technology in Segamat, in Johor state.

The biorefinery will process waste palm Empty Fruit Bunch (EFB), for which there is a large oversupply near the proposed plant thanks to 52 palm mills operating within a 120km radius. For example, adjacent to this facility, **Biovision & Green Energy (B&G)** is building a biomass processing plant, and they will be supplying **Leaf Resources** with 100,000 BDT of waste palm EFB per year.

The biorefinery will also create jobs in rural areas, contributing to Malaysia’s long-term economic growth and resulting in strong support from the Malaysian government.

**Game-changer for bio-based products**

Through bio-based innovation, Leaf utilizes every part of the waste biomass to produce low-cost, high-quality cellulosic sugars, lignin and refined glycerol, feedstock for the modern bioeconomy. Less energy-intensive and more cost-competitive than existing technologies, **Leaf’s** Glycell process represents a real economic breakthrough for bio-based production from lignocellulosic biomass.

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Compliant by Design

Two new grades of thermoplastic polymers have been designed for compliance, helping to address the challenges faced by OEMs needing to comply with safety-of-use regulations, explains Ignacio Buezas Sierra, Business Development Manager at ELIX Polymers.

Regulatory compliance has caused real headaches to many industries in a growing number of segments in recent decades. The need to adapt products and processes, in order to ensure compliance, has never demanded so many resources, or so much understanding of the complete value chain. This scenario is unlikely to change within the current and near-future international landscape.

Polymer producers have been affected primarily by limitations in the use of specific raw materials. Many different tests have been created and implemented to certify the compliance of products, according to different regulations. Nevertheless, at the end of the day, legal responsibility lies with the original equipment manufacturers (OEMs) that bring the final products to market. This situation generates a number of risks and uncertainties across many processes within these companies.

To address this complex issue, ELIX Polymers has launched a new product line that places a focus on regulatory compliance. Several acrylonitrile butadiene styrene (ABS) grades from the standard portfolio have been adapted and analysed, and the information collected during this process could help customers to design, produce and qualify their final parts with greater confidence. The new product line comprises two grades, addressing the levels of safety that OEMs are looking for, namely a food contact ‘TF grade’ and a ‘Chemical Compliance grade’.

The TF grade (ELIX ABS M545TF) represents the highest compliance level, and offers a high-flow ABS material able to provide very high gloss and balanced mechanical properties. ABS M545TF has been developed to offer compliance with standards close to those required in the medical industry, even if normal applications are in the consumer industry. For example, it may be used for personal care devices (toothbrushes, depilatory devices) which are borderline to be considered as medical devices, due to the type of use and contact with skin.

ABS M545TF has also been tested for the fulfillment of other directives, such as food contact regulations. Therefore, customers have reference values to work with, and this can help them to find the best way to process and manipulate the material to meet required safety standards.

OEMs that are working globally often face different levels of regulatory requirements for some type of products, depending on the region where they are selling. For those looking to simplify their supply chain and material homologations, ABS M545TF offers an interesting opportunity as it complies with the most stringent regional regulations related to the safety-of-use of polymeric materials.

The second group of products, Chemical Compliance, has been formulated for most applications where safety-of-use regulations are involved. It includes several products with different levels of flowability, impact resistance and thermal resistance (Figure 1):

- P2H-CC has a very high flowability and medium impact resistance; high gloss for housings, kitchenware or any other application with aesthetic requirements
- P2M-CC has medium flowability and very high impact resistance; also high gloss for applications with aesthetic and impact resistance requirements
- P3H-CC has a medium-flow material with improved chemical resistance compared to standard ABS, with well-balanced mechanical properties
- M220-CC is a high-flow material with balanced mechanical properties targeted for self-colouring applications
- H605-CC is a high-flow and high thermal resistance grade targeted for applications requiring a VICAT value above 100°C
- C108-CC has a high rubber content for applications with very high impact resistance requirements, both at room and low temperature.

In order to ensure that customers can use these ABS grades with confidence, all TF and Chemical Compliance grade polymers have been carefully developed to ensure any colour or additive formulations fulfill the appropriate regulatory requirements. When a colour or special additive package is implemented in one of these products, the product stewardship department (responsible for the compliance of ELIX products) works together with the colour laboratory to guarantee that the use of these components does not create compliance risks. ELIX Polymers has a database of more than 300 colours that are approved for use in applications where food contact, or even contact with skin, are required.

In conclusion, OEMs requiring thermoplastic polymers for injection molding, part production and 3D print manufacturing are under increasing pressure to comply with safety-of-use regulation, which include regulations pertaining to raw materials and impurities. Use of polymers that have been designed for compliance may help address some of the challenges faced by OEMs needing to comply with these regulations, reducing some of the risks and uncertainties and allowing them to manufacture their products with greater confidence.

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In the near future, as Western and developing nations move from fossil fuels to other means of power generation, and as world energy markets continue to be vulnerable to disruptions precipitated by events ranging from geo-political strife to natural disasters, power demands may be stretched. The Ukraine–Russia gas dispute in January 2009 caused the largest natural gas supply crisis in Europe’s history. Energy security is becoming a strategically important political issue. Shale gas could offer capacity where demand has the potential to exceed supply, and nations with shale gas reserves can become less reliant on big energy power brokers such as Saudi Arabia and Russia for supplies.

Hydraulic fracturing involves forcing a mixture of water, sand and chemicals into shale rock formations under high pressure. In the US alone, thousands of wells have been drilled and fractured to produce gas from massive shale formations. In doing so, large volumes of water are used to produce and maintain the hydraulic pressure required to fracture the formation and allow the introduction of proppant, usually sand, to keep these fractures and microfractures open.

Chemicals such as viscosity thickeners and surfactants are used in the delivery of these proppants, and others, such as biocides, scale inhibitors and corrosion inhibitors, are utilized in the treatment of the delivery water in order to maintain its cleanliness and minimize flow assurance issues (in either the delivery of the proppant or the recovery of the shale gas). These added chemicals make up less than 1% by volume of the delivery packages of water and sand, but nonetheless amount to a significant amount as the volumes of water used are usually millions of litres. Probably the most important additive is the viscosifier, which is normally a guar gum (Figure 1) or derivative such as hydroxypropylguar (HPG).

Guar gums and related derivatives are not self-gelling and require a cross-linking agent to be added to cause them to gel in water. Guar gum is very economic because it has almost eight times the water-thickening potency of similar materials and, therefore, only a very small quantity is needed for producing sufficient viscosity – less than 0.06% of the total volume. Also, it is biodegradable and poses no environmental or toxicological problems. As Guar is a natural product it is subject to microbial degradation and therefore biocides (in small amounts) are added to the mix. Additionally, inorganic scale and corrosion have been reported as the biggest flow assurance challenges due to the massive number of wells with limited water samples, leading to delayed water production and uncertainty of risk severity and inappropriate chemical dosages.

In the last two decades, chemical inhibitors have been widely deployed in the US shale gas and oil field operations without much regard to appropriate optimization, which has resulted in chemical consumption being one of the top Loss Of Expenditure (LOE) contributors. In recent years, a number of management practices have deployed to reduce and optimize chemical usage. For example, a three-step scale risk ranking methodology has been developed and verified to predict the severity, rank the risks, and identify the requirement for chemical treatment. Also, a number of scale prediction tools and corrosion evaluation tools are used to cross compare and validate accuracy. Water sampling procedures are identified following this cross-check analysis.

Added chemicals and their deployment in shale gas and oil development have led to public concern over potential water course contamination. However, the chemicals used in these treatments are often the same as, or derivations of, chemicals used in water treatment and purification. The misinformation and lack of factual presentation to the general public has led to widespread concern over the application of fracturing operations outside of the US, particularly in Europe.

The use of chemicals in the production of this resource has a minimal impact on the environment and is outweighed substantially by the energy security benefit and the overall environmental impact reduction of using a cleaner fossil fuel.

References

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**TRACK ON PEPTIDES**

**DAY 1 – PEPTIDES**

WORKSHOP on manufacturing by Fernando Albericio (University of Barcelona)

WORKSHOP on delivery by Anna Maria Papini (University of Florence) and Elisabetta Bianchi (IRBM)

WORKSHOP on analysis TBC

KEYNOTE SPEAKER on Market Trends:
**Frank Otto Gombert** (GPRS - Gombert Pharma Research Solutions)

KEYNOTE SPEAKER on patent/regulatory challenges: TBC

**DAY 2 – CASE STUDIES on peptides**

KEYNOTE SPEAKER: **Melpomeni Fani** (University Hospital Basel)

Research Showcase, Drug Delivery, Overview & Perspectives of Peptide Therapeutics, Manufacturing & Analytical Development, Peptide Formulation case studies by

Elisabetta Bianchi (IRBM)
Daniel Bourgin (DR REDDYS)
Piera Fonte (OLON)
Ewa Kowalska (IPSEN)
Thomas Vorherr (NOVARTIS)

**TRACK ON OLIGOS**

**DAY 1 – OLIGOS**

WORKSHOP on discovery by Christoph Rosenbohm (Roche)

WORKSHOP on manufacturing by Thomas Rupp (Thomas Rupp Consulting)

WORKSHOP on analysis by Ed Huber (Nitto Denko Avecia)

ROUNDTABLE on oligo drug development: moderator Arthur M. Krieg (Checkmate Pharmaceuticals)

Overview of the market by Detlef Rethage

KEYNOTE SPEAKER on regulatory challenges:
**Annekathrin Haberland** (Berlin Cures) and Kathryn L. Ackley

**DAY 2 – CASE STUDIES on oligo drug development**

KEYNOTE SPEAKERS:
**Arthur M. Krieg** (Checkmate Pharmaceuticals)
**Jesper Wengel** (University of Southern Denmark)

Outsource Manufacturing, CMC of Oligos for Ophthalmic Indications, Development of ASOs for Rare Diseases, Fill/Finish, Novel Oligo Conjugates

Belinda Cowling (DYNACURE)
Suzan Hammond (Oxford University)
Bianca Mathee (ProQR Therapeutics)
Matthias Schroff (EXICURE)
A good time to invest in biofuels

Biofuels might be nothing new, says Sarah Harding, PhD, but there’s still a lot that’s new in biofuels.

Dukes of Hazzard fans might remember one of my favourite episodes, when Uncle Jesse’s moonshine was used to power his old ‘ridge runner’, Black Tilly. Could this have been what inspired a generation of students in the 1990s to run their XUD engines on vegetable oil? Or maybe it was just that, at £0.12/L, it was markedly cheaper than diesel, which was steadily edging up to £1/L around that time.

An acquaintance who wishes to remain nameless (it was not entirely legal to run cars on vegetable oil, after all, even for students) recalls shopping in his local supermarket for 50L of sunflower oil.

“Having a party, are you?” the check-out lady enquired.

“Err… yes,” he replied, wondering what sort of party requires 50L of vegetable oil and not much else.

But we digress.

My point is that biofuels are nothing new. At the 1900 World’s Fair, the Otto company demonstrated a diesel engine that ran on peanut oil, and Henry Ford designed a Model T car (1903–1926) powered by hemp-derived peanut oil, and Henry Ford designed a Model T car (1903–1926) powered by hemp-derived peanut oil. These energy sources were pushed into the background following the availability of huge supplies of crude oil in the early 20th century. The biofuel industry has a goal of biofuels to meet more than a quarter of world demand for transportation fuels by 2050.

Biofuels can be derived directly from plants (energy crops), or indirectly from agricultural or industrial waste. Renewable biofuels generally involve carbon fixation, such as that which occurs through photosynthesis in plants or algae. Other biofuels are made through the use of biomass, which can be converted to conventional energy-containing substances by thermal conversion, chemical conversion, and biochemical conversion.

Currently, the most common biofuel worldwide—especially the Americas—is ethanol, which is made by the fermentation of sugar or starch crops such as corn, sugarcane or sweet sorghum, or non-food cellulosic biomass such as trees or grasses. Ethanol can be used in petrol engines, where it is usually blended with petrol (typically 15% bioethanol content).

In Europe, biodiesel is the most common biofuel. Biodiesel is produced from oils or fats using transesterification, and is similar in composition to fossil diesel. Feedstocks for biodiesel include animal fats, vegetable oils, soy, rapeseed, flax, sunflower, palm oil, hemp and algae. Chemically, it consists mostly of fatty acid methyl (or ethyl) esters (FAMEs). Biodiesel can be used in its pure form (B100) but, due to some maintenance and performance issues (e.g. viscosity at lower temperatures) it is normally blended with fossil diesel.

In response to economic, environmental and consumer pressures, oil and gas companies are once again making headway in renewable and low-carbon energy production. Some of them, in fact, have quickly become leading producers of low carbon energy. This isn’t all about biofuels—Total (one of the world’s seven ‘Supermajor’ oil companies) is leading the charge with a major drive in solar energy; Norwegian offshore oil and gas specialist Statoil and Danish oil and gas producer Dong Energy are both focussing on wind turbines; while Canadian pipeline majors Enbridge and TransCanada are growing portfolios of solar, wind, geothermal and hydro projects.

Since 2009, ExxonMobil and Synthetic Genomics have been working together to turn algae into low-emission transportation fuel. The collaboration has fostered significant breakthroughs, including how to scale algae biofuels for commercial deployment. The hope is that this energy source will fuel the world’s trucks, planes and other large transportation vessels. By 2025, ExxonMobil and Synthetic Genomics aim to have the technical ability to produce 10,000 barrels of algae biofuel per day. This will signal a key engineering milestone for large-scale production of algae biofuel.

AlgaEnergy and Yokogawa Electric Corporation are also focussing on algae, with a recent partnership giving AlgaEnergy access to Yokogawa’s advanced technologies that will be key for increasing production volumes. In a statement to the press, Augusto Rodríguez-Villa, AlgaEnergy’s President, stated that the partnership was based on “the belief that more sustainable development is possible and that microalgae can be a key contributor towards that objective.”

Speciality chemicals companies support the biofuel industry with innovative chemistries that reduce air pollution, prevent deposits and corrosion, enhance fermentation and transesterification, improve efficiency, and boost profitability. These include base chemicals, buffering agents, corrosion inhibitors, antibacterial agents, defoamers, absorption fluids, CO₂, scrubber emissions control additives, surfactants… and more.

The shift from fossil fuels to biofuels is no barrier for an industry that has been built its strength in technology development processes and execution. While the transition might not be rapid, there may never have been a better time for companies to invest in renewable energy.

US stock car racing giant NASCAR has been using a 15% bioethanol blended fuel for all of its cars since 2011.
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Boiler feedwater – making the case for reverse osmosis

Paul Sharpe, U.S. Water Product Line Manager - Boiler and Cooling, explains that the efficiency of Reverse Osmosis (RO) has improved significantly in recent years, and that the economics of using RO can make sense for many boiler installations, just as softener systems did many decades ago.

Boiler feedwater is comprised of two very important, and increasingly expensive resources, steam condensate return and city (or well) makeup water. The condensate is valuable due to low electrical conductance, purity and high temperature. The makeup water is valuable because it is being overused and under conserved in many parts of the developed world, causing the cost of water to rise.

Historically, when it came to increasing the quality of boiler feedwater, there have been few options: either soften or demineralize the makeup, or increase the condensate return. However, in recent years, the efficiency of Reverse Osmosis (RO) has improved significantly in quality of water produced, quantity of water throughput, and cost of operating the system. The economics of using RO can make sense for many boiler installations, just as softener systems did many decades ago.

Although the use of a RO system should be individually considered, there are many economic and operational advantages to using this technology. Some examples include:

- Substantial increase in boiler cycles of concentration (reduced blowdown) and reduced heat loss
- Lower makeup water use
- Removal of over 98% of dissolved solids in the makeup — including scale forming salts that lower heat transfer
- Increased boiler efficiency through minimized boiler deposits
- Reduction of feedwater alkalinity — with the direct result of lower neutralizing amine use
- Fuel cost reduction, less makeup water to heat and cleaner heat transfer surfaces
- If a cation exchange softener is used ahead of the RO unit, the concentrate output from the RO may be of high enough quality to use as make up for an evaporative cooling tower system or other process water systems.

Reverse osmosis does not come without a cost. Some drawbacks to using a RO system may include:

- Initial cost of the equipment
- RO membranes periodically need to be cleaned and/or replaced — average life for a well maintained commercial thin film composite membrane is approximately 3 years
- Dynamic flow demand could affect permeate quality — boilers that operate with large load swings may not obtain optimized output from the RO unit
- Depending on the quality of the RO feedwater, pre-treatment may be required — highly chlorinated waters, or those with high levels of scale forming salts, may need to be pre-softened or treated with sulfite and/or acid
- Electrical power for the high pressures involved in pumping the RO feedwater is an added cost of operation
- If the concentrated reject RO water cannot be used for another purpose approximately 20-25% will be sent to drain.

If the savings of using RO were simply to remove scale forming salts, the choice to purchase a system would be simple — the return on investment would not justify the equipment purchase. But combining the advantages of decreased fuel use (highest utility cost), decreased chemical use and overall water and sewer savings, RO can have a short-term payback on equipment costs.

Estimates on savings:

- 50–60% reduction in chemical use
- 4–5% reduction in boiler blowdown
- 3–4% reduction in boiler fuel cost.

Items that should be considered if your facility is reviewing water quality for reverse osmosis:

- Steam pressure — higher pressure requires higher quality feedwater
- Makeup water quality — higher dissolved solids can increase fuel, water and chemical consumption, increasing the benefit of RO for makeup
- Variable steam loading — RO works more effectively at steady flow rates
- Condensate return quantity — high volume (+80%), high quality condensate return may cancel the benefit of RO
- Can the RO concentrate (reject) water be used for other utility water systems?
- What will be the energy and chemical cost of operation?

There are several key advantages to using a reverse osmosis system, and the upfront costs of equipment, installation and operation need to be carefully considered. The first step in the decision process should start on paper; your water treatment professional should be able to work through each of the above concerns and topics and provide details on equipment cost (lease or purchase), operating costs and return on investment or payback period.

The operation and maintenance of a boiler system is one of the most expensive and labour-intensive line items for any facility budget. It is important for facility managers to keep informed on advances in boiler pretreatment technologies. High-quality water is becoming an increasingly expensive and limited resource. Proactive and creative water management can have significant cost savings and, depending on design concerns, the case for RO is a solution worth considering.

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To upend the old adage, where there’s fire, there’s smoke. Burning fossil-fuels in power plants produces exhaust gas, which contains elements, including sulfur, that originated in the combusted fuel. Flue gas from coal plants, incinerators and some other facilities must be scrubbed free of sulfur dioxide (SO2) in order to comply with clean air regulations.

Unfortunately, during combustion, fossil fuels release more than just SO2. Flue gasses contain a veritable cocktail of elements, including heavy metals, that are absorbed in FGD scrubbers and end up in wastewater. Removing these elements represents a major expense for power-plants, which have been known to shut down in response to new discharge regulations. In 2015, the EPA tightened limits on four of these compounds: mercury, arsenic, selenium and nitrate/nitrite.

The new, stricter rules were introduced as amendments to the Effluent Limitation Guidelines (ELG), a series of technology-based requirements first established in 1974 and updated five times in four decades. These guidelines establish physical/chemical and biological treatment as the first established in 1974 and updated five times in four decades. These guidelines establish physical/chemical and biological treatment as the best available technologies to remove these four target compounds from FGD wastewater, but that designation may not last long.

**Business as usual: best available technologies**

Physical/chemical and biological treatment systems target specific compounds. Biological treatment systems, for example, use bacteria to convert dissolved selenium and nitrates to nitrogen gas and elemental selenium. Physical/chemical systems generally focus on mercury and arsenic.

To manage all four target compounds, multiple treatment processes are required, and the remaining wastewater still contains other constituents which may be regulated at the state or local level, such as chlorides, boron, bromides and other salts. This means that effluent from these systems is not suitable for industrial reuse, and may not even be dischargeable in some cases. For this reason, some power plants have opted for zero-liquid-discharge (ZLD) systems which evaporate the liquid water, leaving the dissolved salts as concentrated solids, which are more easily disposed of. Despite producing pure water that can be reused in cooling towers or other parts of the plant, evaporation remains an incredibly expensive solution for FGD wastewater streams that can run into millions of gallons per day.

**Deja-Vu for thermal evaporation?**

In the mid-fifties, when scientists began commercializing desalination processes for drinking water from the sea, they used evaporation to separate salt from water. These plants were effective at producing pure distilled water, but they were energy hogs. Evaporative desalination systems have long since been superseded by a new, more energy efficient technology for separation of dissolved solids from water: membranes.

Membrane technology has made huge leaps in the last decade, with prices falling much faster than other treatment technologies. Adoption of reverse osmosis (RO) membranes, which remove all salts from water, has exploded in a range of sectors, from seawater desalination to ultrapure water production, industrial treatment and municipal wastewater reuse.

One sector where this technology has been slow to advance, however, is in FGD treatment. The reason? High concentrations of divalent ions such as sulfates, silicates, calcium, magnesium and barium form hard scales on membrane surfaces during filtration. These sharp or sticky crystals plug up pores and perforate the membrane, greatly reducing its throughput and lifespan. In some cases, scale can rapidly and permanently damage entire membrane trains, forcing budget-busting replacements of entire filtration systems.

**Vortex innovation cuts costs and boosts performance**

Chemical manufacturers already produce effective, proprietary anti-scalant mixtures which can prevent some scaling, and these are widely used in RO systems. Most membrane systems, however, remain too sensitive to scaling for cost-effective use in FGD applications. Recently, some manufacturers have begun to develop anti-scaling systems based on physical properties as well, which can combine with chemical anti-scalants to shift the balance on membrane adoption in the power sector.

When scaling cations and anions are present in solution above a certain threshold, they will form precipitant scale spontaneously. Scale formation is driven by charge attraction, and chemical anti-scalants work (in an oversimplified sense) by either introducing competing charges, or by disrupting the shape or “stickiness” of scale crystals. These chemicals cannot change the actual concentration of scaling salts in a solution. During membrane filtration, clean water passes through the membrane, leaving charged ions behind at the surface of the membrane. In most systems, the liquid at the membrane surface is relatively static, due to laminar flow dynamics which slow down crossflow as it drags across a surface. This means that concentrations of scaling ions increase rapidly at the membrane surface as clean water passes through the membrane. This up-concentration is what causes FGD wastewater to scale membranes so aggressively.

BKT, a California-based company, has developed a filtration platform called FMX which physically disrupts this process by preventing scaling ions from building up in the first place (Figure 1). Their system uses rotating blades installed between flat-sheet membrane trays to produce tiny vortices of energized fluid that break up the laminar flow layer and mix the wastewater all the way up to the membrane’s surface. In this way, FMX prevents scaling at the root, by eliminating zones of high scalant concentration. The system has so far been tested with nanofiltration.
membranes, which reject divalent salts while allowing monovalent salts to pass through. Using nanofiltration, BKT maximizes treatment rates and attacks regulated compounds (such as mercury, arsenic and selenium) along with the ions that cause scaling headaches. If a user wants to produce pure, low-salinity water, they can follow the FMX system with an off-the-shelf RO, which will last longer and filter faster when paired with FMX pre-treatment. Concentrated brines from FMX or RO systems can then be disposed of using evaporative technologies at much lower volumes (and lower costs).

This new, physical anti-scalant platform has the potential to dramatically improve the economics of membrane treatment by boosting the rate of flow (flux) through membrane systems, improving contaminant rejection, and dramatically reducing the frequency of chemical cleaning. Less aggressive cleaning helps membranes last longer while reducing chemical costs. A series of demonstration trials at three mega-sized power plants have already treated over 1.5 million gallons of FGD wastewater to-date, and found that FMX can more than double flux rates compared to traditional membrane systems, while reducing both energy draw and cleaning frequency. What’s more, by following the FMX with RO polishing, wastewater can be completely purified and reused as makeup water onsite for a potential water savings of millions of gallons per day, per plant.

For all these reasons, anti-scaling membrane systems now present a promising alternative to older processes. In fact, the EPA is currently performing a review of its 2015 rule on FGD effluent, and industry insiders have suggested that membrane technologies are receiving significant attention. The results of that study should be released by this summer. In the meantime, more and more power plants, along with other producers of FGD wastewater, are starting to show interest in membrane technologies.

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Hot topics in cosmetics

Following the huge success of regional in-cosmetics conferences and exhibitions in North America and Asia in 2018, some of the key speakers at those events provide their views on hot topics in cosmetics.

We don’t need to tell you that cosmetics is big business! According to Reuters, the global cosmetic products market was valued at $532.4 billion in 2017, and is expected to reach $805.6 billion by 2023, registering a CAGR of 7.14% during the period 2018–2023. Irrespective of political events and economic turmoil, the global cosmetics industry is one sector that remains largely impervious to the ups and downs. There is simply a continuing and growing usage of products by women, and increasingly by men, across the world.

The in-cosmetics brand, of which Chemicals Knowledge is a proud media partner, has established itself in recent years as the leading events for cosmetics and personal care ingredients. Celebrating R&D excellence, these events are viewed as launch pads for innovation in ingredients and technology, shaping global trends in the cosmetics industry. Chemicals Knowledge caught up with some of the speakers talking part in the conference programmes of in-cosmetics North America and in-cosmetics Asia, both of which took place in the final months of 2018, to hear their views on hot topics in cosmetics.

Of course, it’s one thing to know about these trends, and another to implement those learnings and translate them into better beauty products. Jeb Gleason-Allured, Editor in Chief of Global Cosmetics Industry Magazine, believes that the key lies in better collaboration between R&D and marketing teams.

“If teams are to create products faster, better and smarter, they must improve their agility and communication – both internally, with marketing and technical staff, and externally, with partners such as suppliers, independent labs and contract manufacturers,” said Gleason-Allured, during a presentation on Marketing Trends & Regulation at in-cosmetics North America. “If your company doesn’t innovate, someone else’s will. Brands have to create better products fast and be proactive in developing projects.”

In other words, he says, marketing teams should be providing R&D with feedback on what is happening in the marketplace, and the two should be working together to identify gaps in the market and bring in new technologies to fill them. This is an interesting suggestion, considering that many companies have encouraged separation between their marketing and R&D teams for a number of years.

Perhaps now is the time to consider more opportunities for integration – do you care to ‘integrate to innovate’? It could be a stimulating meeting, we think!

Can premium natural skincare compete with conventional skincare?

Stacey Fraser, Concept Development and Innovator at Nature’s Blueprint Consultancy Services, says…

“In a word, yes. I’ve been working in the natural skincare world for over 15 years and in that time, we have gone from a small range of ‘natural’ ingredients to some of the most sophisticated functional actives available.

Many years ago, I designed a ‘natural’ skincare product that encapsulated an oil blend and vitamins into booster capsules. This product is still a #1 seller in the natural category globally.

We can now take the latest on-trend beauty products and reverse engineer them to create the most natural equivalent, and this is what consumers are asking for. The drive for ‘natural’ is in full demand as people seek products that are pure, trustworthy and offer great efficacy, as well as being sustainable and eco-friendly.

Three big issues when formulating organic

Belinda Carli, Director of Institute of Personal Care Science

Until recently, there were no natural volatile oils, carbomer replacements, good preservation at neutral pH, and hardly any surfactants – now there are. Going green isn’t as hard as it used to be, but there are still limitations.

#1: Marketing claims: If you want to make ‘natural’ and ‘organic’ your main claims, then you need to be certified. All certifiers have different rules, so determine at the start which certifier is going to suit your needs. Then, think how you are going to market your product of difference against competitors with certified organic products, and competitors who make organic claims but aren’t certified.

#2: Stability: It can be difficult to stabilize organic formulas over a prolonged shelf life, but it is essential for regulatory purposes and consumer acceptance. Discuss these issues with your formulator and be prepared for R&D and stability programs before going to market.

#3: Suitable aesthetics: Being limited to organic, natural and naturally derived ingredients means you may need to compromise on skin feel. You may need to be flexible to enable the creation of a suitably commercial but certified organic product.
**Dermocosmetics: The junction of skincare and health and wellness**

*Kayla Villena, Senior Research Analyst – Beauty & Fashion at EMI, says…*

Dermocosmetics brands draw from their pharmaceutical background and technological advances that attract consumers drawn to functionality and benefits. Combined with the desire for medicated, clinical formulations with therapeutic benefits, consumers’ desire to improve the look and feel of skin, to have healthy skin and to address specific skin concerns are driving skincare in a direction that resonates with the general positioning of dermocosmetics.

Ageing remains a leading skin concern, but as consumers shift toward skin health and prevention, dermocosmetic brands are adopting stronger language that fights ageing. Products that address hyper-pigmentation and discolouration give ageing claims more specificity. New launches are addressing specific skin issues such as rosacea, hyperpigmentation and sun damage while general benefits of brightening the skin and reducing dark spots remain common.

**Skin microbiome and cosmetics**

*Kausar Mali, Senior Principal Research Scientist at Microbiology Sciences, says…*

For healthy skin, its natural mechanisms (hydration, nutrients, pH, antimicrobial peptides) play a crucial role in controlling microbial diversity and maintaining the balance and dominance of beneficial microbes. With the rise in consumer demand for more sophisticated, natural, age-defying cosmetics, as well as products to enhance the appearance of the skin to look younger, glowing, smooth, wrinkle and acne free, it is imperative to understand the relationship of skin microbiota with visual facial signs of healthy skin.

We are conducting a 10-year study of 150 healthy men and women, looking at facial features (e.g. wrinkles, hyperpigmentation, porphyryins) and biophysical properties (e.g. barrier function, pH, elasticity), to explore how the skin microbiome composition changes with signs of skin health and to help target the development of microbiome-based beauty products.

**Skin microbiome research – limitations and opportunities**

*Dr Nava Dayan, President of Dr Nava Dayan LLC, says…*

Various molecular and *in-silico* methods have been developed and employed in skin microbiome of research, but a number of key questions remain unanswered.

For example, what is a healthy microbiome baseline? What are the implications of microbial diversity and the shift from homeostasis to clinical manifestation? How do we select appropriate controls for studies? What is the best sequencing and quantification method to use? Can *in vitro* assays on isolated bacteria provide leads to clinical implications? Do preservatives in formulations affect the skin microbiome?

These and other questions are the focus of ongoing research that may shed light on this evolving area of interest.

**Colour cosmetics in Asia: Premiumization, gender fluidity and active ageing**

*Sunny Um, Senior Analyst – Beauty and Fashion at Euromonitor International says…*

Since 2017, Asia has been the leading powerhouse behind global colour cosmetic sales. Economic expansion and consumers’ increasing budget for ‘vanity spending’ has been driving this growth. Lip products and foundations/concealers are the most popular products in Asia. While BB and CC creams show fastest growth, foundations are unlikely to be eclipsed as consumers now buy variations of these products to wear on different occasions.

By 2022, colour cosmetics sales in Asia are expected to grow by 6% CAGR, as China overtakes Japan and Thailand, and Indonesia surpasses Taiwan and Hong Kong. Millennials in China, Thailand and Indonesia choose ‘high quality’, ‘hypoallergenic’, ‘natural or organic’ products, whereas those in Japan and Korea prioritize ‘value for money’ and ‘price’. Asia is witnessing both middle-class expansion in developing markets, and middle-class retreat and market saturation in developed countries. Expanding the consumer base beyond young women to men and older women, while providing skin care-infused colour cosmetics, will embrace all consumers in Asia.
Hot topics in cosmetics

What are sustainable cosmetics?

Dr Barbara Olioso, from thegreenchemist.com, says…

Quite a few brands have started their exploration of sustainability with a focus on packaging, but focusing on just the outward form is not enough.

We must start with the sourcing of raw materials and their impact on the environment. Plant-derived ingredients require more resources and energy than petrochemical ones, but they are renewable and have consumer appeal. If using plant ingredients means increasing demand on natural resources, what green technologies can reduce environmental impact? How can we select raw material suppliers more in line with sustainability for the environment, the animal kingdom, and the populations that live in these environments?

Cold processing has gained popularity, along with clean energy like wind and solar energy. Formulating with a mind to save on energy and water is a growing trend, with some big names promoting more concentrated products that use less water.

The most important thing is to start the journey of exploration and innovation, like the great pioneers of the past.

Environmental safety

Dr Annelie Struessmann, Technical Regulatory Director at CONUSBAT Regulatory Services says…

The cosmetics regulatory frameworks are still not consistently addressing the environmental impact of cosmetic products. Cosmetic ingredients are often discharged into the sewage system and research shows they can be found in aquatic systems like lakes, oceans and rivers, as well as in soil. The potential risk of such contamination may include toxicity to aquatic organisms, flora and fauna, as well as bioaccumulation. Cosmetics packaging also contributes to microplastics and packaging waste, which can cause serious and fatal effects for aquatic life and birds.

Recently, the EU restricted, for the first time, two substances for use as cosmetic ingredients. The restriction applies to Octamethylcyclotetrasiloxane (D4) and Decamethylcyclopentasiloxane (D5) in wash-off personal care products in the EU. No wash-off products may contain more than 0.1% D4 or 0.1% D5. These restrictions demonstrate the importance of environmental safety.

REACH provides a list of chemicals restricted in cosmetic products for environmental reasons. The next step will see this list combined with existing annexes to enhance the cosmetic products regulation, which looks to control substances based on human health concerns.

Regulatory updates from China

Marylene Zhan, Regulation Compliance Specialist at Reach24h Consulting Group China says…

In July 2018, retail sales of cosmetics reached ¥145.6 billion in China, increasing 13.3% from a year earlier. There is tremendous opportunity within China’s cosmetics industry. However, trying to acquire knowledge about regulations and governmental management can be a complicated and time-consuming process, making applying for pre-market administrative approval difficult.

For example, in March 2018, China reformed the structure of its State Council and ministerial departments. CFDA, AQSIQ and SAIC (State Administration for Industry and Commerce) were amalgamated to form the State Administration for Market Regulation. As one of the most important developments impacting the industry this year, institutional reform will undoubtedly influence cosmetic market access and global trade, not to mention the upcoming cosmetic basic regulation’s (CSAR) big changes.

Five big changes in social media and how to leverage them

Carl Heaton, Web Courses Bangkok

Here are five big changes and actionable steps to improve your social media presence and develop a winning social strategy.

1. Phone books are dead: Google has become the most powerful marketing tool. The more information you provide, the more your pages are available to potential customers.
2. Facebook hates hard-sales: Facebook may block posts that appear like an advert. However, successful management of a well-frequented Facebook group can do wonders for positioning brands as the go-to authority in a given subject matter.
3. Instagram is coming in hot: Instagram has fast become the most frequented social media platform, next to Facebook.
4. Twitter is dead: After a $2 billion dollar loss in 2017, Twitter seems to be slowly fizzling out in the eyes of marketers everywhere.
5. Video is on fire! Clever marketers will reuse video content to build a sales funnel and convert viewers into leads.

I recommend brands follow these guidelines to help build a winning strategy: be open with information; use a multimedia focal point in all posts; tell a story in your content that draws users in and finish it off with a call to action; new-age marketing is the most effective form of digital marketing; don’t waste your time with Twitter; invest in some good-quality video content.
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AgTech innovation is broadening to many fronts

Donald R. Marvin, President and CEO of Concentric, considers the most promising areas of endeavour in agtech.

When some of us first started talking about a Second Green Revolution back in 2015, many of us were most excited about nurturing agricultural soils through better farming practices such as conservation-tillage and no-till farming — and we still are.

But three years later, we’re now seeing an emerging landscape of a broader agtech sector that’s pursuing high-payoff ag solutions and attracting major investment dollars.

Initially, agtech innovation focused on developing biological crop treatments for growers and on developing so-called ‘precision agriculture’ technologies. In three short years, early agtech advancements are already changing the face of farming. Though agtech is still defining itself, early agtech-driven innovations — disease-resistant seeds, biological crop inputs, more-precise nutrients, data-driven farm management and robotics — are already part of the grower’s toolkit. These innovations are directed at improving on-farm productivity and, secondarily, curtailing food waste.

Yet, as of today, agtech is only scratching at its full potential. Listed below are the sectors that I believe hold the most promise for enhancing agriculture’s ability to feed the world, while also making more money for farmers and improving our agricultural environment.

Private equity investors are already becoming aware of the broader potential of the sector. According to AgFunder, $4.2 billion in private investment flowed into agtech companies in 2017 — part of a broader $10.1 billion that was invested in agrifood tech companies across the supply chain. That figure is expected to grow in 2018.

In no particular order, the most promising areas of endeavour are described below (Figure 1).

**Sophisticated crop inputs**
Crop inputs have become diverse and more precise. Once poorly understood, biologicals will soon become a standard part of every grower’s regimen. Some companies are focused on biocontrols that help plants fight disease. For example, our current efforts at Concentric focus on the combining of nutrients with our proprietary biologicals to enhance plant health and yield.

**Arbitrage grain trading platforms**
These are digital platforms that connect buyers with growers to form real-time marketplaces, giving farmers more control over their markets. They are attracting interest from investors and growers alike.

**Precision agriculture**
Increasingly sophisticated software and hardware tools make for more effective use of data in making planting decisions, applying fertilizers, assessing and improving soil health, determining nutrient quantities and types, and monitoring growing crops.

**Vertical farming**
This segment is all about growing food in controlled environments, stacked into vertical...
layers that can range from shipping containers to tall buildings. These hydroponic environments provide plants with precise nutrient mixes while also requiring less water and minimizing agricultural runoff.

**Synthetic biology**
This is a large category that encompasses efforts to design or redesign food production (as well as other biological systems) by drawing on leading-edge science from fields as diverse as molecular biology, computer science and chemical engineering.

**Gene editing**
In commercial and academic labs, PhD-heavy teams of biologists, geneticists and computer scientists are developing better tools and methods for editing living cells. One result can be differentiated food products that hold more appeal for both growers and consumers alike.

**Food waste reduction**
The UN’s Food and Agriculture Organization says more than one-third of all food produced globally is wasted. Science is finally getting to work on diverting some of the mountains of food heading for landfills, ideally channeling some of it to hungry people. Solutions being pursued include techniques for keeping produce fresh longer without refrigeration, online marketplaces for selling food that’s not cosmetically perfect and better software tools to help food retailers manage unsold inventory.

In summary, the field we call agtech, though perhaps not as high-profile as some other branches of science, has been quietly attracting money, smart management and armies of PhDs. With activity afoot on these various promising fronts, prospects are good for enlarging and qualitatively improving the global food supply.

Given today’s alarming warnings about population growth and climate change, some would say not a moment too soon.

**Reference:**

**Author:**
Donald R. Marvin is President and CEO of Concentric, an agri-tech company that develops biological and essential plant nutrient inputs for specialty and broadacre crops. Its products target the entire phytomicrobiome: the seeds, plants, root systems and the soil surrounding them. Concentric is headquartered in Centennial, Colo. Its Canadian headquarters and Technical Center of Excellence is located in Montreal. Its commercial business unit, ATP Nutrition, is based in Manitoba, Canada.
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Combining the powers of biological agents and synthetic chemistries

We speak to Professor Moshe Reuveni, Chief Scientist at STK bio-ag technologies, about the advantages of biopesticides and a new generation of ‘hybrid’ products that may present a new era in pest control.

As a leader in biopesticides innovation, STK Bio-ag Technologies (formerly Stockton) is pioneering a new generation of ‘hybrid’ products that combine the powers of biological agents and synthetic chemistries, and which may present a new era in pest control. With recent partnership agreements with industry giants such as BASF and Syngenta, this seemed like a great time for Chemicals Knowledge to catch up with STK’s Chief Scientist, Professor Moshe Reuveni.

STK seems to be in a great place right now! How have the values and mission of the company led you here?

STK was founded and is headquartered in Israel, the ‘innovation nation’! Innovation and sustainable agriculture are in our DNA, and we are committed to the values of sustainable agriculture – from field to fork. This stems from our main mission to provide premium, highly effective products, with low chemical residues and novel and unique mechanisms of action (MOA). We also aim to provide additional yield benefits, and to ensure that our products are flexible and easy to apply, and chemically compatible with many other active ingredients.

What are the main benefits of biopesticides?

There are many advantages. Biopesticides come from nature – they may be plant extracts, like Timorex Gold, which effectively ruptures pathogen cells (Figure 1), or bacteriological, like Aviv, a powerful Bacillus subtilis requiring less than half the dosage of other biopesticides. In any case, biopesticides contain no synthetic chemicals. They are produced from renewable sources, and they leave minimal crop residue, making crops treated with biopesticides much more competitive in domestic and international markets. Regulators, consumers and retail supermarkets all want to reduce the chemical residue on their produce.

The selectivity of biopesticides, which target only their natural enemies, also helps to maintain beneficial insect and mite populations, ensure worker safety and promote environmental safety.

Today’s biopesticides are as effective – or even more effective – than synthetic chemical pesticides, in terms of crop protection and increasing yields. Furthermore, biopesticides are an important weapon in managing pesticide resistance. They can help reduce the selection pressure for the evolution of resistance to synthetic pesticides, and the risk of pests and pathogens developing resistance to biopesticides is low, especially as these agents often have multiple modes of action.

Switzerland recently announced that it is considering a total ban of synthetic pesticides – do you think it is feasible to have a world free of synthetics?

The world’s population is expected to grow from the current 7 billion people to 9 billion people by 2050. In order to feed all of these people and avoid mass starvation, mankind will need to double crop yields globally. This is a tall order, and to achieve this, growers will need effective tools for combating diseases – we think this will need to include biopesticides and synthetic chemical pesticides; or hybrid technologies that combine the two.

The use of biopesticides is forecast to grow by 15% to 20% annually for the foreseeable future, while synthetic chemical use is predicted to grow at a slower annual rate of 3%. If those growth rates are maintained, eventually we will be in a situation where more biopesticides than synthetic pesticides are being used. We think this will be a good situation to be in, for the many reasons discussed above, but we still see a continued need for good synthetic pesticides.

Figure 1. Photomicrograph showing the mode of action of Timorex Gold. The pathogen cell is ruptured, thereby protecting the plant.
Can you tell us more about ‘hybrid’ technologies and how they expect to encourage uptake of biological agents?

STK has introduced the world’s first ‘hybrid’ pesticide, Regev – the ‘pre-mix’ of a synthetic pesticide with a botanical-based biopesticide. Specifically, it combined a Tea Tree botanical extract and difenoconazole in an easy-to-use formulation. The combination of a natural product with broad-spectrum activity and a traditional site-specific synthetic provides growers with the different modes of action of a botanical-based active ingredient and an effective chemical pesticide. The hybrid combination results in a reduced synthetic chemical load on the environment, compared with other traditional mixtures based on two synthetic chemicals. Regev is an effective and unique tool for resistance management, and it is clearly suitable for Integrated Pest Management (IPM) programs.

Historically, biopesticides have been used largely on high-value crops, such as fruits and vegetables, but hybrids like Regev are not only being used on fruits and vegetables, but have proven to be a cost-effective approach for row crops like soy beans, and field and broad acre crops like corn. Regev is already being used in 10 countries throughout Latin America, Israel, Serbia and the Philippines. Plans for 2019 call for the global rollout of REGEV.

How are you working with global majors to encourage global distribution of these technologies?

To accelerate the distribution of STK’s biological technologies for sustainable agriculture, we have entered into partnerships with various companies. In Brazil, Timorex Gold botanical-based biofungicide is co-distributed by both STK and BASF, which is proving to be very effective in this very large country. In Argentina, REGEV is distributed by SummitAgro, and in the US, Aviv, the low-dose Bacillus subtilis biofungicide, is distributed by SimAgro. Not all of our distributors are the global majors, and STK is always open to partnerships with companies large, medium and small.

What’s next for STK?

Beyond the continuing geographic distribution of Timorex Gold, Regev and Aviv, STK has a powerful pipeline of new biological products to provide new tools to help growers reach the goal of doubling their yields by 2050. This pipeline includes new biopesticides based either on powerful natural plant molecules or plant extracts to be used as bio-fungicides or bio-insecticides. In addition, new hybrids combining natural active ingredients and reliable synthetic active chemicals, to be used on wide range of crops and pathogens, are under development.

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Finding harmony within the chemistry–biology dichotomy

Holly Meadows-Smith, Marketing Associate at BioConsortia, explains the need for biologicals companies to work with the chemicals industry to develop compatible, synergistic solutions.

Biological Industry

Estimated at over a $3 billion in 2016, by 2022 the biopesticide market is projected to reach $8.8 billion. Biostimulants are also growing in acceptance, with a particularly rapid CAGR (Figure 1).

Growth in the biologicals market has been driven, at least in part, by consumer apprehensions toward the agrochemicals industry. The resulting focus-shift toward sustainability and environmental consciousness has been transforming agriculture. Added to the fact that effective natural solutions may also provide a solution to chemical resistance issues, even the biggest players have incorporated natural, products into their portfolios.

Within the agricultural bioscience investment arena, biologics are prioritized over new chemicals, genetics, and seeds. Almost all major agrochemicals companies have a hand in the biologics game, either through their own research spend or by procuring smaller biological companies. Major acquisitions and partnerships include Bayer-AgraQuest, Monsanto-Novozymes, BASF-Becker Underwood, DuPont-Taxon, Syngenta-Pasteuria, FMC-Chr Hansen, and Koch-Mendel-Pathway. These alliances alone make for over $2 billion worth of direct investment into biological research programs.

Successful SME players include AgBiome, Koppert, Marrone Bioinnovations, and hundreds more. The biostimulant space (with solutions that range from plant growth promotion to improved fertilizer use efficiency, to abiotic stress tolerance) is less saturated, although growing in size, and is made up of companies such as Agrinos, BioConsortia, Indigo, Verdesian, and Valagro. Many of these companies work in both areas.

New Technologies

Technological advancement is one contributor to the growing success of biologicals, enhancing both the breadth and scope of research programs through lowered cost and superior methodologies. Techniques like microbiome analysis have become common place, and big data and machine learning have become buzzwords throughout the biological space. Companies like BioConsortia use ‘big’ microbiome data to help identify teams of microbes in superior performing plants, while Trace Genomics diagnose mutations and discover organisms based on genetic data that support the development of yield-relevant solutions.

Much technical progress can be attributed to industrial and pharmaceutical biotechnology. Some of these transferable advances include characterization of microbial and natural product chemistry libraries, efficient metabolite screening, and physical assets for scaling-up and producing large volumes of fermentation-based solutions.

CRISPR-Cas9, a ‘new’ gene-editing tool, has recently stepped into the agricultural limelight. CRISPR allows for gene activation, as well as natural gene addition/deletion, through precise mutation of existing DNA. Recently, Monsanto announced their license of the CRISPR-Cpf1 system, which offers even more flexibility to use the methodology across different crops and genes.

Coexistence

The biologics industry still faces many challenges, largely relating to the expectations of growers who have become accustomed to the instant mortality of pests following the application of a synthetic pesticide, for example. In contrast, a microbial seed treatment for the same solution may have no effect on the pest but could induce a response in the plant that allows it to protect itself against the attack. Another challenge for natural solutions is consistency of efficacy. Historically, microbial solutions have been considered efficacious if they show yield effects 50% of the time. This is improving, of course, and will continue to do so as researchers better understand the mechanisms of biological effects. Formulation developments specific to microbial treatments will also ensure that biological products are delivered in an optimized form.

Nevertheless, most experts agree that the best strategy for biologicals is to work side-by-side with synthetic solutions. A natural treatment that can provide growth benefits under a reduced chemical fertilizer program, or brings benefit on top of a GM trait, are both viable routes to market and potentially more acceptable from a grower’s perspective.

On a practical level, a biological treatment is not likely to be applied commercially to a bare seed. Chemical seed treatments are so widely used that compatibility with harsh treatments should be considered at the initiation of biological research programs. For example, BioConsortia uses chemically treated seed throughout the discovery process in order to select for microbes that can survive in these conditions. Poncho/VOTIVO combines natural and chemical solutions and the BioAg Alliance’s new Acceleron B-300 SAT does the same.

Biologicals have great potential to improve crop survival, growth, and yield while limiting negative impacts on the environment. By working within the current system and together with current solutions, biologicals have the potential to deliver the greatest success.

This article is adapted from one previously published in C&EN News.

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Digitization

Driving success in manufacturing data analytics

A review of the Manufacturing Leadership Forum taking place in Antwerp, Belgium, with a focus on the potential of analytics in chemicals manufacturing and the challenges of digital transformation.

The chemicals manufacturing industry has long gathered vast amounts of data. Data historians alone in plants across the world hold data that would have been unimaginable before – or even at the start of – the computerization of industry (commonly referred to as the third industrial revolution). However, it is only fairly recently that the value of those data has started to be fully unlocked and harnessed. Considered the fourth industrial revolution, or ‘Industry 4.0’, the digitization of manufacturing is now picking up speed and companies are starting to realise the promise that it brings: higher quality products, produced more efficiently, more ‘in-spec’ and more economically; and with lower operational risk and better process safety.

The Manufacturing Leadership Forum took place at the end of November 2018 in Antwerp, Belgium. Attended by delegates from world-leading companies in the chemicals manufacturing space, such as Albemarle, BASF, Cargill, Dow, DSM, EOC, Huntsman and Shell, the Forum provided an opportunity to hear from globally-recognised leaders in driving success in manufacturing analytics.

Lloyd Colegrove, Data Services Director, Fundamental Problem Solving Director at The Dow Chemical Company, provided an overview of his own company’s journey into data analytics. Started in the early 2000s, Dow Chemical was a leading adopter of this technology, and is now benefitting greatly from the investments made.

“The key challenge is how to translate data into insights,” Colegrove explained. “We don’t just want to see what has happened and why – but to monitor what is happening now, in real time and in context – and then to predict what is going to happen, so problems can be avoided. Solving the problem after it happens is too late.”

This is, of course, the ultimate goal of manufacturing analytics – to avoid potential problems altogether by detecting early signals and fixing any anomalies before they impact products or processes. But far from being a mythical manufacturing holy grail, this goal is now well within the reach of any company adopting manufacturing analytics and implementing it properly across their facilities.

Jonathan Alexander, Operations Engineer at Albemarle, has seen this transformation first hand, having driven his own company’s digital transformation in the past few years.

“My Monday mornings used to be spent solving all the problems that happened over the weekend,” he explained. “I would fix them, but the same problems would keep coming up… it’s the same thing that happens in all manufacturing plants at all companies all over the world. I needed to figure out how to prevent them from happening again.”

Alexander’s initial objective was to prevent defects in production by simply centring his plant’s processes and reducing variation, to ensure he was meeting his customers’ requirements. By simplifying the plants’ ‘big data’ into a simple red/orange/green dashboard that was intuitive and simple to use, he enabled the plant operators to correct problems in real time (before violating product specifications). The analytics platform includes flowcharts and drop-down lists – built in collaboration with engineers and experienced operators — to help with data-driven decision-making. This has not only achieved the original goal of improving the quality of product under manufacture, but it has also led to remarkable reductions in down-time, resulting in greater efficiencies and lower costs.

“Through this exercise, we’ve increased productivity and reliability, improved product quality, and grown our process knowledge,” declared Alexander. “We’ve rolled it out across multiple plants at multiple sites, and it continues to add value wherever we use it… the possibilities are endless.”

Jim Petrusich, of Northwest Analytics, expanded on those possibilities with an explanation of how manufacturing analytics can enhance process safety. Calling on recent disasters (or near-disasters) in the chemicals manufacturing industry for examples, he pointed out that in every case the workers didn’t have the real-time data they needed to make the right decisions that could have avoided tragic loss of life.

“Manufacturing analytics creates a safety umbrella – real-time monitoring of key process safety parameters is critical,” Petrusich explained. “It can provide immediate return on investment in terms of loss of life, loss of business, litigation, plant assets, regulation, the environment and more. With better process control and fewer unplanned

Manufacturing analytics can detect signals
... enabling preventative measures to be
developed and implemented.
shutdowns, we also have fewer start-ups — where safety risks are highest — and more control throughout each stage of start-up."

Real-time, analytics-based monitoring offers an early warning system that not only protects plant assets and product quality — it also protects the people working at those plants. Manufacturing analytics can detect signals that can be understood and put into context, to allow preventative measures to be developed and implemented.

It’s not just about the numbers, but insight into what they mean," added Dow Chemical’s Eric van den Heuval, in his presentation on Driving Industry 4.0 Success. “Technology is an enabler, not a goal… so it’s important to apply the right technology where it brings the most value.”

However, nothing that’s worth having comes easily. Michael Guilfoyle, Director of Research at ARC Advisory Group (a leading industry analyst group in the manufacturing space) acknowledged that the road to digital transformation can be difficult.

“It requires the rethinking of fundamental pillars, from the technology driving the operation to transparency between operations and customers,” he explained. “Digital transformation makes processes look simple, but involves complex architecture that needs extensive planning.”

Guilfoyle stressed the importance of engaging the workforce in the transformation from the start, and emphasized the importance of people in achieving success. However, as more people enter the process, more culture change needs to be managed, and asking people to work in a fundamentally different way will incur resistance.

Dow Chemical’s Lloyd Colegrove agreed, adding “The biggest challenge is convincing others of the need for change.”

Asking people to embrace change is always difficult. Fortunately, Rory Masureik, a change management consultant specializing in manufacturing excellence (formerly of Johnson Matthey), was on hand to provide some invaluable advice.

“One of the most common reasons for failure in attempts to adopt digitalization is derailment due to forces from the board room,” he said. “Successful manufacturing analytic transformation requires executive support, driving cultural change.”

Unlike many major changes in an organization, the thrust for digitalization — and manufacturing analytics — often comes from operations, rather than the boardroom, Masureik explained. This is because, in most companies, it is the process engineers who will first realize the benefits of this technology, and need to make a case for change to their upper management. While this might seem straightforward, it often goes wrong due to a simple lack of understanding.

“Most C-suite executives don’t have an appreciation of process technology,” he pointed out. “They work in an enterprise domain — not an operations domain — and these very different environments and working practices require very different solutions. But if you can make your executives understand why this is so important, then you are likely to obtain the resources to proceed.”

The key to this, says Masureik, lies in speaking their language — understanding your company’s priorities, and tying the benefits of manufacturing analytics to those priorities, in order to secure executive support. Once C-suite executives understand that it is vital to start on a digitization journey — and how manufacturing analytics are foundational to that journey — they can ensure that the strategy achieves consensus across the company, including the establishment of a transformation programme with appropriate skills, resources and governance.

So is it worth it? Yes, absolutely! Analytics-driven businesses are the future, and any companies not embracing this change will fall behind as their competitors do things better and faster. Dow Chemical, which has installed manufacturing analytics in more than 180 plants globally, has estimated a return on investment of more than $1 million per plant, each and every year.

“There are too many benefits to not go down this road,” commented ARC Group’s Michael Guilfoyle.

“Where are your competitors?” demanded Albemarle’s Jonathan Alexander. “How quickly do you need to do this?”

Alexander answered his own question with a quote commonly attributed to a Chinese proverb: “The best time to plant a tree was 20 years ago. The second-best time is now.”

Companies like Dow started on this transformation in the last decade. These early adopters have paved the way, but even those only just starting to embrace digitization and manufacturing analytics are at the start of the curve. It’s the future of the chemical industry, and not too late to do it. But you must do it, and the sooner you start on this transformation the more competitive you are going to be.

The Manufacturing Leadership Forum is sponsored by Northwest Analytics (NWA), an industry leader in delivering Industry 4.0 manufacturing analytics and intelligence platforms to enable leading manufacturers to effectively manage and improve plant processes across their enterprises and supply chains.

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Focus on operational excellence will drive growth in 2019

Paige Marie Morse, Chemicals Industry Lead at AspenTech, believes that focussing on optimizing performance and operational excellence, especially through the use of predictive and prescriptive analytics, will be key to long-term success in the chemicals sector.

The chemicals sector continues to grow strongly across all regions and we expect that strength to continue during 2019. Access to cheap feedstocks continues to provide North American chemicals manufacturers with a significant cost advantage. We have already seen a huge wave of new capacity and we expect a second wave to emerge in the 2021-2024 timeframe. Europe has also witnessed major announcements of new activity, heralding a recovery here.

Two trends impacting European operators that we expect to see continuing during 2019 are: importing cheap feedstock from operators in the US; and the ongoing push from European operators to get more involved in the specialty chemicals sector. The advantage here is that specialty chemicals is a complex business, technically-demanding and in some senses that suits capabilities in Europe. Operators know that if they perform well in this space, there will be more margin and more profitability – and that continues to encourage broad participation.

Scoping the challenge

Of course, despite the optimistic picture overall, the chemicals sector is still facing significant challenges as we move forward into 2019. There are trade tensions between the US and China and, to a lesser degree, between the US and EU. Chemical operators will need to carefully monitor these tensions because any uncertainty in trade flows is likely to act as a brake on decision-making.

We are also seeing ongoing consolidation and merger and acquisition activity across the industry. That is adding complexity, particularly around the consequent need for asset, software and platform integration.

Driving operational excellence

In more general terms and across all geographical sectors of the market, operational excellence remains a priority. The key for operators, as we look forward into 2019 and beyond, is to ensure that their levels of uptime are as high as they can be – that their assets are running most of the time, and they are optimizing the way they are used. For a polymer producer, for example, the integration of prescriptive maintenance tools with supply chain tools is likely to play a key role in ensuring that they are making their products in the most efficient order possible and getting as much as they can out of their polymer units. For an operator focused on specialty chemicals, the focus might be more on keeping track of how exactly multiple different units and different products are being employed.

In 2019, we also expect growing use of the ‘digital twin’ concept, where operators create a digital representation of a unit and then trial ideas in that environment to help them decide on changes they might make in the real production environment. We also expect to see greater use of AI and predictive or prescriptive analytics – once again, closely linked to the pursuit of operational excellence. Its use will also be focused on keeping assets up and running. By using predictive or prescriptive analytics to pinpoint when a piece of equipment will fail, chemicals operators can plan ahead, develop contingency plans and make cost savings.

There will be a lot of interest in this area during 2019. AspenTech already has several pilots running and has achieved successes with its Aspen Mvell product, in particular. Aspen ProMV, which delivers multivariate analysis tailored to the unique needs of the continuous and batch processing industries, has also proved popular. As a tool focused on delivering quality, Aspen ProMV is well-suited to the chemicals sector because it helps producers optimize operational parameters to ensure that demanding quality requirements in specialty chemicals are met.

Despite this emphasis on predictive and prescriptive analytics, advanced process control (APC) is still a critically important technology within the chemicals sector today. Chemicals operators need to ensure that their assets are as efficient as possible, but they also need to know that they are safe. APC enables them to do all this by making certain that assets stay within their operating range.

Conclusion

In conclusion, as we look forward to 2019 and beyond, prospects for the chemicals sector generally look good as markets all around the world show positive signs of recovery and growth. European operators, in particular, are taking steps to move into the more complex specialty chemicals sector and are taking advantage of the higher margins on offer there. For any chemicals operator though, a focus on optimizing performance and operational excellence will be key to long-term success – and that’s where the latest predictive and prescriptive analytics, together with latest advanced process control technology, will have a key role to play.

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Brexit: regulatory insights

Naheed Rehman, Business Lead Consultant at Envigo, shares insights into the way in which regulatory issues will be managed post-Brexit.

The UK is a leading global chemical producer, with the chemical industry adding £14 billion to the UK economy every year, from a global annual turnover of around £40 billion. Considering the contribution that the sector makes to the economy, it has been a vital part of the Brexit negotiations. Some progress has been made, but a number of questions remain, in particular those relating to the way in which regulatory issues will be managed post-Brexit. We spoke to Naheed Rehman (NR), Business Lead Consultant at Envigo, to find out more.

Last year, the British Prime Minister, Theresa May, said the UK would like to remain part of EU agencies, such as the European Chemicals Agency (ECHA). Is this a feasible goal?

NR: Whatever shape Brexit takes, the goal of mutual recognition is paramount. No – or minimal – change in regulatory compliance requirements will be achieved if the UK is still subject to the EU’s regulatory regime for registration, evaluation, authorization and restriction of chemicals – with existing registrations of UK chemical substances still recognised by the EU. This would achieve the overarching UK industry goal of continuity.

A concern for us all has been a ‘no deal’ Brexit without a transition. In preparation, the Chemical Regulatory Division (CRD) of the UK’s Health and Safety Executive (HSE) specifically set-up an Exit group whose remit has been to examine the implications, changes and consequences of a hard ‘no deal’ Brexit.

The UK government has been developing a new IT capability to enable the registration and regulation of chemical substances. How is this likely to differ from the current EU system(s)?

NR: The new IT capability has almost been completed. It would be equivalent to the EU’s REACH IT system and will be very useful in preparation for a potential hard Brexit scenario – a ‘no deal’.

Existing REACH registrations held by UK-based companies will be effectively copied and transferred directly to the UK replacement of REACH – legally ‘grandfathering’ the existing registrations into the British regulatory regime. Therefore, there are unlikely to be additional compliance requirements.

Are concerns about transfers and relocation caused by Brexit warranted?

NR: There are practical measures that can be taken. For example, at Envigo, we have appointed an Only Representative (OR) – defined under Article 8 of the EU REACH regulations. An OR is appointed by a non-EU manufacturer by mutual agreement and fulfils the REACH obligations of companies importing a substance on its own, in mixtures or in articles. The person or entity must be established in one of the EU member states or in Iceland, Liechtenstein or Norway. That member State then enforces the REACH requirements related to the substance when imported into the EU.

We provide an OR service for US, Korean, Japanese and Chinese customers who want to register chemical substances under REACH. In preparation for a potential ‘hard Brexit’, we have considered the options to transfer our legal entity to a country within the EU.

Do you think Brexit offers an opportunity to reduce red tape, or is it likely to add another layer of complexity?

NR: At this stage the CRD within the HSE are doing their best to minimize Brexit-related disruption to the safety assessment, approvals and registration of chemical substances. Longer term, as the UK regulatory system may no longer be tied to the EU, there certainly is a possibility that the UK could pursue a system with reduced bureaucratic burden.

What do you think will be the most important direct impact of Brexit on specialty chemicals companies?

NR: The most direct impact will be any divergence of regulations, and the additional burden of managing that, and the imposition of tariffs on transport of goods between the UK and Europe.

Clarity is still required on whether the UK’s industry and scientific voice will continue to be represented at future ECHA scientific committee meetings and working groups.

If you had one piece of advice for those companies, what would it be?

NR: They need the reassurance that their non-clinical research partners are working on minimizing potential disruption, whatever the final Brexit deal and transitional period. We are monitoring developments and our preparedness on a daily basis.

We are preparing for all eventualities, including a no deal. Although the potential extension of the transition period from December 2020 to December 2021 is encouraging in terms of an extended period of continuity, it is not certain that such an agreement will be reached. As an industry we must also keep an eye on the mooted mutual recognition principle which would come into play during the period of transition.

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Going Beyond ‘Safety First’

Keith Arnold, CEO of MFG Chemical, explains how the company has incorporated safety into everything it does, and why, as a member of SCOMA’s Board of Governors, he supports lobbying the US government about the challenges of ‘paperwork’ associated with regulations.

Founded more than 35 years ago as a provider of formulated products for the carpet and textile industry, Georgia-based MFG Chemical has evolved into a partner for global chemical companies, offering custom manufacturing services and proprietary industrial products for the agriculture, paints & coatings, mining, oilfield, pulp and paper, water treatment, lubricants, personal care and other sectors.

The evolution continues. In the past couple of years, MFG has developed two new platforms in response to customer requests: a high-purity line of dioctyl sodium sulfosuccinate (DOSS) surfactants and a portfolio of emulsion polymers. On a bigger scale, the company acquired a 24.5-acre plant in Texas in March 2018. It is currently undergoing a multi-million dollar investment and, by the end of 1Q19, will include debottlenecking and new capacity additions, including two new reactors, one of which is 20,000 gl In size.

MFG also recognises the importance of investing to improve its day-to-day operations. Safety is an ongoing focus for MFG.

“We don’t prioritize safety,” explains CEO Keith Arnold. “It can’t come in front of other things; it has to be integrated into everything we do. We have therefore made safety a core value.”

The company has received full certification to the new ISO 9001-2015 Quality Standard, and continues to modify and update its process maps to mitigate risks. In 2017 the company introduced a more comprehensive Personal Protective Equipment (PPE) identification program, under which plant managers are responsible for getting operators trained on any new PPE for each process. In addition, MFG is making further enhancements to its operational procedures and training programs, and looking very closely at behavioural safety. For example:

- Further enhancement and utilization of the Chempax ERP system
- Giving all employees access to a classical employee assistance program, which was initiated in 2016
- Investments in a new 4,500-gallon reactor at the surfactant plant, two new storage tanks equipped for handling a highly reactive monomerm, and installation of a new foundation at the polymer plant
- Implementation of a comprehensive fob, visual (cameras) and physical internal and perimeter security system at corporate headquarters and manufacturing plants
- All department heads have identified their future replacements, who are receiving leadership training
- Separate projects are underway to understand and improve the company’s time capacity and plant utilization, and address operational efficiencies.

Instilling safety as a core value at MFG has been made possible in part by the company’s participation in SOCMA’s ChemStewards program. “ChemStewards has provided a structure to our safety program with requirements for training, procedures and document control,” Arnold said. “Everyone knows and understands our Quality and EHS&S Statements, and each employee sees safety as his/her responsibility. The success of the program is reflected in our total recorded incident rates.”

In 2018, the company’s drive to further heighten and improve its programs was recognised in SOCMA’s annual ‘Performance Improvement Awards’. Such recognition is invaluable, according to Arnold.

“These awards instill confidence in both our employees and our customers,” he said. “More importantly, our certification to ChemStewards and our comprehensive company involvement with SOCMA have given MFG Chemical an umbrella of creditability and the ability to partner with and maintain Tier 1 Fortune 100 Chemical Companies as customers.”

Arnold is also active in communicating the chemical industry’s concerns to the House and Senate in Washington, DC, through his involvement in numerous SOCMA events, including the Washington, DC, Fly-Ins, regional round tables and the National Chemical Safety Symposium.

“By participating in the Fly-Ins, we elevate our knowledge of what is going on in DC and have the opportunity to communicate our concerns and needs to members of the House and Senate,” he explains. “The most important message we want to communicate is the need to alleviate the vast amount of ‘paperwork’ associated with regulations. We all want to be safe and responsible members of the community; regulatory reporting is enormous and makes it challenging to run a business.”

Arnold concludes, “Today’s chemical companies must ascribe to and be certified with a robust EHS&S program, but small and medium-sized companies can’t do it all on their own — they need the assistance of associations like SOCMA and the support they provide.”

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We speak to María Jesús Almenar Martin, Head of Group SHE&Q at Azelis, about the company’s commitment to maintaining the highest possible values in sustainability and social responsibility.

Azelis was recently awarded Gold rating from EcoVadis, a testimony to the company’s great efforts in corporate social responsibility (CSR). Chemicals Knowledge spoke to María Jesús Almenar Martin, Head of Group SHE&Q at Azelis, who also heads Azelis’ CSR efforts, to discover more about the values driving the company’s achievements in CSR.

Firstly, congratulations on your EcoVadis Gold rating! Can you explain what this means to Azelis?

Thank you! The EcoVadis Gold rating very much reflects how we want to be seen: as a sustainable, reliable, compliant supplier to the industries we serve. Getting the Gold rating means that we are part of the top 1% distributors assessed by EcoVadis. It acknowledges that we are a company who does the things right and has the right processes in place which are sustainable and transparent.

Where did Azelis’ focus on CSR begin?

Azelis has long been committed to Responsible Care & Responsible Distribution. These are voluntary initiatives for the continuous improvement of HSE (Health, Safety & Environment) standards. However, being a global distributor, we needed a broader programme that could help us with the increasing challenges in the entire supply chain. CSR helped us to further develop our labour and fair-operating practices, and install respect towards human rights, and the environment.

How would you summarize Azelis’ company values?

Our values are embedded in everything we do and form the solid foundation of our relationships with customers, principals, suppliers and other stakeholders. We listen to our people on the ground, we provide space and opportunity for all good initiatives, and we stimulate innovation and ambition.

Servicing a wide array of industries, we try to be the best local champion for each one of them. This is only possible through focussed and dedicated people, who have industry qualifications and experience, as they know the local markets best. Staying abreast of the latest market trends, serving on various industry bodies, sharing knowledge internally and externally alike are only some of the ways that enable that.

Are these values part of your employees’ daily lives?

The Azelis charity fund, Because giving back matters, was set up in 2018. This fund allows us to give back, as a company and as a community. Starting last year and continuing every year forward, Azelis will donate approximately €20,000 to a charitable cause – our employees choose a global charity that is close to their hearts. We also fully embrace local charity initiatives, such as local teams visiting children’s care centres to help out.

The entrepreneurial mindset of the Azelis community stimulated the creation of two important learning initiatives this year: the Azelis University (for the Americas region) and the Sales Academy (for the EMEA region). Both initiatives focus on stimulating learning, development and entrepreneurship.

We also organise a yearly knowledge review on ethical business conduct and compliance, to make sure everyone understands our high ethical standards and is able to represent these while doing business.

I understand you participate in the United Nations Global Compact initiative – can you tell us more about that?

The UN Global Compact initiative is the world’s largest corporate sustainability initiative and a call to companies to align strategies and operations with universal principles on human rights, labour, environment and anti-corruption, and take actions that advance societal goals.

When the UN Global Compact defined 17 Sustainable Development Goals (SDGs), this constituted a huge paradigm shift. It wasn’t only governments anymore who had a role to play in solving some of the world’s most burning problems, it was now companies too. All those issues that SDGs tackle are interdependent, can’t be solve in isolation, but they also can’t be solved through isolated actions either – partnerships are key.

As a signatory, we report annually on our progress towards the set CSR goals. Azelis also supports the UN strategy of achieving the

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Respect and responsibility have been at the heart of Azelis for decades. And with the launch of our new Corporate Social Responsibility (CSR) programme, we’re committed to implement the highest standards in ethical behaviour, human rights, labour, anti-corruption and environment. Our journey to sustainability is continuing, and we are striving to make a positive impact across our global supply chain. Together we will create a difference for future generations.

To find out more about the launch of the Azelis CSR programme, please visit azelis.com/en/about-azelis/corporate-social-responsibility

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Corporate Social Responsibility

UN 17 SDGs by 2030. We have identified the SDGs we can influence as a company and as a community, and we implement them through:

- Enabling employee development
- Promoting employee well-being
- Ensuring equal opportunity and diversity
- Reducing energy consumption while maximizing renewable energies sources
- Reducing waste while maximizing recycling
- Preventing environmental incidents
- Practicing responsible procurement
- Using fair operating practices
- Participating in the development of society.

I have heard you talk about your ‘sustainable procurement policy’ – what do you mean by this?

This means the adoption and integration of CSR principles into procurement of products and services within the supply chain. We ask our principals and suppliers to adhere to local legal regulations or internationally recognised standards with regards to labour practices, environment protection and fair operation practices.

As a global distributor, Azelis has principals and suppliers all over the world, so we need to make sure that our suppliers are engaged in similar CSR strategies as ours. We have the obligation to verify that these commitments are respected at all times and we do this through regular assessments.

At the other end of the chain, how do you help your customers to be more sustainable and socially responsible?

To support our customers in being more sustainable and socially responsible themselves is an important ambition of ours and we do this in various ways.

Through our sustainable procurement policy, Azelis has a due diligence process that assesses our partners, making sure that these suppliers and the products we offer on their behalf come from sustainable and socially responsible partners.

A lot of our daily work is about developing formulations and innovative solutions in our application labs. By combining the raw materials of our principals in a new way, we can develop products that create added value for our customers. Many of our formulation efforts are focused on bringing solutions to environmental challenges, and we’re proud to say that several of these formulations have been acknowledged with important innovation awards. Our UK Personal Care lab team recently created an all-natural powdered soap that requires a minimum amount of water to activate its cleaning and hydrating characteristics. Our Homecare & Industrial Cleaning lab team also shows expertise in creating sustainable products. Some of their latest innovations were a neutral, sustainably-derived degreaser and a novel sprayable oven cleaner formulated without caustic soda to reduce CLP labelling and avoid corrosive labelling. We see the same eagerness to create green solutions in our other market segments.

What’s next for Azelis CSR?

Since the launch of our CSR programme, our CSR performance has evolved and we are continuously finding the best ways to measure our performance and further develop our commitments. We want to be the reference for sustainability in our business, and set the standards for sustainability in the chemical distribution. The EcoVadis Gold rating was not only a recognition – it has set expectations higher. We have to make sure we stay focussed, and we keep doing what we have been doing – acting responsibly towards all our stakeholders, day in, day out.

Do you have any advice for other companies in the specialty chemicals industry, trying to reduce their impact on our world?

I would definitely recommend all businesses to consider CSR as an essential asset that guarantees the future of the chemical industry. CSR goes beyond legal, economic or societal requirements and obligations; companies also have a moral responsibility to act on for the consumers they serve. Embracing the principles and ambitions of CSR and initiatives such as the UN Global Compact can help companies prepare for the future.

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