CHEManager INTERNATIONAL 2/2021

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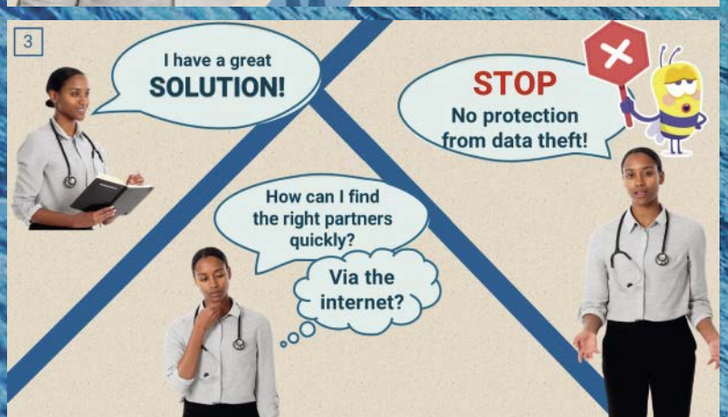

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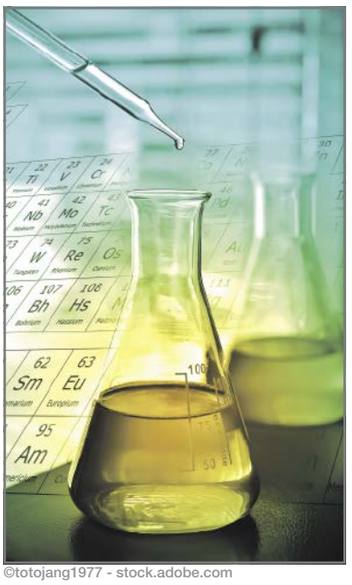

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Innovation

Taking an Active Role in the Industry Transformation

The World Economic Forum Engages the Foremost Leaders of Industry and Society to Shape Global Agendas

Buzz words like climate change, plastics waste, supply risks, or digital transformation are describing current challenges facing the chemical industry. At the same time, our fast-changing world is getting more and more complex, with interconnected problems that demand collaborative efforts – e.g. the Covid-19 pandemic. Governments, enterprises, and civil society are undertaking numerous initiatives to search for more sustainable solutions and take action. The World Economic Forum (WEF), established in 1971 as a not-for-profit foundation, offers platforms to integrate and aggregate these efforts. The Chemical and Advanced Materials Industry program is headed by Fernando J. Gómez, a versed industry expert, who joined the Forum in 2010. Michael Reubold and Ralf Kempf discuss with him the chemical-industry-related topics that are high on the WEF's agenda.

CHEManager: To start with, could you briefly explain the World Economic Forum's overall mission and the instruments or methods applied to fulfill it?

Fernando Gómez: The World Economic Forum has a very ambitious mission, namely "Committed to Improving the State of the World". As you may imagine there is no single way to fulfill this, which means the Forum has to be one of the most dynamic organizations globally, constantly changing and constantly striving to innovate.

A few things are still very characteristic, though, and first of which is the multistakeholder principle over which the Forum was founded. If we seek to improve the state of the world, this is

Fernando J. Gómez, World Economic Forum

not for politicians alone, for business leaders alone, or for academics alone. Improving the state of the world requires a platform where the views, the experiences, the aspirations, the capabilities, and the resources of many can converge to catalyze change.

The second principle I would like to highlight is global leadership. Only when leaders are engaged can we really increase our chances of effecting change. Leaders can execute, partner with each other, agree and make decisions.

As such, our methods to catalyze change have expanded. We are still recognized as the foremost convener, but to go beyond bringing people together, the World Economic Forum has developed a few additional roles through the last five decades. It curates peer-level communities of interest, where members interact openly and develop collective understanding of issues that are relevant to their sector, geography or their corner in society.

> *"Chemical companies have evolved incredibly in their approaches to innovation in recent years."*

Along the way, the forum saw the need to create a trusted space for the collective knowledge and the shared insights that these communities were developing to be accessible and serve decision making. Interestingly, the Forum had to develop its own tools to illustrate the complexity and interconnectedness of this knowledge. We ran initiatives and projects, which were for some time the main vehicle to turn those insights into action, and indeed the Forum still supports interested parties as they seek to advance projects. More recently, the Forum developed capabilities to act as a platform, so that it can multiply that impact. It now hosts and contributes to alliances and coalitions that align with its mission — whether or not these alliances were born within the Forum's activities. It has been quite an evolution.

In the Forum's programs and activities, you are overseeing the involvement of partners from the chemical and materials industries. Which topics are high on the community's agenda?

F. Gómez: These issues will sound very familiar to you and your readers. These topics are inter-related and quite frankly, hard to prioritize, but the current consensus revolves around a few:

Sustainability: More specifically reduction of greenhouse gas emissions, development of a circular economy and responsible use of resources.

Digitalization and the industry: Encompassing not only the implications of its own digital transformation but its role in the transformation to a much more digitalized society.

People: This includes not only the changes in the workforce but perhaps more importantly, the role of our business in society. There is a brilliant opportunity for chemical companies to maximize their contribution to society through collaboration.

How do you practically work or collaborate with the members of the chemical industry to take action and advance the topics mentioned?

F. Gómez: At the Forum, the tactics are many. To build awareness and shape the industry agendas, the Forum fosters dialogue within and among communities. It holds discussions, issue-specific meetings, brings voices from other stakeholder groups such as innovators, public figures, Nobel laureates, youth and NGOs.

To inform decisions and guide strategy the Forum consolidates, connects and disseminates knowledge, publishes reports, community papers and increasingly uses its social media and digital channels.

To drive collective action and generate impact, it supports its partners and communities as they start new alliances and mobilize the resources needed.

All the above is now in practice with our partners form the chemicals sector. We are now hosting an early dialogue on ESG and our sector, for example — beginning to understand the implications of ESG investing on the sector and creating a space for sharing practices so that the overall adoption of metrics for these environmental, social and governance factors is smoother.

It is obvious that the chemicals and materials companies have to find ways to reduce the environmental impact of their production in order to help advance the global sustainability agenda. What measures are they taking, what concepts are you discussing with group members?

F. Gómez: By now it is rather well understood that the chemicals industry, like other industrial sectors, needs to dramatically transform its production processes if it aspires to meet the most critical targets in the climate space.

This requires a strong focus on technology e.g. development, de-risking, upscaling and integration, as well as on all the elements of a conducive enabling environment: finance, policy and new business structures. In that area, the Forum has mobilized commitments through the Collaborative Innovation on Low Carbon Emitting Technologies, LCET, initiative, which has brought companies to collaborate in new ways to put the sector on the path to net-zero emissions.

Innovation indeed plays a central role in developing energy-saving materials, technologies for the generation of renewable energy, and also in establishing concepts such as a circular economy, for instance for plastics. How can the Forum support such approaches to innovation that extend well beyond new molecules and applications?

F. Gómez: Despite the availability of many innovation avenues to chemical companies, we still heavily rely on composition of matter or process innovation as the traditional pathways to solving problems — and these remain competitive areas to a large extent. Nevertheless, chemical companies have evolved incredibly in their approaches to innovation in recent years and the Forum has offered spaces for this transformation, too.

Three areas come to mind:

Innovation requires collaboration well beyond 'what customers demand'. New entrants, start-ups, new complementary technologies… these co-exist at the Forum in communities such as Technology Pioneers or Global Innovators. Today's innovation partners include data companies,

Continued Page 6 ▶

advanced manufacturers or on-the-ground activists. They connect here.

Innovation is distributed across groups, geographies, or maturity stages. Digital platforms like UpLink not only lower the barrier of their interaction dramatically, but also facilitate the collaboration and establishment of partnerships and alliances.

Some of these technologies are so new that no governance structures exist for them to flourish and deliver the most to society — say… blockchain or artificial intelligence, which advance so rapidly that it is hard for governments and society to keep up with fast-paced development. In those cases, to foster responsible innovation, the Forum's Center for the Fourth Industrial Revolution and its affiliate centers around the world engages companies, governments and academics in the co-creation of such governance and policy structures. For example, one of our chemical industry partners worked in regulation in digital trade as it relates to 3D printing. Truly cutting edge.

To continue delivering socioeconomic value, the industry must lead the process of its own transformation. What is driving this transformation and which topics/aspects does it encompass?

F. Gómez: There is no single dimension that is driving such a transformation, in fact there are many underway as well. Transforming to a more sustainable, more digitalized, more innovative sector is not new. To truly transform there are a couple of important dimensions in which the sector needs to be more deliberate.

First, the transformation to a more inclusive sector: We are not done with delivering on the SDGs, and in a society that is at risk of greater division, the chemicals sector has a major transformation opportunity to inclusivity, to closing gaps across the board. Above all, to lead other sectors. This industry has delivered and over-delivered in customer expectations and in meeting performance requirements, but as the world shifts to much more connected schemes, chemical companies need to transform into systemic leaders. Rally others, bring them along, inspire other sectors in changing an entire system. Want a better global food, mobility or energy system? Lead the way! We have demonstrated that, when called to action, we respond. Perhaps it is time to be the caller.

Chemicals and materials companies have to find ways to reduce the environmental impact of their production in order to help advance the global sustainability agenda. The World Economic Forum has mobilized commitments through the Collaborative Innovation on Low Carbon Emitting Technologies, LCET, initiative, which has brought companies to collaborate in new ways to put the sector on the path to net-zero emissions.

Demand patterns, and thus supply and value chains will become increasingly dynamic in our VUCA world, putting extra pressure on industry and society. Which programs or initiatives address topics like risk management and resilience?

F. Gómez: Yes, that has actually been a focus area through 2020, both institutionally — e.g. through our Covid-19 Action Platform, which has brough together stakeholders from all sectors to work alongside WHO or logistics companies in solutions to minimize the impact of the current pandemic — and at the specific industry level, in which we supported a group of companies along their journey.

In the case of the chemicals sector, it was important to think not only of the response to a shock like Covid-19 (for example, with masks, hand sanitizer or personal protective equipment) but in the recovery and resilience-building phases. Very early on, it was critical to address vulnerabilities on multiple sides: securing feedstock and other inputs for our own production and securing the movement of chemicals and materials to minimize disruptions to global production of just about everything. There, industry associations did a great job aligning the voice of the industry, especially towards transport and supply chain restrictions.

Nevertheless, we also believe we have played a small role as our partners advanced collaboration in rebuilding sustainable infrastructure, followed society's interests in sustainable consumption and even deployed expertise and protocols to secure a safe return to work. A bit of that happened over our collaboration platform.

How important for the World Economic Forum's work is public engagement and how do you stimulate it, especially in your industry community?

F. Gómez: Public engagement is an integral part of the World Economic Forum's work, and it, too, has been through an important evolution. For an organization that has consolidated its convening and engagement of peer communities and top leaders, social media and public engagement have opened many channels for society to be part of this change.

It works largely to disseminate insights and views especially of the Forum's communities. It also serves as a way for almost anyone in the world with ideas, with actual ongoing efforts or with specific needs — to put them 'on the radar' of our initiatives and programs. We learn a lot through public engagement and are convinced that the world also learns about issues in a connected and tangible way through our public engagement.

> *"Public perception and public understanding of the role of our sector is not straightforward."*

For chemicals it remains a challenge. Public perception and public understanding of the role of our sector is not straightforward. Unfortunately, the word "chemical" carries a negative connotation — now probably closely followed by "plastic". The many ways in which our sector brings about socioeconomic benefit rarely make their way to a widespread societal understanding. We want to be part of this and have offered our public engagement channels to our partners and other members of our communities — but there is a lot that still needs to be done to reach out effectively, to influence mindsets positively and above all, to retain integrity and thoroughness while remaining impartial. It is a journey, and we are in it!

www.weforum.org/platforms/shaping-the-future-of-energy

The Age of Sustainability

A Decade of Ongoing Change to Come for Chemical Companies

Many people will chime in when it comes to environmental damages caused by the chemicals industry. Seveso 1976, Bhopal 1984, the Rhine contamination 1986, the Exxon Valdez accident in 1986 and the Deep Water Horizon blast in 2001 are only the ones that are in the public memory. Every chemicals company and supply chain in this industry has been part of an environmental discussion and been affected by it. However, a lot has changed since the 1980s when environmental topics became more business relevant in the chemicals industry and adjacent industries.

It started primarily in the Western hemisphere with high investments into environmental treatment plants and continued with stringent product safety measures and the development of alternative products. Some of these initiatives were used as protection against emerging countries and as measure to compensate for the cost of goods sold deficits, while most of them were used to reach sustainability goals. The effect of these measures is also reflected in the industry's greenhouse gas emissions. Since 1990, the emissions of the EU chemical industry have fallen nearly 60%.

Nevertheless, the implementation of measures aiming for increased sustainability takes time, is costly and directly translates to higher prices for more sustainable and environmentally friendly products. For many years, consumers were not willing to pay a premium for products with a lower carbon footprint. Thus, cheap products coming from China and India, produced under different conditions, competed with products manufactured under environmentally improved circumstances in the Western hemisphere. The carbon footprint was not an issue at all.

This perception has changed dramatically, mainly driven by governments and NGOs all around the world. The momentum was further accelerated by the Fukushima accident in 2011 which led many governments to rethink their position regarding the future protection of the environment. The Blue-Sky Initiative of the Chinese government, started in 2017, is the latest example of such efforts. As a direct result, this has already and will continue to have a significant impact on the supply chain of chemical, agrochemical and pharmaceutical pro-

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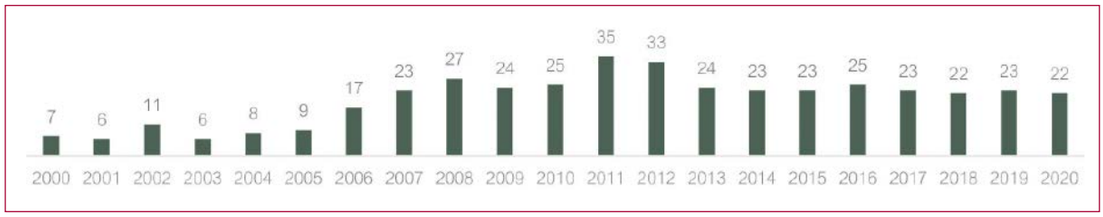

Fig. 1: Number of deals in the chemicals industry focused on sustainability

Source: Capital IQ — Screening criteria: Keyword (Renewable, Sustainable, Recycling), Transaction Status (Closed), Percent Sought (>50%) and Industry Classification (Chemicals)

ducts. The discussion on e-mobility as the solution to reduce pollution from fossil-based engines has gained significant traction since 2018. It already has had and will continue to have an impact on the setup of many chemical companies, not only in the petrochemical space.

Chemical companies, either small or large, will be fighting more than ever for acceptance in society and are expected to provide product solutions to today's and future problems. A lack of sustainability will cause a gap in competitiveness and subsequently value of companies.

Next Efforts to Improve the Carbon Footprint of Chemical Products

Sustainability has resulted from efforts over many years to improve the human-caused impact on the environment, which has worsened significantly over the last decades up until recently. Today the mid- and long-term targets are clear, one being the significant reduction of carbon dioxide emissions until 2050 as agreed to by most nations. In fact, 127 countries (responsible for 63% of global emissions) are considering or have already adopted net zero targets. Announcements with significant impact were recently made by China with its intention to reach carbon neutrality before 2060, which by itself reduced the below stated end of century estimates by 0.2 to 0.3°C. Furthermore, Joe Biden's administration aims for US carbon neutrality by 2050, which would reduce the global warming by another 0.1°C.

Taking the ambitious targets into consideration, it is no surprise that sustainability has also become an increased industry focus of investors in 2020 compared to prior years. But even though there is a broad consensus in politics, society and economy about what needs to be achieved, the paths to a "better world" are not underpinned by operational measures and are often scattered. What is missing are the concrete measures and actions to be taken and, above all, what they can be achieved with.

There is a significant disconnect between the targets and the chemical industry's as well as consumer's reality. Furthermore, a more orchestrated global initiative is needed to make change happen. Beyond geopolitical measures there are solutions to be developed by companies, and products to be offered that are affordable for consumers, even though it is clear that bio-based and sustainable products and supply chains will cost more than today's products. Currently green products tend to come with significant markups of on average 75–85% and often exceed the amount the average consumer is willing or able to pay.

Circular Economy and other Initiatives Towards Sustainability

Linear economy is responsible for more than 50% of landfill of the 2 billion tons of trash generated around the world, while 60% of the global methane emissions of 570 million tons are created in conjunction with human activities. In this respect targeted and enforced measures are crucial if sustainability should become reality. Here, the chemicals industry represents an important driver; since only 6.6% of the 138.9 million tons consumed chemical products in the EU are recycled today.

Circular economy is not a cure-all solution, but it is at least an effort and maybe a long-lasting approach to reduce waste and improve the eco-balance and thereby achieve better sustainability. However, the transformation towards a circular economy involves more than just recycling waste. It also involves a variety of measures and technologies that are utilized to, for instance, transform waste or plastic to oil, waste to energy, alternative or renewable feedstocks, second-generation fuels or Fischer-Tropsch synthesis to transform carbon dioxide into higher carbons. There is no one-size-fits-all approach. Large investments, improved technologies, and new and better materials to produce similar-performing consumer products will be needed. Furthermore, supply chains must be altered and adapted to create new or at least better value chains.

This will also affect chemical distributors in the future. The concept of simply purchasing material in China or India and distributing it at a premium in Europe or the US will not be good enough anymore. Large distributors have already started to change their pattern and product platforms. Likewise, fine chemicals and intermediates produced under limited sustainability aspects will not fuel the business concepts of the future that have the goal to establish a circular economy and to excel in future markets.

"Reaching sustainability has become a key aspect for chemical companies and adjacent businesses along the product chain."

The circular transition for chemical companies relies on internal transformation that starts with a solid strategy and objectives followed by the decision on a portfolio of specific circular initiatives. The selection of initiatives should always be made based on a thoroughly conducted analysis of the company's current situation. Here, a visual representation of the value chain and material flow internally as well as within the broader ecosystem allows executives to identify the main weak points.

At all times it is essential that the respective leadership team fully supports the transition and promotes it throughout the organization since a successful strategy requires more than the efficient execution of formulated initiatives. Far-reaching internal change should always accompany the practical implementation.

Transformation via M&A

Time is ticking and decisions have to be made. In a nutshell, reaching sustainability has become a key aspect for chemical companies and adjacent businesses along the product chain

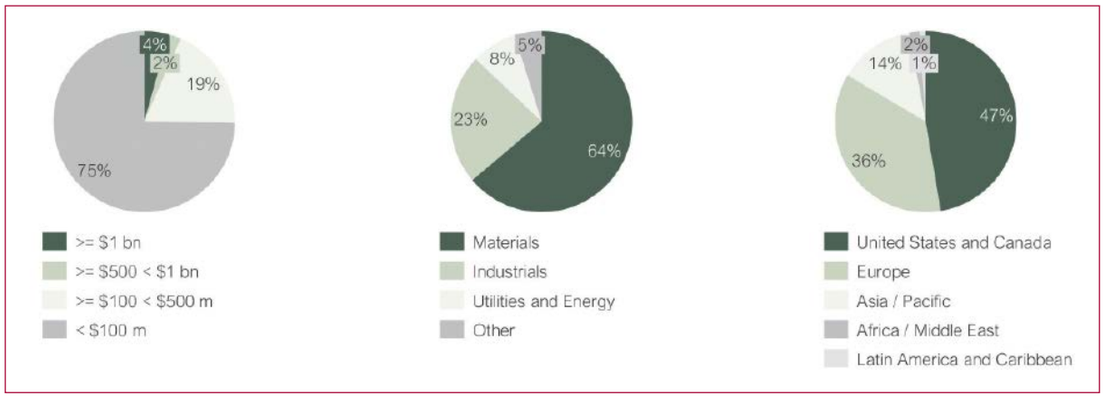

Fig. 2: Transactions in the chemicals industry by range, sector and region

Source: Capital IQ — Screening criteria: Keyword (Renewable, Sustainable, Recycling), Transaction Status (Closed), Percent Sought (>50%) and Industry Classification (Chemicals)

with a high entry hurdle for everyone. And it does not stop there, as valuations and prices for companies will be impacted by sustainability criteria. According to a recent study (Pitch Book 2020, "Sustainable Investment Survey"), sustainability is a key criterion to achieve improved and long-term results — it boosts attractiveness of companies and, subsequently, transaction values.

This, however, means that a showcase just here and there will not be sufficient anymore. To transform a business, more than that is needed — more than a few products and more than just a strategy. It often requires structural transformations. This entails the question of how much time remains for transition as well as whether the costs can be borne by a company on its own. Most companies will need to evaluate whether the "make"-, meaning in-house development, or the "buy"-approach, meaning acquisition of skills, technologies or supply chains, is the right way to go. An alternative to both approaches could be the merger of companies either to be able to accomplish the huge investments by risk sharing, or in order to concentrate parts of the supply chain under the same roof. Examples are chemical and waste management companies which optimize their value chain.

In this regard, M&A deals with sustainable aspects in the chemicals sector are on a constant level since the discussion gained traction. The greater portion of targets can be described as rather small, headquartered in the Western hemisphere with solutions mostly in materials and industrials sectors.

A value-generating transformation through M&A is an appropriate way to boost change while, at the same time, increasing the value of the company. Also, selling a company at the right time or merging it with another company is an option to climb the ladder of sustainability. These options must always be tailor-made and require a lot of industry expertise and business experience — locally as well as globally.

In addition, start-ups play an important role in a time where the chemical industry is striving for more sustainability. For them, the topic of a structured "exit value creation", early enough to develop a company towards the future exit of the current shareholders is often not considered or at least underestimated. Very often it is more common to "dress the bride" 6–9 months before the sales process starts. However, developing an M&A process under more strategic and mid-term aspects accompanied by professionals is a different approach — it needs a mix of combined M&A experience, business development skills and management experience from the outside.

Finally, finding the right targets in the sustainability space, either start-ups or established companies, requires a lot of experience and industry know-how combined with access to a global network of M&A advisors.

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A list of sources and references is available from the authors.

On the Way to Climate Neutrality

European Chemical Producers Invest in a Greener Future

The EU Commission's ambitious plan for a European Green Deal, launched shortly before the pandemic struck in early 2020, aims to make the continent the world's first climate-neutral region by 2050. The goals spelled out in January last year call for reduction of greenhouse gas emissions by at least 50% up to 2030, compared with 1990 levels. While green groups have pushed for even bigger cuts, others have expressed fears that this could cripple industry.

Europe's chemicals and energy industries are taking a pragmatic approach. Large companies as well as a plethora of smaller specialized firms believe Brussels' goals are indeed achievable, even in an age of uncertainty. This high-tech sector also has an ace up its sleeve, the necessary financial and technology resources to bring it off.

The industry can move swiftly forward and demonstrate leadership in innovating and deploying competitive new technologies for products such as solar panels, wind turbines, batteries, building insulation, medicines or chemical recycling technologies, Marco Mensink, director general of the European Chemical Industry Council (CEFIC) says. But to stem the "massive investment" the Green Deal will require, "it will need the right framework conditions to remain competitive during the transition."

Toward the greening of Europe, the EU Commission is prioritizing energy efficiency, focusing on fuels such as renewable hydrogen and sustainably produced bio-methane, as well as seeking to promote innovation in chemical processes, to reduce the overall environmental footprint of industry. To encourage innovation, Brussels is offering a carrot and a stick: financial incentives, along with a more ambitious regulatory framework that will require only minor adjustments to REACh.

Mensink notes that industry "will need massive amounts of renewable energy in future." To test the potential, CEFIC has signed a Memorandum of Understanding to collaborate on the RE-Source Platform founded by SolarPower Europe, WindEurope, The Climate Group and CDP (RE100) and the World Business Council for Sustainable Development (WBCSD), a European alliance of stakeholders representing clean energy buyers and suppliers. The platform pools resources and coordinates activities to promote a better policy framework for corporate renewable energy sourcing, at EU and national level, while raising awareness and facilitating business opportunities.

Producers Lead the Way with Examples

Before chemical producers can make truly sustainable products, the energy and feedstock balance has to be right. Two important focal points in the transition away from fossil fuels are electrification of crackers and use of more renewable feedstock. At BASF's recent Capital Markets Day, CEO Martin Brudermüller, who is currently president of CEFIC, gave a glimpse into how the world's largest chemical producer intends to "go green," building on the vast integrated network it calls Verbund.

For 2050, BASF has set itself the ambitious goal of achieving "net zero emissions." An interim step will be to reduce absolute CO_2 emissions by 25% by 2030, compared with 2018. While it's already technically feasible for integrated chemical producers to eliminate CO_2 emissions almost entirely, it's not yet economically feasible, Brudermüller stresses. This will be "an ambitious journey over decades," he says, "but we need to act now to get there."

Upstream, hydrogen will be an important driver. In a first move, BASF plans to make its own "green" hydrogen, starting with building a large water electrolysis plant at Ludwigshafen, due on stream in 2024. To harness other renewable energy sources, it is eyeing offshore wind parks and large-scale redeployment of waste heat from its chemical plants, the latter a project being pursued with Siemens Energy.

As part of The Cracker of the Future consortium, BASF, Borealis, BP, LyondellBasell, SABIC and Total are working on electric cracking as a means of reducing CO_2 emissions from ethylene production. Steam crackers, which break down hydrocarbons into olefins and aromatics, require enormous amounts of energy. Typically, the reaction is carried out at about 850°C, which requires burning large volumes of fossil fuels. But as the energy grid becomes increasingly supplied by renewable sources, the consortium members believe an innovative approach could be using renewable electricity to heat the furnaces, which also would help to decarbonize emissions.

The collaboration between the six petrochemical majors in the Northwest Europe "cracking corridor" is bound up with the region's Trilateral Strategy for the Chemical Indus-

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try being developed in cooperation with the Dutch national government, Belgium's Flanders region, the German state of North Rhine-Westphalia and the German, Dutch and Belgian chemical industry associations.

BASF and SABIC have also linked with Linde to develop and demonstrate solutions for electrically heated steam cracker furnaces and are evaluating construction of a multi-megawatt demonstration plant at BASF's Ludwigshafen site, to start up in 2023. They estimate the technology could potentially cut CO_2 emissions by as much as 90% compared with burning fossil fuels. The companies, which have already worked together on concepts to use renewable electricity, have applied for funding under the EU Innovation Fund and Germany's Decarbonization in Industry program.

"Cracking furnaces are one of the largest CO_2 emission sources in the whole petrochemical value chain," says Jürgen Nowicki, CEO of Linde Engineering. "This is a time-tested, optimized technology that we are now putting on a completely new footing, not in the laboratory, but on a large industrial scale."

In the Netherlands in addition to the US, Dow and Shell are working together to design and scale e-cracker technologies. Over the coming years, the companies plan to first try to prove any technological innovations in laboratory and pilot operations before scaling up to commercial crackers.

Driving the Renewables Revolution

Many European chemical companies have been pursuing plans to develop circular plastics, for the most part reprocessing soiled waste from municipal collection systems. Ineos Styrolution, to give one example, has developed styrenics recycling processes with satisfying results, but integrating these seamlessly into the production chain will take some time.

"To stem the massive investment the Green Deal will require, it will need the right framework conditions to remain competitive during the transition."

For its ChemCycling program, BASF is working with a number of companies processing waste into pyrolysis oil, which can be used to make near-virgin polymer. SABIC is partnered with chemical recycling specialist Plastic Energy, which has developed and patented a feedstock called Tacoil, derived from plastics waste classified as non-recyclable, and Austria's OMV has been working on a similar process to produce "ReOil".

Finnish refiner Neste is one of the principal architects of the European feedstock revolution, cooperating with chemicals and plastics producers, and in at least one case retail, to relieve the burden on the environment by removing and reusing non-recyclable plastic waste. According to estimates, only about a third of plastic waste is currently recycled, so there is considerable ground to be made up in order to meet the EU's ambitious targets for creating a circular economy. Rules implemented by the European Council in 2018, e.g., call for plastic packaging recycling rates of 50% by 2025 and 55% by 2030.

In autumn 2020, Neste reached an important milestone toward its goal, processing liquefied plastics waste for the first time at industrial scale, together with Belgian plastics distributor and compounder Ravago, which helped source the waste. The next processing run in the race to produce renewable feedstock is in preparation at Neste's fossil-fuel-fired refinery in Porvoo, Finland.

Big names are on the refiner's growing list of partners. Clariant is cooperating with Neste to use its renewable hydrocarbons to make sustainable solutions more accessible to a variety of industries, including plastics, hot-melt adhesives and coatings. DSM's engineering plastics arm is striving to replacing fossil fuels with recycled plastics waste, 100% bio-based hydrocarbons or a combination of the two. The Finnish company is also working with plastics producers and the Dutch holding of Swedish retailer Ikea to use its refinery residues in plastic home furnishings as well as production of renewable PP.

In a project not involving Neste, the UK's ReNew is preparing to build a chemical recycling plant at Teesside that would process end-of-life plastics into petrochemicals. With a throughput capability of 80,000 t/y, this would be the first plan to employ the Cat-HTR process, part of the catalytic hydrothermal liquefaction platform developed by technology supplier Licella, at commercial scale.

No Signs of Italy's Proposed Bioeconomy

Beyond petrochemicals, the European transition to renewable futures has been slower, though using agricultural resources to feed new production processes is seen as an opportunity. One major disappointment has been the hoped-for greening of Italy's plastics sector following the collapse of its petrochemicals industry. With its industry-leading biopolymer Mater-Bi, Novamont has swung from success to success, but Eni's plans to turn its plastics arm Versalis into a pillar of the green economy have mostly fizzled.

Even the acquisition of the remaining "green" businesses of insolvent plastics producer M&G has not helped Versalis. Eni CEO, Claudio Descalzi informed the workforce in March that decommissioning of the Porto Marghera petrochemical cracker will take place in spring 2022. No signs of the bio-cracker once being talked have materialized but Eni management has dangled a promise to create a new biotech corporate segment, which would see capital spending of more than €1.5 billion.

"Before chemical producers can make truly sustainable products, the energy and feedstock balance has to be right."

Dede Williams and Elaine Burridge, CHEManager

M&A Activity Will Continue, No Doubt!

Chemical Distribution Mergers & Acquisitions Activity in a Post-Covid-19 Economy

About this time last year, just when Covid-19 related lockdowns had begun to influence business and private life dramatically, everybody was anxiously looking at how mergers & acquisitions (M&A) activity in chemical distribution would develop. Looking back, one can say that the first quarter of 2020 was actually quite good with eight reported transactions. Not quite as good as Q4-2019 with 20 transactions though, and also not nearly as good as Q1 of the previous year with 13 transactions.

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But 2019 had overall been the most active year since the financial crisis of 2008/09 with an almost 40% higher activity level than the previous years on average. As transactions take some time to develop, all this was no big surprise. The work had mostly been done before travel and meeting restrictions cut in, so all that was left was to let the ink dry on the contracts, have a few drinks (an activity which had to be postponed in most cases) and then send out the press releases. Then things started to change quickly and significantly.

Chemical distributor M&A activity in 2020 was the lowest in seven years. But let us be clear, this is likely to be an exception. Activity levels did drop in Q2 and Q3 of 2020 to two and 11 reported transactions respectively. But later on things started to rebound. For Q4-2020 we recorded 15 transactions, one of the highest quarterly activity levels in history. In the last three months up to end of March this year, another 17 transactions were announced, nine of these in January alone. There is the theory that some of those transaction just could not be signed by year-end and where hence pushed into 2021. And most people agree, there is doubtlessly more to come.

Drivers of M&A Activity

A number of developments in the chemical distribution industry do have an impact on M&A activity. The various stakeholders have vested interests here. Let us start with customers and their needs. Customers and their' needs typically do not exert a strong influence on the level of M&A activity. The "formulator" companies that distributors sell the products to are typically interested in working with distributors that are reliable suppliers of a targeted portfolio of products fit for purpose, available locally on short notice, and marketed at a competitive price as well as attractive delivery and payment terms. Company size does not matter that much here, but other criteria such as scope, technical expertise, responsiveness or an understanding for the "small, local guy" do. So vis-à-vis distributor M&A activities the customers are sort of "neutral". Suppliers are different though. More and more chemical producers want to work with a distribution partner that can service a whole continent, rather than working with a long list of "local champions", a different one in each country, as it was often the case in the past. For these chemical companies a "reduction of complexity" is high on the list of objectives. M&A projects by their preferred distributors can help here, provided the acquisition targets are carefully selected, the projects are well executed and the acquired companies are thoughtfully integrated. In this context, the size (of a distributor) matters, particularly with regards to the need to have "critical mass".

How the incumbent population of distributors in a given geography / industry market combination thinks and how the individual companies position themselves is a big factor in M&A. The larger distribution groups that are stock exchange listed (e.g. Brenntag, DKSH, IMCD and Univar) or are owned by private equity investors (e.g. Azelis) have always looked at acquisitions to enhance their growth rates, both in terms of sales and operating profits. Over the last few years, a number of mid-sized companies have taken financial investors on board (e.g. Barentz, Biesterfeld, Caldic or Oqema) and then subsequently ramped up M&A activities. Access to financing is also no issue to these two groups of companies, as there is plenty of liquidity in the market that is looking for attractive investment opportunities that are exhibiting good returns. More than half of the transactions recorded in 2020 were done by distribution companies with a turnover in excess of €1 billion.

It should be noted in this context that our statistics may not cover small, local deals that have not been published in a clearly visible fashion in the European and/or North American trade journals or on the usually consulted "reference" websites.

Add to this category a group of mid-sized privately held or even family-owned distributors that have made selective add-on acquisitions in the past. Many of these companies have some very profitable years behind them and hence are sitting on well-filled war chests. However, this last group of companies tends to be a bit more conservative when it comes to the valuation of acquisition targets. Although this is in general a sensible attitude to have, it has let some of the potential deals fall apart in pre-Covid times, as the rather frothy expectations of sellers regarding transaction multiples were sometimes at odds with the willingness of potential buyers to cut a deal at these levels. The "dampening effect" of Covid-19 may bring some much-needed realism back into the discussions, particularly about mutually acceptable valuations, even if it is shattering the high hopes of potential sellers.

Guenther Eberhard, DistriConsult

Forecasts for Valuation Models are always an Issue

During the last 12 months, the task of performing valuations of acquisition targets did not get any easier. Although chemical distributors did generally very well in 2020, no company could really escape the effects of the various lockdowns, and economic uncertainty in general. Local logistics, at the core of any distributors' activity, held up very well though. Aggregated across different user industries, the business of distributors typically exhibited good resilience. But going forward and predicting future developments continues to be a challenge.

Additional sources of uncertainty, such as the (petrochemicals) supply disruption triggered by the bad weather spell in the US Gulf during parts of Q1 or the general logistics imbalances need to be factored into the respective calculations. Currently there is hardly a product group in the che-

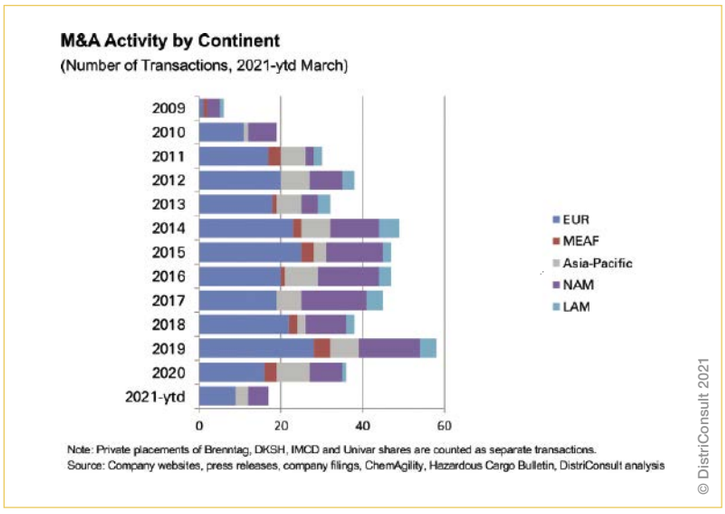

Fig. 1: M&A Transaction Numbers 2009 to 2021-ytd
M&A frequency in 2020 was considerably lower than in previous years; Europe is still the most active geographic region followed by North America.

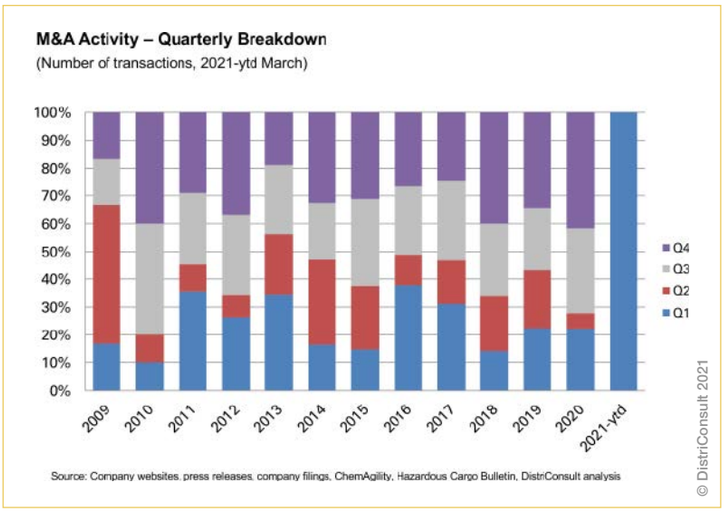

Fig. 2: M&A Deal "Seasonality"
M&A activity is typically very strong in Q4 of each year with a spill over into Q1 of the following year; this is particularly obvious in 2020/21

micals and polymers industry, where the supply situation can be considered as stable. Shortages and supply delays or disruption are more the norm than the exception. It will take a while before growth trajectories can again be determined with sufficient reliability. Until then potential buyers will be wary not to overpay and remain "sitting on the fence" for a while. Sellers may also want to wait a bit, so they are able to show an upward trend for sales and profitability again.

The Way Forward

Over the next 12 months, our view is that M&A activity will come back to the levels seen before the pandemic. On the buyers' side, the growth strategies put in place previously by the companies mentioned above mandate further action. Implementation is going to continue, often encouraged by suppliers. And financing is available too. Even some of the largest distributors still have some gaps to show when it comes to geographic coverage or industry (sector) participation. Those gaps are being systematically closed. Selective add-ons will therefore continue to be very interesting. There are many willing buyers, provided the target fits a given strategy and is otherwise attractive.

In this context, a comment on "distressed assets": Not that many companies really have the resources and willingness to solve other people's restructuring problems, although it cannot be excluded that some courageous companies will look out for such deals, to be done at a bargain price. But that would be an exception in our view.

On the sellers' side, the situation is possibly a bit more diverse. For many owner-operators of smaller distribution companies the question of succession planning has always been around. Sometimes individuals did not want to acknowledge that and have hence left decisions open for too long. But the effects of Covid-19 on business and society in general have got people thinking. The topic has come more into focus for many owners. And some will change their approach as they may decide on doing other things in the next phase of their life after all. Small companies, who tend to pride themselves of their agility and nimbleness, generally have fewer levers to pull when it comes to diversifying risk. Being part of a larger entity, a group of companies or even a global network can bring certain benefits here. Having more "stability" may be just what a business needs in volatile times.

As the overall industry outlook is getting a bit more predictable again, hopefully, over time recovery will morph into growth. The forecasts underlying valuation models will become more reliable too, giving both sides in a potential transaction the notion that they are getting an attractive deal at an acceptable level of risk. That will certainly help deal-making and drive further consolidation of the industry.

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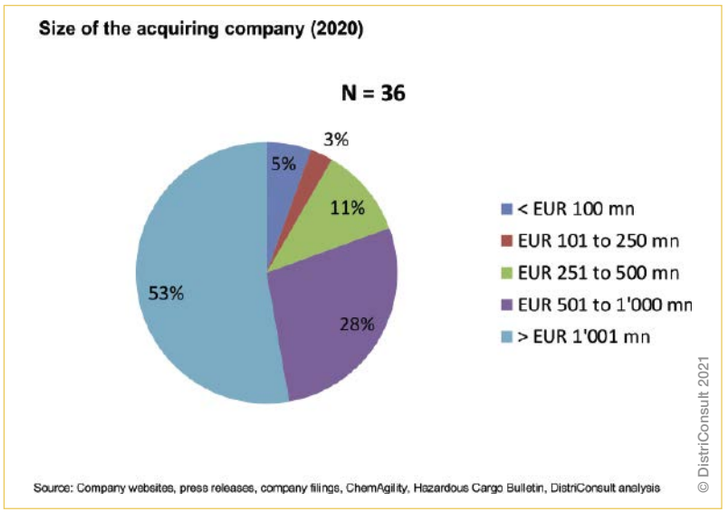

Fig. 3: Acquiring Company Size Breakdown (2020)
Companies with a turnover of more than €1,000 million p.a. account for more than half of the recorded Corporate Finance and M&A transactions.

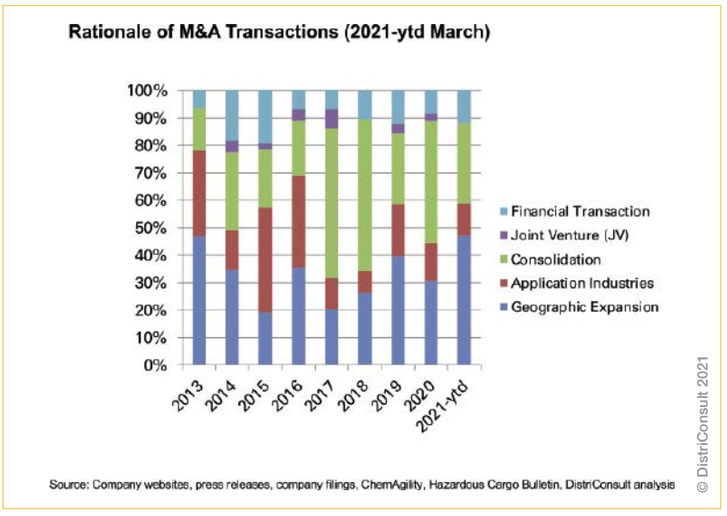

Fig. 4: Transaction Drivers 2013 ff
2020 was again more about consolidation, after geographic expansion as main driver during 2019.

Mergers & Acquisitions Are an Integral Strategic Component

How to Build or Maintain Critical Mass in the Chemical Distribution Industry

In the drive to reach growth objectives, or to maintain and enhance "critical mass", mergers & acquisitions (M&A) has been a theme for the chemical distribution industry for years. The industry leaders (by size and geographic reach) were all built through a series of such transactions. As the practice is further trickling down to the smaller and mid-sized company layer of the sector, and more distributors espouse external growth options, it is worthwhile to spend some time on a reflection of recent events in this context.

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Although M&A activity has been slowed down to some extent by the Covid-19 pandemic, the basic drivers are still relevant. Thus, it can be expected that industry consolidation will even be accelerated by the effects of the global lockdown that has been causing a global economic crisis, disruptions in international trade, production outages, and thus stressed supply chains.

Other factors such as the digital and ecological transformation of the chemical industry and its impact on value chains, trade conflicts, or Brexit will even increase the need to enhance critical mass and establish more widespread networks — and thus build more resilient businesses.

CHEManager asked executives and industry experts to share their views on the rationale for M&A activity in chemical distribution. We proposed to discuss the following aspects:

- Have the key drivers for mergers & acquisitions in the chemical distribution industry changed due to the Corona crisis?
- Will industry consolidation and thus M&A activity continue or even speed up after the Corona crisis?
- Do you want to play an active role in the industry consolidation, and if so, what is your strategy?

Read the insightful answers of the experts here.

Industry Consolidation Will Offer Opportunities

Christopher Erbslöh,
Managing Director, C.H. Erbslöh

"More industry consolidation may not be needed, but it will continue."

Growth in terms of turnover or volume is not our measure of success. We measure our success by looking at the solutions we can provide to our partners - customers and suppliers -. M&A might provide an option, if it helps us to gain resources or scope needed to provide solutions short term, which would otherwise take a long time to build. We thus tend to take a more opportunistic approach to M&A rather than having the buy-and-build approach as part of our core strategy.

C.H. Erbslöh and the LEL Alliance will continue with this approach, as we have a good set up for organic growth in our key geographic market, which is Europe. Other players in Europe will, however, continue to drive the trend for consolidation, not only in Europe, as their needs and strategies are rooted in different goals and philosophies. Especially stock-listed and investor-backed groups will continue and even accelerate their M&A activities globally, as they can only feed the hunger for ever growing profitability from their investors by increasing their geographical reach, and industries served, at a pace unachievable without acquisition. As long as the capital markets and interest rates do not change dramatically this will probably continue long-term, at altering paces.

More industry consolidation may not be needed, but it will continue, and it will offer opportunities to all distributors, suppliers and customers in the industry, no matter what their size. The winners of the consolidation process will be those that uncover the opportunities, find solutions, and turn them into successes.

Industry Consolidation Will Continue

Dennis Verhaert,
M&A Director, Azelis

"Covid did not slow down our M&A activity nor did it change our M&A strategy."

Not a lot has changed in this respect as the key drivers have remained the same. However, even though Covid is a global event, its timing and impact on economies and market segments have varied depending on the circumstances. As a result, some local champions exposed to a limited set of economies or market segments have been strongly affected by Covid. This has triggered a reflection in the market, with some smaller players seeing the benefits of being part of a global, more diversified, network.

We believe that industry consolidation will continue. The underlying drivers have remained the same, such as the trend to rationalize and simplify distributor relationships, market globalization, and increasing regulatory requirements. Covid accelerated the use of digital technologies and the expectations of principals and customers to have access to digital value-added services, such as online portals. Additional opportunities that evolve from new digital innovations will further drive consolidation. Azelis has been, and will continue to be, an active consolidator of the specialty chemicals distribution industry. Covid did not slow down our M&A activity nor did it change our M&A strategy. M&A allows us to accelerate growth with strategic principals, expand geographically and provide a more comprehensive product portfolio to our customers. Whilst being a global player, we will continue to act locally to serve local needs with an entrepreneurial mind-set and the desire to provide sustainable innovation and formulation services to our customers.

The Rationale to Grow through Acquisition Remains

Neville Prior, Group Chairman, Cornelius Group

"Many distributors have found organic growth to be difficult and this will reinforce their acquisition strategies."

The coronavirus crisis has certainly not diminished the will of acquisitive distributors to reduce their ambitions, and the previous rationale to grow through acquisition remains. This is likely enhanced as they seek „bargains" in the wake of economic difficulties, subdued consumer demand and as smaller distributors face the prospect of enacting digital strategies alongside the need to embrace environmental, social and corporate governance. Alongside this, investors and financial institutions have plenty of funding looking for a home, so those organizations with private equity backing or publically quoted have pressure from that direction and are actively exploring options. Many distributors have found organic growth to be difficult and this will reinforce their acquisition strategies.
In addition to these factors, it has become clear that a number of factors have changed the global scenario and distributors will need to adjust:
1. The face of consumerism has changed in the wake of Covid-19 with a focus on ethical and sustainable products coming to the fore.
2. Brexit has caused supply chain issues between the EU and the UK.
3. The crisis has exposed the fact that too much manufacturing is concentrated in very few counties, and in particular China.
4. Geopolitical tensions are leading to an enhanced East-West divide.

This will lead distributors to require more local presence and hence drive further along the acquisition trail.
Like every distributor, Cornelius is considering what the future looks like and whether acquisition plays a part. Whilst we will not be looking to a multi-acquisition strategy, we will consider opportunities that play to our strengths and that make strategic sense. This would not divert us from an organic growth strategy, after all, our principals want to see us growing their market penetration and ensuing sales growth.

M&A Is an Integral Strategic Component

Christian Kohlpaintner, CEO, Brenntag

"The industry consolidation is primarily driven by factors irrespective of the Corona crisis."

The industry consolidation is primarily driven by factors irrespective of the Corona crisis. The most significant of which are a highly fragmented marketplace, favorable profile for the distribution trade, and inexpensive financing. Thus, industry consolidation will continue.
And Brenntag will take an active role in this as it is an integral component of our overall growth strategy. We will continue to allocate some €200–250 million for M&A per year and sharpen our focus towards emerging markets and Asia, in particular China. We want to grow in selected industry segments and strive to identify targets delivering a more sizable operating EBITDA contribution. In 2021, we already started executing this approach with signing an agreement to acquire Zhongbai Xingye, a specialty food ingredients distributor in mainland China.

Consolidation in the Chemical Distribution Market will Continue

Thomas Dassler, Managing Director, Häffner

"The pandemic showed how resilient the business model of most chemical distributors was."

The key drivers for M&A in chemical distribution did not change significantly as a result of the Corona crisis. On the contrary: the pandemic showed how resilient the business model of most chemical distributors was, due to their high level of diversification and flexibility.
While business volume in the textile cleaning and automotive paint and coatings sectors suffered major setbacks during the first wave, characterized by numerous and widespread factory closures, other market segments such as life science (food, raw materials for disinfectants) continued to generate exceptionally good earnings.
Since April 2020, the EBITDA multiples of chemical distributors stocks more than made up for their initial Covid-19 set-back. The segment currently trades well above 12x.
In particular, distributors with innovative as well as sustainable and specialized products are currently achieving record multiples. Companies that are heavily dependent on the automotive industry are presently experiencing below-average valuations.

The consolidation in the chemical distribution market will continue. In addition to the product portfolio, as well as exclusive partnerships with suppliers, customer base and segments, strategic coverage and geographic location are important factors in the selection of a potential acquisition target.
The Häffner Group strives to achieve its organic growth by further developing its strategic business fields in close cooperation with our customers and suppliers.
At the same time, we are always on the lookout for strategically suitable acquisitions in Germany and abroad to accelerate our growth.

M&A Activities Are a Key Growth Driver

Thomas Sul (top) and Natale Capri (bottom), Co-Heads Business Unit Performance Materials, DKSH

"Specialty chemical distribution is, in fact, grow ing fast[er] than chemical production."

"Leading listed and private distributors are focused on M&A activities as a key growth driver."

M&A activities in the specialty chemicals distribution industry have accelerated considerably in the past years. After a Covid-related dip in early 2020, we saw M&A activities picking up and, since last autumn, accelerate faster as both strategic and financial buyers actively pursue transactions.
Specialty chemical distribution is, in fact, growing faster than chemical production and leading listed and private distributors are focused on M&A activities as a key growth driver.
We expect this trend to continue as there is ample room for consolidation due to the fragmented market structure. The main reasons driving further market consolidation via M&A are regional cross-selling opportunities and an increasing need and scalability of value-added services such as regulatory compliance, advanced technical and formulation expertise, digitalization and transparent reporting.
We at DKSH are a pure specialties player with a blanket coverage of Asia and Western Europe where we serve over 30.000 customers. We have a strong presence in life science as well as in industrial chemicals and are entrusted by many of the global leading players in chemicals and ingredients. Our team is continuously scouting for M&A opportunities that are complementary to our setup. We don't buy for size and will only acquire if there is a strategic fit. Over the last 10 years we have completed seven acquisitions, the last one being Axieo in Australia and New Zealand, our largest acquisition to date. Axieo was fully integrated after 7 months even during the pandemic and has been performing very well.
With a strong and healthy balance sheet and experienced management team, we are confident to further expand our organization with M&A in the future to provide even better services for our suppliers and customers through cross selling, more value-added services and innovation through our extensive network of formulation labs.

Chemical Distribution Industry Proved Remarkably Resistant

Thorsten Harke,
President, Harke Group

"We do not think that economic difficulties will be the decisive driver for further M&A activities."

We think that the key drivers for M&A activities in the chemical distribution industry are still intact, ranging from completing product programs, adding technical expertise and regional coverage for offering better services to customers and principals up to increased efficiency and productivity.
Chemical distribution industry proved remarkably resistant against the Corona crisis up to now. Hence, we do not think that economic difficulties will be the decisive driver for further M&A activities. Yet, with the Covid crisis, central banks are currently virtually flooding the markets with cheap money, which will surely push M&A activities further as people are looking for investments, with loans for M&A projects being cheap currently, driving up transaction prices (inflation).
However, one has to be aware that the phase of exceptionally low interest rates will not last indefinitely and might reverse in the not-too-distant future, at which point of time not only M&A markets, but also chemical markets and the economy as a whole will strongly consolidate. This means the risks of M&A transactions are increasing with the high prices being paid, and a strong consolidation is to be expected eventually when interest rates will rise again. With the currently dramatically rising raw material prices, freight rates, etc. all over the world, this might happen soon.
Therefore, we continue to look actively for acquisition opportunities, yet are becoming more careful and selective, the higher the price-earnings ratio is rising for these acquisitions. Our management philosophy is long term oriented, and therefore the achievable synergies and strategic value of these transactions have to rise together with the higher transaction prices, in order to allow us to remain profitable also at times, when the artificially created, inflationary boom is turning to the usual bust.

Corona will Have Little Influence on Consolidation

Peter Stockmeier,
Managing Partner, Stockmeier Group

"Consolidation will continue and the current Corona situation will have little influence on this."

At the beginning of the Corona crisis, Stockmeier decided to put all ongoing M&A activities on hold in order to see the impact of the pandemic. Fortunately, the past business year was very successful, allowing us to resume our activities in this area.
We expect the consolidation in the world of distribution will continue and that the current Corona situation will have little influence on this. The requirements for our industry through regulations such as the Biocide Regulation, but also topics such as sustainability, supply chain laws, etc. are increasing. In addition, we are investing in the area of digitalization. All this causes costs that are easier for a larger unit to handle.
Stockmeier has shown successful growth over the last 2 decades, both organically and through various acquisitions. We will continue this course and further expand our strong position in the European chemical distribution market. As a family-owned company, we want to be a reliable partner for our principles and customers operating throughout Europe, and we will continue to strive for this goal on a long-term basis.

Key Drivers for M&A Have not Changed

Frank Schneider,
Member of Group Executive Committee, IMCD

"The accelerated digital transformation has facilitated the creation of new opportunities."

The key drivers for mergers & acquisitions have not changed for the chemical distribution industry. This has always been a market with great consolidation potential. In 2020 and during the first months of 2021 we have seen a very dynamic business environment for the chemical distribution and the chemical industry overall.
A crisis typically brings new risks and challenges, and Covid-19 indeed has affected day-to-day business processes as well as M&A activities. However, the accelerated digital transformation that we have seen in the industry, but also within our company has facilitated the creation of new opportunities. In IMCD's case, it fast-tracked the identification of targets and the initial contact through to the due diligence and closing.
How and if there will be a sustained effect from this crisis, is hard to judge. However, we do not expect M&A activities to slow down in the future. For IMCD, mergers & acquisitions are a central element of our growth strategy. We will continue to strive to strengthen market segment positions and to drive geographical expansion on our way to rapidly globalize our network.

Consolidation will Pick up Speed

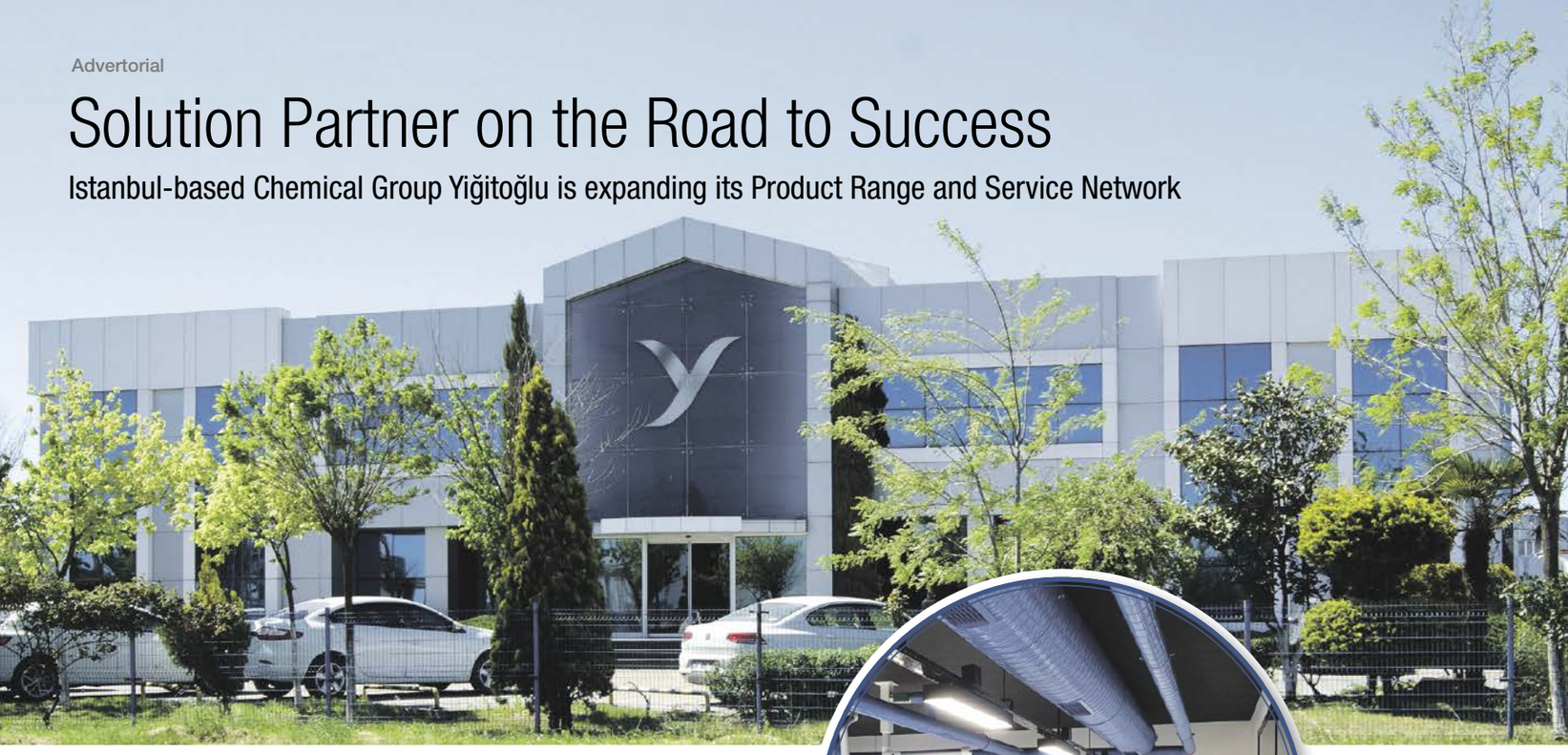
Felix Thalmann,
CEO, Büfa Group

"A company must remain adaptable — this also means investing and disinvesting in other companies."

The Corona pandemic is having an impact on all areas of our lives. Many topics such as sustainability, digitalization, innovations and also the topic of consolidation will have an even higher priority after the global crisis than before.
Consolidation will pick up speed because economies of scale and good local as well as global networking will become increasingly important. Irrespective of the industry, a major consolidation push will set in; global players will partially take over niche players. This is because the pandemic has exposed the weaknesses of companies and accelerated negative developments in some businesses. Particularly where the consequences of the corona crisis are not yet fully foreseeable, such as in smaller or medium-sized companies, the challenging economic situation will lead to a corporate change.
World trade will not decline after the pandemic, but it will change permanently. Global supply chains are fragile, so they need to be constantly improved and made more secure. Alternative options and routes, such as the Silk Road, need to be built. Basically, companies will adapt their supply strategies in order to position themselves for the future. A company must remain adaptable — this also means investing and disinvesting in other companies. There will also be some new companies that will master new challenges with innovation and flexibility. Presumably, the agile start-up scene will also emerge stronger from the pandemic.
As a traditional and family-owned company, Büfa recognized early on that it would have to be flexible in meeting the faster pace of corporate change. With our three business divisions operating in the chemicals, cleaning and composites sectors, we are broadly positioned. In addition, we invest in innovative ideas and companies and we actively participate in consolidation processes in various areas. Partnering with other market players will also become increasingly interesting in order to position ourselves in a versatile way, to combine forces, utilize synergies and ultimately to be better able to absorb crises.

Solution Partner on the Road to Success

Istanbul-based Chemical Group Yiğitoğlu is expanding its Product Range and Service Network



Yiğitoğlu, the family-run Turkish chemical manufacturing, distribution and logistics services group that started commercial activities in 1956, has set out to expand its geographic footprint.

Headquartered in Istanbul, the group's service network spans across Turkey with regional directorates. Seven warehouses provide customers with smart storage technology and 85,000 sqm of storage capacity located in the most important industrial zones in Turkey. In addition, the network already includes an office in the Shanghai province in China, and with the vision to extend its business to a global scale, the Group is about to open representative offices in Moscow (Russian Federation) and Dubai (UAE).

Growth Strategy 2030

Besides geographic expansion, Yiğitoğlu also drives organic growth. In December 2020, Emrullah Yiğitoğlu, chairman of the board, announced the future global growth strategy. It is based on a diversification program and has already been implemented by adding a fully owned production facility for the manufacturing of hot-melt adhesives to the company's Çorlu plant.

Marketed under the name "MyAdhesive", Yiğitoğlu will engage in the hygienic, packaging & labelling and mattresses industry sectors with the newly formulated range of hot-melt adhesives. The multi-million US-dollar investment marks only the beginning of a new era the company is ready to embark on. "More than 60 years of history have given us the recognition and reliability needed to shape the future and add a new dimension to our product portfolio" said Emrullah Yiğitoğlu. ''The distribution business model however will change to exclusivity with dedicated regional account managers and further activities will be added on soon" states Emrullah Yiğitoğlu.

Distribution hubs in Çorlu, Antalya, Izmir, Mersin and Bursa, laboratories, the office in Shanghai as well as an e-commerce trading platform currently under development bring the corporation closer and faster to their partners around the globe. "We trade the world's best raw materials from global leading manufacturers, and we are now adding our own brand to prepare the future for our corporation" said the company's chairman.

From its headquarters in Çorlu, west of Istanbul in the European part of Turkey, MyAdhesive is clearly targeting growth opportunities in international markets , with a focus on consumer products. The company strives for excellence and recognition in mature and emerging markets with smart solutions in industrial sectors of adhesive components. By applying European technology, global entrepreneurship, high-tech solutions, electronic trading and a global distribution network the company will ensure success around the globe.

Vision

Yiğitoğlu, with its skilled, highly loyal, and virtuous employees who have adopted the organization's vision, aims to become an institution, that along with its products and quality will also provide continuous benefits by its working methods and values as well address the world market by its sustainable development.

The services and products the group has been consistently offering in two categories, being "Professional Cleaning Products and Systems" and "Chemical Product Groups", ensure that the name Yiğtoğlu is used synonym with quality and reliance.

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myAdhesive Smart Solutions

yiğitoğlu

Ensuring Value and Efficiency in the Supply Chain

Chemical Distributor Barentz Has Proven to be Resilient to Overcome Unforeseen Circumstances

A global life science ingredients and specialty chemicals distributor established in 1953 in Amsterdam, the Netherlands, Barentz today employs around 1,500 people worldwide and operates in more than 60 countries. With an annual turnover of €1.65 billion the group specialized in pharmaceuticals, personal care, and human and animal nutrition has a strong presence in EMEA and Asia-Pacific and a rapidly growing presence in North America and Latin America. Ralf Kempf interviewed CEO Hidde van der Wal about the company's performance in 2020 and latest strategic developments.

CHEManager: Mr. van der Wal, the Coronavirus pandemic, combined with old and new trade conflicts and increasing protectionism, is putting stress on chemical supply chains. How has Barentz, with its global presence, weathered the impact of this crisis so far?

Hidde van der Wal: In a global economy there is a high probability that you will be affected by local regulations, currencies, weather conditions, crops and so on. In our 65+ years existence we have experienced many crises and developed very solid supply chains with forecast models to ensure we have enough inventory to overcome unforeseen circumstances. As a result, we see opportunities instead of strain on our supply chain.

The impact of the crisis has reached a few verticals but in our total life science ingredients and specialty chemicals distribution portfolio, we have reached a double-digit growth in our 2020 turnover. In the past we have experienced similar situations and in the last decades, we have proven to be well prepared and resilient.

What measures have been taken to enhance the resilience of your supply chains? As global crisis management often requires a regional perspective, the company might be well-prepared with its locations in more than 60 countries.

H. van der Wal: The strength of a distributor is the art of being flexible in your operations. We customize our supply chain per region and adapt to local habits enabling us to serve our customers at their required location. This allows us to deliver to our customers within 24/48 hours in each region.

Do you think that supply chains will be organized differently in the future as a result of the Coronavirus pandemic?

H. van der Wal: We prefer the best-in-class principle and aim to improve our supply chain and logistics ser-

Hidde van der Wal, CEO, Barentz

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vices each day. We strive for precision so that we meet the different levels of service for our customers and suppliers. We customize our supply chain and deliver what is agreed. Through our knowledge of our customers and the local and regional markets, we can support them with rolling forecasting, clever algorithms, and intelligent IT support. Our objective is to support and relieve customers whilst ensuring value and efficiency in the chain for our partners.

What, in your opinion, are the most important current market trends in chemical distribution and what is driving them?

H. van der Wal: Legislation makes many things in different parts of the world more complicated, making it more complex for smaller distributors. It is not only REACh but also climate change, emission controls and new ways of generating energy which create new standards and demand for continuous adaptations. We aim to comply with the ESG rules to help our suppliers and customers identify material risks and growth opportunities.

In addition, we have also seen this contribute to a strong consolidation in the market. At Barentz we seek to be one of the consolidators to help guarantee global leadership and responsibility in the life science distribution chain. This creates value for our stakeholders, our customers, our suppliers, our employees, and our communities.

What are the biggest challenges caused by the digital transformation of the industry and how do you tackle them?

H. van der Wal: As a society we are learning more and more of what digitalization means, and each industry needs to adjust and adapt to the changes and developments. It is important not to ignore digitalization and to be active in finding digital solutions and dare to embrace change. The challenge is finding the right digital footprint. Creating our digital future is like running a marathon. We are constantly monitoring the end result and celebrating the split times. We recently launched a fully automized e-sampling system in Europe, that guarantees delivery of samples within 24 hours.

Barentz has recently expanded its global footprint with partnerships and acquisitions. What have been important steps and what are you planning in the near future?

H. van der Wal: We strive to grow our business organically with more than five percent per year whilst ensuring we serve and meet our customers' and suppliers' interests. Just recently we announced the opening of our office in Argentina, following the appointment by Roquette Freres as their strategic partner in Argentina for all human nutrition and pharmaceutical ingredients businesses. Roquette and Barentz have been working closely together for many years in several countries by developing distribution channels backed up by technical expertise. The opening of the Argentinian office is aligned with our strategy to further grow in the South American market.

Besides this we have a selective but active buy-and-build strategy to create global leadership in the life science distribution market. This allows us to strengthen our existing geographical regions and to develop new regions. A great example is the recent acquisition of Maroon Group in North America in December 2020.

> *"We have a selective but active buy-and-build strategy to create global leadership in the life science distribution market."*

In today's competitive global market, chemical distributors strive to increase their significance in the chemical value chain by becoming innovation partners for their principals and customers. How do you adapt your business model to the changing market environment?

H. van der Wal: I really believe we have been a frontrunner in developing and formulating solutions for our customers using ingredients from our principals. We strongly support our business with almost thirty application labs and dedicated technical experts. We continuously develop and support new trends which has led to at least twenty percent growth potential per year. It is important to forecast future needs and even more important to know how to adapt and change your team to the new and fast changing future.

What is your vision of the future of the chemical distribution sector? What role will distributors play in the chemical value chain, also considering the prevailing circularity concept?

H. van der Wal: Our core business is distribution and creating value in the chain which includes sales, marketing, stock management, new product development, formulation, regulation, product registration, new business development and legal services. All these services create enormous value for customers and principals. This will not change, but the road to the future will. We need to continuously adjust to stay in line with 'now' and the future. By including circular concepts, e-concepts and by lowering emission footprints, we will optimize our value and become a very significant and important element in the total value chain. We are not afraid of the future, we welcome the 'new' and will move into the right direction to support and strengthen our business.

www.barentz.com

How Chemical Companies Can Beat Customer Churn

Six Key Areas to Focus on and Keep Customers Content

The chemical industry is at a crossroads: customer behavior and needs are changing, and chemical companies must rethink how they do business to meet shifting expectations. Accenture's B2B Customer Insights survey identified six key areas chemical companies can target to keep their customers satisfied and drive growth. By doing so, they can beat customer churn and build better relationships with their buyers.

When it comes to choosing a chemical vendor or supplier to work with, today's B2B customers are increasingly focused on product quality and the level of service on offer. But our research shows that to maintain competitiveness, chemical companies must rethink how they do business. Most are already aware of challenges in this changing landscape: 78% of chemical companies are concerned about losing their customers.

Business customers now expect more — and they're willing to pay for it. Our global research on buyer values found that 46% of customers would pay notable price premiums (at least 5%) if all their needs were met. About 56% of them would make sizable increases (over 10%) in purchase volumes. Buyers want tailored solutions at scale from trustworthy and transparent providers. To keep their clients content, chemical companies should innovate the entire customer experience. In the past, account management, long-standing relationships and price were the most important factors. Today, the biggest driver of customer churn is a below average commitment based on traditional channel management and price instead of value focus.

To prepare for the new reality of providing value in the digital age, chemical companies should seek an immediate alignment of go-to-market and customer expectations. This will pay dividends in the short term. It will also help boost the mid-term shift to a digitally powered organization. Targeting the six key areas outlined below will help chemical companies keep B2B customers engaged and content with both the products they purchase and the service they receive.

1. Experience, Expectations & Loyalty: Tailored Solutions Are Key

Customer behavior and demands have shifted. Failing to respond to these changes can be very costly: 58% of buyers said they would change providers if their preferences were not met. Chemical companies must build and foster relationships with customers through tailored solutions delivered at scale. Indeed, more than a third of respondents to our survey rank the flexibility to tailor solutions to specific customer needs as the most important key buying factor.

Götz Erhardt, Accenture

To boost relationship quality, chemical companies must also establish trust and transparency. This can be best achieved by investing in R&D with an understanding that this encompasses not only chemical products but also services and new business models in response to evolving customer needs.

Timely, consistent, and reliable communications remain a very important facet of customer experience. This cuts across (digital) communications and sales channels such

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as distributors and agents in terms of support throughout the entire buying cycle — from inquiry to after sales technical service and trouble shooting. Leveraging a well-designed channel mix and architecture can massively reduce churn. While automated solutions such as chatbots can help, it is vital that, e.g., conversational AI engines and other digital assistants are trained and managed properly just as much as direct sales and service employees.

2. The Changing Market Landscape: Value Is no longer Decided by Price

Product quality and customer service are the most important key buying factors. Almost half of chemical companies (46%) say they're struggling to get these right and fear competitors could surpass them. Additionally, 56% of buyers said they could switch to alternate materials, including those from outside the chemical industry, if a product did not meet their standards. Chemical companies must double down on quality while greatly expanding the scope of their customer service.

Value is no longer decided by price, but by creating individual experiences and solutions. Service quality and reliability are valued most regardless of the company's size. A notable exception are large companies which are primarily influenced in their decision making by product and solution quality. They often take high quality interactions and convenience as a given.

Smaller companies tend to be more price sensitive while larger businesses are more driven by loyalty. Chemical companies can satisfy both through subscription-based models for services and products, using a dedicated digital platform for purchases, support and more. New entrants in this field include platforms like Chemondis or Knowde as well as e-commerce players such as Alibaba, which are increasingly drawing volumes and building out digital features as well as experience-driven interactions.

3. Moments that Matter: Human vs. Digital Self-Service

Even before the upheaval of last year, interactions via digital channels were on the rise. During the first 6 months of 2020, there were approximately 52% more interactions via digital channels than human interactions. The pandemic has spurred this on as restrictions made business as usual almost impossible. Chemical companies can capitalize on this by introducing more frequent, positive, and proactive touchpoints across the customer lifecycle.

While chatbots and other automated solutions can help here, human interaction is still necessary. It's a vital component of customer satisfaction in the post-digital age. The moments that matter most for customers all continue to be high human touch. Chemical companies should look to digitalization to drive efficiency in routine and low-touch interactions while focusing the high-touch human interactions on the decisive moments for customer satisfaction. Among these are newly developed products and services which can make a difference regarding loyalty. Multichannel experiences with both human-agent and digital service channels solve the issue of preference as customers are able to use a variety of channels for communication.

4. Dedicated Access and Account Management with Digital Support

The prevalence of dedicated account management is decreasing with just 29% of respondents leveraging an individual or team to handle sales and service requests or transactions. Even when utilized the frequency of interactions is relatively low: more than two thirds connecting directly with customers only on a monthly to quarterly frequency. The reason for the diminishing emphasis on dedicated account personnel is simply that customers expect access to all relevant information through the chemical company's digital platforms.

Technology can be used to streamline interactions through platform-based customer portals. These should provide a full range of ordering capabilities, including automated transactions, and permit faster electronic "conversations". This will allow customers to access up-to-date information and receive immediate feedback about requests online. Automated after sales services can handle customer interactions 24/7 through a variety of channels, ensuring queries are always answered.

Sales and service representatives can drive value for buyers by targeting specific needs through the identification of new products and services such as automated replenishment, higher efficacy, CO_2 reduction, better lifecycle performance and circularity to name only a few. Sales and service employees at chemical experience leaders are knowledge masters who keep their customers up to date with the latest advances. Our research found that there is clearly room for improvement as only one third of customers are satisfied with their experience of proactive support.

5. Priorities and Influencers: The Importance of Reputation

The time has come for chemical companies to take a decisively customer-orientated stance and leverage their external community influence rather than being contempt with their internal reputation and mediated reports of customer satisfaction. Our research notes that external brand reputation is highly important for buyers when selecting a chemical supplier. Other factors, like internal opinions, reviews from co-workers and past performance have less impact.

The days when price was the most influential factor are long gone — cost savings also have little influence on decision making. However, returning customers are less likely to stick with a chemical company if they have experienced any critical issues with products or services. In such cases, it will take significant measures to keep the purchaser from switching to another company — 81% of customers would expect a discount of up to 25% to prevent them from switching.

6. Technology Innovations: Applying the B2C Playbook

As part of our research, we investigated the investment in and focus areas of technology innovation as key pillar of taking the business customer experience to the next level. Most companies know tech innovations are a must-have — 66% of chemical companies believe new technologies can help them get customer centricity right and boost profits by more than 10%.

Chemical companies that lead with experience are increasingly implementing technology innovation across the entire buying cycle. In a nutshell: they have started to apply the B2C playbook. And they are now providing experiences that business customers truly value. Nevertheless, the journey has just started for chemical firms to match well established B2C experiences in the business-to-business realm.

Business customers of chemical companies are willing to pay more for experiences that boost value. The majority of respondents indicated a willingness to pay for features such as reduced search times, shorter order lead times, digitalized technical support as well as better (and digital) access to new products and services. If these requirements can be fulfilled a good return on investment in developing new customer experiences can be expected. Moreover, there are additional opportunities to build better partnerships with B2B customers by way of new technologies. For example, blockchain can be used to establish records transactions between chemical suppliers and buyers in a secure way to create a single source of trusted data. Likewise, 24/7 AI-powered customer service enables higher levels of data-driven service quality and can massively reduce churn rates.

However, 74% of chemical companies are already facing data-related challenges. They have either got too much, too little, or poor-quality data. To solve these issues, they must commit to being a data-driven organization. Dedicated analytics teams can make effective use of the large volumes of data typically available to chemical companies by extracting deeper insights that power better decision making.

Conclusion

Changing customer behaviors, needs and demands are forcing chemical companies to rethink their organizations. By focusing on the six key areas described above, chemical companies can rise to the challenge and build closer relationships with customers and deliver even greater value. This will help them stay competitive now and in the future.

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Integrating Science and Creativity

Acquisition of DuPont Nutrition & Biosciences Extends the Portfolio of IFF into the Pharma Market

On February 1, 2021, DuPont's Nutrition & Biosciences business (N&B) officially separated from DuPont and merged with International Flavors & Fragrances (IFF). Now, the new IFF offers even more innovative solutions beyond flavors and fragrances. With 2019 pro forma sales of more than $11 billion the US company is a global leader in ingredients and solutions for global food & beverage, home & personal care and health & wellness markets. Michael Reubold asked Dago Caceres, Global Strategy Manager for Pharma Solutions at IFF, about the strategy ahead for the company and its pharmaceutical division in particular.

CHEManager: Mr Caceres, as a global supplier of consumer ingredients, the new IFF seems well-positioned to unlock value for customers. In a nutshell, which solutions and products does IFF offer?

Dago Caceres: IFF offers a broad portfolio and capabilities that integrate science and creativity, to bring great value to our customers. Thanks to our newly expanded portfolio and capabilities, we have already discovered multiple connection points amongst the four business divisions Nourish, Scent, Health & Biosciences, and Pharma Solutions.

The division Nourish combines IFF's Taste division with N&B's Food & Beverage segment and offers enhanced capabilities to provide innovative solutions to food and beverage industry manufacturers.

Scent creates and pioneers fragrances, scent solutions and cosmetic actives across the fine perfumery, personal, fabric and home care industries.

Our division Health & Biosciences is one of the most advanced biotechnology platforms in the world and

Dago Caceres, Global Strategy Manager, Pharma Solutions, International Flavors & Fragrances (IFF)

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works closely with customers to deliver safer, healthier, and more sustainable solutions for products and their processes.

And Pharma Solutions, which has increasingly innovative capabilities in the pharma and dietary supplements market due to the complimentary portfolio we are now bringing to the table, provides excipients, ingredients, and technologies to support pharmaceutical and dietary supplement customers in a highly regulated industry.

What is N&B bringing to IFF in terms of products, applications, and market presence?

D. Caceres: It is well known in the industry that many of the active pharmaceutical ingredients or active nutraceutical ingredients in the market today have unpleasant sensory attributes, like bitterness or gritty mouthfeel. Previously, we had limited capabilities in curating the overall sensory experience, as our emphasis was on excipient performance to produce high-quality medicines, mainly in oral delivery forms. Our portfolio offers taste making capabilities, particularly for tablets and capsules.

Now, our expanded portfolio helps broaden our capabilities, especially when developing patient-friendly alternative delivery formats, such as liquid suspensions, gummies, and orally disintegrating tablets — just to name a few. A pleasurable sensory experience is a critical component for dietary supplement products on the market, and it has become a progressive focus within the pharmaceutical industry as well. Drug manufacturers are seeking ways to increase patient compliance — especially for drugs tailored to pediatric and senior populations.

Our elevated portfolio, capabilities and expertise in the flavors and taste masking arenas provide endless opportunities for drug and supplement manufacturers. It is early days after the integration of the two companies, but we have already witnessed strong customer interest to better understand how the heritage N&B and IFF portfolios intertwine to bring differentiated offerings to customers.

In which areas do you expect significant synergies, for instance in R&D, market approach or geographic presence?

D. Caceres: There are multiple examples and areas where we do expect significant synergies, but three in particular come to mind:

First, from the geographical standpoint, Pharma Solutions' ability to introduce to pharmaceutical and dietary supplement customers the breadth of offering that IFF brings to the table to improve the overall patient experience. There are certain geographies where Pharma Solutions has been historically strong and regional customers can benefit from the expanded portfolio.

> *"IFF's portfolio provides Pharma Solutions with multiple opportunities to work with other divisions."*

Second, from the technology standpoint, there are multiple opportunities to provide more holistic solutions to customers that would allow them to differentiate in the marketplace. The key will be to prioritize and work on the ones where we see the strongest market pull.

Last, there is a lot we can learn from each other in terms of best practices to improve the overall customer experience.

Pharma Solutions is not an isolated business unit within IFF. On the contrary, IFF's portfolio provides Pharma Solutions with multiple opportunities to work with other divisions to develop even more advanced, marketable products. Each business division may lean on the other to leverage and better understand our customers' needs.

Having said that, our participation in the healthcare industry is also a strategic component to the IFF portfolio as a whole — since the merger, our participation in the healthcare market has only expanded and strengthened.

How much science is involved in your R&D efforts as compared to customer-focused, application-oriented innovation?

D. Caceres: It is a balance, and getting that balance right is critical. We have the capabilities and fundamental science knowledge to develop disruptive excipients and ingredients that are novel to the pharmaceutical industry. Having unparalleled solutions in our portfolio allows us to advance ground-breaking scientific discoveries.

However, listening to customers is also a priority. Customers often desire minor modifications to their existing products or want to thoroughly understand excipient functionality and how its properties will affect their own processes. A few decades back, the focus on the excipient's contribution to the final drug's overall quality was relatively low and emphasis was given to the active pharmaceutical ingredients. Today, excipients are playing a more prominent role, and customers want to understand their functionality and how the variability of our products affect their formulation robustness. From that perspective, we continue to develop intimate knowledge of ingredient functionality to carefully modify products based on customers' specific goals.

One last point: the fundamentals in the pharmaceutical industry are quality, reliability, and consistency — that is not going to change. The higher quality you have, the better control you have of your product to provide performance consistency. And the more reliable you can be as a supplier, the better positioned you will be with customers. With IFF, our emphasis on those three criteria is — and will continue to be — remarkably strong.

In addition to customer needs, which market trends are driving your business activities and growth?

D. Caceres: As mentioned, the emphasis on quality, reliability and consistency are paramount, especially through a global pandemic. Each ingredient in medications and treatments must be scrutinized and delivered according to the highest quality and compliance standards.

There are three other important drivers for business growth. The first one is the cost-in-use of excipients. We provide innovative offerings to ensure customers are using our excipients in the most successful, cost-effective way for large volume drawls. For example, in tablet production, granulation is a time-consuming technique that can potentially result in product cross-contamination and loss — making this a costly method. Our advanced polymer portfolio enables matrix tablet manufacturing via a direct compression process, which is a less complex, more cost-effective way to produce high-quality tablets.

The second key driver is differentiation. We work closely with customers to help target specific delivery systems and develop tailored applications to succeed in a competitive market. For example, we have a number of advanced analytical capabilities at our disposal to openly collaborate with customers and assist according to their specific needs. Helping customers stand out with an effective, high-quality product is critical to expanding not only their business growth, but ours as well.

> *"The fundamentals in the pharmaceutical industry are quality, reliability, and consistency – that is not going to change."*

Biotechnology continues to become more relevant in pharma, and we see high potential for science-driven technology providers like us to make existing biomanufacturing processes more robust and cost-effective. There is plenty of potential in this area and we can leverage expertise from our H&B division.

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Is the Beauty Industry Sending the Wrong Message?

Ingredient Trends Reveal: Consumers Are Moving Away from Solely Focusing on the Surface

The success of the beauty industry, in large part, depends on how effectively its advertising can convince consumers that they need to invest in new products in order to become more beautiful. Beauty product and cosmetic procedure companies have historically preyed upon women by leveraging their insecurities to be used against them

Timo von Bargen, Covalo

But today, as gender and diversity, as well as the body positivity movement, become more and more prevalent among young consumers, beauty companies are finding that they are going to have to re-define how products are advertised if they want to stay relevant.

Wealth, Class, And Social Status

It is no secret that beauty products have long been associated with wealth, class, and social status — but in different ways. Going back as far as ancient Egypt, wealthy Egyptians would line their eyes with black makeup made of things like charcoal or even lead in some cases. Richer Egyptians could afford more vibrant makeup made from expensive ingredients, giving them a way to distinguish themselves from their less wealthy counterparts through their physical appearance.

Throughout history, nearly every culture has used cosmetics to enhance physical appearance in some way. In Edwardian England, for example, women started using makeup to very subtly enhance their features. In the early decades of the 20th Century, beauty products were becoming increasingly common, and cosmetics were used by the wealthy to give the appearance of effortless perfection. Even today, many still hold on to the belief that the art of makeup is in making it look like you are not wearing any makeup at all. But regardless of how makeup is looked at or what cosmetics trends are big in the moment, the overarching theme points to the fact that makeup, historically, has been used to associate beauty with prestige in society.

A 2016 study investigated the ways in which men and women looked at cosmetics among their peers in relation to feelings of dominance or prestige. The study concluded, after surveying how both men and women perceive makeup, that men see makeup as a direct correlation with earned prestige, where women see makeup as a way for other women to assert dominance over one another. In other words, men view makeup as a natural correlation between success and status, where women see makeup and recognize it as a manipulation tool used to assert dominance. All of this has contributed to the ways in which cosmetics are advertised, as makeup is often advertised as a tool for success (even generation z often refers to becoming more beautiful as a "glow up" as if success and happiness are correlated to beauty).

Cosmetics and Body Image

Because cosmetics are often associated with status and prestige, advertisements for them have a direct connection to an increase in anxiety, as well as lower self-esteem and self-confidence, particularly among young women. Beauty advertisements are designed to make women feel that there is something wrong with their physical appearance in order to sell them a product.

A 2012 study discussed the ways in which women are constantly reminded of what beauty standards are, and how they don't live up to them, through advertisements for new products. Even since then, an onslaught of new cosmetics, skin care products and cosmetic procedures have further convinced people that in order to be considered beautiful, they need to have perfect, young-looking skin with chiseled features, a sun-kissed glow and shining, full hair. From lip size to hair thickness and even eyebrow shape, cosmetics and the advertisements for them are inherently designed to point out a person's flaws so that they can sell a solution.

In particular, cosmetics and cosmetic procedures designed to change a person's appearance to make them appear more skinny or chiseled are often associated with modern beauty standards but are seldom associated with directly conflicting with the body positivity movement. Where the fashion industry is highly scrutinized for its use of thin bodies as a beauty standard — and a size standard for clothing in most societies — the beauty industry is largely exempt from that type of criticism. However, the beauty industry often places an even greater importance on thinness as a form of beauty.

Even among natural beauty companies and products, thin bodies are associated with health in ways that larger bodies are not. Recent movements to further canonize the body positivity movement have begun including the cosmetics industry. A 2019 Refinery 29 article pointed out

Google for Beauty Ingredients

Covalo was developed as part of an innovation project at Clariant, the Swiss-based specialty chemicals company. The original platform was called Chemberry and launched in 2018, while still part of Clariant, with the aim of being the „Google for beauty ingredients". Chemberry was re-named Covalo after spinning-off from Clariant in early 2021 and expanded its mission to make beauty product development faster and easier by connecting brands to suppliers of ingredients, packaging, and services such as manufacturing, regulatory support and testing.

www.covalo.com

the ways in which the word "skinny" is used in the beauty industry to advertise products to people. The article argues that products designed to do things like decrease signs of aging or eliminate cellulite do little to contribute to a body positive society and, in fact, are more harmful than they are effective.

Other products, like beauty products designed to make dark skin appear whiter, contribute to body image issues among Black women and men that have darker, more melanated skin. Many Asian products, still, advertise white skin as a desired beauty standard, sending a clear message that darker complexions are a problem that needs to be fixed and not a form of beauty on their own.

In addition to body type or skin color, the one stereotypical beauty ideal that has resisted changing trends over time is age. Reducing wrinkles, looking youthful, and having smooth skin are all beauty product claims that have withstood time and still remain one of the most prominently advertised sections in beauty shops: anti-aging products. In fact, whereas in the past these products were marketed to people aged 45+, now products in this space are being promoted also to younger people under the age of 30 with claims that they proactively slow down the development of aging spots, dark eye circles, or wrinkles.

Ingredient Trends Are Going Back to the Roots (literally)

Although these superficial beauty ideals remain prominent in the industry, consumers are moving away from solely focusing on the surface.

They are increasingly conscious of what they put on and into their bodies and, in line with the growing preference for whole foods when it comes to our diet, consumers are looking for beauty products with natural, plant-derived ingredients because they believe these ingredients to be "better for them" and for the environment.

Whether this is true warrants a separate discussion in and of itself since it is not necessarily always the case. What is true, though, is that the words "natural" and "clean" are not regulated by governing bodies and can therefore be applied by brands based on their own definitions — and there is incentive to do this since consumers respond to it.

This trend is also reflected in the search trends we are seeing on the platform. Searches are primarily conducted by formulators and R&D teams within beauty brands when sourcing ingredients as they develop a new product.

The most searched terms on Covalo's beauty ingredient search engine in the first months of 2021 include "Oils", "Plant Extracts", "Powders", "Surfactants", and "Essential Oils", with "Plant Extracts" being a consistently high-ranking term since mid-2020.

Despite wanting more natural products, consumers still want to see results that address the skin "problems" so deeply ingrained in our society, such as reduction of wrinkles, dark spots, and so on. This is reflected in rising searches for performant yet natural ingredients that ingredient-savvy consumers are picking up on. One example is Bakuchiol.

Since 2019 we have seen a 300% increase in searches for this ingredient, an antioxidant that is often referred to as the natural alternative to retinol, which is the incumbent star anti-aging ingredient (a vitamin-A derivative touted for speeding up skin cell turnover, thereby reducing fine lines and dark spots). Bakuchiol is derived from the seeds and leaves of a plant native to India and Sri Lanka that is commonly known as babchi.

How Can the Beauty Industry Change?

In the future, brands and cosmetics suppliers should be careful to avoid language in advertising that contributes to harmful stereotypes on what is and is not considered beautiful. In an age where diversity is being celebrated, products that advertise to whiten skin, remove signs of aging, make your face appear more slender, or use cosmetics as a way to attribute wealth and success are likely to feel more outdated and obsolete. Similarly, in a world where the boundaries of gender are stretching—especially among younger consumers—makeup and cosmetics are being attributed as a fun way to express your creativity rather than exhibit beauty and social status.

When it comes to the natural movement, brands should be clear about what they define as natural or clean, and even when marketing these products they should remain conscious of the beauty issues or ideals that are being promoted to ensure the product is still inclusive.

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High-Level Roundtable on the Implementation of the Chemicals Strategy for Sustainability

Chemical Industry to Support Transition Towards a Climate-Neutral and Circular Economy

In mid-October 2020, the European Commission published its Communication "Chemicals Strategy for Sustainability – Towards a Toxic-Free Environment". The chemicals strategy is part of the Green Deal whose primary goal is to bring about climate neutrality for Europe by 2050.The implementation of the chemicals strategy with over 80 measures will have far-reaching consequences for the chemical industry and the users of chemical products.

CEFIC has called for a Chemicals Strategy for Sustainability (CSS) that recognizes the essential role of chemicals to deliver climate ambitions, ensures a high level of safety and integrates holistically the multiple dimensions of the Green Deal – climate neutrality, materials circularity, and resource efficiency – while boosting competitiveness and innovation to serve Europe's strategic interests.

Effective and coherent implementation of the Chemicals Strategy for Sustainability, therefore, will lay important foundations for achieving the goals of the EU Green Deal. The Commission has established a high-level roundtable on the implementation of the CSS, with representatives from industry, science and the civil society to advise the Commission on realizing the strategy's objectives in dialogue with the stakeholders concerned. The roundtable's first meeting was held in early May, and discussions focused – and will focus in the following meetings – on how to make chemicals legislation work more efficiently and effectively, and on how to boost the development of innovative, safe and sustainable chemicals across sectors.

In a joint statement, the roundtable members confirmed to play their part in building on the most advanced chemical safety legislation in the world and continue their efforts to further develop and invest in safe and sustainable substances.

With more than 80 legislative and non-legislative measures to be rolled out over the coming years, the natural question is which policies should be prioritized to accelerate this Strategy towards success?

First, creating a toolkit of stronger measures to enforce existing chemicals legislation at the EU border would make an enormous difference to public health and environment. Enforcement would also reassure those who comply with legislation and invest in sustainable chemistry that their competitiveness will remain safeguarded.

Another important driver for the success of the CSS would be to prioritize the development of mechanisms to accelerate Safe and Sustainable-by-Design innovation in Europe in coherence with the climate transition and circularity objectives. Defining what constitutes "Safe and Sustainable" must come first, while sustainability must be achieved without compromise on safety. Introducing clear market incentives will always drive growth of industrial change faster than by introducing wider bans and restrictions.

"Working together with policymakers, civil society and academia, we must ensure that implementation of the CSS helps, not hinders, successful delivery of Europe's Green Deal and strategic autonomy" the joint statement concludes. (mr)

Sustainable Synthesis of Biochemicals

Commercialization of Platform Chemical LGO and Bio-based Solvent Cyrene

Non-food biomass is the world's most abundant natural bio-based resource and every year, millions of tons of renewable cellulose are underutilized or wasted. This includes waste cellulose from forestry, paper mills, crops and food processing. There is a clear opportunity to produce bio-based, non-toxic, high-performance alternatives from the most abundant polymer in the world.

Globally, the chemical industry is under increasing regulatory pressure and hazardous chemicals are at risk of being banned once suitable alternatives are available. Yet replacing traditional chemicals with bio-based alternatives is challenging and resource-consuming. Bringing new products to the market involves extensive development, process trialing, optimization, and product regulatory approvals.

From R&D to Commercial Scale with Furacell

When Circa was founded in 2006, the company's aim was to convert non-food cellulose into high-performance, renewable chemicals, at scale – extracting value from waste biomass and addressing a gap in the market for better, more sustainable materials.

Circa's Furacell technology was developed in 2009 and has been patented and fine-tuned for over ten years, across five pilot plants in Australia. Throughout its development, the original manufacturing philosophy has been maintained even as production volumes have increased: tolerance of different cellulose-based feedstocks (sawdust, bagasse, straw etc.) and near atmospheric pressure, as well as being as environmentally benign and energy-neutral as possible.

Extensive research done by Circa and its partners worldwide identifies a vast range of bio-based derivatives which can be produced from levoglucosenone (LGO, an α β-unsaturated ketone with protected aldehyde functionality), including Cyrene, a low-toxicity, bio-based dipolar aprotic solvent — and Circa's first commercial-scale biochemical.

From biomass using the Furacell process, the company produces LGO, a versatile platform chemical and building block, as well as biocoal. The other main by-product is water. Circa's fifth pilot plant FC5, a joint venture between Circa and Norwegian pulp and paper company Norske Skog, went online in 2019. Located in Tasmania, Australia, it is the first and only plant producing LGO at the ton scale. The next plant, ReSolute, is currently under construction in France as part of an EU Horizon 2020 flag-

Jason E. Camp, Circa Group

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ship project. ReSolute will produce 1,000 tons of green solvent Cyrene directly from LGO.

The biocoal produced as a by-product of the Furacell process is a valuable product in its own right which is in high demand. Biocoal is a form of charcoal produced by the pyrolysis of bio-waste, which has a number of uses including as activated carbon or a renewable or smokeless solid fuel.

A new Bio-based Solvent, Ready for Market

Cyrene, a cyclic ketone containing two protons alpha to the carbonyl group, is an alternative to traditional, fossil-based solvents. The Furacell process reduces the carbon footprint of its production up to 80% compared to similar petroleum-based solvents.

Developed by Circa in conjunction with the Green Chemistry Centre of Excellence (GCCE), Cyrene has a unique property set, including viscosity, surface tension and polarities, which makes it extremely well-suited to the production of advanced materials and synthesis of small molecules. All results to date indicate that Cyrene is a safer and more sustainable, high-performance alternative to traditional dipolar aprotic solvents.

The global dipolar aprotic solvent market is currently estimated at around one million tons and is currently mostly served by unsustainable and toxic fossil-based solvents such as NMP and DMF. Governments and industries worldwide are looking to find substitutes to these chemicals which are harmful to human health and the environment.

Cyrene is widely acknowledged as the only viable, low-toxicity and sustainable alternative. It also offers a dramatic reduction in waste creation both during production and at end-of-life. Not only is Cyrene better for the environment and less toxic than traditional solvents, it has also been shown to outperform them in many applications.

Extensive trialing of Cyrene by industrial and academic researchers has shown that it outperforms traditional dipolar aprotic solvents in 20-30% of applications. Specific processes in which Cyrene has shown significant advantages include the production and printing of graphene, manufacture of water filtration membranes, production of polymers (including bio-based polymers) and synthesis of fine chemicals.

Circa Group

Bio-based chemicals company Circa Group converts waste biomass into advanced, renewable chemicals with its proprietary Furacell process. Circa's product portfolio includes flavors, fragrances, agrochemical and pharmaceutical building blocks, as well as bio-solvents like Cyrene, an alternative to traditional solvents.

In March 2021, fifteen years after its creation, Circa has gone public and raised approximately €56 million to fund the construction of a new plant on the Carling Saint-Avold site owned by Total in Eastern France – part of the EU Horizon 2020 Bio-based Industries Joint Undertaking flagship project ReSolute — and to boost its manufacturing capabilities and commercialization of the levoglucosenone biomolecule platform.

Investing in a new Commercial Plant

Cyrene's development was aided by access to EU funding — in 2017, Circa joined ReSolve, a €4.3-million EU project focused on replacing traditional, fossil-based solvents. Led by the University of York, ReSolve used Furacell as one of two core technical streams to demonstrate and produce new, renewable solvents.

Then in 2020, Circa led a consortium which was awarded the EU Horizon 2020 Flagship project ReSolute to develop the first commercial plant to produce Cyrene. The plant will be located in Carling Saint-Avold in Eastern France and will have a production capacity of 1,000 tons of Cyrene per year. Engineering work has started, and the estimated commissioning date is the end of 2022.

Future Plans

Future applications of LGO derivatives include pharmaceuticals, agrochemicals, graphene, electronics, batteries, paints and coatings, flavors and fragrances as well as polymers.

With the ReSolute 1,000-tons plant under construction, a detailed study for a 5,000-tons plant, completed with Norske Skog, provides further support on the company's trajectory for plants of up to 50,000 tons.

Increased global regulation is creating the conditions for more sustainable chemicals like LGO and Cyrene to flourish and we are clearly seeing increasing demand from consumers and brand owners who are pushing towards more sustainable chemicals. Circa is developing chemicals at scale which are more sustainable and safer for people and the environment, contributing to a more circular economy.

Jason E. Camp, CTO, Circa Group Ltd., Circa Sustainable Chemicals Ltd (UK), Dunnington, York, England

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Successor Initiative to Sustainable Process Industry through Resource and Energy Efficiency (SPIRE)

Processes4Planet Roadmap Aims at Transforming the European Process Industry

The European Green Deal is a game changer for society and more specifically for the process industries. These industries produce materials which directly contribute to the quality of life of citizens and are essential to most of the value chains of the economy.

Their presence on European territory is of strategic importance for the independence and resilience of its society to unexpected events and crises. Being large energy and resources consumers, the process industries are by the same token key to enable a climate neutral energy system and to contribute to a circular economy.

The systemic shift required to transition to a climate neutral and circular society calls not only for technological innovation, but rather for a holistic systemic socio-economic approach.

In full consistency with the "New Industrial Strategy for Europe", Processes4Planet (P4Planet) – successor to the Horizon 2020 public-private partnership Sustainable Process Industry through Resource and Energy Efficiency (SPIRE) – aims at developing and deploying the innovations needed for a profound transformation of the European process industries to make them circular and achieve overall climate neutrality at EU level by 2050, while enhancing their global competitiveness. The innovations will have an integrated approach on climate and environmental issues.

The roadmap, which is being developed by P4Planet, outlines the transformations through which the process industry can contribute and the connections along the value chains that are fundamental to enable these transformations.

Through cross-sectorial technological and non-technological innovation efforts, P4Planet will achieve three general objectives: developing and deploying climate-neutral solutions; closing the energy and feedstock loops; achieving a global leadership in climate-neutral and circular solutions, accelerating innovation and unlocking public and private investment (competitiveness).

The partnership will work on emerging technologies and on the scaling up of technologies already developed at higher TRLs to deliver expected CO_2 emission reductions by 2030 and to achieve its full impact by 2050. P4Planet will implement its cross-sectorial R&I roadmap based on four transformation levers:

- Process innovation, with four core drivers: energy mix (including H_2), energy and resources flexibility/efficiency, electrification of industrial processes and carbon capture and use
- Industrial-urban symbiosis
- Digitalization
- Non-technological innovation

Relevant funding will be necessary to reach these goals. A total of €34.5 billion of investments are estimated to be needed until 2050 to develop and progress this highly ambitious pipeline of innovation. (rk)

Small, Modular Flow Plants

An Opportunity for Supply Chain Security?

Recent global events have highlighted the risks associated with the reliance on global chemical supply chains. As a result, an increasing number of countries are now actively bringing back the manufacture of critical raw materials, intermediates and products. After decades of outsourcing, local production infrastructure is often unavailable and needs to be re-established. Consequently, small modular continuous flow plants are gaining attention as an appropriate solution to secure these local supply chains whilst ensuring safe, sustainable processes are implemented.

The past decades have seen chemical production become an increasingly global activity, with APIs in particular becoming 'world travelers'! Recently, changes in geopolitics and local environmental regulations have initiated numerous discussions on the risks associated with reliance on the outsourcing of critical raw materials and finished products. This has resulted in an increased number of production projects considering the use of alternative production techniques such as continuous manufacturing (CM).

In 2020, the weakness associated with global chemical supply chains was highlighted in a dramatic manner as Covid-19 was designated a global pandemic:

- Border closures and travel bans placed restrictions on the movement of goods and personnel
- Industry shutdowns were common in the worst hit areas, leading to short-term raw material shortages
- Transportation restrictions and customs backlogs resulted in significant tied-up inventory

Although the industry has responded positively and pulled together for the common good, when you consider the time needed to start-up raw material production, re-schedule intermediate manufacturing, perform the needed site inspections and move materials around the globe — the impact of 2020's manufacturing restrictions will continue to be felt for months to come.

Whilst efforts towards strengthening local supply chains were in progress pre-2020, Covid-19 has undoubtedly accelerated this at a country level, with evaluations now assessing the cost of reducing future risk vs. the cost of doing nothing!

Challenges of De-risking

There are many challenges associated with deglobalization and localization. Firstly, heavy reliance on outsourcing means that many countries do not have the infrastructure required to manufacture critical raw materials, intermediates and APIs at scale; secondly, there can be a local skills shortage.

Opportunities of De-risking

The ability to de-risk supply chains however brings opportunities for countries in that they can control locally material production and reduce the need to stockpile. By building in surge capacity for times of national crisis, processes can be operated close to 'just in time' manufacturing. The fact that existing infrastructure is not available gives the potential to use new technologies to deliver improved product quality, with a reduced environmental impact for example.

Where previously the drive was to realize the lowest landed cost and production in 'someone else's backyard', current planning puts a known value on resilience and is driving the desire to have local manufacturing control. Key stakeholders in this ongoing change will be governments and regulators who are targeting:

- Critical raw material access
- Faster responses to pandemics and natural disasters
- Faster supply of emerging therapies
- Efficient development of personalized / customized products
- Reduced environmental impact

In order to realize these goals, the regulatory and financial burden of change needs addressing!

© Chemtrix

Why Continuous Manufacturing?

Continuous Manufacturing (CM) is a technique that has been gaining global importance over the past decade as a result of improved process control and reduced operating costs, leading to increased manufacturing profits and a competitive edge. Recent years have shown that the reason for a company to change from 'batch to flow' have been varied, often depending on the sector, process type of interest and scale of operation. Supply chain security and improvements in process sustainability are strong emerging drivers for the adoption of CM.

With the product key, the infrastructure needed varies greatly and depends on the available chemistry, cost of goods, volumes required and the hazard profile of a transformation — as a result, no single solution fits all scenarios. The modularity and flexibility of continuous flow set-ups enables the development of small, agile production plants that can be

Flow-enabled tonne-scale production from a fume hood at Buchem.

Plantrix, a flexible, modular flow reactor for metric-tonne scale manufacturing.

used for the manufacture of multiple products — with easy re-configuration allowing for rapid product change-over.

Following on from this, the ease of replicating these small footprint systems represents an opportunity for manufacturers to develop a process and subsequently deliver production units across multiple countries to serve the local product demands. This is in stark contrast to the current approach of a single large-scale plant, with warehousing used to manage supply chain disruptions.

How to Address Appropriate Flexibility?

When thinking of a batch facility, flexibility is the word that first comes to mind — as such, manufacturers look for flexibility and future use when designing a CM facility. Flexibility can mean many things, it can be towards types of raw materials, products and/or transformations, together with production location and capacity.

Key to maximizing the benefit of a small, agile production unit is to stay simple and build in smart flexibility — avoid unnecessary complication or features that are unlikely to be used. We advise at the outset to look at developing functional modules, e.g. dosing, reaction, thermal control and isolation. Then look to the types of processes that you want to perform — by clustering process requirements and chemical transformations you will see commonality in dosing / reaction / thermal / material of construction requirements. For example, cryogenic processes have different requirements to hydrogenations which have different demands to nitrations — but can all be performed using CM.

Work to define your operating philosophy since this will size your equipment. In CM, the volume of material produced is linked to the duration of operation — as a result, significant quantities of material can be produced from small footprint equipment with an intrinsically low hold-up volume. Consider if you need to manufacture your annual quantities of an agrochemical over 3 months in order to meet seasonal demands or can you produce your API steadily over 12 months? The former will require a larger reactor that is used for a short period of time, whilst the latter could be a small, dedicated unit that runs 24/7 throughout the year. Whichever approach is selected, don't forget to build in surge capabilities: This can be done by starting up a parallel production train or by leaving a time buffer that allows additional material to be produced by running for a few days longer.

"Whilst efforts towards strengthening local supply chains were in progress pre-2020, Covid-19 has undoubtedly accelerated this at a country level."

This way of working ensures that you define modules with achievable specifications, accessing the needed flexibility by freely combining different modules. With that said, should you have a very specific requirement, with a good basis, consider dedicating a small production line to that particular process – rather than compromising all other cases because of it!

Small, Agile Production Units

Recent global events will undoubtedly change the way that we manufacture fine and specialty chemicals, through to APIs with supply chain management favoring in-house local/distributed manufacturing models. By shifting from world plants to small, agile plants that serve different markets via replicated local facilities, companies can realize geographic diversification whilst countries gain the needed security of supply. In addition, this will significantly reduce the environmental burden associated with moving raw materials, intermediates and products between processing sites/countries. Reductions in CAPEX can be anticipated due to smaller-footprint installations and on-demand manufacturing will significantly reduce capital tied up currently in 'work in progress' material inventories.

For close to two decades, the US FDA and other regulatory bodies have encouraged the adoption of emerging technologies that aim to ensure high quality materials for patients and to mitigate against drug shortages. The release of ICH Q13 'Continuous Manufacturing for Drug Substances and Drug Products' is anticipated within the year.

Covid-19 has changed the conversation! It is time to ask, what is the value of increased supply chain resilience vs. risk tolerance?

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Paving the Way for Sustainable Infection Control

Membrane-mimetic Coating Based on Self-assembly Nanotechnology Prevents Biofilm Formation

LipoCoat is a biotech company specialized in 'bio-inspired' coatings that improve the safety, comfort, and performance of medical devices with a focus on health and nutrition. The pipeline comprises discovery and (pre)-clinical programs in the medical device and drug discovery space. Established in September 2016, the start-up's ambition is to become a leading biotech company dedicated to improving health and well-being through the discovery, development, and commercialization of novel surface solutions. Jasper van Weerd, founder & CEO, takes us on LipoCoat's journey.

CHEManager: Mr. van Weerd, LipoCoat was founded 5 years ago. How did it all start?

Jasper van Weerd: LipoCoat was founded in late 2016 and is a spin-off company from the MESA+ Institute of Nanotechnology at the University of Twente, the Netherlands. The company is based on my research conducted between 2010 and 2014. At the time, I was a PhD student under supervision of professors Pascal Jonkheijm and Marcel Karperien. I took inspiration from nature and developed a biomaterial coating platform.

What got you excited about the results of your research that then turned into a spin-off company?

J. van Weerd: The coating mimics the cell membrane in such a way that surfaces in watery environments can exhibit anti-stick properties, thus preventing such occurrences as microbial build-up. This innovation was patented and LipoCoat landed its first strategic partner for a rigid contact lens coating in the same year it was incorporated.

The past years, LipoCoat's team grew fast and secured growth funding, built its own lab facility on the innovation campus of the University of Twente, became ISO 13485-certified and received many accolades for its works. Furthermore, LipoCoat was selected to join the Johnson & Johnson JLabs incubator program.

What kind of support did you receive right after the start and which obstacles did you have to master so far?

J. van Weerd: In the lead-up to founding the company, a lot of business development support was provided by the University of Twente and the grant program NanoNextNL. They enabled the first steps. Furthermore, LipoCoat made use of so-called valorization grants, subsidies, and loans to fund our prototype development. A major challenge when developing medtech innovations is funding. We were able to manage this challenge by having a seasoned management team and by relying on the start-up ecosystem.

What is the USP or differentiating feature of your 'bio-inspired' coatings?

J. van Weerd: Our mission is to make healthcare better by improving the comfort, performance and safety of medical devices enabled by our coating. LipoCoat's innovation is a bio-inspired coating technology that prevents biofilm formation to reduce healthcare associated infections — HAI. Current solutions that address these infections often rely on the use of antimicrobial compounds, such as antibiotics embedded in the biomaterial or applied as surface coating. In general, these solutions do not solve the unmet need for infection control and are associated with drawbacks, such as increased usage of antibiotics, which causes the risk of antibiotic resistance, and ecotoxicity and patient toxicity. LipoCoat, on the other hand, offers a passive approach to infection control without the need for antimicrobial compounds. Our solution could pave the way for sustainable infection control.

Jasper van Weerd, LipoCoat

Which application areas do you focus on?

J. van Weerd: The Covid-19 pandemic shows the importance of scientific progress in regard to infection control. Luckily, our coatings have a wide range of applications, including medical devices, R&D tools, in vitro diagnostics — IVDs — food and pharma. LipoCoat has been able to design additional features into the coating next to the anti-fouling properties such a lubricity improvement, widening it scope. We are aiming to launch LipoCoat-enabled contact lenses in the course of 2021 and in a few years' time, we expect our first coated catheters to enter the market. In addition, other use cases are actively explored in our discovery programs, including R&D tools, cell culture systems, cosmetic and therapeutic applications.

What has been the most exciting project so far?

J. van Weerd: In Q1 2021, LipoCoat was selected from 1,700 candidates for the Heraeus Accelerator Program. Heraeus is one of the largest family-owned companies in Germany. Together with the Heraeus Medical Components department, LipoCoat is now evaluating its technology for catheter applications. At the end of the accelerator program, LipoCoat shall present a minimally viable product — that is, an early prototype for evaluation and feedback purposes. Heraeus contributes its know-how and experience in prototype testing and problem solving. Participating in the Heraeus Accelerator Program has been a very rewarding experience so far.

What will be the next steps to develop your company?

J. van Weerd: To make the leap to further growth, a follow-on funding round of €2 to €3 million is planned for 2021. With this investment round, LipoCoat wants to build its revenue streams, increase its development and production capacity, and expand its international footprint by gaining access to USA and Asian markets.

Personal Profile

Jasper van Weerd, founder & CEO of LipoCoat, holds a Bachelor in Applied Science from Saxion Hogescholen Enschede (University of Applied Sciences), in the Netherlands, and a Masters in Biomedical Engineering from the University of Twente. He is credited with authoring or co-authoring 11 internationally acclaimed, peer reviewed scientific papers. In addition, he was a visiting researcher at Penn State University. He worked for 2 years on the EU Hibiscus project. This included work at Universities in the Netherlands, Italy, and the United Kingdom. From 2010 till 2014 Jasper was engaged with his PhD at the University of Twente, entitled, "Novel Biomedical Applications of Supported Lipid Bilayers". His PhD has resulted in numerous public awards and credits, evolving into the launch of LipoCoat in 2016.

Business Idea

The Technology and its Advantages

LipoCoat's innovation is a bio-inspired coating technology that mimics the cell membrane, more specifically the phospholipid bilayer. When applied, the coating self assembles to form a dynamic, hydrophilic bilipid layer only 5 nm thin. Once it is wet, this lipid layer can demonstrate certain properties simultaneously which can be tuned to the desired expression. With a range of formulations, hydrophilicity, stability, and lubricity can be adjusted to complement the inherent anti-biofouling and anti-thrombogenic nature of the coating. Thus, biocompatible and high-performance medical device coatings can be prepared that may be used in applications such as contact lenses, catheters, and implants.

In nature, the phospholipid bilayers of cells serves as a universal interface between distinct chemical environments. They also regulate the passage of molecules and proteins into and out of the cell essentially acting as a biological 'customs border'. For example, if physical flexibility is a requirement, extra cholesterol inserted into the bilayer can enhance fluidity and proteins can be incorporated to facilitate specific functions. Hence, LipoCoat mimics the lipid bilayer, retaining its dynamicity. This property enhances coating-stability through the process of regeneration. Small defects such as scratches regenerate spontaneously because molecules reorganize to fill in the gaps.

The team have developed multiple proprietary coatings to exploit these properties and have assembled a toolbox of various base molecules and gathered the know-how to tailor coating composition and architecture to meet application needs. As such, LipoCoat is a membrane-mimetic coating with anti-fouling, wetting and lubricous properties that are introduced by chemical control of the interface composition.

The LipoCoat coatings enable sustainable infection control — no antibiotics, no toxic compounds, no side effects. The coatings are based on self-assembly nanotechnology and are anti-fouling, bio-compatible, hydrophilic, cost-efficient, and scalable. They have a wide range of applications, including medical devices, R&D tools, in vitro diagnostics, food and pharma.

- LipoCoat BV, Enschede, The Netherlands
  www.lipocoat.com

Elevator Pitch

Successes, Milestones and Roadmap

LipoCoat was established in September 2016 and is a spin-off company from the MESA+ Institute of Nanotechnology based at the University of Twente, the Netherlands.

Headquarters are located at Kennispark Twente in Enschede, across from the University of Twente campus. By 2017, the company had secured its first seed funding and expanded its management team. By 2019 the company grew to 17 FTE, built its own lab facility across from the University of Twente campus, and became ISO 13485-certified.

In autumn 2019, LipoCoat joined the Johnson & Johnson JLabs incubator program and also has a base at JLabs' facilities in Beerse, Belgium. In 2020, LipoCoat secured a series A investment round and expanded its efforts to include the catheter application.

Milestones

- LipoCoat has won 20+ awards, competitions and grants.

2015

- Winner of, amongst others, Pitch Holland-Innovative, NanoLabNL Voucher, Jury Award Dragon's Den NNNL

2016

- Awarded funding by Red Medtech Ventures
- Awarded MIT-Grant RVO
- Winner of NanoNextNL Valorisation Grant

2017

- Special Award Business Delegation Tokyo
- Awarded H2020 SME-1 Grant
- Awarded NWO Take-Off 2 Grant

2018

- Awarded High-Tech Lease Fund Grant

2019

- EU Seal of Excellence
- Top 30 Global Start-ups — GIST Catalyst
- European Biotech Start-up of the Year

2020

- Best Medical Device Coatings Company of 2020
- Raised €1,5 million extra from several investors in April 2020

As of April 2021, the company has raised €4.1 million in total (combination of equity and non-dilutive funding). LipoCoat is always interested in establishing new alliances and partnerships to leverage their strengths: identifying novel applications, expanding the understanding of microbiology, and developing new substrate solutions with innovative modes of action that impact health care and well-being.

LipoCoat's headquarters are located at Kennispark Twente in Enschede, the Netherlands, across from the University of Twente campus, where the company also built its own lab facility.

LipoCoat was established in 2016 as a spin-off from the MESA+ Institute of Nanotechnology based at the University of Twente. By 2019 the company grew to 17 FTE.

Rethinking the Base Material Side

New Sustainable Plastics Substitute Made from Paper

Plafco Fibertech, founded in 2017, was created as a spin-off from an EU-research project coordinated by Jukka Valkama, a professor at the Cooperative State University of Baden Wurttemberg in Karlsruhe, Germany. For three years the company has been dedicated to the industrialization of the process for producing the plasticized fiber composite (Plafco) material for paper. The new material is made by physico-chemical-transformation of paper into an all-cellulose-composite in a continuous process. Plafco can upgrade a paper, without changing its chemical composition, into new products e.g. for substitution of plastics in packaging products. The straight-forward continuous processing enables low operating costs, thus giving Plafco excellent price-value properties. Furthermore, the material delivers a smooth and tight surface for additional functionalization or barrier-coating, which reduces the need of surface chemicals in the end products.

© Plafco Fibertech

Jukka Valkama, Plafco Fibertech

Personal Profile

Jukka Valkama, CEO, founder and shareholder of Plafco Fibertech, studied forest product chemistry/paper technology at Helsinki University of Technology and received a Ph.D. in paper engineering from Technical University Darmstadt, Germany, in 2007. He is head of the department for paper and packaging technology at the Duale Hochschule Baden-Württemberg (DHBW, Baden Wuerttemberg Cooperative State University) in Karlsruhe, Germany. He has several patents and innovations and has long background in entrepreneurship and is also a member of several industry associations and serves as an expert for topics around new materials and sustainability in advisory boards.

CHEManager: Professor Valkama, you founded the company in 2017, but the idea was born earlier. How did it all start?

Jukka Valkama: In 2013 we had the initial idea to examine if with state-of-the-art knowledge about dissolution of cellulose it would be possible to upgrade paper into a vulcanized fiber type of products by using paper processing technology. After the successful application in the WoodWisdom EraNet program we spend three years researching different solvent systems and fiber raw materials. Initially we found the Plafco system and proved that it can be produced by modifying the existing technology available. We patented the technology at the university and transferred the IP rights to Plafco Fibertech in 2017 in order to convert the results into industry applications.

What makes the technology so unique?

J. Valkama: Plafco is made from paper, which is developed by the company itself, and large rolls are made by paper factories following directions that they are given. Chemical pulp fibers are available globally in large amounts at competitive price levels. This secures high availability and affordable production costs for Plafco. The transformation into a plastic substitute product includes introducing the paper into a bath in which chemicals first dissolve part of the cellulose from the natural fibers. The chemicals are based on sodium hydroxide and urea, which are very common chemicals used in different industries. The dissolution chemicals are then removed by washing in the following step. The dissolved cellulose acts as a glue, automatically filling all accessible gaps in the paper. After drying, the new material is ready for use in paper-converting units. The Plafco material is much stiffer, stronger, denser and more uniform, giving the material airtight and also oil-proof properties. Food stuff suitability is also one important property of Plafco.

Which obstacles have you had to master so far?

J. Valkama: Plafco has been topping lots of material tests and the product has generated very high interest in industries. Pulp producers, paper manufactures, machine suppliers, packaging producers and end customers have given very positive resonance that one might think it should be easy to get the "baby" running. The biggest obstacle so far, however, has been to get the first funding for the piloting unit. We are talking here about an investment-intensive start-up. We have been ready for more than a year to start the build-up of the piloting plant for production. Actually, we are looking for a funding of €3 million and running several negotiations regarding the funding, but still no deal has been signed. So, we are having a chicken-egg problem in the death valley of a start-up company. I believe that we are going to get the first pilot unit, with a capacity of about 5.000 t/a, cleared this year.

What has been your most exciting project so far?

J. Valkama: Our most exciting project was to develop a packaging for tissue handkerchiefs made of the handkerchief itself. The Plafco packaging fully replaces the traditional PE plastic packaging and makes the product much more sustainable. Being able to make the Plafco process work in very low grammages of less than 20 g/m² was very exciting. Also, this product was our first demo product made all the way from raw material to the end product including the printing. We showed that the idea works and that the process in the future can be a real game changer in the industry.

What will be the next steps to develop the technology and the company?

J. Valkama: Our R&D and product development is running every day, we have done the pre-engineering ready and are focusing on finding a partner, who is ready to invest on our company to get the pilot plant running. The whole technology and process development can be made with the pilot unit only. We have finished all development projects on the laboratory scale and focus on product development for potential end customers. We are still almost booked out in the laboratory and are working with very interesting partners from the food stuff, medical, paper, energy and auto motive sectors.

Business Idea

Plasticized Fiber Composite

The aim of Plafco Fibertech is to commercialize the use of a new type of wood based cellulosic fiber composite for applications in, amongst others, the paper, packaging and construction industries. Plafco, i.e. plasticized fiber composite, is a new material whose manufacturing process is protected by an EU patent in several EU countries. Plafco is an affordable and fully bio-based, biodegradable, marine degradable, compostable, and recyclable material. In comparison to most paper or plastic materials, Plafco has higher strength, stiffness and density, which allows the use of less material in end products, but also to save in additional coatings.

The unique material is fully bio-based combined with the strength characteristics corresponding to many plastics and market leading corrugated boards. Although Plafco has unique properties like high surface homogeneity and moisture resistance, its manufacturing process is similar to that of paper industry processes and, therefore, known technology, excluding the novel Plafco process phase add-on developed by the start-up.

Production is possible with existing paper machine technology. The production principles and scale of properties enhancement of the material have been verified by a proof-of-concept pilot during the research phase and consequent hand-made pilot demo product trials.

The core business idea of the company will be to become a licensor of the technology required to manufacture the Plafco material and support the customers by technical and product-specific consulting as well as being a supplier for special Plafco products. Licensing may apply to the sale and manufacture of machines, raw materials, end-user products and other manufacturing equipment.

A chosen machine manufacturing partner is expected to join forces with the company in a joint endeavor where the machine company is allowed to manufacture Plafco machine units under a license for fixed yearly license fee and fee per units sold under the license. Special Plafco products include high-profit, small-amount products e.g. for medical and electrical applications.

- Plafco Fibertech Oy
  Helsinki, Finland

Elevator Pitch

Milstones and Roadmap

Plafco Fibertech was established in 2017 in Helsinki, Finland, and in the meantime has opened an operative arm in Germany. The eponymous plasticized fiber composite (Plafco) material can be a game-changing innovation for a more sustainable future. The start-up company was founded to industrialize the production technology for the material, a patented process to transform raw paper into the composite material.

Milestones

2014 – 2017
- WoodWisdom EraNet project COMPAC (plasticized lignocellulose composites for packaging materials)
- Plafco production process technology patented

2017
- Establishment of Plafco Fibertech
- Blue Sky young researcher award for co-inventor Tero Tervahartiala

2018
- Business Finland funding for pre-engineering study

2019
- Cleantech Scandinavia Top 25 finalist
- Sustainability award Top 25 finalist
- First demo products launched and published

2020
- Pilot plant proof-of-concept finished
- Winner of NEO2020 award

Roadmap

2021
- Funding for pilot plant and build-up of the pilot unit

2022
- Demo production, technology development

2023
- Pre engineering for industrial unit

2024
- Build up and start of first industrial production unit

2025
- Licensing

Jukka Valkama, CEO, founder and shareholder of Plafco Fibertech, in the company's laboratory-scale pilot plant. The start-up is looking for a funding of €3 million to start the build-up of the piloting plant for production.

The plasticized fiber composite material can be used to substitute plastics in products such as single-use drinking straws as well as to replace multilayer paper packaging by a more stiff and wet resistant one-layer product.

DCAT Week 2021 — Virtual Event

A virtual version of DCAT Week, the premier global business development event for companies engaged in the bio/pharmaceutical manufacturing value chain, will take place July 12–16, 2021, offering five days of education. Organized by the Drug, Chemical & Associated Technologies Association (DCAT), the event will conclude with a keynote address by 2020 Nobel Laureate Jennifer Doudna.
www.DCATWeek.org

Chemspec Europe 2021 — Hybrid Event

Chemspec Europe will take place on September 29–30, 2021, in Frankfurt, Germany, in an expanded format that combines the on-site show with an online platform. The event is the key platform for manufacturers, suppliers and distributors of fine and specialty chemicals. The product portfolio of this exhibition covers fine and specialty chemicals for various industries. Lectures and webinars presenting the latest results of ongoing R&D projects round-off the event.
www.chemspeceurope.com

CIEX 2021 — Hybrid Event

Taking place in a hybrid format on October 6–7, 2021, in Frankfurt, Germany, the conference is aimed at R&D and innovation experts from the consumer, industrial and specialty chemical sectors. By bringing together all players across the value chain, the event creates a unique platform for participants to learn, exchange ideas, and collaborate in panel discussions as well as 1-on-1 meetings.
http://ciex-eu.org

CPhI Worldwide 2021 — Hybrid Event

CPhI Worldwide, taking place as hybrid event in Milan, Italy, on November 9–11, 2021, is the leading networking event and exhibition dedicated to pharmaceutical developments, trends, products and services. Exhibitors include providers of contract research and synthesis services, suppliers of APIs, excipients, ingredients, intermediates and finished dosage forms, as well as producers of pharma manufacturing and packaging equipment.
www.cphi.com

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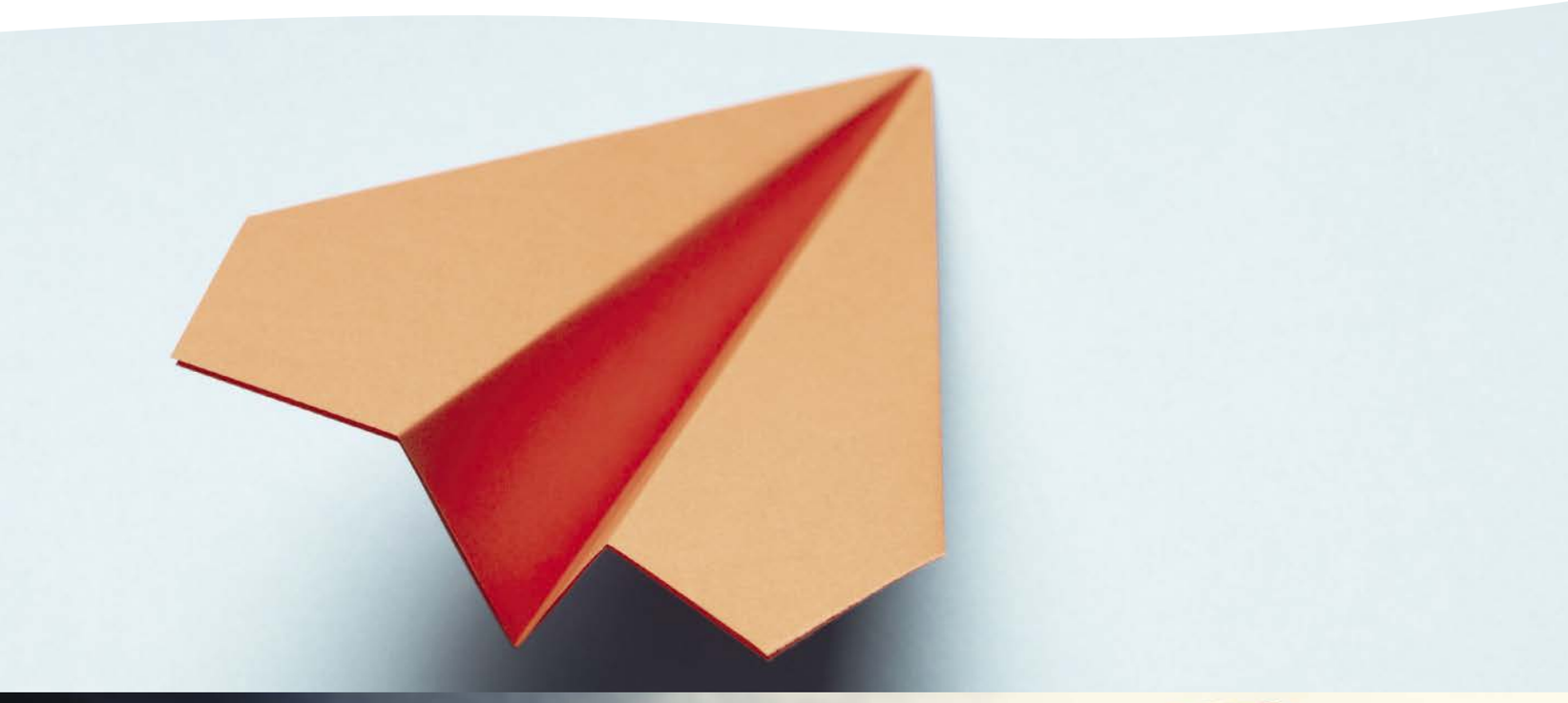

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