INNOVATIVE SUPPORTING PERFORMANCE

OUR PEOPLE IN THEIR OWN WORDS

GIVING 3D PRINTING A BOOST

BOSTIK: A TALE OF SUCCESSFUL INTEGRATION

INNOVATIONS
Arkema 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.**
2017 will be remembered as a record-breaking 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 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 high-potential businesses and accelerated industrial investment in emerging economies.

It’s important to explain what we do.

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.

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 long-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 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.

Chief Executive Officer Thierry Le Hénaff looks back at this remarkable performance.

Arkema – Innovative / 3

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

L’ATELIER 4.20

“The showroom inaugurated at Arkema’s headquarters in Colombes, France, is an extraordinary showcase for our innovations and know-how.”

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 macroeconomic 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.

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 agile 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.

“3D and 4D technologies considerably reduce time-to-start-up for new plants and optimize production line ergonomics.”
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 its 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, adhesives and water treatment polymer markets.

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.

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.

April
NEW MOLECULAR SIEVE UNIT
Thierry Le Henaff 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 represents a significant growth driver and strengthened our position as the world’s second largest producer of molecular sieves.

May
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 showcasing universal access to drinking 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 four-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.

May
BOSTIK EXPANDS IN THE UNITED STATES
Bostik acquired CMP Specialty Products, the flooring and care preparation business of U.S.-based CGM, Inc. The business, which generated $15 million in sales in 2016, offers significant synergies with Bostik.

June
RILSAN® TURNS 70
Employee and customer events worldwide showcased the impressive story of our flagship high-performance 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.

June
NEW ACRYLICS INVESTMENT
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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.

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.

L’atelier 4.20 by Arkema was inaugurated at the Colombes headquarters (France) to showcase Arkema’s Innovative Chemistry vision. The immersive, high-design 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.

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.

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 stellar performance for Arkema’s team, at the forefront of innovation.

Elium® racked up another success by winning the JEC Asia Award in Seoul. This award recognized Elium® 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.

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 Multihull 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.

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 Multihull 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.

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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.

**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 the 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. Cross 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.

**CORPORATE SOCIAL RESPONSIBILITY**
Arkema is committed to being a responsible chemical company. This means shrinking our environmental footprint and offering customers innovative, sustainable solutions, as well as promoting employees’ individual and collective development and communicating openly with stakeholders.

**DIGITAL TRANSITION**
We recently appointed a Chief Digital Officer (CDO) to fast-track our 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 enameling and industrial applications like 3D and 4D modeling for plant construction and predictive maintenance to improve innovation and operational excellence.

**ACQUISITIONS**
Since 2007, we have divested nonstrategic 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 13 acquisitions over the last ten years have added nearly €1 billion in new sales, much of this in specialty chemicals (Bostik, Des Boven, Xi 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.

**HIGH-GROWTH REGIONS**
We have considerably expanded our production base in Asia, investing nearly €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 biochemicals plant in Malaysia.

**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-thinking strategy.

**FUTURE 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-thinking strategy.

**OUR SALES WILL REACH €10 BILLION IN 2020**
BERNARD BOYER, EXECUTIVE VICE PRESIDENT, STRATEGY

“Specially 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 an investment focus, with big projects in the United States and Asia. This strategy should lift sales to €10 billion by 2020.”

“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 an investment focus, with big projects in the United States and Asia. This strategy should lift sales to €10 billion by 2020.”
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.
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.

**Calvert City, Kentucky - 2018**
A 20% increase in production capacity for Kynar® PVDF fluoropolymers to keep pace with local demand in the new energies, water management, chemical engineering and cable markets.

**Mobile, Alabama - 2018**
Construction and startup of a world-class Kepstan® PEKK production unit to serve anticipated growth in carbon-fiber-reinforced composites and 3D printing.

**Hondfleur, France - 2017**
Inauguration of a molecular sieve unit. Recognized for their adsorption and dehydration properties, molecular sieves are used in refining, petrochemicals, construction and healthcare.

**Gujarat, India - 2017**
High-performance, haloret, pressure-sensitive adhesives (HPWSA) unit inaugurated by Brutik for applications in flexible packaging formation, transportation and show manufacturing.

**Navi Mumbai, India - 2018**
Unit to produce Reafree® low volatile-organic-compound resins opened to serve the industrial and architectural coatings markets.

**Nansha, 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 and sports textiles.

**Kerteh, Malaysia - 2020**
Doubling of methyl mercaptan production capacity to keep up with strong growth in the animal nutrition, refining and petrochemical markets in Asia.

**Clear Lake, Texas - 2019**
Operational startup of a single reactor to produce acrylic acid, thereby replacing the two existing reactors and increasing the site’s productivity. Target markets include paint, adhesives, superabsorbents and polymers for water treatment and oil and gas recovery.

**Arkema invested €430 million** last year in these industrial projects.

**Arkema plans to invest an additional €120 million in 2018.**

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**ANNUAL GROWTH OF OVER 3% FOR THE GLOBAL CHEMICAL INDUSTRY**

**VIBRANT MARKETS**

Unit sales of electric vehicles estimated at 100 million in 2035 versus 1.2 million in 2014.

Number of connected devices estimated at 21 billion in 2020 versus 6.4 billion in 2016.

The number of wind turbines installed worldwide has been rising by 20% each year since 2013. (Source: Roland Berger Strategy Consultants)
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 SUCCESSFUL INTEGRATION**

Bostik’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.

**BOSTIK + ARKEMA by the Numbers**

- **BUSINESS**
  - 20%: The share of Arkema’s sales generated by Bostik in 2017. Bostik accounted for nearly half of High-Performance Materials sales and has helped lift the segment’s contribution to Arkema’s business from 30% in 2014 to 46% today.

- **MARKETS**
  - 55%: The share of Bostik’s sales from the Industry (adhesives used in transportation, packaging, labels) and Non-Woven Products (personal care products, diapers) segments. The remaining 45% comes from the construction and consumer DIY markets (floor prep solutions, adhesives, sealants, coatings).

- **R&D**
  - 2.6%: The percentage of 2017 sales that Bostik invested in R&D (up from 2.3% in 2010). The brand operates four R&D centers and 11 technical centers, with a total team of 300 people. It has launched 600 new products since 2014.

- **LEADERSHIP**
  - 3: Bostik’s ranking in its three segments (Industry, Personal Care and Construction & Consumer Products). The brand is strengthening its leadership by targeting high-potential markets such as automobile manufacturing, electronics and packaging, and plans to double its 2016 sales to €1.6 billion by 2023.

- **RESULTS**
  - +33%: The increase in Bostik’s EBITDA since 2014 (€210 million in 2017). In addition to higher sales, the gain was driven by synergies with Arkema’s feedstock purchases, pooled logistics, operational excellence programs and more.

- **LOCATIONS**
  - 9: The number of sites added to Bostik’s network since 2014 through acquisitions and industrial investments. The brand now has 58 facilities in 50 countries and plans to open 15 new sites by 2023.

- **RESULTS LEADERSHIP**
  - +33%

- **MARKETS**
  - 55%

- **BUSINESS**
  - 20%

- **R&D**
  - 2.6%

- **LEADERSHIP**
  - 3

- **SUCCESS STORY**

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**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, high-performance 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 packaging lamination, transportation and shoe manufacturing. This follows last year’s startup of Bostik units in Malaysia, the Philippines 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 12% today.

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**Innovation: Stronger Together**

In addition to compatible solutions in their shared markets, Bostik and Arkema overlap 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.

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**FOOD PACKAGING**

Arkema and Bostik pool their technological expertise in the reusable food packaging market. Arkema’s Chroma® 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 reusable flexible packaging for consumers. The innovation, called Reseal®, is protected by several Bostik patents.

**PROCESS: SWITCHING TO EXTRUSION**

By moving 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 Cerdate 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.

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**WATER FILTRATION**

This technological synergy is at work in the manufacture of ultrafiltration cartridges used to purify brackish water, thereby promoting universal access to drinking water. The filters are produced with Arkema’s Kyflex® PVDF fluoropolymers and supported by Bostik’s ZP® adhesives.

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**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 so, 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 maker’s tough specifications for holding temperatures and formulation changes while accommodating fast-paced production.

**HOUSING OF THE FUTURE**

The Small House lab 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 experimented with the functions of the facade: 160 square meter sustainable house, whose adhesive technologies and smart materials fleshed out the house of the future. The Smart House lab embodies Arkema’s open innovation process.

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**SUCCESS STORY**

**Arkema - Innovative**

**ARKEMA’S KYNAR® PVDF FLUOROPOLYMERS**

are produced with water. The fibers used in the manufacture of ultrafiltration cartridges used to purify brackish water. The filters are produced with Arkema’s Kyflex® PVDF fluoropolymers and supported by Bostik’s ZP® adhesives.

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**BOSTIK: 11 CLOSE-TO-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 foundation of a mortorbolted for tiling, for example, is adapted to the type of sand used in the customer’s area, anywhere around the world.

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**“SMART ADHESIVES MORE THAN EVER”**

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 both contribute 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 specially chemicals gives Bostik a differentiating 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, flexibility, etc. – required by the use.”

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**“INNOVATIVE / SMART”**

ARKEMA - INNOVATIVE /

2017
To 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.

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.

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.

SUCCESS STORY
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 Multihull trimaran, which was assembled in part using the brand’s adhesives.

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COMMUNITY
“WE TARGET EVENTS THAT GIVE MEANING TO THE PERFORMANCE ACHIEVED WITH OUR ADHESIVES.”

MASS TRANSPORT: 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. Partnering Bostik with Super Vulcaseal®, an elastomer sealant well known to Filipino DIY customers, highlighted the campaign’s impact.

PLUS...
SOLIDARITY IN FRANCE:
Partnership with the APF-Telethon to support research into rare genetic diseases.

PLUS...
RUGBY IN AUSTRALIA:
Advertising banners in Super 12 championship stadiums.

SOCCER IN THE UNITED KINGDOM:
Sponsoring in the Division 4 amateur championship.

GALLERY
Arkema - Innovative / 22
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.

SDG 6
CLEAN WATER AND SANITATION
Water treatment is one of Arkema’s innovation priorities. Our RD&I has developed a Kynar® PVDF fluoropolymer grade and partnered with Polyamide on a new generation of more efficient and durable ultrafiltration membranes to produce drinking water. The Membrana 205 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 Sall for Water, a nonprofit that organized a round-the-world sailing trip to distribute drinking water purified 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 OptiC™ program aims to reduce chemical oxygen demand (COD) in our production sites’ wastewater by 40% by 2023.

SDG 7
AFFORDABLE AND CLEAN ENERGY
Our materials support the transition to sustainable energies. Kynar® fluoropolymers and carbon nanotubes lighten the life of lithium batteries and enhance their performance. We’re also developing Blumax™ thermoplastic resin to produce electrification wind turbine blades made of fully recyclable thermoplastic composite. Lastly, several innovative technologies are being developed. For example, 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.

SDG 12
RESPONSIBLE CONSUMPTION AND PRODUCTION
Arkema uses innovative plant-based feedback to produce chemicals and materials. We’ve been manufacturing a wide range of high-performance bio-based polymers, Blumax® from castor oil for 20 years. We also make it easier to recycle finished products. Our Kierstar® and Opticstar® protective coatings, for instance, strengthen recyclable glass bottles and enhance their appearance, thereby doubling re-use from 25 to 50 cycles.

SDG 13
CLIMATE ACTION
Arkema has developed lightweight, high-performance thermoplastic materials that can replace glass or metal in the automotive and aerospace industries. These materials reduce vehicle and airplane weight thereby reducing fuel consumption and carbon emissions. We’re also committed to shrinking our corporate environmental footprint by reducing our direct greenhouse gas emissions by 50% by 2025 (see reached the 48% mark in 2017).

How we contribute
We define our contribution to the SDGs at three levels: strategic, direct and indirect. Our strategic contributions (see examples below) include RD&I 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.

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

SDG 3
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 fostered an accident rate per million hours worked (IRR) since 2012. Today, at 1.0, our IRR is one of the lowest in the chemical industry.* By Arkema and contractor employees working at our sites.

SDG 5
GENDER EQUALITY
To achieve a more gender-balanced workforce in the malodinated chemical industry, we have set a target to increase the percentage of women in senior management positions from the current 19% to 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 to a mentor/manager mentor, with whom they may freely discuss their career path trajectory.

SDG 11
SUSTAINABLE CITIES AND COMMUNITIES
Sustainable building materials and solutions are another Arkema RD&I focus. Our acquisitions of Bostik, and more recently Den Braven, have broadened our portfolio of sealants, coatings, adhesives 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.

SDG 15
LIFE ON LAND
To shrink our environmental footprint, we pledged to reduce volatile organic compound (VOC) emissions by 23% 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, 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.
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).

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.

VIEGO-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.

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.

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 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.

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

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.
As a responsible industrial company, we join forces with the other members of our value chain – employees, customers and suppliers – to optimize CSR performance. The following five initiatives illustrate this virtuous circle.

**1. 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. The idea is to give all employees who communicate regularly with other stakeholders the tools to highlight Arkema’s CSR policy and answer related questions,” says Sophie Huguier, Sustainable Development Manager.

**2. PARTNERING WITH CUSTOMERS TO INNOVATE SUSTAINABLY**

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, renewable or recycled 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.

**3. 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 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 invited to register on the EcoValis 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.”

**4. RECYCLING 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 fluor spar – a byproduct of fluor gas production – into a high-performance additive for cement factories and metalworking. In 2013, concerned about landfilling fluor spar, we initiated a recycling study. After five 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 fluor spar and encourages all European producers to develop recycling initiatives for this feedstock.”

**5. CREATING RECYCLING CHANNELS**

Arkema 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. Launched 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.
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.

1 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.

2 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. EFPIs are not impacted by changes in scope, allowing us to track Arkema’s performance more effectively.

3 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.

4 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.

5 KEEP THE LINES OF COMMUNICATION OPEN WITH ALL STAKEHOLDERS

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

The 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.

Resin flows into a mold slowly, eventually taking on the shape 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 manufacturer even makes the mold. Simulation can save months of development time,” says Nessim Ghamri, head of the Application and Process Modeling team. The approach accurately depicts the material’s behavior and the stresses it must withstand during mass production. To make models predictive, they are tested using experimental protocols developed for Arkema’s materials. “Basically, we give our customers the configuration data they need in light of the material’s specific processing constraints. It’s a little like giving them the best recipe.”

“Molecular modeling is revolutionizing the way we work. It allows us to protect our innovations more effectively because we can file patents faster.”

CHRISTOPHE CARRETIER, Head of Scientific Computing (CRRA)

What if you could “see” a new material before it is even produced? Digital simulation software can now predict how materials will behave and how customer production processes will affect their mechanical properties.

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

With 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 Baselich, 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.”

To ensure production facility integrity, Arkema is testing a monitoring program at a few sites around the world. “Our plants are regularly taken off line for several weeks at a time to conduct regulatory inspections mandated by each country’s administrative agencies. These shutdowns impact our production and are very costly. When you have a lot of pipes and equipment to check at a single site, it’s important to prioritize which ones to inspect. We use digital technology as a decision-making tool, based on a probabilistic approach. That way, we can target our efforts to prevent problems before they arise or decide which equipment requires only light monitoring,” explains project manager Didier Emery.

Designed for easy use on the plant floor, the Risk-Based Inspection system is the product of pooled knowledge. In particular, it leverages corrosion kinetics modeling to better assess the likelihood of corrosion. Feedback from the plants is integrated to fine-tune the system, which should eventually cover most of our processes. We plan to apply the methodology across all Arkema sites to improve facility availability and reliability. We’ve been able to space out maintenance turnarounds, now scheduled every six years instead of five.

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

SERGE HERBÉ, Arkema’s Engineering Department
Aerospace 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 on-stream in late 2018. PEKK’s success story is just beginning.
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.

When a giant South Korean electronics company recently 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 and every new application – 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”

Pezotech, an Arkema subsidiary that produces very high-value-added, PVDF-derived fluoro polymers, is also showing it can innovate in cutting-edge electronics. The startup is conducting research on how to make usually sensitive interfaces using conductive ink and ultrathin 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. Pezotech has other innovative surprises in store. For example, its researchers are working onhapatic applications – pursuing a glove prototype – that can add sensations of touch to 3D vision.

“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 learning 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 every two to three years,” notes Karine Elie. Concerning production, a new acrylate resins unit will begin operating in early 2019 in Nantsha, 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 beeltd up its research teams in Asia, the world’s flagships 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 make coatings for battery separators. The stakes are huge.”

The global electronics market is growing

By researching nanostructure formation in our block copolymers, we plan to push the envelope on electronics miniaturization.

The power of today’s microprocessors has increased by a factor of seven or eight a year. In 1970, a PC had 2,300 transistors, whereas now, a chip the size of a fingernail can contain five billion.
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.

**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.

**OPTICS**

Eyeglass makers use our Rilsan® polyamide powders to manufacture original, customized frames. 3D printing is also used to make optical lenses, an application to which our transparent N3xtDimension® resins are perfectly suited.

**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 orthopedic models that mirror the contours of the patient’s face.

**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, orthodontia will soon be a thing of the past.

**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® acrylic resin range is also used to print athletic shoe soles with excellent elastomer properties. The result is a very attractive design and unmatched flexibility.

**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 replace, for example, aircraft air ducts with complex shapes. Such complex parts can also be made using Rilsan® polyamide powders.

**AUTOMOTIVE**

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

**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 only 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 200 platform, making possible mass-produced aviation parts that withstand extreme stress.

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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.

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 you recognize the considerable expertise at Arkema?
D. M.> Recognition is a key part of Arkema’s HR policy. A cutting-edge 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.

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 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 Sales 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.

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

Three questions for Dominique Massoni, Vice President, Human Resources & Internal Communication Development

1,616 employees hired worldwide in 2017

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
Because 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 onsite 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

The digital transition may help break down walls in companies. Arkema’s HR is counting on it to smooth the flow of communications among employees and boost efficiency, notably through Yammer, an internal social networking service that allows employees to discuss specific topics and capitalize on 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 emails so users can focus on useful messages.

The number of researchers at Arkema.

THE IMPORTANCE OF RECOGNIZING PROFESSIONAL EXPERTISE

In 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 in the organizational pyramid. Experts don’t 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.

“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

NEW CODES

It’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 at new hires from the hyper-connected 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.

450

The number of salespeople who attended the Sales Academy over the past two years (Arkema’s entire sales force worldwide).
Arkema has an exceptional pool of high-level scientific and technical 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.
Kevin 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.”

Carole Casteran is a production engineer at Arkema’s Lacq thiocarbamates 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!”
DIALOGUE

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

Marie-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 EDUCATION FUND

The 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.

SAIL FOR WATER: MISSION ACCOMPLISHED

The 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 Deperrois 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 ultrafiltration 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 ultratine particles, but bacteria and viruses as well.

1,000 filtration kits distributed

THE SAINT-AUBAN PLANT PUTS ON A FESTIVAL

Presented outside the official competition at the 2017 Cannes Film Festival, “Faces Places” (Visages villages) – directed by French graffiti artist 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 JR 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’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

“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’.”

JR

1,000 filtration kits distributed

ARKEMA INNOVATION / 50 / Arkema - Innovative

ARKEMA - Innovative / 51
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.

“This cup is going to be a fabulous race and 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.

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.

“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

“On October 1, 2017, the Arkema 3 Mini 6.50 set off on the Mini Transat La Boulangerie race packed with technological innovations, many of them developed by Arkema’s Lacq 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 round-stern boat in its class to use foils (fins extending out from the sides) to skim over the waves.

“Team members at Arkema’s Lacq Research Group (GRL) Composites Lab helped build the Mini 6.50 Arkema 3 – a technological challenge and an exciting human exploit.”

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 Escolé, 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.”
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 by our polymers, resins, adhesives and additives. The following pages provide our materials a well-deserved moment in the spotlight.

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.

MY LIFE IN A BAG

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DIY TIME

1. This low-odor, water-based paint made with Synaqu® 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 30 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.
DRIVE MY CAR  1. Car makers use Rilsan®, 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 Alphaglass® polymethyl methacrylate (PMMA) 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 Synacure® 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 sunglasses 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 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.

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

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, creativity and appetite for growth, especially when it comes to structural sustainability trends. This long-term commitment is a great responsibility and an exciting challenge.”

CHRISTOPHE ANDRÉ,
Executive Vice President, Technical Polymers & Performance Additives

“We are committed to supporting our customers’ development and success, and that’s why we focus so sharply on high performance and leadership innovation. Examples of our tangible, high valued-added solutions include fluoropolymers for new energy and water treatment and specialty polylamides 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.”

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. It is possible before anyone else does. But most importantly, it means having a good sense of timing.”

LUC BENIOF-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.”

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 1,500 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 to adapt.”

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.”

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THREE NEW DIRECTORS TO JOIN THE BOARD IN 2018

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.

The Board of Directors has also decided to support the candidacy of Jean-Marc Bertrand, a member of the Supervisory Board of FCP Arkema Actionnariat France, for the position of director representing employee shareholders. He would replace Patrice Bréant, whose term expires at the end of the next Annual Shareholders’ Meeting.

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 Enaud 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.
## Sales by Business Segment

<table>
<thead>
<tr>
<th>Revenue</th>
<th>High-Performance Materials</th>
<th>46%</th>
</tr>
</thead>
<tbody>
<tr>
<td>€585 million</td>
<td>up 23.7% from 2016</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revenue</th>
<th>Industrial Specialties</th>
<th>31%</th>
</tr>
</thead>
<tbody>
<tr>
<td>€544 million</td>
<td>up 17.3% from 2016</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revenue</th>
<th>Coating Solutions</th>
<th>23%</th>
</tr>
</thead>
<tbody>
<tr>
<td>€244 million</td>
<td>up 17.3% from 2016</td>
<td></td>
</tr>
</tbody>
</table>

## 2017 Key Figures

### Income Statement Items (in millions of euros)

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>8,326</td>
<td>7,535</td>
<td>+10.5%</td>
</tr>
<tr>
<td>EBITDA</td>
<td>1,391</td>
<td>1,189</td>
<td>+17.0%</td>
</tr>
<tr>
<td>EBITDA margin (in %)</td>
<td>16.7%</td>
<td>15.8%</td>
<td>-</td>
</tr>
<tr>
<td>Recurring EBIT</td>
<td>942</td>
<td>734</td>
<td>+28.3%</td>
</tr>
<tr>
<td>Recurring EBIT margin (in %)</td>
<td>11.3%</td>
<td>9.7%</td>
<td>-</td>
</tr>
<tr>
<td>Operating income</td>
<td>845</td>
<td>717</td>
<td>+17.9%</td>
</tr>
<tr>
<td>Adjusted net income</td>
<td>592</td>
<td>418</td>
<td>+41.6%</td>
</tr>
<tr>
<td>Net income – Group share</td>
<td>576</td>
<td>427</td>
<td>+34.9%</td>
</tr>
<tr>
<td>Adjusted net income per share (in euros)</td>
<td>7.92</td>
<td>5.56</td>
<td>+48.0%</td>
</tr>
<tr>
<td>Dividend per share (in euros)</td>
<td>2.30</td>
<td>2.05</td>
<td>+12.2%</td>
</tr>
</tbody>
</table>

### Balance Sheet Items (in millions of euros)

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital employed</td>
<td>6,554</td>
<td>6,829</td>
<td>-4.0%</td>
</tr>
<tr>
<td>Cash flow from operating activities</td>
<td>1,008</td>
<td>821</td>
<td>+225.0%</td>
</tr>
<tr>
<td>Free cash flow</td>
<td>565</td>
<td>426</td>
<td>+32.4%</td>
</tr>
<tr>
<td>Recurring capital expenditure</td>
<td>421</td>
<td>423</td>
<td>-0.5%</td>
</tr>
<tr>
<td>Capital intensity (recurring capital expenditure/sales)</td>
<td>5.2%</td>
<td>5.6%</td>
<td>-7.1%</td>
</tr>
</tbody>
</table>

(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.
SHAREHOLDER RELATIONS

Since our initial public offering in May 2006, we have maintained active and ongoing dialogue with the financial community to explain our projects, strategy and objectives.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Market capitalization (in billions of euros)</th>
<th>Performance since January 1 (situation at December 31)</th>
<th>Price at yearend (in euros)</th>
<th>Average of 30 most recent closing prices (in euros)</th>
<th>High (in euros)</th>
<th>Low (in euros)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>7.7</td>
<td>9.3%</td>
<td>101.53</td>
<td>103.12</td>
<td>110.60</td>
<td>87.69</td>
</tr>
<tr>
<td>2016</td>
<td>7.0</td>
<td>43.9%</td>
<td>92.94</td>
<td>91.75</td>
<td>95.28</td>
<td>48.17</td>
</tr>
</tbody>
</table>

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%.

RECMMENDED DIVIDEND UP 12% TO €2.30

Dividend (in € per share)

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)

By type of investor

- Institutional: 89%
- Individual: 6%
- Employee: 5%

By region

- France: 33%
- United Kingdom: 17%
- Rest of Europe: 13%
- Rest of the world: 33%
- North America: 4%

CONTACTS

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Investor.relations@arkema.com
+33 (0)1 49 00 74 63

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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