OUR PEOPLE IN THEIR OWN WORDS

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GIVING 3D PRINTING A BOOST

INNOVATIONS SUPPORTING PERFORMANCE

BOSTIK: △ A TALE ^Z OF SUCCESSFUL ⁴ INTEGRATION



CONTENTS





Thierry Le Hénaff



Arkema at a Glance



NEWS 2017 **Highlights**



BUSINESS **A** Promising Future



OPINION



SUCCESS STORY **Bostik: A Tale** of Successful Integration



CSR STRATEGY Fully Committed to the United **Nations' Agenda Aspects**



INNOVATION Innovation in All Its



TALENT MANAGEMENT Retaining **Our Talented** People



PROFILES Meet Carole, Kevin, Mike and Marie



DIALOGUE Interactina with Our **Stakeholders**



LIFESTYLE **Our Materials** at Work **Around Us**



GOVERNANCE & FINANCE

COMMITMENT TO INNOVATION

rkema is an international producer of specialty chemicals. Like other chemical companies, we make molecules, monomers and polymers and provide numerous innovative solutions to meet our customers' needs. We are also proud to be a responsible chemical company with an ambitious growth strategy that respects the environment and delivers robust results

So what sets us apart? Innovative spirit.

Innovation has been a core component of our DNA and corporate culture since the very beginning. This focus and commitment require a sustained investment in R&D, as well as patience, wise choices and the freedom to learn from mistakes. To be sure, we innovate as a chemical producer by developing lightweight, resistant and increasingly recyclable technical materials for demanding applications. The quality and intensity of our R&D are widely recognized, as attested by our presence in Clarivate Analytics' Top 100 Global Innovators Report for the seventh straight year. But our innovative spirit is also on display in many other areas.

We also innovate in:

Digital technology, not just in customer relations, but also by applying its power to the infinitesimally small, designing new materials virtually before we even make them. We also take advantage of virtual reality when we build new production facilities. Communication. An example is L'atelier 4.20, an immersive, interactive showroom dedicated to our most recent discoveries and designed to make chemistry accessible to all. **Sports, with our two sailboats.** These floating laboratories give us an opportunity to test our very latest materials and adhesives in high-profile races. **Environmental protection** at our plants, by developing processes that reduce our carbon emissions and water and energy consumption. Human resources management, by deploying tools that allow us to collaborate across borders and facilitate interactions among our employees. Relations with stakeholders, most notably in education, with programs that make students aware of the extraordinary opportunities available in chemistry.

This innovative spirit has fueled our growth since the company was founded in 2006. It continues to transform our way of working and to adapt our products to the major challenges of today's world. This report will take you on a voyage through Arkema's innovative chemistry, in all its dimensions.

INNOVATIVE CHEMISTRY, IT'S AS SIMPLE AS THAT.

OPINION



THIERRY LE HÉNAFF CHIEF EXECUTIVE OFFICER

2017 will be remembered as a recordbreaking year for Arkema, which in just over a decade has repositioned itself in specialty chemicals and now ranks among the industry's top performers. The year was shaped by historically high financial results, significant acquisitions and investments, disruptive innovations and environmental stewardship. Chief Executive Officer Thierry Le Hénaff looks back at this remarkable performance.

What were the standout events and achievements of 2017?

T. L. H.> > We've had plenty to celebrate, between our acquisitions in the United States, production investments in Asia and renewed presence among the Top 100 Global Innovators in Clarivate Analytics' annual ranking. Our victory in the Transat Jacques Vabre yachting race was especially meaningful. Skipper Lalou Roucayrol's first place finish at the helm of the Arkema trimaran was also a win for Arkema innovation. His Multi50 sailboat was designed for and built with our highest-performing materials. Our innovation is on display every day in increasingly eco-friendly products that make life more comfortable in housing, transportation, new energies and elsewhere. In 2017 we also opened our L'atelier 4.20 showroom at headquarters. This new venue packed with digital technology lets the public explore our groundbreaking innovations and six research platforms*. It's important to explain what we do.

How would you describe Arkema's performance in the past year?

T. L. H.> > It's simple: Arkema turned in the best performance in its history. Sales rose 10.5% to €8.32 billion and earnings before interest, taxes, depreciation and amortization (EBITDA) increased 17% to a record €1.391 billion on the back of strong results in our three business segments: Industrial Specialties, High-Performance Materials and Coating Solutions. We also achieved good growth in all three of our host regions (Europe, North America and Asia). In a sign of confidence in our medium- and lona-term potential. the Board of Directors has recommended that shareholders approve a 12% increase in the dividend, from €2.05 to €2.30 per share.

What were the key factors behind the year's success?

T. L. H.> > The first is our teams' unflagging engagement and enthusiasm in implementing our strategy worldwide. This growth-focused strategy has not changed since day one. It revolves around three key drivers: innovation (our DNA), selected acquisitions in our highpotential businesses and accelerated industrial investment in emerging economies.

The 240 patents we filed in 2017 (up 20% from 2016), which protect our know-how and position us in longterm niches, demonstrate the power of our innovation. We're preparing major advances in wind power with a new generation of recyclable blades using our Elium[®] thermoplastic resin, as well as breakthroughs in transportation with lightweight technical polymers to replace metal and in 3D printing with a wide range of materials and solutions.

We continued to make acquisitions in adhesives for our Bostik subsidiary. After adding European sealants leader Den Braven in late 2016, we acquired U.S.-based CMP Specialty Products and XL Brands in 2017. These two outstanding companies give us a complete line of flooring solutions in North America.

We also invested in India, China and Malaysia to increase production capacity for industrial adhesives, fluoropolymers, photocure resins and thiochemicals so we can meet strong local demand.

Lastly, our more intermediate chemical lines also contributed through their competitiveness and strong customer relationships.

"We're preparing major advances in wind power with recyclable blades."

How does corporate social responsibility add to this momentum?

T. L. H. > > We have fully integrated CSR policy into our growth strategy, through strong commitments to safety, the environment, individual and collective development, stakeholder dialogue and innovation. To give a few examples, the environmental programs deployed in the last few years reduced our greenhouse gas emissions in 2017 to below our initial target and our 1.6 accident rate per million hours worked is one of the lowest in the industry. We've also initiated a comprehensive program to address diversity that combines awareness and training. The goal is to raise the percentage of senior management positions held by women to between 23% and 25% by 2025 from 19% today - an ambitious commitment in the often male-dominated chemical industry.

OPINION

L'atelier 4.20 BYARKEMA

"THE SHOWROOM INAUGURATED AT ARKEMA'S **HEADQUARTERS IN** COLOMBES, FRANCE, IS AN EXTRAORDINARY SHOWCASE FOR OUR INNOVATIONS AND KNOW-HOW."

ANAGEMENT

UKSHA AU COUR DE VOTRE VOIT

L'ATELIER 4.20

Interactive animations demonstrate the value that our products and materials add to everyday applications. This innovative showroom is designed to make the world of chemistry accessible to the general public.

"Arkema has fully integrated CSR policy into its growth strategy."



What is your mindset looking forward?

T. L. H.> > We will continue to count primarily on ourselves, more than on the macro-economic environment, fully confident in the quality of our projects. We'll also continue to make acquisitions in adhesives and advanced materials and invest in production. In 2018, we will pursue work on the new bio-based polyamide production facility in Asia, which represents a significant investment of €300 million. This project will support our growth ambitions in emerging economies. In 2018, industrial capex will total around €550 million, up from €435 million in 2017. Our ambitions and high targets for 2020 and 2023 attest to our confidence in the future.

"3D and 4D technologies considerably reduce time-to-start-up for new plants and optimize production line ergonomics."

A DESIGN

Lastly, how are you negotiating the digital revolution that is sweeping through the industry?

T. L. H.> > Our digital transition will make us even more gaile and enhance our innovation capabilities. The recent appointment of a Chief Digital Officer, who reports directly to me, shows that we intend to make digital technology a part of all our businesses. Naturally, marketing and sales will be strongly impacted, first in the B2C segments targeted by the Bostik brands, but also in B2B segments with our Sartomer resins and technical polymers. We're also harnessing the power of digital technology in our building projects. 3D and 4D technologies considerably reduce time-to-start-up for new plants and optimize production line ergonomics. We saw the benefits of this at our Honfleur site in France, where we were able to design and simulate workstations with operators' input and finish six months ahead of schedule. We will use the same technologies to build our polyamides facility in Asia. In R&D, powerful molecular modeling applications help us develop new products faster, which is very important for patent filing. Our digital transition will also make us even more attractive to top talent in our traditional engineering fields, as well as in new marketing and digital functions. So Arkema's future will be more innovative than ever, but also more digital, in every aspect of the company's operations.



ARKEMA AT A GLANCE



A GLOBAL INDUSTRIAL COMPANY



3 BUSINESS SEGMENTS AND 9 BUSINESS LINES









COATING SOLUTIONS • ACRYLICS • COATING RESINS AND ADDITIVES







• Bio-based products

• New energies

- Water management
 Electronics solutions
- Lightweight materials and design
- Home efficiency and insulation

17 HIGHLIGHTS OF 2017

Come along as we travel the globe to revisit the investments, acquisitions, sporting events, awards and other key moments of 2017.

January **A NEW INVESTMENT IN ACRYLICS**

Arkema invested \$90 million to upgrade its Clear Lake, Texas acrylic acid plant and made it one of the most competitive in North America. This investment confirms our position as the region's number two producer of acrylic acid and laid the groundwork for meeting growing demand in the superabsorbent polymer (SAP), coating, adhesive and water treatment polymer markets.

June MISSION ACCOMPLISHED FOR SAIL FOR WATER

As Sail for Water's main sponsor, Arkema celebrated completion of the NGO's successful round the world tour showcasina universal access to drinkina water. In support of this important cause, Arkema's innovative solutions for more efficient, long-lasting filters were tested during the trip. Sail for Water's three-man crew travelled 33.000 miles in a sailboat over 20 months before returning to Toulon, France. Along the way, they distributed 1,000 filters, giving more than 30,000 people the means to produce their own drinking water.

April **KYNAR® A SUCCESS IN CHINA**

New Kynar® PVDF capacity was successfully added at our Changshu complex near Shanghai. The 25% increase in capacity strengthened Arkema's position as a global PVDF leader, with production facilities in Europe, North America and Asia.

Mav BOSTIK EXPANDS IN THE UNITED STATES

Bostik acquired CMP Specialty Products,

the flooring and floor preparation business of U.S.-based CGM, Inc. The business, which generated \$15 million in sales in 2016, offers significant synergies with Bostik.

January ARKEMA RECOGNIZED FOR INNOVATION

For the seventh year **in a row,** Arkema demonstrated its R&D's effectiveness by making the list of the Top 100 Global Innovators published by Clarivate Analytics

(formerly Thomson Reuters).



February KEPSTAN® TAKES OFF

Arkema doubled its French production capacity for Kepstan[®] PEKK (Polyether Ketone

Ketone), a very high performance polymer, and confirmed plans to invest in a world-class PEKK unit at its Mobile, Alabama site in the United States. The two investments are focused on developing lightweight materials, especially composites and 3D printed parts for aviation applications. The Alabama unit is expected to come on stream in late 2018



NEW MOLECULAR SIEVE UNIT

Thierry Le Hénaff inaugurated the new specialty molecular sieve unit in Honfleur, France, in support of our customers' growth in the refining and petrochemicals markets, notably in Asia and the Middle East. The €60 million investment represented a significant growth driver and strengthened our position as the world's second largest producer of molecular sieves.



June

RILSAN® TURNS 70 **Employee and customer** events worldwide showcased

the impressive story of our flagship highperformance polymer, Rilsan® polyamide 11. Wholly plant-sourced and recognized as one of the world's best-performing specialty polymers, Rilsan[®] continues to enjoy a promising future in automotive, sports and oil industry applications.



Arkema - Innovative / 9



2017 HIGHLIGHTS

June **BOSTIK, OFFICIAL PARTNER OF THE TOUR DE FRANCE**

Previously an official supplier, the adhesive specialist signed on for two years as an official partner of the Tour de France. The cycling race – one of the most popular sporting events in the world - gives the Bostik brand fantastic visibility, with some ten million fans lining the course and two billion viewers following on TV.



Julv AMBITIOUS OBJECTIVES AND MAJOR PROJECTS +

At Capital Markets Day, Arkema presented its long-term growth strategy and affirmed its determination to speed development in specialties, which should account for more than 80% of revenue by 2023. The three major investments announced for Asia double production capacity at the thiochemical site in Malaysia, increase Sartomer's photocure resin production capacity in China and build a biosourced polyamide 11 unit that will increase our global capacity by 50% (location to be announced). At €300 million, this last investment is the largest ever announced.

August FLOODING OF THE CROSBY, **TEXAS SITE**

Hurricane Harvey brought torrential rainfall to Texas and Louisiana, the heaviest

in U.S. history. Before the hurricane landed, our Texas plants shut down production in compliance with their preparedness plans. The Crosby plant was especially hard hit, finding itself under two meters of floodwater. The backup generators were submerged, cutting off the plant refrigeration. The organic peroxide made on site becomes flammable if left unrefrigerated. Ultimately, nine trailers containing drums of organic peroxide caught fire and burned between late August and early September. Arkema worked with federal, state and local authorities to manage the situation. People residing near the site were evacuated as a precautionary measure.

September L'ATELIER 4.20 SHOWCASES **OUR INNOVATIONS**

L'atelier 4.20 by Arkema was inaugurated at the Colombes

headquarters (France) to showcase Arkema's Innovative Chemistry vision. The immersive, highdesign showroom lets all stakeholders, from employees and customers to journalists and shareholders, explore the advanced solutions and materials developed by our researchers. The exhibits feature experiments and interactive presentations.

November

ARKEMA WINS THE TRANSAT JACQUES VABRE

On the morning of November 16, skippers Lalou Roucayrol and Alex Pella crossed the finish line of the Transat Jacques Vabre race in São Salvador, Brazil, coming in first in the Multi50 category. From Le Havre, France, the pair sailed 4,350 miles in 10 days, 19 hours and 14 minutes, at an average speed of 16.81 knots. It was a stellar performance for Arkema's trimaran, at the forefront of innovation.

November **ELIUM® WINS** AN AWARD IN SOUTH KOREA

Elium[®] racked up another success by winning the JEC Asia Award in Seoul. This award recognized our resin as a disruptive technology poised to change the composites industry. Only Elium® resin allows manufacturers to make wind turbine blades out of recyclable composites

November SECOND BOSTIK **ACQUISITION IN** THE UNITED STATES

Bostik acquired XL Brands, a major producer of flooring adhesives in the United States, for Bostik to offer comprehensive

\$205 million. This move enables solutions in this fast-growing, high-value-added market and to become a flooring adhesive leader in the United States.

December

On December 12, at the One Planet Summit organized by French President Emmanuel Macron in Paris and attended by 27 heads of state, Arkema and 90 other French companies reviewed their investments since the historic 2015 climate agreement was signed at COP21 in Paris. In a new agreement, the participants reasserted their commitments to drastically decrease global greenhouse gas emissions.

November A YOUNG SKIPPER AND A MONOHULL FULL OF PROMISE

On the same day, Quentin Vlamynck, the 25-year-old skipper of the Arkema

monohull, crossed the finish line at 11:23 a.m. (CET), in Le Marin, Martinique, in the second leg of the Mini Transat la Boulangère race. He ranked sixth after 14 days and 21 hours at sea. It was a demanding crossing aboard an ultra-innovative vessel, with a hull made of Elium® recyclable resin.





MOBILIZING FOR CLIMATE +



Arkema - Innovative / 11

BUSINESS

A PROMISING FUTURE

Arkema is accentuating its focus on specialty chemicals through innovation, targeted acquisitions and a stronger presence in high-growth regions. This clear strategy is driven by advances in marketing and operational excellence, corporate social responsibility and the digital transition.

INNOVATION

Arkema's R&D emphasizes sustainable development through bio-based products, new energies, water management, electronics solutions, lightweight materials and design and home efficiency and insulation. These six areas account for around two-thirds of our new patents each year. Major innovations like high-temperature Rilsan[®], a light, tough polyamide that replaces metal in engines, and Elium®, the first liquid thermoplastic resin used to make recyclable composite parts for wind turbine blades, grew out of this forward-looking strategy.

HIGH-GROWTH REGIONS

We have considerably expanded our production base in Asia. investing nearly $\in 1$ billion there over 10 years. During the same period, sales generated in Asia doubled from 13% of the consolidated total in 2006 to 26% in 2017. In July 2017, we announced three major capex projects in the region. These include a €300 million polyamide 11 production facility, increased production capacity at the Sartomer site in China, and a doubling of methyl mercaptan capacity at our thiochemicals plant in Malaysia.

ACQUISITIONS +

Since 2007, we have divested non-strategic businesses and made selective acquisitions that position us in advanced materials, adhesives and specialty resins and as a global leader in our main product lines. Our 15 acquisitions over the last ten vears have added nearly €4 billion in new sales, much of this in specialty chemicals (Bostik, Den Braven, XL Brands, Sartomer and Coatex). Organic growth and future acquisitions should lift the specialties segment to more than 80% of our business in 2023, up from 72% today.



MARKETING EXCELLENCE

In 2016, we developed a sales and marketing excellence program to meet customer expectations more effectively and promote our broad and deep product portfolio. Key Account Managers now guarantee uninterrupted, high-quality local Arkema service to large customers who buy materials from multiple business lines worldwide. Dedicated customer relationship management (CRM) tools and specific training back this cross-functional approach.

OPERATIONAL EXCELLENCE

Arkema understands that full employee involvement is the key to implementing the industry's most effective safety and operational excellence policy. We set tangible goals at all levels, aligned with our business and financial targets, that encourage exemplary management and individual engagement. On-site teams and their managers share information regularly through peer observation, performance reviews and tidiness and cleanliness checks to ensure that issues are resolved quickly and efficiently in a safe work environment.



CUSTOMER

CORPORATE SOCIAL RESPONSIBILITY

In a world facing numerous economic, environmental and social challenges, Arkema is committed to being a responsible chemical customers innovative, sustainable solutions, as well as promoting employees' individual and collective development and communicating openly with stakeholders.







BERNARD BOYER EXECUTIVE VICE PRESIDENT, STRATEGY



"Specialty products are expected to account for 80% of our business in 2023. Acquisitions will play a part in this growth, with a priority on small and medium-size businesses that offer a good fit. We plan to seize opportunities in the still-fragmented adhesives market and invest heavily in technical polymers and performance additives. Production will continue to be on investment focus, with big projects in the United States and Asia. This strategy should lift sales to €10 billion by 2020."



digital transition with the goals of developing new growth opportunities, encouraging collaboration that strengthens our digital culture and creating an effective digital ecosystem. We intend to leverage e-marketing and industrial applications like 3D and 4D modeling for plant construction and predictive maintenance to improve innovation and operational excellence.

BUSINESS

Stable Growth Drivers

Adhesives, advanced materials, molecular sieves, upstream and downstream acrylics and thiochemicals are all benefiting from strong growth in cutting-edge markets. These include 3D printing, eco-sustainable housing, automobile manufacturing, animal nutrition and aviation, all of which are shaping the Arkema of tomorrow.



ADHESIVES Strong Potential Made Stronger

Recent acquisitions in adhesives validate our growth strategy. The 2016 purchase of Den Braven's high-performance sealants made Bostik the market leader. The successive acquisitions of XL Brands, a flexible flooring adhesives leader, and CMP Specialty Products, a floor prep solutions company, have given Bostik a comprehensive lineup of wood flooring, carpet, vinyl and tiling adhesives and floor preparation solutions in the fast-growing U.S. market Other acquisitions are planned in the short and medium term.

Opportunities in Emerging and Long-standing Markets

A new Kepstan® PEKK plant is under construction in the United States. Arkema is expecting higher demand for this very high-performance polymer, whose mechanical properties and resistance to high temperatures (up to 260 °C), chemical agents and abrasion make it suitable for aviation composites and other demanding applications.

Our new Kynar® PVDF fluoropolymer capacity in the United States and China will support strong growth in water filtration, electric batteries and photovoltaics, as well as growth in long-standing markets such as automobile manufacturing, chemical engineering and oil industry cables.

In Asia, Arkema will invest €300 million in the next five years to build a world-class plant to produce amino 11 monomer and Rilsan® PA11 bio-based polymer from castor oil. To date, Rilsan® PA11 is the only 100% bio-based, high-performance polyamide qualified to replace metal in demanding applications, such as automobiles, electronics and 3D printing. These markets are poised to grow between 5% and 10% annually in Asia.

MOLECULAR SIEVES Refining and Petrochemicals Pivotal

Petrochemicals Pivotal to Growth Our new unit, opened in Honfleur, France, in 2017, strengthened our position as the world's second-largest producer of molecular sieves. The plant makes very high-performance molecular sieves, with adsorption and dehydration properties that are sought after in petrochemicals for aromatics separation, in healthcare as oxygen concentrators, in construction, and in pharmaceutical packaging. The facility satisfies strong demand from refining and petrochemicals, especially in Asia

and the Middle East.

THIOCHEMICALS Animal Nutrition as a Growth Driver

The thiochemicals plant in Kerteh, Malaysia will double its methyl mercaptan production capacity by 2020. This sulfurbased synthetic intermediate is a key ingredient in biomethionine, used in animal nutrition, and dimethyl disulfide (DMDS), used by the petrochemical and refining industries. In Asia, these markets are growing by more than 5% a year. Arkema is also looking at doubling capacity at its Beaumont facility in the United States.

UPSTREAM AND DOWNSTREAM ACRYLICS From Water Treatment to 3D Printing

The new acrylic acid reactor currently being installed at our site in Clear Lake, Texas (United States) will give us an annual production capacity of 270,000 metric tons by 2019. This will position us nicely to support demand in the markets for superabsorbents, coatings and adhesives, polymers for water treatment and assisted oil and gas recovery.

In Nansha, China, a new photocure acrylate resins production line will be commissioned in early 2019 to help Sartomer respond to strong growth in printed circuit and smartphone screen manufacturing and in 3D printing, with the N3xtDimension® range. Both niches are expected to expand by 10% a year.

In Navi Mumbai, India, Arkema added a new unit in 2018 to produce powder resins for coatings, along with a laboratory to develop applications and provide technical assistance. These Reafree® low volatile-organic-compound resins are used to make industrial coatings for automotive and architectural applications.

BUSINESS

Going Where the Growth Is

More than ever, the map of our industrial investments reflects our desire for strong positions in North America, France and especially Asia where markets promise sustained growth for specialty chemicals. Asia* - 2021 ← A new Rilsan® powders and pellets plant will increase production of bio-based polyamides 11 for automotive, 3D printing and consumer goods applications. *location to be announced

 Changshu, China -2017 and 2020
 Kynar® PVDF fluoropolymers production capacity increased by 25% to support local growth in new energies (batteries and photovoltaic solar) and water management.
 Rilsamid® polyamide 12 production capacity is slated to rise 25% by 2020. The product's recognized qualities make it popular in electronics, the automotive industry



ANNUAL GROWTH OF OVER 3% FOR THE GLOBAL CHEMICAL INDUSTRY

2015

GLOBAL REVENUE OF \$3,347 BILLION

40%	China
21%	Japan-South Korea
18%	Europe
14%	North America
7%	Other (including southeast Asia)



GLOBAL REVENUE OF \$5,213 BILLION

49%	China
6%	Japan-South Korea
14%	Europe
15%	North America
16%	Other (including southeast Asia)

VIBRANT MARKETS

Unit sales of electric vehicles estimated at



Number of connected devices estimated at



in 2020 versus 6.4 billion in 2016.

The number of wind turbines installed worldwide has been rising by



(Source: Roland Berger Strategy Consultants)

Arkema - Innovative / 17

SUCCESS STORY

Three years after joining Arkema's High-Performance Materials segment, Bostik, the smart adhesives specialist, is leveraging investment, innovation and customer-approach to expand its technological leadership in industry, personal care, construction and consumer products markets.

BOSTIK: A TALE OF SUCCESSEUL INTEGRATIC



ostik's specialty adhesives have tremendous growth potential in the years ahead. Although presently accounting for just 13% of assembly methods worldwide, adhesives are well positioned to challenge traditional mechanical systems like screws in construction and transportation. "From lighter materials to energy efficiency and sustainable products, we provide the operational and environmental responses global businesses expect," says Vincent Legros, President & Chief Executive Officer of Bostik, one of the world's leading providers of smart adhesives for industry, personal care products, construction

and consumer goods. A sign of the firm demand for specialty adhesives, Bostik's revenue rose by 26% from €1.53 billion in 2014, the year it joined the Arkema family, to €1.94 billion in 2017.

In addition to harnessing the €50 billion global adhesives market's 3% average annual growth, Bostik is capitalizing on the marketing, financial and technological synergies created by its integration into Arkema. "The merger increased our capex capacity and innovation potential, while making our brands more attractive to professionals and consumers," notes Vincent Legros. >>>









SUCCESS STORY

Targeted Acquisitions

Targeted acquisitions over the last three years have accelerated the growth of Bostik's Construction and Consumer Products segments. In late 2016, they acquired Den Braven, a leader in high-performance sealants for insulation and construction in Europe. In 2017, Bostik expanded its flooring solutions in the U.S. market with the acquisition of CMP Specialty Products, a floor prep business, and XL Brands, a leader in flexible flooring adhesives. Bostik now offers comprehensive, highperformance solutions in the United States and is becoming a powerhouse brand in this vibrant, fast-growing market.

Industrial Investments

This increased investment capacity has also helped grow the production capacity. Bostik opened a plant in Gujarat, India in 2017 to make polyurethane adhesives for flexible packaging. This move strengthened its position in a region experiencing a vibrant 4 to 5% growth, home to value-creating markets like flexible package lamination, transportation and shoe manufacturing. This follows last year's startup of Bostik units in Malaysia, the Philippine's and Sweden, all motivated by "the same need to stay close to customers," as Vincent Legros explains.

Shared DNA

Lastly, Bostik and Arkema complement one another when it comes to innovation, a key component of their shared DNA as can be seen in the R&D partnerships described in the following pages. Already a technological leader in the Non-Woven Products segment (personal care, diapers, etc.), Bostik is looking to gain similar recognition in acrylic-based and structural adhesives. "Access to Arkema's unique know-how in synthesizing chemicals has opened up new growth opportunities for us," acknowledges Vincent Legros. By 2020, Bostik expects to generate 18% of its revenue from products less than three years old, compared with 15% today.

Innovation: Stronger Together

n addition to compatible solutions in their shared markets, Bostik and Arkema over-lap in R&D platforms that support the Group's innovation policy. This synergy has changed some production processes and included cutting-edge technologies to adapt to market demands.

FOOD PACKAGING

Arkema and Bostik pool their technological expertise in the resealable food packaging market. Arkema's Orevac® polymers, recognized for their barrier and adhesive properties, go into making the multilayer structures of flexible packaging. Meanwhile, manufacturers use Bostik's M-Resins®, pressure-sensitive adhesives, to design reseatable flexible packaging for consumers. The innovation, called Reseal[®], is protected by several Bostik patents.

HOUSING **OF THE FUTURE**

The Smart House test home at the Venette research center near Paris (France) was created in 2015 by Bostik and Arkema to explore innovations in high-performance insulation, energy efficiency, renewable energy use, comfort and health. Researchers experiment with the functions of the full-scale 160-squaremeter sustainable house, whose adhesive technologies and smart materials foreshadow the home of the future. The Smart House lab embodies Arkema's open innovation process.

....

WATER **FILTRATION**

The same technological syneray is at work in the manufacture of ultra-filtration cartridaes used to purify brackish water, thereby promoting universal access to drinking water. The fibers are produced with Arkema's Kynar® PVDF fluoropolymers and supported by Bostik 2KPU[®] adhesives.



MODELING, OR HOW TO SIMULATE **HIGH PRECISION**

In 2017, to formulate the best adhesive for the use, Bostik replicated the application environment of a disposable diaper maker. To do this, Bostik enlisted modeling specialists from Arkema's CRRA research center near Lyon (see article page 32). Through simulation, they were able to analyze the physical and chemical processes that occurred as the adhesive was applied to the diapers' elastic side strips, as well as the product's behavior during wetting, bonding, cooling, etc. Bostik developed very effective solutions meeting the diaper market's tough specifications for heating temperatures and formulation changes while accommodating fast-paced production.



MARKET TECHNICAL CENTERS

In addition to its four R&D centers in France, the Netherlands, the United States and China, Bostik has a global network of 11 technical centers that align solutions with specific local needs. The formulation of a mortar-adhesive for tiling, for example, is adapted to the type of sand used in the customer's area, anywhere around the world.

PROCESS: SWITCHING TO EXTRUSION

By switching from a batch process to a continuous extrusion method to make a high-performance adhesive, Bostik optimized production and improved the product's properties. It took six months in 2017 to transform the technology, with the help of Arkema's Cerdato research center in France. The result has reduced contact time between the different components in the adhesive's formulation (sticky resins and the polymers used as a reagent) from several hours down to a few minutes. And unlike batch production, this particular extrusion keeps the formulation's components from overheating. The result is excellent control of chemical synthesis and improved adhesive performance.



FRANCOIS COURT BOSTIK RESEARCH, DEVELOPMENT AND INNOVATION DIRECTOR



"There are real marketing and technological synergies between Bostik and Arkema. Marketing, because our solutions complement each other in shared markets such as packaging and construction, and technological, because our upstream and downstream activities feed one another and Bostik contributes to Arkema's innovations in sustainable housing, lighter materials and electronics. Since improving an adhesive's properties mainly comes down to how you formulate its components. Arkema's expertise in specialty chemicals gives Bostik a differentiatina advantage in smart adhesives.

Our innovation combines Arkema's upstream technological expertise with our detailed knowledge of customer needs and regulatory requirements.

Our R&D teams can change a polymer's design to give the specific properties - strength, fluidity, etc. required by the use."

BOSTIK: 11 CLOSE-TO-

Bostik Sticks Out with a Catchy Image

 o boost its share of mind among the general public, the brand with the gecko mascot has put a priority on sports and arts events that showcase the

use of its products.

Bostik continues to move closer to consumers by building a strong brand that everyone recognizes. In France, its share of mind has jumped 11 points since 2015, rising to 29% in 2017. The same uptrend has been seen in other countries where Bostik is courting attention.

Bostik is sticking its unusual gecko image on sports, cultural and community events that offer a connection to the use of its products and also enjoy a high international profile. "We target events that give meaning to the performance achieved using Bostik adhesives," explains Alexandra Delatte, Branding & Communication Director. "When events like the Tour de France bicycle race, transatlantic yacht races and art competitions use our products, we gain credibility. And the attendant media exposure significantly enhances our brand recognition."

Bostik renewed its sponsorships in 2018 and is accelerating its digital strategy towards consumers. This year's schedule includes advertising videos, online tutorials and e-business campaigns. "By gaining ground in the B2C segment, Bostik is also making itself more attractive to professionals," says Alexandra Delatte.

"WE TARGET EVENTS THAT GIVE MEANING TO THE PERFORMANCE ACHIEVED WITH OUR ADHESIVES."

22 / Arkema - Innovative

A GECKO IDENTITY WITH STICKING POWER

Gary the Gecko has symbolized Bostik's brand identity since 2014. This powerful image spurs curiosity and embodies the properties of Bostik's solutions. A reptile native to Asia just a few centimeters in size, the gecko colonizes regions with very different climate and biotopes. The gecko's feet stick to any type

of surface and it can carry loads 40 times its own weight.

AFMTELETHON

COMMUNITY MASS TRANSIT: MINGLING WITH

THE CROWD IN THE PHILIPPINES

The brand decked out the ticket windows, turnstiles and ticket stubs of one of Manila's busiest light rail lines (400,000 passengers a day) for several weeks in 2017. Pairing Bostik with Super Vulcaseal®, an elastomer sealant well known to Filipino DIY customers, heightened the campaign's impact.

Plus... SOLIDARITY IN FRANCE:

Partnership with the AFM-Telethon to support research into rare genetic diseases.

sports

BOSTIK BREAKS AWAY FROM THE PACK IN THE TOUR DE FRANCE

Bostik became an official partner to the Tour de France bicycle race in 2017 after two years as a supplier. The brand is featured at five locations in the last 30 kilometers of each stage and receives a large number of passes for customers. This year, Bostik has developed an innovative adhesive for the riders' race bibs to withstand the wind, rain, sweat and generally extreme conditions encountered each day.

TRANSATLANTIC RACING - A TANDEM WITH THE WIND IN ITS SAILS

Bostik joined Arkema as proud sponsors of

French skipper Lalou Roucayrol and his Spanish crewmate, Alex Pella, winners of the 2017 Transat Jacques Vabre race (see page 52). The pair was at the helm of the Arkema Multi50 trimaran, which was assembled in part using the brand's adhesives.





Advertising banners in Super 12 championship stadiums.

SOCCER IN THE UNITED KINGDOM:

Sponsoring in the Division 4 amateur championship.



DESIGN: PUZZLING OUT BRAND RECOGNITION IN THE UNITED STATES

Bostik has sponsored the annual

Design N'Gather mosaic design competition since 2016. Each entry is turned into a mosaic by an Artaic robot, which assembles the pieces using Bostik's Dimension® RapidCure™ pre-mixed, glass-filled grout. The 2017 Grand Prize winner Lisa Darroh-Pouls accepted her award in front of an audience of 600 artists and designers. Her masterpiece is on exhibit at a flagship Las Vegas hotel.

Plus... ARCHITECTURE OF MEXICO:

Organization of the first Pixel Mural Competition featuring Bostik's high-performance Panel Tack™ to assemble the frescoes.

CONTEMPORARY ART IN FRANCE:

Collaboration with Wilfrid Almendra, a Franco-Portuguese artist known for her visionary spirit, at the Palais de Tokyo museum in Paris in October 2017.



Arkema - Innovative / 23

FULLY COMMITTED TO THE UNITED NATIONS' 2030 AGENDA

As a supporter of the United Nations Global Compact, Arkema has committed to the 2030 Agenda for Sustainable Development, a plan of action for people, planet and prosperity. The UN's 17 sustainable development goals (SDGs) support the choices we made in 2012 when we introduced our own corporate social responsibility policy. Here we take a closer look at nine strategic contributions.

V SDG 6

CLEAN WATER AND SANITATION

Water treatment is one of Arkema's innovation priorities. Our R&D has developed a Kynar® PVDF fluoropolymer grade and partnered with Polymem on a new generation of more efficient and durable ultra-filtration membranes to produce drinking water. The filters treat 20% more water using the same amount of energy. In 2016 and 2017, committed to promoting universal access to drinking water, Arkema became the primary sponsor of Sail for Water, a non-profit that organized a round-the-world sailing trip to distribute water filters based on our new technology. During the circumnavigation, the crew distributed 1,000 filters, enough to produce drinking water for 30,000 people. Closer to home, our Optim'O program aims to reduce chemical oxygen demand (COD) in our production sites' wastewater by 40% by 2025.

SDG 7

AFFORDABLE AND CLEAN ENERGY

Our materials support the transition to renewable energies. Kynar® fluoropolymers and carbon nanotubes lengthen the life of lithium-ion batteries and enhance their performance. We're also developing Elium® thermoplastic resin to produce next-generation wind turbine blades made of fully recyclable thermoplastic composite. Lastly, several innovative technologies are being combined to make photovoltaic panels more efficient and durable. For example, our transparent, ultra-UV-resistant Evatane® resins are used to assemble the panel's different components, while Kynar® polymer films provide long-lasting panel-back protection.

Our global Arkenergy program aims to reduce the Group's net energy purchases by 15% by 2025.



CO SDG 12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Arkema uses renewable plant-based feedstock to produce chemicals and materials. We've been manufacturing a wide range of high-performance biobased polyamides (Rilsan®) from castor oil for 70 years.

We also make it easier to recycle finished products. Our Kercoat® and Opticoat® protective coatings, for instance, strengthen returnable glass bottles and enhance their appearance, thereby doubling re-use from 25 to 50 cycles.



HOW WE CONTRIBUTE

We define our contribution to the SDGs at three levels: strategic, direct and indirect. Our strategic contributions (see examples below) include R&D efforts related to our six innovation platforms*: here, the goal is to increase our positive impacts, for example by providing materials to develop new energies. Other strategic contributions include our safety, environmental footprint and diversity commitments: here, we strive to reduce our negative impacts, notably by decreasing our production facilities' carbon emissions.

* Bio-based products, renewable energies, water management, electronics solutions, lightweight materials and design, and home efficiency and insulation.

GOOD HEALTH AND WELL-BEING

Arkema fully supports the chemical industry's voluntary Responsible Care® initiative and considers safety and health to be core priorities. We have made them a cornerstone of our CSR policy. We take active measures to improve our employees' working conditions, including peer observation, ergonomic workstations, and safety briefings at the start of tasks and meetings. Our initiatives have halved our accident rate per million hours worked* (TRIR) since 2012. Today, at 1.6, our TRIR is one of the lowest in the chemical industry.

* By Arkema and contractor employees working at our sites.



• SDG 13

CLIMATE ACTION

Arkema has developed lightweight, high-performance thermoplastic materials that can replace glass or metal in the automobile and aerospace industries. These materials reduce vehicle and airplane weight thereby reducing fuel consumption and carbon emissions.

We've also committed to shrinking our corporate environmental footprint by reducing our direct greenhouse gas emissions by 50% by 2025 (we reached the 48% mark in 2017).

∮ SDG 5

SDG 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Sustainable building materials and solutions are another Arkema R&D focus Our acquisitions of Bostik, and more recently Den Braven, have broadened our portfolio of sealants, coatings, adhesives, mortars and grouts, all of which help insulate buildings thermally and acoustically. At the Smart House, a connected, automated test home at the Bostik Smart Technology Centre in Venette, France, we study the challenges of tomorrow's housing, collecting and analyzing data on environmental footprint, energy autonomy and efficiency, comfort and health.

LIFE ON LAND



To achieve a more gender-diverse workforce in the male-dominated chemical industry, we have set a target to increase the percentage of women in senior management positions from the current 19% to 23%-25% by 2025. A number of initiatives have been introduced to support this goal, including a mentoring program launched in 2016 to promote the advancement of women to higher and senior management positions. Participants are assigned a male or female seniormanager mentor, with whom they may freely discuss their career path trajectory.

Arkema solutions contribute to the development of digital technologies. Our nanostructured polymers support miniaturization, while our electroactive Piezotech[®] polymers, which change shape when stimulated by an electrical current, pave the way for functionalized, connected objects and numerous medical applications. These include blood pressure sensors and surgical guides precise to within one millimeter.

SDG 11

SUSTAINABLE CITIES AND COMMUNITIES



To shrink our environmental footprint, we pledged to reduce volatile organic compound (VOC) emissions by 33% between 2012 and 2025. That target was achieved in 2017, with emissions down 34% in relation to 2012. This achievement demonstrates our commitment to limiting Arkema's impact on wildlife and plants.

SDGS SET THE COURSE

Adopted at the United Nations in September 2015 by 193 countries, Adopted at the United Nations in September 2015 by 193 countries, the UN's sustainable development program addresses our planet's major economic, social and environmental challenges for 2030. The plan's 17 sustainable development goals (SDGs) provide a universal roadmap to eradicate poverty, protect the planet and create peace and prosperity for all. Governments, civil society and businesses are urged to do their part

CSR, AT THE CORE OF OUR **STRATEGY**

Our CSR policy is built on a solid foundation and a commitment to sustainable growth, not just for us, but everyone in our value chain. Virginie Delcroix, Vice President Sustainable Development, explains.



"INTERNALLY, THE SDGS HELP US REACH THE ENTIRE CORPORATE COMMUNITY AND MAKE IT EASIER TO SPREAD A CULTURE OF CORPORATE SOCIAL RESPONSIBILITY."

How much have the Sustainable Development Goals (SDGs) set by the United Nations informed Arkema's CSR initiatives?

Virginie Delcroix – In 2012 we organized Arkema's CSR process around five facets of our business and strategy: safety, the environment, innovation, social development and dialogue with our stakeholders. When the UN SDGs took effect in early 2016, we naturally connected our six

When the UN SDGs took effect in early 2016, we naturally connected our six innovation platforms to six of the 17 goals. Arkema's innovation strategy was supported by the United Nations' 2030 Agenda.

In 2017, we further identified SDGs linked to our five CSR priorities and stepped up our response to the world's social, environmental and economic challenges. This helped us to better assess Arkema's CSR and sustainability contributions and expand our commitment as a responsible chemical producer and our contribution to society across our value chain.

Internally, the SDGs help us reach the entire corporate community and make it easier to spread a culture of corporate social responsibility. More broadly, the SDGs give stakeholders a common language, making it easier to communicate and consolidate contributions.

How does Arkema involve stakeholders in its process?

V. D. – Stakeholder dialogue – especially along the value chain comprising our employees, suppliers and customers – is part of our DNA (see pages 28 and 29). In 2017, we focused in particular on helping suppliers assess their CSR performance. So far we've evaluated over 1,000 suppliers using Together for Sustainability (TfS), a chemical industry initiative to create a responsible supply chain. Based on the results, we have zeroed in on suppliers who need to show improvement. In addition, following on the materiality analysis conducted in 2016, we've met with stakeholder representatives to present accomplishments and keep the conversations going.

What do you take away from the assessments of rating agencies?

V. D. – Arkema's good ratings recognize both our efforts and those made with our partners. But let's not confuse things: ratings aren't an end to themselves. They are an excellent way to measure our progress and to pinpoint paths to improvement.

CSR STRATEGY

SUSTAINED RECOGNITION OF OUR **PERFORMANCE**

The 2017 assessments of five environmental, social and governance (ESG) rating agencies reflect the progress made by Arkema over the last several years. The Group's long-term goal is to be included in the Dow Jones Sustainability Index (DJSI).





ROBECOSAM





ARKEMA A SIGNATORY AT THE ONE PLANET SUMMIT

Arkema reaffirmed its commitment to low-carbon industry at the One Planet Summit convened by French President Emmanuel Macron on December 12, 2017 in Paris, two years after the 21st UN Climate Change Conference and the Paris Agreement. With 90 other French companies in attendance, the summit gave us a chance to discuss the reduced environmental impacts of our activities and our R&D focus on sustainable projects.

CDP confirmed that Arkema's strategy takes environmental aspects into account more effectively. It gave us an A- for addressing climate change issues and a B for water management.

ROBECOSAM, a specialist in sustainability investing, moved Arkema up in its 2017 ranking, putting the Dow Jones Sustainability Index (DJSI) of the best CSR performers in sight.

ECOVADIS, an agency that analyzes environmental and social performance as well as business ethics and responsible purchasing, kept Arkema at its Gold, or highest level. Arkema has ranked among the top 3% in the EcoVadis evaluation since 2015.

VIGEO-EIRIS compiles an index of the 120 best CSR performers among European listed companies. The ranking is based on a variety of criteria including the environment, human rights and governance. Arkema has ranked among the top 10 chemical companies in the Eurozone 120 and Europe 120 indices since 2015.

FTSE4GOOD assesses companies' CSR appeal with a focus on responsible business portfolios. Arkema featured again in its 2017 ranking.

Arkema - Innovative / 27

HOW WE LEVERAGE OUR VALUE CHAIN

As a responsible industrial company, we join forces with the other

TRAINING EMPLOYEES IN SUSTAINABLE DEVELOPMENT

We are launching a two-year program in 2018 to step up the sustainable development training of Arkema employees who interact with external partners. Purchasers are already knowledgeable about corporate social responsibility issues and work directly with suppliers to promote and comply with CSR guidelines. The same will soon be true for the entire global sales force. who communicate regularly with other stakeholders the tools to highlight Arkema's CSR policy and answer related questions," says Sophie Huguier, Sustainable Development Manager.

CREATING RECYCLING CHANNELS Arema promotes the circular economy. After focusing on recycling our own production waste, we are partnering with stakeholders in the value chain to recycle finished products containing our materials. The *Reverplast project is a perfect example*. Bunched in 2016 as part of a commitment to green growth with the French government, Reverplast is expanding in 2018 throughout the European Union. The project will create a dedicated channel to recycle acrylic glass (or PMMA), of which Arkema is a leading global producer. In partnership with a waste collection company, Arkema has already analyzed acrylic glass stockpiles (mainly in the rear lights of cars) in Europe and is working on a process efficient enough to produce competitively priced recycled acrylic glass. Outlets might include composites for the wind power industry or automobile manufacturing.

RECYCLING INDUSTRIAL WASTE

RECTCLING INDUSTRIAL WASTE The Waste Category Council, a multidisciplinary team with members from research, purchasing, environmental affairs and other departments, has developed programs to recover and recycle production waste at Arkema plants since 2016. A good example is found at the Pierre-Bénite facility, France, where Arkema now processes synthetic fluorspar – a byproduct of fluorogas production – into a high-performance additive for cement factories and metalworking. In 2013, concerned about landfilling fluorspar, we initiated a recycling study. After three years of collaboration among R&D, production, process, logistics and other experts, a new product called Fluor-Spark® was developed that has become recognized in cement production and metalworking as an effective way to reduce energy costs. Fluor-Spark® was our response to specific sustainable development challenges, as Gilbert Fuchs, the project's manager explains: "The EU recognizes the strategic importance of fluorspar and encourages all European manager, explains: "The EU recognizes the strategic importance of fluorspar and encourages all European producers to develop recycling initiatives for this feedstock."

PARTNERING WITH CUSTOMERS TO INNOVATE SUSTAINABLY

IO INNOVALE SUSTAINABLE We are working to meet and anticipate the major challenge of developing innovative, sustainable solutions for customers. Our innovation and collaboration focus on eco-design, smaller carbon footprints, renewably-sourced feedstock and energy savings. And we have a strategic management process for our products and solutions based on how they contribute to sustainable development. Continuous, selective innovation enhances our offering of sustainable solutions. Both the Technical Polymers business unit and Bostik have pilot projects under way in this area.

ASSESSING **SUPPLIERS**

We have deployed an action plan with Arkema suppliers to improve CSR scores. Bernard Martinez, a purchaser in the Industrial Services Category (CSI) team, tells us more.

"We encourage our suppliers to do better in the same way that our customers encourage us our customers encourage us to improve. From big companies to small businesses, the response from our suppliers has been quite positive as we work together on the Together for Sustainability international industry initiative. Every supplier is initiative. Every supplier is invited to register on the EcoVadis platform and fill out the evaluation questionnaire. Any supplier whose performance falls short is asked to take corrective action. The effectiveness of these measures is reviewed at a later date. We also systematically audit the sites of suppliers who work with our production units. We conducted about 30 audits in 2017."



FIVE CSR COMMITMENTS

Arkema aims to rank with the best in the chemical industry in CSR. In 2012 we set five major commitments backed by a formal management process, measures and, in certain areas, targets for 2025.



"Developing an innovative, sustainable range of solutions for our customers is an integral part of our CSR approach. As a responsible manufacturer, we comply with health, safety and environmental standards worldwide and maintain open lines of communication with all our stakeholders."

LUC BENOIT-CATTIN, Executive Vice President, Industry



RANK WITH THE BEST-**IN-CLASS IN** THE CHEMICAL **INDUSTRY** FOR SAFETY

Arkema's industrial safety process focuses on technical, organizational and human (Behavior Based Safety) factors and their interrelationships. A shared safety culture across Arkema has sharply improved our safety performance in the last decade.

Our safety commitments are reflected in three tangible targets.



* Accident rate per million hours worked

Site Audits

Audit all Arkema sites using the Arkema Integrated Management System (AIMS)*



2015 2016 2017 2025 ** This "all-in-one" audit assesses our improvements in safety, environmer and quality performance.





* Proaram designed to raise risk awareness and reduce the numbe of accidents.



SHRINK THE ENVIRONMENTAL FOOTPRINT OF OUR ACTIVITIES

We are focused on trimming our emissions, reducing resource consumption and stepping up our use of renewable resources. We also make sure that our products do not harm human health and safety or the environment.

We have set four environmental targets that are measured by Environmental Footprint Performance Indicators. EFPI are not impacted by changes in scope, allowing us to track Arkema's performance more effectively.



Energy

0.98

Reduce net energy purchases by 15%

0.92 0.89

0.85

Water Reduce chemical oxygen demand (COD) by 40%*



2012 2015 2016 2017

*The initial goal to cut COD by 20% was achieved in 2016. Arkema decided to take this a step further by raising the target to 40% in 2025.

2025



MAKE SUSTAINABLE DEVELOPMENT **A CENTERPIECE OF OUR INNOVATION** POLICY AND OUR **PRODUCT LINES**

We create solutions that respond to today's major environmental challenges, which include new energies, the fight against climate change, access to clean drinking water, the use of bio-based feedstocks, and home efficiency and insulation.





FOSTER THE PERSONAL AND COLLECTIVE DEVELOPMENT **OF OUR PEOPLE**

Everywhere in the world, Arkema's employee relations policies revolve around two concerns: the personal development of our employees and social development through improved collective working conditions and diversity.

Two diversity indicators have been introduced to track the number of women and non-French nationals in senior management positions.











Our Common Ground[®] initiative encourages dialogue with all our stakeholders, including those living and working near our plants, local schools and colleges and suppliers, to build balanced, sustainable relationships based on trust.



2015 2016 2017



DIGITAL CHEMISTRY

The tremendous power of digital tools offers new ways to invent materials that deliver better performance and to design better production facilities. We take you into a more-palpable-than-ever virtual reality, where it is possible to model the infinitesimally small, simulate the production of finished products or build a fully virtual plant.





Molecular modeling is revolutionizi ore effectively e can file pate

CHRISTOPHE CARRETIER, Head of Scientific Computing (CRRA)

32 / Arkema - Innovative

Experimental laboratory research into new materials can count on digital tools in the design of new compounds and the development of their production processes.

he latest-generation molecular modeling tools let us predict the properties and behavior of molecules even before we develop them, sparing us lengthy laboratory testing," says Abdelatif Baba-Ahmed, an Arkema computing and optimization expert from Arkema's CRRA research center in France. During preliminary design phases, digital tools make for shorter and better targeted lab testing. This means work on developing production processes can get under way much faster.

Anticipating the Most Efficient Processes

As Christophe Carretier, head of Scientific Computing, explains: "If you can zero in as closely as possible on the properties of the products you'll be processing, you can identify commercial scale-up solutions earlier and design facilities that are cheaper, more productive and safer." In other words, studying the properties and interactions of modeled molecules a few billionths of a meter in size makes it possible to anticipate the design of heavy production equipment. Thanks to this spectacular reduction in scale, teams can both optimize formulations and devise the most efficient processes ahead of time



manufacturer even makes the

mold. Simulation can save

months of development time,

the Application and Process

The approach accurately

behavior and the stresses it

must withstand during mass

production. To make models

using experimental protocols

materials. "Basically, we give

data they need in light of the

material's specific processing

giving them the best recipe."

constraints. It's a little like

our customers the configuration

predictive, they are tested

developed for Arkema's

depicts the material's

Modeling team.

says Nessim Ghamri, head of

esin flows into a mold slowly, eventually taking on the shape I of a running shoe sole. The process is happening on a computer screen, using the latest 3D simulation techniques. The shoe's production is being simulated here by a specialized team from Arkema's Centre de Recherche Rhône-Alpes (CRRA) in Pierre-Bénite, near Lyon, France. "In this case, digital simulation injects our Pebax[®] elastomer grade virtually, so that we can predict and control the material's behavior during processing, before the sole

Groundbreaking **Modeling Tools**

The prodigious surge in computing power is constantly refining modeling's ability to simulate the behavioral laws of materials. Our specialists deploy tools that go beyond standard digital performance by adding their own models to the software. "It's something none of our competitors do. For example, we're trying to describe how composites behave in aviation, automotive and wind power applications, taking into account the need for lighter weight materials and ensuring that the finished parts have the required properties. Our ability to reliably simulate processing is key to predicting how parts will be impacted under the harshest conditions. We can then recommend the best tradeoff between cost and properties for each part, using replicable, efficient processes. In a way, we're making things virtually."

INNOVATION

Here at Arkema, we see digital as an opportunity to enhance the construction of our new production facilities.

DIGNAL MANUFACTURING STEP INTO A NEW-DUALNE

ith today's technology, you can walk around a virtual production unit and inspect everything down to the smallest detail before the first brick is laid. Arkema's new specialty molecular sieve production capacity inaugurated in 2017 in Honfleur, France, is a good example. The plant was entirely designed using digital technology and 3D immersive simulation software. Operators were able to simulate their movements in their future workshop and point out 230 ways to make it safer, more ergonomic and more efficient. What's more, the 3D digital model trimmed six months off the design and construction phases. All the data for our first paperless project were sent electronically, speeding up the decision-making process. "The more we can plan ahead, the

fewer do-overs we have at the building

site. Anticipating problems saves both time and money," says Serge Herbé, Project Engineer in Arkema's Engineering Department.

Next Up, 4D Modeling

The Honfleur plant confirms the promise of digital technology in production projects and paves the way for a new generation of tools. One example is 4D modeling, which adds the dimension of time and lets you visualize a project's progress on the 3D model. This optimizes scheduling and promotes collaboration among everyone involved in a project. "I'm struck by digital technology's impressive ability to promote collective intelligence," notes Laurent Baseilhac, Director of Processes with responsibility for the digital transition in manufacturing. "Digital is a tremendous improvement driver, pushing us to reinvent our businesses and unlock their value, to be more efficient each day."



ARKEMA

"Digitized industrial design will be standard practice in the future for developing our industrial projects around the world."

SERGE HERBÉ, Arkema's Engineering Department



KEPSTAN® COMPOSITES, FOR AN "IMPEKKABLE" TAKEOFF

Aircraft manufacturers have found that our Kepstan[®] PEKK, used as a resin for composites, is a powerful ally in their drive to make lighter-weight airplanes. A recent development agreement with global technical composites manufacturer Hexcel cements our position as a key supplier to the aviation industry.

erospace is a major market for composites and has definitely fueled the development of these materials in the last few years, including our PEKK thermoplastic, an exceptionally resistant high-end technical polymer. PEKK, combined with carbon fibers, forms a high-performance composite prized as a much lighter-weight alternative to metal (around 50% lighter). Initially successful in secondary parts such as leading edges and mobile flap shutters, high-performance PEKK composites are now used in aircraft bodies, wings and even in sections subject to the greatest stresses, like the wing-fuselage connection.

Reinforcing PEKK resins with short or long carbon fibers produces exceptionally lightweight composites offering remarkable thermal (up to 260 °C) and mechanical resistance. "A metal always responds in the same way, regardless of the direction of the stress. With composites, the response depends on how the fibers are oriented. This makes it possible to tailor materials to the end use and opens up a huge field of applications," explains Philippe Bussi, in charge of the PEKK development.

Developing Thermoplastic Composites for the Aircraft of the Future

The newly minted strategic partnership between Arkema and Hexcel, a leading U.S. supplier of composites for the aviation industry, will devise PEKK composite ribbons for the fuselage parts of next-generation aircraft. "The solutions we develop together in a common laboratory will make lighter materials adapted to the fast-paced production methods of aircraft manufacturing," comments Philippe Bussi.

To keep up with skyrocketing demand for PEKK in composites and 3D printing (see p. 40), Arkema – one of the world's two PEKK producers – has doubled its production capacity in France and broken ground for a world-class facility in Mobile, Alabama (United States). This new plant is scheduled to come onstream in late 2018. PEKK's success story is just beginning.



HOW FAR WILL COMPOSITE MATERIALS GO?

In tons used per year, composites (10 million tons) are relatively small potatoes compared to plastics (300 million tons) or aluminum (50 million tons), according to a JEC Group study. The figures for steel and concrete run into the billions of tons. Even so, composites are becoming increasingly common in aerospace, boat building, automobile manufacturing and construction. Annual growth for thermoplastic composites of the type Arkema makes exceeds 10%.

M FC CC PEKK RESIS AND EXPC AND

Composites now make up more

than 50% of certain newer

aircraft models, such as

the Airbus A350 and the Boeing 787.



MATERIALS FOR EXTREME CONDITIONS

PEKK COMPOSITES OFFER EXCELLENT RESISTANCE TO SCRATCHING AND ABRASION, CHEMICAL EXPOSURE AND HEAT (UP TO 260 °C) AND ARE AS RIGID AS SOME METALS.



Arkema - Innovative / 37

MATERIALS FOR **CUTTING-EDGE** ELECTRONICS

Arkema is developing specialty materials that target the electronics of the future. Used in tablets, smartphones and television sets, these materials improve screen definition and brightness, as well as battery and component performance.

every two to three years," notes Karine Elie. Concerning production, a new acrylate resins unit will begin operating in early 2019 in Nansha, China.

"The Stakes Are Huge"

The same need for innovation and responsiveness prevails in the lithium-ion battery market, where Arkema has carved out a leadership position. It owes this success to Kynar® PVDF resins, which bind active particles in cathodes and make coatings for battery separators. With local presence always top-of-mind, the PVDF business has beefed up its research teams in Asia, the world's flagship electronics market. "We regularly invite customers and prospects to our R&D centers in Changshu, Seoul and Kyoto," explains Thomas Fine, Global Market Manager Battery - Technical Polymers. "This gives us an opportunity to talk technology and build mutual trust. It's an invaluable approach in the portable electronics and automotive battery markets, where the demand for new solutions is extremely strong. Our challenge is to supply increasingly efficient materials – by that, I mean materials that

increase battery power and lifespan while allowing manufacturers to produce faster and cheaper. We'll still need an enormous amount of innovation in the years ahead to support these markets. The stakes are huge.

Adding Touch Sensations to 3D Vision

Piezotech, an Arkema subsidiary that produces very high-value-added, PVDF-derived fluoropolymers, is also showing it can innovate in cutting-edge electronics. The start-up is conducting research on how to make unusually sensitive interfaces using conductive ink and ultra-thin layers of electroactive polymers. Interfaces like these make it possible to produce electronic devices on flexible surfaces such as fabric and paper at a low cost. For instance, a talking book demonstrator recently came out using electronic printing. Piezotech has other innovative surprises in store. For example, its researchers are working on haptic applications – pursuing a glove prototype – that can add sensations of touch to 3D vision.

hen a giant South Korean electronics company recent-ly presented an ultrathin TV screen that can be rolled up like a tapestry, our researchers definitely took notice. "The totally flexible screen, pliable as a sheet of paper, is based on a cutting-edge technology that we're working on," says Karine Elie, Vice President Sartomer Asia, an Arkema subsidiary. "Electronics has always been a major application for our resins, which are used in television screens, tablets and smartphones to enhance definition and brightness. The challenge is to adapt to each new generation of products in a fast-growing market. We're keeping a close eye on the race for higher resolution, as the next-generation Quantum Dot (QD) and OLED screens hit the market. These new products are driving strong demand for specialty acrylate resins like the ones we're developing."

Focus on Innovation

Backed by extensive experience and expertise gained in the United States and Europe, Sartomer is steadily beefing up its R&D in Asia, keeping scores of researchers busy at its Guangzhou, China center while leaning on local teams in Japan and South Korea. "It is vital for our R&D, as well as our production and logistics, to respond as quickly and efficiently as possible to local needs, because products in this market are updated





NANO BUT MIGHTY



BY RESEARCHING NANOSTRUCTURE FORMATION IN OUR BLOCK COPOLYMERS, WE PLAN TO PUSH THE **ENVELOPE ON ELECTRONICS** MINIATURIZATION.

The power of today's microprocessors would have been hard to imagine a few years ago. In 1970, a PC had 2,300 transistors, whereas now, a chip the size of a fingernail can contain five billion. This spectacular leap was enabled by advances in lithographic techniques that make it possible to etch circuits on sub-micrometric scale ranging from 50 to 100 nanometers. But the process has its limits. Semiconductor manufacturers now want to go smaller than 20 nanometers. To do that, they'll rely on the ability of certain block copolymers to self-organize. The idea is to push the boundaries of miniaturization by controlling the sequential organization of molecules, on a scale of a few nanometers, to produce more powerful nano-components. In partnership with researchers from the Leti Cea Tech center for research and specialized technology in micro and nanotechnologies in Grenoble and from the LPCO organic polymer chemistry laboratory in Bordeaux, both in France, Arkema has developed real expertise in this area. We're combining this expertise with Brewer Science Inc., a global leader in the field. Our partnership with Brewer helped speed the recent market launch of OptiLign™ lithographic materials, based on directed self-assembly (DSA) of block copolymers. Arkema is now working at its Lacq research center (GRL) in France to develop a second generation of self-assembled block copolymers that can create extremely high-resolution patterns seven, or even six nanometers – with the goal of offering the semiconductor market increasingly small, inexpensive, energy-efficient electronic components in the near future.





ARKEMA GIVES 3D **PRINTING** A BOOST

Nowadays, 3D printing isn't just for prototyping – it has become a reliable, rapid way to mass produce parts. The 3D revolution is affecting all industries and creating a global market, growing nearly 20% a year. Arkema is well-positioned with an exceptional lineup of polymer materials, resins and services.

rkema makes its mark in additive manufacturing (AM) with a wide range of materials including Rilsan[®] polyamides, Kepstan[®] PEKK, and Sartomer's N3xtDimension® acrylic photocure resins, available in powder, filament and liquid form and compatible with the market's main printing technologies. "We're the only supplier that can respond effectively to a broad list of specifications for mechanical and thermal resistance, flexibility, transparency, color and durability, explains Guillaume de Crevoisier, 3D Printing Business Director. Arkema stands apart in its ability to supply materials and services for highly diverse applications in aviation, medical equipment and even athletic gear. "Thanks to our knowledge of end markets and our broad line of solutions, we can advise decision-makers and help them choose the material and printing technology best suited to their needs."

A WIDE VARIETY OF APPLICATIONS

Our materials' synergistic mechanical properties make it possible to produce all sorts of objects, including decorative, functional, or customized technical parts, in small or medium runs. Here are some examples from different sectors.

SPORTS

Soccer cleat midsoles can be printed using Rilsan® powders to achieve the right shape and stiffness for every foot and field. Our broad N3xtDimension® acrylate resin range is also used to print athletic shoe soles with excellent elastomer properties. The result is a very attractive design and unmatched flexibility.

PARTNERING WITH THE BIG 3D PRINTER MANUFACTURERS

Arkema has an open R&D policy on partnerships with the field's major players to develop additive manufacturing materials. This means that customers of the HP 3D Multi Jet Fusion™ printer can print parts using new Arkema materials developed on HP's open platform. Our partnership with German manufacturer EOS led to the development of Kepstan® PEKK powders tailored to the latest EOS P 500 platform, making possible mass-produced aviation parts that withstand extreme stress.

MEDICAL

Our N3xtDimension® resins are used to print models of internal organs with very realistic textures and colors that are used for hands-on surgical training. Other applications, this time using Rilsan[®] polyamide powders, include guides for bypass surgeries modeled on the individual patient's arteries and customized ventilation masks that mirror the contours of the patient's face.



OPTICS

Eyeglass makers use our frames. 3D printing is also an application to which our are perfectly suited.

DENTAL

Our N3xtDimension[®] resins can be used to produce customized dental mouthpieces, worn at night to gently correct tooth alignment. The mouthpieces are easily remade on a regular basis to guide tooth movement. With this system, unattractive orthodontia will soon be a thing of the past.

AUTOMOTIVE

Our N3xtDimension[®] resins go into automotive applications, including prototype parts for design testing and finished parts for engines. A well-known automobile brand uses our Rilsan® polyamide powders to print decorative options that allow buyers to personalize their cars.

AVIATION

Airplane manufacturing requires small or medium-size runs of complex machined or assembled parts. To replace metal parts, Arkema has developed an extremely tough Kepstan® PEKK tailored to additive manufacturing that can be used to make, for example, aircraft air ducts with complex shapes. Such complex parts can also be made using Rilsan® polyamide powders.

Rilsan[®] polyamide powders to manufacture original, customized used to make optical lenses, transparent N3xtDimension[®] resins

A global market worth

n 2016, expected to grow to \$8 billion in 2020. Printing materials account for 15% of the market.

Wohlers Associates Report 201

Arkema - Innovative / 41

COULC .

TALENT MANAGEMENT

NURTURING OUR TALENT

Arkema's Human Resources teams identify potential, recognize expertise and provide support for all of our professions as they negotiate ongoing change in an era shaped by the digital transition.

THREE QUESTIONS FOR DOMINIQUE MASSONI, **VICE PRESIDENT, HUMAN RESOURCES & INTERNAL** COMMUNICATION DEVELOPMENT



2017 HIRES BY REGION



22.5% France 15.7% Europe (excluding France) **28.7%** North America 27.1% Asia 6.0% Rest of the world

How do you unlock the value in Arkema's professions?

D. M. > > Our workforce, with its combined knowledge and know-how. represents tremendous potential. It's our job to unleash that potential by supporting employees as their professions change and by making the most of their expertise. We have more than 200 job families, in four major categories: production, R&D, business and support. Each year we hire between 1,600 and 1,700 employees worldwide. For Arkema to thrive, it is crucial that we develop our talent, offer stimulating careers and create a positive atmosphere. Our training and career management policies are designed to promote each individual's professional growth and desire to be part of the Arkema adventure.

How do your support initiatives fit together?

D. M.> > Our HR policies foster workplace well-being, empowerment and experience sharing, as well as skills development and the promotion of talent. That's why we are working hard to expand our training initiatives

"For Arkema to thrive, it is crucial that we develop our talent, offer stimulating careers and create a positive atmosphere."

worldwide. We have created dedicated training academies to enhance technical and management skills in specific professions, promote discussion and get new points of view from outside speakers. A good example is the Sale's Academy. This is a vital program because our salespeople play a key front-line role We also emphasize management training through a Leadership Academy and a Top Executive Academy. Lastly, we created a corporate HR team this year focused on developing job families and on anticipating how the digital transition will affect all work practices.

How do you recognize the considerable expertise at Arkema?

D. M.> > Recognition is a key part of Arkema's HR policy. A cuttingedge company like ours is brimming with experts in research, processes, industrial property, law and other fields. We have put together a specific approach to promote employees with a high level of expertise who are recognized by their peers.

THE ARKEMA SALES ACADEMY





ecause sales excellence is a strategic growth priority for Arkema, our policies are designed to make customer service the central concern throughout the company, starting with the sales teams. That's the purpose of our customized Sales Academy training program, which offers on-site seminars, e-learning initiatives and targeted coaching. The program was rolled out to increase sales efficiency by creating a community of sales professionals. The Sales Academy gives them a place to share experience, learn about new tools for a more digital working environment, network with each other and build confidence. The Academy also promotes cross-BU approaches to foster a 360° vision and create more opportunities.

"Unleashing our sales force's potential."

The number of salespeople who attended the Sales Academy over the past two years (Arkema's entire sales force worldwide).

DIGITAL **TECHNOLOGY PUTS COLLECTIVE INTELLIGENCE TO** WORK FOR HR

he digital transition may help break down walls in companies. Arkema's HR is counting on it to smooth the flow of communication among employees and boost efficiency, notably through Yammer, an internal social networking service that allows employees to discuss specific topics and capitalize their information in real time, no matter where they are. "People

can use it to create a help group for a profession or share ideas on topics like workplace well-being, gender equality, or even shared interests. Yammer can help you get and give information and solve problems faster by working with the right people, explains Gauthier Danloux, Yammer manager in Internal Communication. The network has more than 200 active discussion groups and offers a news feed option that cuts down on e-mails so users can focus on useful messages.

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NEW CODES

t's still going to take a little time for digital habits to become ingrained. The idea is to guide people through the transition rather than force it on them. Millennials are especially well prepared, which is why we plan to make the most of Arkema's digital natives. For example, we are planning to form a digital squad of new hires from the hyperconnected generation to breakfast with top managers on a regular basis. Similarly, a digital champions community is on the drawing board to give people involved in the digital transition in different fields a place to share their experiences. Likewise, an internal think tank of the HR specialists and business managers has been tasked with analyzing digital's impact on new business opportunities and on the way Arkema's professions will change in the years ahead. The end goal is to make digital resources work best for each employee so everyone can move to a higher level in their respective fields.

THE IMPORTANCE OF RECOGNIZING **PROFESSIONAL EXPERTISE**

n a company like Arkema, it is important to develop specific career paths for management and for experts, especially with our exceptionally high-caliber pool of knowledge and expertise. Our 1,500 researchers make up 8% of our total workforce. They are joined by hundreds of process engineers, legal and financial experts, industrial property and other top-flight professionals in their fields. It's not enough to rank positions vertically by level of responsibility in the organizational pyramid. Experts don't

"I was designated an expert in structural characterization and regulatory compliance testing. This decision showcases chemical analysis, a discipline often overlooked in R&D. Being recognized as an expert reflects positively on the individual, but also on the technical teams working with her."

FLORENCE CHURLAUD, Group Manager, Specific Regulatory Compliance Testing team, Cerdato, France



necessarily have a team or budget to manage but they possess rare skills, work in critical fields, drive innovation and share knowledge In short, they are a unique asset. That's why Arkema has introduced professional expertise criteria to assess the qualification levels of engineers and technicians in different job positions. This approach allows them to grow in their jobs, take on more responsibility and gain recognition or qualifications based on their professional expertise as assessed by a committee of peers.



umber of researchers at Arkema



"A BIG COMPANY WITH A START-UP MINDSET"

arie Huzar-Ea is part of the Kynar® fluoropolymers development team for new energies and filtration in Arkema's Technical Polymers business unit. "When I learned about the company durcing an initial recrutment meeting, I saw that its values – solidarity, simplicity, responsibility and performance - were a good fit for my temperament," says Marie.

A year later, the young hire confirms that her first impression was right: "My background as a graduate of Institut d'Études Politiques (Sciences-Po) in Paris and the HEC business school was unusual. I don't have an advanced technical degree like most of my peers, and that makes me especially appreciative of how kind they are to me. The people here are both highly expert and unassuming. I'm learning an enormous amount. Communications and interactions are smooth – we aren't buried under a mound of procedures. I enjoy the fact that I get to meet a variety of individuals from different fields, including researchers, legal specialists, salespeople, market managers, customers and end users, and we cultivate a spirit of partnership. Kynar® is a material used in high-performance applications. Lithium-ion batteries are one of the fast-growing markets, along with water filtration and renewable energy solutions such as photovoltaics. We're in the thick of today's most pressing issues. It's exciting to see how we can address these through innovation. I feel perfectly in sync with these new challenges. Arkema is a young, agile company deeply committed to innovation. I really like the mix of a big international company with a start-up mindset."



"TURNING OUR RESEARCH INTO COMMERCIAL SUCCESS"

rkema has an exceptional pool A of high-level scientific and tech-nical talent. A good example is Dr. Michael Abrams. Over his 17-year career at Arkema, Mike has consistently helped drive innovation at the King of Prussia R&D Center near Philadelphia, Pennsylvania in the United States. His work has generated dozens of patents. He is the R&D leader for our portfolio of organic peroxide products used to crosslink, or cure, polymers and elastomers. This crucial chemical function is used by manufacturers to harden plastics and

enhance their intrinsic properties. Mike and his team are developing new formulations that exceed customer requirements for performance, safety and cost in industries like automotive, cable and wire, and adhesives. To support such innovation, Mike regularly interacts with people across all disciplines, including researchers in Europe and Asia, sales, production, legal, logistics and regulatory teams and, of course, customers. "Effective cross-functional communication is essential for turning our research into commercial success," he explains. With



a PhD in chemistry from the California Institute of Technology, Mike is also responsible for maintaining close ties with PhD students at America's leading science universities in the company's ongoing search for new talent. He is also a member of the American Chemical Society Corporation Associates Committee, serving as Arkema's voice with industry partners.

Arkema - Innovative / 47

PROFILES



"OUR SAFETY EXPERTISE IS A COMPETITIVE ADVANTAGE"

evin Sun leads Hydrogen Peroxide & Derivatives Asia. It's a job made to order for this dynamic manager, an engineer by training with an MBA, who is equally at home in production and in marketing. Although bold moves in business come easily to him, Kevin's top priorities are to ensure that his people are safe and his facilities are reliable. It's a winning strategy: "Our Shanghai hydrogen peroxide plant and our teams' skills and expertise are recognized for environmental and safety performance. This is a competitive advantage now that China is doubling down on improving industry's environmental impact." Just three years after joining Arkema, Kevin has new challenges in sight. "In Asia, Arkema is a leader in traditional hydrogen peroxide markets like pulp bleaching," he acknowledges. "But we also have to develop new grades to support our growth in the region and compete in a tougher environment." His game plan is already thought out: "A priority of mine in the coming years is to leverage our specialty grades to focus on high-end markets with strong growth potential, especially in electronics and food packaging. But that said, I believe you can only achieve top performance with engaged, high-caliber individuals and teams. People are the backbone of our long-term success."



"AS INTENSE AND REWARDING AS EVER!"

rate Casteran is a production engineer at Arkema's Lacq thiochemicals plant in southwestern France, where sulfur-based chemicals are produced for a range of applications in the petrochemicals, refining, animal feed and other markets. Carole oversees the technical side of six production lines at Lacq. Her team of 85 people, working in shifts, keeps production running 24/7. "My first and main responsibility is the safety of everyone who works here," emphasizes Carole. She likes these units, which were completely remodeled in 2014 after gas production in the region was halted: "I was fortunate to be involved in every phase of the project to revamp the production processes. Today we produce more, more efficiently." The Saint-Gaudens (France) native has followed an impressive career path. After studying engineering for five years at the



Toulouse INSA engineering school, she did an internship at the Arkema Carling site, then moved on to Lacq in 2004. "I'm happy to be working in a big company like Arkema," says Carole. "To me, it means I'll always have access to unparalleled expertise. I know I'll get the answers I need from competent people both here at the plant and from Corporate Engineering." Carole has no qualms about being in charge: "The secret is to put teamwork first. Everything comes down to listening to each other and sharing information, so we can capitalize on feedback. It's up to me to relay the messages so that they're heard and passed on across the organization. After 14 years at Arkema, I'm as interested as ever in our projects, in tracking their execution and in operational tasks. Each year is as intense and rewarding as ever!"

na - Inn<u>ovative / 49</u>

REACHING OUT TO OUR STAKEHOLDERS

Our employees are proud to work for Arkema, and they donate their professional skills and free time to causes we sponsor that are important to them. Examples include projects in education, humanitarian work and even film



ARKEMA, THE CLASS

arie-Laure, Florence and Xavier, three Lacq Research Group (GRL – France) chemical technicians, would have been surprised if we'd told them they'd soon be back in school. Yet that's exactly what happened when they volunteered to speak at nearby Oloron Sainte-Marie middle school. Florence polished her presentation to make sure that "the content was fun enough to be accessible to students and concrete enough to explain the role of chemistry in everyday life. As for Xavier, "I prepared samples so they could actually touch a composite material. Maybe that will inspire some students to go into chemistry later on." In partnership with French foundation CGénial, educational outreach is deployed at almost all Arkema sites in France with the goal of breaking down barriers, interacting with the community and attracting young people to science and technology.

ARKEMA **ENGINEERS AND TECHNICIANS GO BACK TO SCHOOL** WITH A SMILE

SAIL FOR WATER: MISSION ACCOMPLISHED

•he French Sail for Water crew arrived at its final destination in France in June 2017 after sailing around the world – nearly 33,000 nautical miles, or 61,000 kilometers, in 625 days. It was the thrill of a lifetime for three friends. Thomas Degermann and Romain and Nicolas Sainte-Claire Deville. More than just an odyssey aboard the 12-meter Williwaw. Sail for Water was a generous, ambitious project that distributed 1,000 portable filtration kits to provide drinking water

access to more than 30,000 people in some 10 countries. The stakes are high given that 2.6 million people die every year for lack of safe drinking water. Arkema has made water management a research priority and developed a new filter in partnership with Polymem, a French specialist in ultra-filtration systems. Sail for Water distributed these new filters featuring the latest generation of hollow fibers for ultrafiltration made from a new grade of durable, hydrophilic Kynar® fluoropolymer. This technology not only filters out ultrafine particles, but bacteria and viruses as well.





ARKEMA EDUCATION FUND

he Arkema Education Fund was created in 2016 as part of the company's tenth anniversary celebrations. The Fund finances non-profit programs submitted by employees who are actively involved in the projects. Applications from around the world are reviewed by an international selection committee, including representatives from Human Resources and Communications and Arkema's ethics mediator. Twelve projects were selected in 2017 and granted money to support thousands of volunteers working worldwide in educational and teaching initiatives. Scholarships, school repairs and hands-on support for autistic students are but a few examples of the fund's reach.



"We're very proud of what we accomplished. We'd like to thank Arkema for meeting the challenge of designing an efficient filtration device that anyone can use. Its simplicity is what makes the system so great!"

THE SAIL FOR WATER CREW



THE SAINT-AUBAN PLANT PUTS ON A FESTIVAL

resented outside the official competition at the 2017 Cannes Film Festival, "Faces Places" (Visages villages) – directed by French graffiti art star JR and celebrated director Agnès Varda - was nominated for an Oscar in the best documentary category. Employees at Arkema's Saint-Auban plant in France crossed their fingers, hoping the film would win. Alas, the film did not take home a statuette, but employees were proud to have taken part in a novel experience. In this project, JR and Agnès Varda filmed and photographed France's blue-collar workers, farmers and shopkeepers and created large portraits to post at their workplaces. They stopped at our Saint-Auban plant where IR set up several giant photographic installations to spotlight our employees. In the film, Agnès Varda takes viewers through personal and collective memories of a part of France that is rarely given a starring role.

> "We met some intense personalities" at the Saint-Auban plant and we were worried we might shake them up a bit. But we were wrong-they understood the project. As one person told me, 'art is made to surprise people"

ARKEMA

TWO SAILBOATS, FEAM-BUILDING PROJECTS

The Arkema Multi50 trimaran and Arkema 3 Mini 6.50, Team Arkema Lalou Multi's two sailboats, are popular with our employees all over France, but especially at the Lacq research center where their main materials innovations were developed

0.17

ARKEMA

TRANSAT JACQUES VABRE VICTORY

On November 16, 2017, Lalou Roucayrol and Alex Pella won the prestigious Transat Jacques Vabre race at the helm of a trimaran sporting the Arkema name and logo. It was a day of celebration for the company's proud employees.

a fierce battle," promised Lalou before the competition began. The French skipper and his crewmate Alex Pella fought to the very end to pull out a superb victory. It was the first for Lalou, who was competing in the transatlantic race for the ninth time. Leaving from Le Havre, the Arkema crew covered the course's 4,350 theoretical miles in 10 days, 19 hours, 14 minutes and 19 seconds – a record! Backed by their extensive experience and excellent working relationship, Lalou and Alex pushed the Multi50 in winds that never let up, making a masterful comeback of more than 100 miles that will long be remembered. Karine Fauconnier, herself the winner of the Transat Jacques Vabre in 2007, offered invaluable support as routing and weather strategist: "I wanted our team to win whether I was on board or not." Karine helped the winning crew plan the best routes to the finish line.





"130 Arkema employees turned out to root for us when we set off. I'm very happy and proud to bring this victory home to them!"

LALOU ROUCAYROL, the Arkema Multi50 skipper

MINI ARKEMA 3 MAXI CHALLENGE

Team members at Arkema's Laca Research Group (GRL) **Composites Lab helped build** the Mini 6.50 Arkema 3 - a technological challenge and an exciting human exploit.



n October 1, 2017, the Arkema 3 Mini 6.50 set off on the Mini Transat La Boulangère race packed with technological innovations, many of them developed by Arkema's Laca Research Group (GRL) Composites Lab in France. GRL team members turned out in large numbers to cheer on skipper Quentin Vlamynck as he left from La Rochelle. The emotion filled departure culminated the two years of collaboration with Team Lalou Multi required to build and master this revolutionary prototype.

A Successful Partnership and Unforgettable Experience

From the beginning, the construction of the Arkema 3 Mini 6.50 was planned as a full-scale test bed for Arkema materials. The sailboat's hull and deck were made entirely of thermoplastic composite using Elium[®] recyclable acrylic liquid resin. Bostik's SAF® structural adhesives were used to assemble and glue the bulkheads and Altuglas[®] ShieldUp acrylic glass windows. Besides its innovative materials, Arkema 3 is also the first rounded-stem boat in its class to use foils (fins extending out from the sides) to skim over the waves.

"It's nice to share a moment like this with Arkema's teams. It gives us an opportunity to bring together everyone who helped build this unique sailboat."

QUENTIN VLAMYNCK The Arkema 3 Mini 6.50 skipper



"It took almost two years of work to implement technical choices that had never been tried before and build the Arkema 3 Mini 6.50," explains Pierre Escalé, Composite Materials R&D engineer, GRL "No one had ever seen a sailboat of this kind, built of recyclable thermoplastic resin, before it was launched in June 2016. It's truly breakthrough technology. With this adventure came a very rewarding collaborative spirit and strong bonds with Team Lalou Multi. That explains why today, at GRL, we're all very attached to the project and to Quentin. In a way, his race is ours too."



MATERIALS IN THE SPOTLIGHT

Arkema's wide range of products are used everywhere to make life easier, enhance sports performance and help manufacturers build lighter-weight vehicles and more comfortable, eco-sustainable homes. Yet all too often, the public is unaware of the key role played our polymers, resins, adhesives and additives. The following pages provide our materials a well-deserved moment in the spotlight.





MY LIFE IN A BAG 1. Our Encor® finishing resins enhance this handbag's leather look. 2. Smooth-touch Orgasol® powders give this lipstick and blush extra texture and softness. Their metal casing is scratch-proofed by a Sartomer® UV resin-based coating. 3. Our Synolac® and Synocryl® resins are the main ingredients in this nail polish. 4. This medication's primary active ingredients are synthesized using a hydrazine hydrate-based intermediate. 5. For improved performance and durability, this smartphone's lithium-ion battery uses an electrode containing Kynar® PVDF, which binds the active materials. Our **Sartomer®** specialty acrylates in the screen optimize definition and brightness.

LIFESTYLE







DIY TIME

1. This low-odor, water-based paint made with Synaqua® acrylic resins and Coapur® thickeners is ideal for living areas. It provides outstanding splatter-free coverage that holds up over time. 2. For a warm interior, choose scratch-resistant oak parquet protected by Sartomer® UV resin varnish. 3. There is a Bostik smart adhesive for every need, from mortars and grouts for floor prep to adhesives for wood or flexible PVC flooring, carpets and tiling. 4. The Bostik line has everything you need for DIY projects, including high-quality Den Braven acrylic grouts and sealants, Bostik baseboard adhesives and Sader® multi-purpose, extra-strength adhesives. 5. In double-glazed windows, our Siliporite® molecular sieves absorb moisture and prevent condensation between the two sheets of glass. The inside glass is treated with Certincoat®, a clear coating that conserves heat. And Durastrength® and Clearstrength® additives make the imitation-wood PVC profile impact- and UV-resistant.



KITCHEN ARTS 1. Tinted or transparent, **Altuglas**[®] acrylic glass is prized by designers for furniture like this chair, lamps, store display stands and illuminated signs. **2.** This food processor bowl is made from **Rilsan[®] Clear**, a very durable, transparent bio-sourced polymer that withstands heat, steam, hard knocks and repeated cleaning. What's more, it is guaranteed bisphenol-free. **3.** Returnable glass bottles can last up to 50 cycles using our **Kercoat[®]** protective and **Opticoat[®]** scuff-masking technologies. **4.** The excellent adhesive properties of **Orevac[®]**, **Lotader[®]**, **Lotryl[®]** and **Evatane[®]** resins glue together the component plastic, aluminum and cardboard layers of these tough beverage cartons to create a barrier to oxygen. The cartons are sterilized using **Valsterane[®]** hydrogen peroxide and printed with our new **Sartomer[®] Low Migration** UV inks, developed especially for food packaging.

LIFESTYLE





DRIVE MY CAR 1. Carmakers use **Rilsan® HT**, a polymer that withstands high temperatures and is six times lighter than steel, to replace metal and rubber tubes in engines and cut down on vehicle weight. **2.** Tail lights made of **Altuglas®** polymethyl methacrylate (PMWA) are visible from a distance because this tough and transparent acrylic glass lets 92% of the light shine through. **3. Sartomer®** UV resin-based coatings protect the shell of this headlight and make it extremely durable. **4.** Metallic paint containing **Synocure®** resins is widely used for autobody parts like this hubcap.





TAKE YOUR GAME TO A HIGHER LEVEL 1. The sole of this Mizuno running shoe and the shell of this Scarpa ski boot are made of **Pebax®**, an elastomer whose exceptional impact resistance, energy return, lightness and flexibility have made fans out of the major sports brands. 2. These sunglass frames are made of Rilsan[®] Clear, one of the few polymers to combine excellent optical properties such as transparency, color depth and shine with chemical resistance, lightness and flexibility.
 3. The elegant satin finish on this ski helmet is produced and protected by Sartomer[®] UV resins.
 4. The epoxy resin used to make this hockey stick contains our Nanostrength[®] additives for greater strength and impact resistance.



EXPERTISE AND LEADERSHIP

Chaired by Thierry Le Hénaff, the Executive Committee makes the company's strategic management decisions. It is comprised of three Executive Vice Presidents in charge of Arkema's operations and four Executive Vice Presidents with functional responsibilities. Each member describes his executive management responsibilities below, inspired by a favorite quote.



THREE EXECUTIVE VICE PRESIDENTS IN CHARGE OF OPERATIONS

"Whatever you can do, or dream you can do, begin it. Boldness has genius, power and magic in it." - Johann Wolfgang von Goethe

MARC SCHULLER,

Executive Vice President, Coating Solutions & Industrial Specialties

"To manage competitive, global production operations successfully, we must always have an eye out for good opportunities to strengthen our positions and make investments or acquisitions in an increasingly volatile and hard-to-predict environment. Being bold in business means having a good idea and the right solution for our customers - if possible before anyone else does. But most importantly, it means having a good sense of timina."



"If one does not know to which port one is sailing, no wind is favorable." - Seneca

VINCENT LEGROS, + Executive Vice President, Bostik

"2017 was a very full year at Bostik. We designed our roadmap and started deploying it with a focus on acquisitions, growth and the development of new solutions. My role on the Executive Committee is to convince my peers to buy into Bostik's projects, while being a proactive partner for Arkema's other growth plans."

FOUR EXECUTIVE VICE PRESIDENTS WITH FUNCTIONAL RESPONSIBILITIES

"A goal without a plan is just a wish." - Antoine de Saint-Exupéry

THIERRY LEMONNIER, Chief Financial Officer

"We need our shareholders' and creditors' confidence to achieve Arkema's ambitious growth plan, which hinges on our ability to deliver outstanding financial performance and to implement a disciplined financial policy. We have a robust balance sheet and have made the most of favorable market conditions to build up a large cash reserve. This gives us reason to be optimistic about future investments and acquisitions."



"As for the future, your task is not to foresee it, but to enable it." - Antoine de Saint-Exupéry

LUC BENOIT-CATTIN, Executive Vice President, Industry

"My goal is to make sure that we constantly do better in terms of operational safety, environmental impacts, capital expenditure, new technologies and the supply chain. These are the cornerstones of our future success."



to adapt."

"Innovation distinguishes between a leader and a follower" - Steve Jobs

• THIERRY LE HÉNAFF, Chairman & Chief Executive Officer

"The world around us is changing faster and faster. Businesses have access to technologies - especially in the area of information and data processing - that didn't exist just a few years ago. This is forcing them to adapt non-stop. In this demanding environment, which requires attention to risk, there have never been so many opportunities for those who know how to seize them. More than ever, our customers expect us to support their creativity and appetite for growth, especially when it comes to structural sustainability trends. Arkema is ready to meet these exciting challenges, backed by its agility, powerful innovative technologies, and enthusiastic talented people.

"The only enterprise that is doomed from the start is the one we do not attempt." - Paul-Émile Victor

CHRISTOPHE ANDRÉ, + Executive Vice President, Technical Polymers

60 / Arkema - Innovative

& Performance Additives

"We are committed to supporting our customers' development and success, and that's why we focus so sharply on high performance and leading-edge innovation. Examples of our tangible, high value-added solutions include fluoropolymers for new energies and water treatment and specialty polyamides for automobiles, electronics and athletic equipment. We work hand in-hand with our customers in their constant drive to push the performance envelope. This long-term commitment is a great responsibility and an exciting challenge."





"The two most important things in any company do not appear in its balance sheet: its reputation and its people." - Henry Ford

MICHEL DELABORDE, +

Executive Vice President, Human Resources & Corporate Communications

"Putting people back at the center of the company is vital. Arkema isn't worth anything without its employees' enthusiasm, professionalism and full commitment to major projects. The 1,600 new employees who join us each year prove that we're a vibrant, attractive company - and I'm proud of that."



BERNARD BOYER, ← Executive Vice President, Strategy

"One of Strategy's major responsibilities is to transform our business portfolio. We've accomplished a great deal since the spinoff and we can all be proud of how far we've come together. But we're not finished yet. The chemicals industry is constantly evolving and we'll have to keep changing



S CHAMPANY

DIVERSE SKILLS SERVING STRATEGY

he Board of Directors sets Arkema's strategy and ensures it is applied. Chaired by Thierry Le Hénaff, the Board has 11 other members, including eight independent directors, a director who permanently represents a shareholder Fonds Stratégique de Participations (FSP), a director representing employee shareholders and a director representing employees.

Left to right

- MARC PANDRAUD Vice Chairman of Investment Banking for Europe, the Middle East and Africa, JP Morgan integration project at Safran
- ISABELLE BOCCON-GIBOD, permanent representative of the French equity fund Fonds Stratégique de Participations (FSP)
- VICTOIRE DE MARGERIE. Chief Executive Officer, Rondol Technology • PATRICE BRÉANT,
- Director representing shareholder employees
- HÉLÈNE MOREAU-LEROY. Director of the Zodiac Aerospace
- THIERRY LE HÉNAFF. Chairman & Chief Executive Officer • FRANCOIS ENAUD,
- Chairman, FE Developpement SAS • THIERRY MORIN.
- Chairman, Thierry Morin Consulting
- YANNICK ASSOU Chief Executive O of Latécoère
- NATHALIE MURACO
- Director representing employees
- LAURENT MIGNON, Chief Executive Officer, Natixis SA
- MARIE-JOSÉ DONSION.
- Chief Financial Officer, Alstom

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eight times, the same as in 2016. The 2017 attendance rate was 90.5%.



The Board of Directors has decided to present the following nominations for approval at the next Annual Shareholders' Meeting on May 18, 2018:

Marie-Ange Debon was appointed Suez Group Senior Executive Vice President in charge of France, Italy and Central Europe in March 2018. Previously, she served as Senior Executive Vice President in charge of Suez's International Division (Water and waste management, outside Europe), since 2013. She has been a management committee member since 2008. Her appointment will bring to the Board her senior management experience in the public and private sectors, as well as her extensive accounting and financial experience, acquired throughout her career.



Alexandre de Juniac has been Director General & CEO at the International Air Transport Association (IATA) since September 1, 2016. He will bring to the Board his experience as a senior manager in several industry sectors, as Chairman & CEO of a large publicly-listed corporation and as Executive Director of a global organization facing a variety of major challenges.





TWO PERMANENT SPECIALIZED COMMITTEES THE AUDIT & ACCOUNTS COMMITTEE

The Committee is chaired by Marie-José Donsion and made up of two other directors. Isabelle Boccon-Gibod and Hélène Moreau-Leroy. Thierry Lemonnier, Arkema's Chief Financial Officer, is its Secretary.

The primary responsibilities of this Committee are to ensure the quality of internal control and the reliability of the information provided both to shareholders and financial markets.

THE NOMINATING, COMPENSATION & CORPORATE GOVERNANCE COMMITTEE

The Committee is chaired by Thierry Morin and comprised of two other directors: François Énaud and Victoire de Margerie. Michel Delaborde, Executive Vice President, Human Resources & Corporate Communications. is its Secretary. This Committee makes recommendations and proposals concerning the Board's membership, compensation policy for Arkema's CEO and corporate governance best practices.



FINANCIAL PERFORMANCE

AN EXCELLENT FINANCIAL PERFORMANCE IN 2017

strategy and the power of its growth projects in specialty businesses.

€<mark>8,</mark>326M

Sales up 10.5% from 2016 (€7,535 million in 2016)

2.4% and included a strong 4.4% gain in High-Performance Materials driven by operations in Asia, innovation and the start-up brinew onns. The price effect duded of solva did was positive in an three segments. This reflects higher selling prices in the specialty businesses (71% of consolidated sales) and favorable market conditions in intermediate chemicals (29%). Changes in business scope – including the acquisition of Den Braven and the divestment of the activated carbon and filtration aid and oxo-alcohol businesses – had a positive 3.3% impact. The negative 1.7% currency effect stemmed primarily from the strengthening of the euro against the U.S. dollar.

€1,391M

EBITDA up 17% from 2016 (€1,189 million in 2016)

Earnings before interest, taxes, depreciation and amortization (EBITDA) rose to a record €1.391 billion, exceeding the 2017 target of €1.3 billion set in 2014. EBITDA increased in all three business segments, despite higher feedstock costs than in 2016. This performance was fueled by growth at Bostik, notably with the to sustainable development, new production units for advanced materials, excellent results from Industrial Specialties, a cyclical upturn in acrylics and operational excellence initiatives.

STRONG CASH FLOW GENERATION

€565M Free cash flow (€426 million in 2016)

In 2017, Arkema generated free cash flow of €565 million, up €139 million from 2016. The increase is attributable to strong EBITDA growth and effective management of working capital, despite higher feedstock prices. Free cash flow includes expenditure of €441 million for property, plant and equipment and intangible assets, of which €10 million in exceptional spending for the initial work to double

€1,056M Net debt (€1,482 million in 2016)

Net debt declined sharply from the previous year and stood at 0.8 times full-year EBITDA. The net debt-to-equity ratio narrowed to 24% from 35% at end-December 2017.

16.7% **EBITDA** margin (15.8% in 2016)

£592M Adjusted net income (up 41.6% from 2016)

€576M Net income – Group share (up 34.9% from 2016)

SALES BY BUSINESS SEGMENT



46%

HIGH-PERFORMANCE

MATERIALS

The segment's results reflect volume growth

in advanced materials led by robust demand

in Asia for lighter-weight materials, the new

energies and consumer goods markets, the

impact of the new molecular sieve plant in

Honfleur, France, and Den Braven's contribution

to the uptrend at Bostik.

Sales: €3.83 billion

up 11.9% from 2016

EBITDA: €632 million up 10.9% from 2016

EBITDA margin: 16.5%

31%

INDUSTRIAL SPECIALTIES

A return to strong results in fluorogases and very favorable market conditions in the methyl methacrylate/polymethyl methacrylate (MAM/PMMA) chain supported the segment's good performance.

Sales: **€2.54 billion** up 9.9% from 2016

EBITDA: €585 million up 23.7% from 2016 EBITDA margin: 23%

2017 KEY FIGURES

Income Statement Items (in millions of euros)	2017	2016	Variation
Sales	8,326	7,535	+10.5%
EBITDA	1,391	1,189	+17.0%
EBITDA margin (in %)	16.7%	15.8%	-
Recurring EBIT	942	734	+28.3%
Recurring EBIT margin (in %)	11.3%	9.7%	-
Operating income	845	717	+17.9%
Adjusted net income	592	418	+41.6%
Net income – Group share	576	427	+34.9%
Adjusted net income per share (in euros)	7.82	5.56	+40.6%
Dividend per share (in euros)	2.30 ⁽¹⁾	2.05	+12.2%
Balance Sheet Items (in millions of euros)	2017	2016	
Shareholders' equity	4,474	4,249	
Net debt	1,056	1,482	
Gearing (in %)	24 %	35%	
Capital employed	6,554	6,829	
Cash Flow Items (in millions of euros)	2017	2016	
Cash flow from operating activities	1,008	821	
Free cash flow	565	426	
Recurring capital expenditure	431	423	
Capital intensity (recurring capital expenditure/sales)	5.2%	5.6%	

(1) Dividend recommended to the May 18, 2018 Annual Shareholders' Meeting

Alternative performance indicators are described in Note 1 to the Consolidated Financial Statements for the year ended December 31, 2017 as presented in Chapter 4.3.3 of the 2017 Reference Document.



COATING SOLUTIONS

The improved acrylics cycle and price increases across the value chain led growth in sales and EBITDA.

> Sales: €1.92 billion up 8.6% from 2016

EBITDA: €244 million up 17.3% from 2016

EBITDA margin: 12.7%

FINANCIAL PERFORMANCE

SHAREHOLDER RELATIONS

explain our projects, strategy and objectives.

(in €) +84.4% Peer average: +39.4% CAC40 +24.3%

ARKEMA SHARE PERFORMANCE FROM JANUARY 1, 2015 TO DECEMBER 31, 2017

Up 283% since the IPO

The Arkema share's cumulative gain since the initial public offering in May 2006. Over the same period, other CAC 40 companies saw their share value increase by an average of 7.2%.

ADKEMA SUADE DEDEODMANCE

	2017	2016
Market capitalization at December 31 (in billions of euros)	7.7	7.0
Performance since January 1 (situation at December 31)	<mark>9.3%</mark>	43.9%
Price at year-end (in euros)	101.55	92.94
Average of 30 most recent closing prices (in euros)	103.12	91.75
High (in euros)	110.60	95.28
Low (in euros)	87.69	48.17

RECOMMENDED DIVIDEND UP 12% TO €2.30

Dividend (in € per share)



(1) Dividend recommended to the May 18, 2018 Annual Shareholders' Meeting

In line with our dividend policy, the Board of Directors will ask shareholders to approve a €2.05 increase in the dividend for 2017 to €2.30 per share at the May 18, 2018 Annual Shareholders' Meeting. This represents a payout of close to 30% of adjusted net income. The recommendation reflects the Board of Directors' confidence in the company's growth outlook, robust cash flow generation and strong balance sheet.

SHAREHOLDER BASE (AT DECEMBER 31, 2017)



CONTACTS

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CALENDAR

May 18, 2018: Annual Shareholders Meeting (Paris)

August 1, 2018: First-Half 2018 Results November 6, 2018: Third-Quarter 2018 Results





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INNOVATION ON SHOW!

At Arkema, we're proud to be innovative, and even prouder to be able to share our innovations with you. L'atelier 4.20 is a showroom dedicated to our latest discoveries, bringing chemistry to all. It's an interactive, educational, fun experience, where we reveal how our materials and innovative solutions address major social challenges and make your life easier.



Discover L'atelier 4.20 at: ark.ma/atelier420-en



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