

# INNOVATION

2018 ANNUAL AND SUSTAINABLE PERFORMANCE REPORT



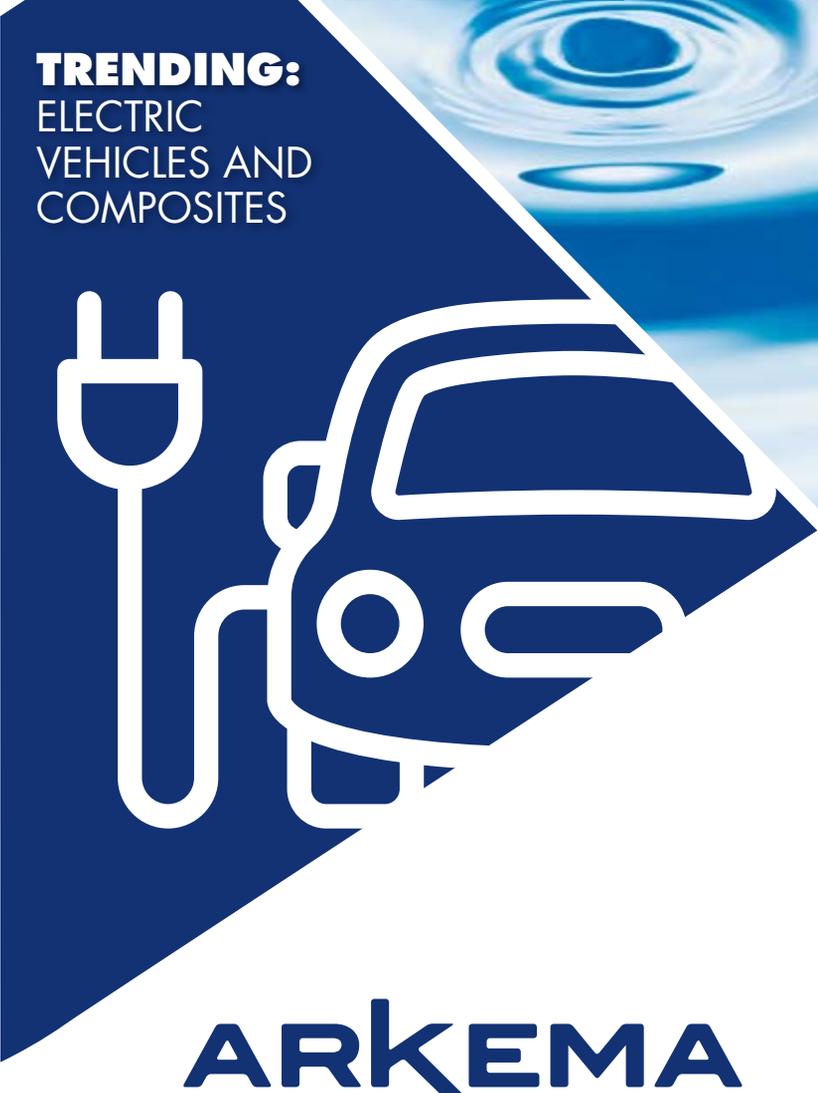
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ARKEMA**

**OUTSTANDING  
MATERIALS**



**OUR YOUNG  
TALENTS  
SHARE THEIR  
STORIES**

**SOCIAL  
COMMITMENT  
IS IN  
OUR DNA**



**TRENDING:  
ELECTRIC  
VEHICLES AND  
COMPOSITES**

**ARKEMA**  
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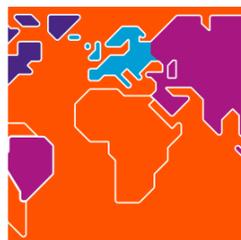
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**Thierry Le Hénaff, a Bigger Picture**

# KEEP TRANSFORMING TO BETTER PREPARE THE FUTURE

We have many assets we can leverage to keep building the Arkema of the future, including a balanced, high-quality portfolio of activities; strong positions in specialty business lines that offer a number of sustainable growth opportunities; global, competitive product lines in intermediate chemicals; technological innovations; and a commitment to society.

**How would you sum up 2018 at Arkema?**

**T. L. H.** – In 2018, Arkema continued to grow despite the more volatile global economy. We posted close to €9 billion in revenue, driven by strong organic growth of 8%. EBITDA rose 6% to €1,474 million, surpassing the records set in 2017. Cash generation remained strong, with a free cash flow of around €500 million even though we accelerated our investment in organic growth and the feedstock situation deteriorated. Lastly, our environmental and safety performance improved again last year. These remarkable results show that Arkema is robust. We can adapt in a mixed macroeconomic environment, complicated by volatile feedstock and currency prices and the uncertainties created by world geopolitical tensions. They confirm the quality of our business portfolio, which combines excellent positions in specialty chemicals — 70% of our revenue and good long-term growth prospects — with competitive, globally positioned intermediate product lines that posted a record year. They also reflect our teams' unflagging commitment to customers, our balanced regional footprint and our vibrant technological innovation, which is a powerful growth driver.

**Today, no one can ignore major environmental and social challenges. What is Arkema's strategy in that regard?**

**T. L. H.** – We've all witnessed the profound social and technological changes that have rocked the world in the last few years.

"CONFIDENT IN OUR MEDIUM- AND LONG-TERM POTENTIAL, THE BOARD OF DIRECTORS RECOMMENDED RAISING THE DIVIDEND ALMOST 9%, TO €2.50 PER SHARE."





A rising global population, the need to protect the environment, climate change, the growing scarcity of resources and the digital transition all present both challenges and opportunities for an industrial company like ours. The solutions we are developing for our customers in lighter materials, new energies and bio-based products make us a key player in meeting those challenges. Our ability to innovate enables us to respond to the sometimes extreme challenges our customers and partners face in the cutting-edge sectors of aerospace, electronics, oil and gas production, automotive manufacturing and sports. It also helps us move them toward more sustainable growth every day.

**How does Arkema's social commitment contribute to its success?**

**T. L. H.** – We're interested in a bigger picture than our financial performance. To prosper over time, companies must not only post solid financial results, they must also contribute in some way to the society we live in. Our program is increasingly grounded in a commitment to the community. In terms of being a responsible producer, we want to rank with the best for safety and environmental footprint. But we've also made strong social commitments. For example, we have ambitious gender equality goals. We aim to have 23 to 25% women senior managers by 2025, up from 18% in

"OUR SOCIAL COMMITMENT IS BASED ON A CLEAR, AMBITIOUS VISION OF OUR BUSINESS AND CONTRIBUTION TO SOCIETY."

2016. More and more women are entering our fields, a trend that is picking up speed, and that's a good thing. It's why we wanted to be a national sponsor this year of the FIFA Women's World Cup 2019™, which is being held in France. As a good corporate citizen, we're also stepping up our initiatives to promote education and youth inclusion through sports and music. We're building strong ties with various nonprofits in low-income neighborhoods. Supporting communities and acting locally are important values to me. They also motivate many Arkema employees.

**What approach are you taking to the future?**

**T. L. H.** – 2018's excellent results prove that the strategy we've pursued since Arkema was created is the right one. We're on target to meet our goals. But also and most important, we are honing a vision focused on the long term. What we want to do in 2019, given 2018's very strong results, is demonstrate Arkema's resilience in a more complex environment, while continuing to strengthen our specialty chemicals so that they generate 80% of our revenue in 2023. We'll continue to invest to keep up with our customers' needs, especially in Asia and North America. Several major start-ups are planned in 2019. Among them are a plant to produce Kepstan® PEKK, an extreme performance thermoplastic, in the United States, a resin plant for Sartomer in China and an acrylics unit in the United

States. We're making active progress on our big projects to grow thiochemicals in Malaysia and specialty polyamides in Asia in general. We're also continuing our policy of targeted acquisitions, notably in adhesives. This is shown by our three acquisitions in 2018 in growing niche markets that offer synergies with bostik – in the United States, Japan and in quick-drying adhesives in Europe. All these projects will help bolster the already majority share of our specialty chemicals activities, cementing our position as a leading producer of specialty chemicals and advanced materials. We've launched demanding cross-functional programs worldwide to push marketing excellence and digital transformation. They will be stepped up and will help us achieve our goals.

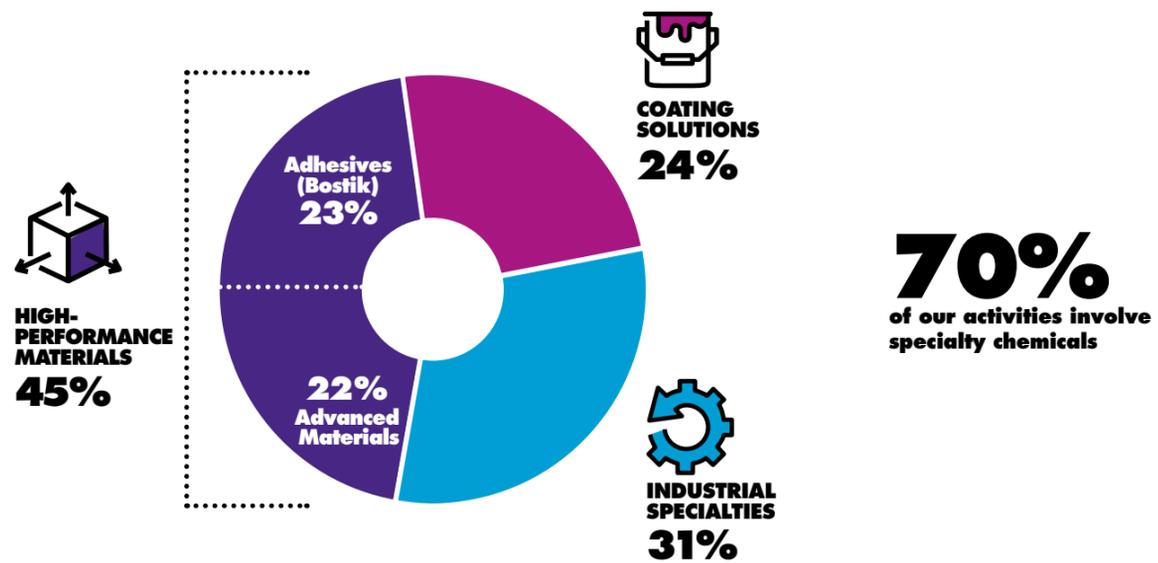
I know that I can also count on the engagement of our 20,000 employees worldwide, our entrepreneurial culture and our values of performance, solidarity, simplicity and responsibility to meet these challenges. All Arkema directors and Executive Committee members are with me in believing that our many assets and quality projects position us well for the next few years and will sustain our ability to create value for years to come. Arkema is an incredible personal, industrial and technological adventure for our employees, stakeholders, customers and regions. For me, our future depends on further quickening Arkema's momentum, a challenge as ambitious as it is exciting. —

"TO SUCCEED, I KNOW THAT I CAN ALSO COUNT ON THE ENGAGEMENT OF OUR 20,000 EMPLOYEES WORLDWIDE."

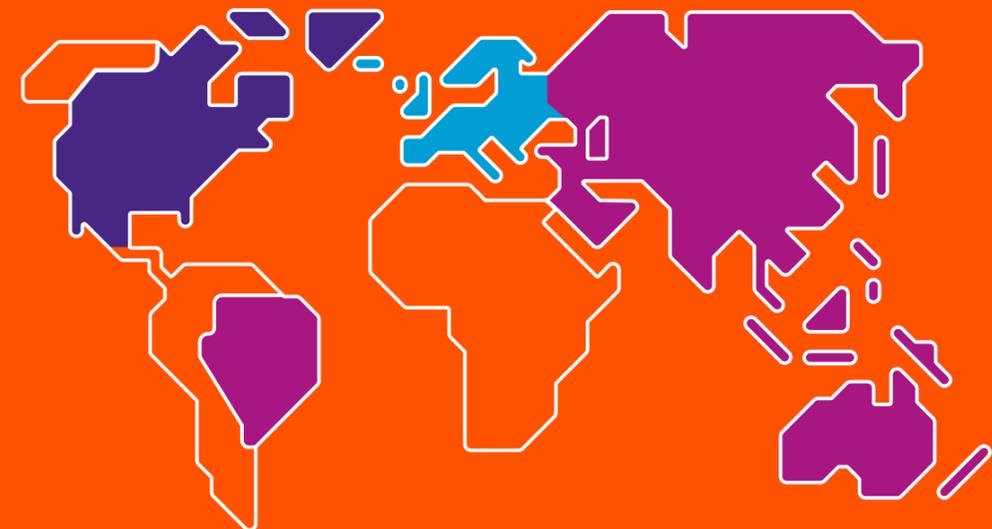
**ARKEMA AT A GLANCE**



**A PORTFOLIO BUILT AROUND FOUR MAJOR BUSINESS SEGMENTS**



**A GLOBAL MANUFACTURER**



**INNOVATION, A CORE FOCUS OF OUR BUSINESS PURPOSE**



**Six Words That Hold the Key to Arkema.**

A major producer of specialty chemicals and advanced materials, Arkema helps tackle key societal challenges such as the need to enhance energy efficiency and create new sources of energy through innovation and sustainability-focused products. A responsible, engaged industrial operator, we also strive continuously to shrink our environmental footprint and keep the lines of communication open with our stakeholders. Our strategy can be summed up in six key words.

**Chemicals.** Our plan in the next few years is to cement our global leadership in specialty chemicals, which are high-value-added products that offer strong growth potential and are manufactured close to end markets. Examples include high-performance polymers — also called advanced materials — as well as coating resins and adhesives. We aim to generate over 80% of our revenue from specialty chemical activities in 2023, up from 70% today. —

C  
adhesives

**Adhesives.** Our goal in adhesives is to more than double our revenue from 2016 (€1.6 billion). A third of the increase will come from organic growth and two-thirds from targeted acquisitions. We intend to be fully involved in consolidating this attractive but still fragmented market. Adhesives and advanced materials together are expected to comprise nearly 60% of our revenue in 2023, up from 45% in 2018. —

**Materials.** The highly specific properties of advanced materials (which account for 25% of our revenue) offer fantastic opportunities to innovate in developing lightweight transportation materials, bio-based polymers, new energies and electronics. We are expanding capacity for such products, including a new Sartomer plant for UV photocure resins in China, the start-up of a new Kepstan® PEKK production plant in the United States, and new specialty polyamide facilities in Asia and France. They support our goal to grow our advanced materials volumes by around 5% by 2023. —

**Innovation.** We compiled a list of issues facing society to make sure that our portfolio of solutions addresses our customers' specific needs, to better target our R&D efforts. This regularly updated exercise prompted us to define six innovation platforms that dovetail with six of the United Nations' sustainable development goals. These platforms cover bio-based products, lightweight materials and design, new energies, water management, electronics solutions, and home efficiency and insulation. —

M  
innovation

**Commitment.** We aim to grow Arkema's business activities sustainably and responsibly and to tackle social and environmental challenges. Our corporate social responsibility (CSR) policy is built

C  
A  
L  
S  
COMMITMENT

on three strong, pivotal commitments: to offer innovation-driven, sustainable solutions; to responsibly manage our industrial activities; and to foster open, local dialogue with our stakeholders (see pages 58 to 65). —

**R&D.** Our growth is driven by indisputable R&D expertise, enabling us to roll out innovative new products each year, support our customers technically and improve the performance of our processes. Our R&D expertise is built on the work of our 1,600 researchers at 15 centers worldwide. We can also count on a sizable portfolio of more than 9,000 patents that is growing yearly, as evidenced by the 244 new applications we filed in 2018. —



**Chemistry Rocks!** You come across our products all the time without even realizing it. They're everywhere, discreetly in the background, making your life easier. Read on to see a few examples of how Arkema chemicals help make your day safer, more convenient and more energy efficient.



**1 Bostik Adhesives**  
Bostik, an Arkema subsidiary, makes hundreds of adhesives, sealants and grouts. Its high-value-added solutions are found everywhere in the home, from flooring to interior decoration, repairs to DIY projects, and packaging to personal care products. They're also used in cars, planes and trains. In transportation, the elastic, waterproof adhesives of windows, roofs and metal frames reduce vibrations and vehicle weight, helping to cut fuel consumption.

**2 Pebax® Elastomer**  
Our Pebax® elastomer makes jogging, running, hiking and track & field athletic shoes lighter, springier and more flexible. This chemical wonder was designed at our R&D center in Normandy, France. Pebax® elastomer offers a unique range of properties, including light weight, effective energy return, long-lasting elasticity, toughness, flexibility and impact resistance. It is used in the soles of the top athletic shoe brands, including Nike, Adidas, Puma, The North Face, Mizuno, Asics, Reebok, Under Armour, and New Balance. Stiffer Pebax® grades are also used to make the ski boot shells of such big-name brands as Alpina, Scarpa, Dynafit, Fischer and Scott.

**3 Altuglas® Polymer**  
Often called acrylic glass, Altuglas® PMMA offers outstanding optical properties and well-balanced physical and mechanical characteristics. As transparent as crystal, lightweight, easy to process and naturally UV age-resistant, it has long been used, in both clear and tinted versions, in interior and bathroom furniture, illuminated signs, LCD flat panel displays, automobile tail lights and more.

**4 Sartomer® Resins**  
These acrylic resins have made it possible to develop high-performance adhesives for smartphone and tablet touchscreens that help ensure optimal light diffusion and sharp picture quality. They deliver key properties, specifically durability, protection against yellowing and excellent flexibility. These resins also go into the varnish used to protect smartphone and tablet backs and shells, offering a scratchproof coating and a unique matte or gloss finish.

**5 Certincoat® Coating**  
Certincoat® coatings let the sunlight in and keep heat from getting out. A huge plus in cold climates, these low-emissivity flat-glass coatings make windows smarter and improve building insulation. The end result: heating savings of 30%. A version for flat glass installed in warm climates is also available. This coating limits the penetration of UV rays, reducing the need for air conditioning.

**6 Nitroxy® Revolution Molecular Sieves**  
These porous, minuscule beads are used in a new generation of portable oxygen concentrators for people suffering from respiratory insufficiency. Until now, patients had to drag cumbersome oxygen bottles the size of a small suitcase and weighing up to 12 kilograms around with them. Nitroxy® Revolution molecular sieves act as filters, capturing the nitrogen in the air and concentrating 95%-pure, oxygen-enriched air in a lighter (around 3 kilograms), quieter and more manageable medical device. This solution makes life more convenient for patients, who can once again go to the movies, fly in planes and use public transit.

# 2018

## SNAPSHOTS

**A slew of acquisitions, investments and R&D partnerships here,** a handful of innovations and awards there, a sprinkling of soccer and sailing and a pinch of corporate giving via sponsorships all add up to a full and colorful album. Here's a look back at our 2018 highlights.



### March

**Thermoplastic Composite Solutions Take to the Air.** Hexcel and Arkema sign a strategic partnership to develop the thermoplastic composite solutions of the future for the aerospace industry. The deal combines Hexcel's expertise in carbon fiber with Arkema's mastery of PEKK powders.



### January

**Arkema Launches a "Salary Rounding" Scheme.**

"Salary Rounding" lets employees in France donate the euro cents on their monthly pay slip to a nonprofit of their choice, from among the six selected by Arkema. These include Association Handi-Chiens, Association des Paralysés and Secours Populaire. To show our support, we match our employees' donations.

### February

**New Project to Produce Polyamide 12 in China by Mid-2020.**

We unveil a 25% expansion of Arkema's global polyamide 12 production capacity, alongside the major project we had already announced in the bio-based polyamide 11 chain. The addition at the Changshu complex in China will help us keep pace with strong demand in Asia for applications such as cable protection, lightweight automotive materials to replace metal, and high-tech sports shoes.



### April

**New Kynar® Fluoropolymer Capacity in the United States.**

We successfully start up new Kynar® PVDF capacity at our Calvert City, Kentucky, plant. This 20% increase in our production capacity means that Arkema can continue to keep up with strong regional demand from emerging applications such as water filtration, while also serving more established markets such as the chemical process industry and high-performance cables for the automotive, fiber optic and oil industries.





# soccer

**April**

**Arkema, First National Supporter of the FIFA Women's World Cup France 2019™.** FIFA and the Local Organizing Committee of the FIFA Women's World Cup France 2019™, due to be held from June 7 through July 7, 2019, are pleased to announce the signing of Arkema as their first National Supporter. The partnership is a great opportunity for Arkema to support and spotlight the place of women in both sports and business.



# sailing

**April**

**Arkema Set to Sail Again.** Arkema has been involved in sailboat racing since 2013, sponsoring Team Lalou Multi and its Multi 50 trimaran and Mini 6.50 prototype built with recyclable composites. Both innovative boats employ materials produced using Arkema technologies. In April, Arkema announced an extension of the partnership and the construction of a new Multi 50. It's expected to take to the water in 2020, in time to compete in the Route du Rhum 2022.

**May**

**Bostik Steps Up Its Growth in Adhesives in Japan.** Arkema announces the Bostik-Nitta joint venture's plan to acquire Nitta-Gelatin Inc.'s industrial adhesive business and build a new world-class adhesives plant in Japan. These steps will help Bostik serve its Japanese customers in the buoyant markets for nonwovens used in personal care products and the packaging, labeling, transportation and electronics markets.



# Japan



# confidence

**April**

**A Successful Share Capital Increase for Employees.**

Over 8,000 Arkema employees subscribed 610,405 shares, investing a total of €50 million, during our sixth share capital increase specifically for them. The amounts invested and the high participation rate underscore employee confidence in our long-term strategy.



# innovative

**May**

**Arkema Exhibits at the Viva Technology 2018 Trade Show.** Arkema exhibits for the first time at the Viva Technology trade show at the Paris Porte de Versailles convention and exhibition center. Our stand in the Hall of Tech showcased projects jointly developed with twelve of our partners, illustrating our open innovation and digital transformation strategy.



# progress

**June**

**Arkema Helps Farmers Complete World's First Sustainable Castor Bean Cultivation Program.** Arkema, BASF, Jayant Agro-Organics and Solidaridad team up on Project Pragati — a Hindi word meaning progress — to help more than 1,000 Indian farmers grow castor beans sustainably. Arkema is a leading supplier of bio-based polymers derived from castor oil.



# digital

**June**

**Pebax Powered® Reaches Out to Athletes.**

Arkema rolls out pebaxpowered.com, a brand-new website dedicated to Pebax® sports applications. It's a major first for us. The site is part of a digital marketing strategy to show consumers the technical advantages of Pebax® in sports shoes. Whether you run, ski, play soccer or practice another sport, Pebax Powered® ups your game.



France



June

**New Production Capacity for Specialty Polyamide Powders.**

Our more than 50% expansion of global production capacity for ultra-high-performance powders at the Mont site in France will let us keep up with strong demand in industrial applications such as coatings, composite materials and 3D printing. The around €20 million investment will come on stream in late 2019.

July

**Opening of a 3D Printing Center of Excellence in UV-Curable Resin Technologies.**

Arkema opens a 3D Printing Center of Excellence at the Sartomer facility in Exton, Pennsylvania. This advanced R&D lab will enable Sartomer and its partners to further develop cutting-edge photocure resins for 3D printing through collaborative research. The center will expand our worldwide R&D network dedicated to developing advanced materials for additive manufacturing.



October

**Universal Access to Drinking Water: Chapter Two.**

Following the success of Sail for Water, Arkema is supporting a new NGO, the No-Thirst Initiative, to promote universal access to safe drinking water for people living in remote areas of Nepal. The project distributes Kynar® PVDF membrane filtration kits to communities.

composites



September

**Arkema and Barrday, Inc. Team Up to Manufacture Composite Solutions for the Oil and Gas Market.** Barrday, Inc., a major player in the composites market, and Arkema announce the creation of a joint venture to manufacture and market high-performance carbon fiber and specialty-polymer tapes for the growing oil and gas production market.



October

**Arkema Helps Develop a PMMA Recycling Process.**

Arkema is a partner in the MMAtwo consortium, an E.U. project to recycle PMMA — also known as acrylic glass — by depolymerizing waste to convert it to feedstock. We also chair the project's Executive Board. Our involvement reflects our desire to promote the recycling of finished products and the circular economy.

October

**Bostik Expands in High-Performance, Fast-Setting Adhesives.**

We cement our position in high-performance adhesives with the acquisition by our affiliate Bostik of Afinitica, a Spanish company specializing in instant adhesives, also known as cyanoacrylates. This targeted acquisition gives Bostik a solid foothold in adhesives produced for markets with strong growth potential, such as electronics and medical devices.



November

**Arkema and École Polytechnique Create Chair of Excellence.**

Arkema, French engineering school École Polytechnique and its Foundation decide to create a Design and Modeling of Innovative Materials International Teaching and Research Chair to promote world-class R&D research and help invent the materials of tomorrow.



December

**BMW Recognizes Our Technical Polymers for Sustainability.**

Arkema is one of 15 global suppliers recognized by the renowned German automaker for innovation. We picked up an award for developing high-performance polymers derived from sustainable castor oil and used to make engine parts.

SOCIAL COMMITMENT,  
 ARKEMA'S  
**DNA**

**The Social Commitment Charter adopted in 2018 is an even stronger affirmation of our desire to set a good social and environmental example.** We do that through very concrete initiatives, with compelling results. Virginie Delcroix, Vice President, Sustainable Development, brings us up to speed.



**In May 2018, Thierry Le Hénaff signed Arkema's Social Commitment Charter, which has reshaped our CSR strategy. Is Arkema taking a new approach to corporate social responsibility?**

**Virginie Delcroix** – Adopting this charter is, first, a strong signal that our CEO and Executive Committee are committed to taking CSR — an ever more important cornerstone of Arkema's growth — farther. Our CSR strategy is expressed through three robust commitments, to innovation-driven sustainable solutions, responsible management of industrial activities, and open dialogue and close relationships with stakeholders. Backed by our attention to our fundamentals of innovation, safety, employee dialogue and establishing roots in our communities, this strategy clarifies and gives more meaning to the CSR commitments of the company and our employees. Since Arkema's creation in 2006, we have repeatedly asserted our intention to be a responsible chemical producer, one that aims higher than regulatory requirements as it looks to meet the most ambitious global standards. You'll recall that we adhere to the Responsible Care® initiative and the U.N. Global Compact and have made the United Nations' 17 Sustainable Development Goals the lodestar of our CSR strategy. We are deploying the necessary resources to achieve our goals, through an innovation strategy focused mainly on the key sustainability challenges and the introduction of proactive programs. A number of specific commitments support the charter, in areas such as innovation, safety, health, the environment and quality, human rights, business ethics and the fight against corruption.

**Stakeholder dialogue is a core focus of Arkema's social commitment. How do you approach it?**

**V.D.** – It's pivotal. We can't create sustainable value for society unless we listen to society. Locally, that's what our dynamic, more than 15-year-old Common Ground® program is for, via outreach to municipalities, nonprofits, schools and universities, and people living or working near our sites. Our business units constantly interact with customers, suppliers and business partners. More broadly, in 2016 we conducted our first materiality analysis, nailing down the expectations of all stakeholders, both internal — employees and employee representatives — and external — customers, suppliers, NGOs, shareholders, neighbors, media and regulatory authorities. An analysis of the results showed strong consistency in how our internal and external stakeholders prioritized the topics considered material (or salient) for Arkema. It also pinpointed areas for improvement and added new strategic goals such as diversity. An annual dialogue initiative followed, with a stakeholder panel that had a significant impact on our thinking and our social commitment charter. A second materiality analysis began in 2019, including an expanded stakeholder panel in our three main business regions.

**Speaking of indicators, the Environmental Footprint Performance Indicators (EFPI) tracked at Arkema since 2012 are much improved.**

**V.D.** – Yes, we're all really happy about it. At year-end 2018, the intensity of our greenhouse gas emissions (down 54%), volatile organic compound emissions (down 38%), chemical oxygen demand (down 41%) and net energy purchases (down 12%) had decreased sharply from 2012 levels (see following pages). These results, driven by proactive initiatives involving best practices, capital expenditure and pivotal programs such as Arkenergy and Optim'O, reflect our mature approach to environmental issues — so much so that we've already achieved some of our long-term 2025 goals. We're going to keep pushing ahead, of course, updating certain goals.

**Also in 2018, Arkema undertook a systematic assessment of its products and solutions through a CSR lens. Can you tell us more about that?**

**V.D.** – Arkema already offers a wide range of sustainable solutions, through our long-established choice of six innovation platforms. The systematic assessment begun in 2018 aims to take an increasingly active approach to setting the direction for our products. The idea is to evaluate the environmental and social impacts and benefits, the potential risks and, ultimately, the contributions to the United Nations' Sustainable Development Goals of each of our solutions (the product and its application). We will do so in an integrated manner across the life cycle, from feedstock sourcing to production processes, the way our products are used and their end of life. The circular economy is an integral part of this approach. In 2018, we concentrated on three pilot business units — Acrylics, Technical Polymers and Bostik — to devise the assessment method, which draws on industry guidelines such as those of the WBCSD<sup>1</sup>. It's a long-term project that enjoys strong support from the Executive Committee and benefits from the business units' involvement. Consequently, in 2019 and 2020, we plan to cover most of the solutions we market. Besides which, assessment isn't a goal in itself. What really counts is helping to manage the portfolio and the sustainable growth strategy created for Arkema and its partners. —

1. WBCSD: World Business Council for Sustainable Development



“WE HAVE MADE THE UNITED NATIONS' 17 SUSTAINABLE DEVELOPMENT GOALS THE LODESTAR OF OUR CSR STRATEGY.”



# How We Put Our Social Commitment to Work

**Arkema strives to improve continuously through three strong, pivotal commitments: product solutions to tackle the challenges of sustainability,** a smaller environmental footprint and open dialogue with our stakeholders. We take action, backed by figures and results, and plan to do even better!



Provide  
**Innovative, Sustainable Solutions**  
to Tackle Major Social Challenges

- ➔ **Addressing the challenges of growing urbanization**
  - **Kynar® PVDF** ultra-filtration membranes to produce drinking water.
  - **Thiochemicals** for animal feed.
- ➔ **Responding to the increasing scarcity of fossil fuel resources and developing new energies**
  - **Bio-based Rilsan® polyamides 10 and 11** produced from castor oil.
  - **Kynar® PVDF** for lithium-ion batteries and photovoltaic panels.
- ➔ **Enhancing the energy efficiency of transportation and construction in response to the impacts of climate change**
  - Advanced materials that replace metal in cars and aircraft:  
**Rilsan® HT polyamide** and **Kepstan® PEKK**.
  - **Kynar Aquatec®** white reflective roof coatings.
- ➔ **Stepping up the development of new technologies**
  - Sartomer **N3xtDimension®** photocure resins, **Kepstan® PEKK** and **Rilsan® polyamides** for 3D printing.
  - **Rilsan®** and **Sartomer®** advanced materials for smartphones and tablets.



Be a Responsible  
**Industrial Operator**

- ➔ **Lower consumption and smarter production**
  - **Energy:** Trimming net energy purchases by **12%**<sup>1</sup>
- ➔ **Shrinking our environmental footprint**
  - **Water:** Lowering chemical oxygen demand (COD) by **41%**<sup>1</sup>
  - **Air:** Reducing volatile organic compounds (VOCs) by **38%**<sup>1</sup>
  - **Climate:** Slashing greenhouse gas (GHG) emissions by **54%**<sup>1</sup>
  - Proactive **life cycle and circular economy analysis**
- ➔ **Striving for best-in-class workplace health and safety**
  - Target: Achieve a **TRIR** (total recordable injury rate per million hours worked) **< 1.2<sup>2</sup>** (1.3 in 2018)
  - Target: Achieve a **PSER** (process safety event rate per million hours worked) **< 3<sup>2</sup>** (4.4 in 2018)

1. 2018 results in terms of intensity compared with 2012. Target reductions for 2025: energy 15%, COD 40%, VOC 33%, GHG 50%.

2. By 2025.



Foster Open  
**Dialogue and Close Relationships**  
with Our Stakeholders

- ➔ **Sustainable procurement and working closely with our suppliers**
  - **Together for Sustainability Initiative: 1,400+** suppliers evaluated; 60%<sup>3</sup> obtained an improved CSR rating in 2018.
- ➔ **Enhanced employee diversity and gender equality**
  - Proportion of **women in senior management** positions of between **23% and 25%**<sup>4</sup> (**21%** in 2018).
  - Proportion of **non-French nationals in senior management** positions of between **42% and 45%**<sup>4</sup> (**39%** in 2018).
- ➔ **Using corporate philanthropy to sponsor educational and outreach programs**
  - The **Education Fund** helps finance around a dozen nonprofits throughout the world.
  - **Corporate sponsorship** in France with Théâtre des Champs-Élysées, which puts on interactive operas for schools, Sport dans la Ville, etc.
- ➔ **Participating in the local community**
  - Over **1,000 Common Ground® initiatives** throughout the world (plant tours for local residents and schools, meetings with locally elected representatives and nonprofits, donations, etc.).

3. For the suppliers who updated their assessment in 2018. 4. By 2025.

WATER

# AN INNOVATION, INDUSTRIAL AND HUMANITARIAN CHALLENGE

**With the global population set to top 9 billion in 2050,** many of the world's regions are already battling severe water stress. Access to an adequate supply of clean water is — alongside energy and food resource management — one of the most critical challenges of the 21st century. The United Nations has made it a major sustainable development goal: “Ensure availability and sustainable management of water and sanitation for all” (SDG 6). As a responsible corporate citizen, we intend to do our part to bring about this decisive change. We have therefore made water resources a core focus of our innovation policy, our industrial operations and our stakeholder relationships around the world. Our push for progress focuses on three areas, which resonate strongly with the three goals of Arkema’s Social Commitment Charter.

**1 Innovation-Driven, Sustainable Solutions**  
We have made sustainable water management a major focus of our innovation policy and have dedicated one of our six R&D platforms to it. We stand out uniquely for our high-performance solutions for water filtration membranes, made for water purification, but also increasingly, wastewater treatment markets. These solutions employ specific Kynar® PVDF grades that retain their low-fouling performance for years. Other Arkema products also have key water cycle applications. For example, hydrogen peroxide is a proven solution to eliminate sulfur residues; Rilsan® polyamide 11 powder is a bio-based alternative to stainless steel for coating water pipes; and various acrylic monomers are used as flocculants, which aid in water purification by causing particles to clump.

**2 Responsibly Managed Industrial Activities**  
Launched in 2016, Arkema’s Optim’O program sets ambitious goals to improve the way we manage water at our 136 production sites, notably by reducing the amount of organic matter in our effluents. This proactive program has yielded very convincing results. Arkema’s overall COD (chemical oxygen demand)<sup>1</sup> dropped from 3,437 tons to 2,174 between 2012 and 2018. This was achieved through the combined effects of enhanced industrial processes, detailed water balance tracking and the development of a genuine, company-wide culture focused on water challenges. While well on its way to surpassing its initial quantitative goals, the Optim’O program is still pushing hard to meet new goals, set for 2025.

**3 Open Dialogue and Close Relationships with Our Stakeholders**  
Arkema strives to create with customers, partners and suppliers a responsible value chain that drives progress. That is what prompted us to pursue Project Pragati in India, working with growers of castor beans, which are used in our bio-based Rilsan® polymer. This voluntary initiative significantly optimizes, among other things, local farming practices and the associated water use. A staunch supporter of basic human rights more broadly, including access to clean water for all, Arkema works with nonprofit partners on the cause, distributing water filtration kits in different regions of the world.

<sup>1</sup> Chemical oxygen demand, or COD, is an indicator tracked by regulatory agencies worldwide. It measures the amount of oxygen an aquatic environment needs to break down pollutants discharged into it, at the expense of the oxygen aquatic life needs to breathe.



# 1 Water Ultrafiltration: A Unique Material for a Global Challenge

**The durable low-fouling properties of our Kynar® PVDF DH 100 allow us to help develop ultrafiltration solutions unlike any others in the world.**

If you open an ultrafiltration module, you'll find hundreds of membranes — made of 1- to 2-millimeter-diameter microporous tubes — bundled together inside. They let water flow through under low pressure, but trap particles, bacteria and viruses. "This kind of purely mechanical filtration uses little energy and is employed worldwide for drinking water production and purification," says Bernard Schlinquer, Kynar® & New Markets Manager at Arkema. Scarcity of clean water is a planet-wide public health issue in which Arkema is

intensely involved, through a non-exclusive partnership with French filtration module maker Polymem to create a material with unparalleled performances. "The specific nanoscale structure of our Kynar® PVDF DH 100, the product of six years of R&D, gives it durable low-fouling performance," explains Bernard Schlinquer. The result is much finer filtration, the ability to treat roughly 20% more water for the same amount of energy and twice the life span (10 years rather than five) of conventional materials.

**A DOUBLING OF SALES IN 2018**

Brought to market in 2013, these next-generation PVDF membranes have had success on a par with their performance: sales volumes doubled in 2018 "and we

expect another upswing in 2019," says Bernard Schlinquer. In addition to the water purification market (municipalities and water utilities, most notably in North America and Europe), the membranes are experiencing fast growth in the wastewater treatment sector, where they're used in particular to make membrane bioreactors. This is especially true in China, where huge infrastructure programs have been introduced to halt the pollution of streams and waterways. Membrane filtration is poised to expand in developing countries, as an alternative to bottled water. —



# 3 Water, Driving Progress for Stakeholders

**Arkema conducts initiatives across the water value chain to improve management of this resource by growers of feedstock, such as castor beans, and isolated communities. Find out more below.**



# 2 Optim'O: "More Than the Numbers, a Culture of Excellence in Water Use"

INTERVIEW  
Jean-Yves Robin, Optim'O Leader



**Since 2016, the Optim'O program has spurred 136 Arkema production sites to tackle industrial process water issues, with already impressive results. Jean-Yves Robin, Optim'O leader, shares his take.**

**Between 2012 and 2018, Arkema's chemical oxygen demand (COD)<sup>1</sup> fell from 3,437 tons to 2,174. How did the company manage that?**

**Jean-Yves Robin** – First, we pushed every site to precisely

quantify its actual discharges and how well its treatments — including those done offsite — were performing. Based on that, we take objective steps to fine-tune facility settings or adjust some processes, especially washing. An initial investment in the Lesgor (MLPC) plant in France, for example, halved the COD discharged into the local river in 2018. We're also investing in advanced treatment solutions such as installing a dissolved air flotation (DAF) system at our Bécancour plant in Canada. We're not just interested in COD either. We also focus on suspended matter. An example is Pierre-Bénite in France, where

a whole series of tweaks in our operating procedures slashed the amount of suspended matter discharged by two-thirds.

**Has Optim'O also cut down on the amount of water used by Arkema?**

**J.Y. R.** – That wasn't the program's original goal, but exhaustive mapping of water flows did, in fact, turn up ideas for improvement, from simple "leak-spotting" to process modifications. Our monomer plant in Hengshui, China, is an example. Integrating steam supply systems with neighboring industrial sites reduced our withdrawals from the water table by 70%.

**You are close to achieving Optim'O's goals, notably a 40% reduction in COD by 2025. What's next for the program?**

**J.Y. R.** – Now we have to keep our momentum going and strengthen it, through strong business unit and site involvement. Some actions are in progress and others in the pipeline. We have the ambition and possibility to do even more. Optim'O is also an opportunity to identify best-in-class performers. Some plants have highly optimized processes to fully reuse their water flows internally, minimizing discharges. This allows plants in the same business

units elsewhere in the world, with fairly similar production facilities, to copy their process solutions and best practices. Above and beyond its quantitative goals, Optim'O's big benefit is promoting a culture of excellence in water use, at every level of the company. Water is, of course, an environmental issue for Arkema. But it's also a factor in industrial and financial performance. —

1. Chemical oxygen demand, or COD, is an indicator tracked by regulatory agencies worldwide. It measures the amount of oxygen an aquatic environment needs to break down pollutants discharged into it, at the expense of the oxygen aquatic life needs to breathe.



**GROWING CASTOR BEANS WITH LESS WATER IN GUJARAT**

As the world's biggest buyer of castor oil (the feedstock for Rilsan® polyamide 11), Arkema purchases our supply from hundreds of small farmers in Gujarat, India. To improve the social and environmental conditions for growing this crop, Arkema launched Project Pragati in 2016 (see page 58). This initiative brings progress to the region, especially in water use. "Our agricultural experts support nearly 3,000 farmers, providing them with equipment and advice on choosing seeds, managing waste and irrigation," says François Guillemet, Arkema's Director of Purchasing. Optimizing practices at pilot farms — using alternating drip irrigation at the right times — cuts water use 25%, while boosting harvests. The next step is extending these practices across the production region. —

**NO-THIRST INITIATIVE: 300 ULTRAFILTRATION KITS FOR NEPAL**

After its sailboat trek and distribution of nearly a thousand water ultrafiltration kits in 10 countries between 2015 and 2017, the NGO Sail for Water has passed the torch to the No-Thirst Initiative. That nonprofit in turn has enlisted Arkema's support for a mission in Nepal. "We donated 300 'mobile' ultrafiltration modules, developed with Polymem, along with backwashing systems that extend their life to almost 10 years," says Aline Teysier, in charge of Arkema's corporate giving initiatives. In late 2018, we sponsored the nonprofit Blue Gold, which set off on a four-year world tour with 100 kits aboard its catamaran. Some of them have already been distributed in Senegal. —

3D PRINTING

WORLD'S MOST  
**COMPLETE**  
 OFFERING  
 OF MATERIALS



**In today's smart factory era, the rise of 3D printing, also known as additive manufacturing,** is creating unprecedented opportunities in prototyping and, most recently, small- and medium-batch production. Advantages include freedom of design, fast manufacture, customization and smaller amounts of raw materials. Arkema is playing a lead role in this technological breakthrough. We offer the aerospace, automotive, medical and sports industries an unmatched line of materials — and expertise — to support the three main additive manufacturing processes.

**WHY 3D PRINTING AND MASS PRODUCTION CHANGE EVERYTHING**

Besides its proven prototyping advantages, additive manufacturing redefines the scope of what small- and medium-batch industrial production can do.

**No Design Limits**  
 The restrictions associated with conventional production methods are a thing of the past. Machining often requires assembling parts (creating weaknesses in the process) and injection molding means making a mold (ruling out any shape that can't be unmolded). But additive manufacturers are limited only by their imagination.

**Making It Here and Now**  
 All you need to start printing a part is a template — which can be sent electronically anywhere in the world in a matter of seconds. It is ideal, for example, for making a replacement part that will enable an airplane to get back in the air right where it's stranded. More generally, 3D printing is the fastest process for small batches, whereas injection molding, which requires you to make a mold first, remains unmatched for large runs.

**Optimizing Raw Materials**  
 Conventional subtractive processes start with an initial bar or slab of material that is "sculpted" to create the desired shape, generating waste in the form of scraps, shavings and chips that can't always be recycled. In contrast, 3D printing only uses the material needed to make the shape, layer by layer. Lower consumption equals smarter production.

**More Customization Than Ever**  
 Today, customization is one of the biggest expectations in both the B2B and B2C markets. 3D printing removes all limits. We now have on-demand manufacture plus customized mass production of everything from automotive parts to athletic gear and medical devices. Welcome to the age of mass customization.

**Controlling Costs and Reducing Risks**  
 3D printing production costs are constant, versus conventional methods, in which costs decline as the number of items produced increases. Again, that makes it especially well suited to small batches and custom production, or cheaper production testing using a small run before investing in the equipment needed for large-scale production.

# A Primer

## Getting in on the Ground Floor Supporting an Industrial Revolution

Driven by the explosion in digital technology and process digitalization, 3D printing technologies are profoundly reshaping what industry can do. Previously limited to prototyping, they have now spread to small- and medium-batch production lines, in a growing number of fields. Arkema first dipped a toe into this world in 1988 with rapid prototyping. We correctly read and anticipated the revolution in progress, making 3D printing a major focus of our growth strategy.



## Listening Deep Knowledge of Requirements

Arkema serves many prestigious customers worldwide and has a detailed grasp of the challenges and opportunities in sectors that are pioneering additive manufacturing: the aerospace, automotive, medical and sports equipment industries. We help our customers to apply their expertise to switch new applications to 3D printing. We connect them with end-user expectations and the latest capabilities of printer makers to support the process from solution design through implementation.

## Materials

### The Most Complete Line of Solutions in the World

The result of a proactive strategy to support the 3D printing market, our portfolio of materials is unparalleled. It includes leading brands such as Sartomer's N3xtDimension® resins, bio-based Rilsan® polyamide 11, Orgasol® polyamide 12 and Kepstan® PEKK resin. The portfolio covers the three major additive manufacturing processes: selective laser sintering (SLS), digital light processing (DLP) and fused filament fabrication (FFF), also called fused deposition modeling. This wealth of options lets us provide the best solution for every specification, meeting needs that include mechanical strength, heat resistance, flexibility, transparency, color, toughness and more.



## Investment Stepped-Up Production Capabilities

To keep up with soaring demand, we invest heavily in our production base. In 2019, we opened a new Kepstan® PEKK resin production line at our Mobile, Alabama, site in the United States. New production capacity has also been announced for Sartomer's photocure resins at the Nansha site in China and for Orgasol® ultrafine polyamide 12 powders at the Mont plant in France, both in 2019, and for bio-based Rilsan® polyamide 11 resins in Asia in 2021.



## Innovation Three Dedicated Centers of Excellence

We opened a new center of excellence in 2018 to develop innovative photocure resins for 3D printing, at the Exton, Pennsylvania, facilities of Arkema subsidiary Sartomer. The state-of-the-art laboratory applies our ability to innovate to technologies such as stereolithography (SLA), digital light processing (DLP) and multi-jet printing (MJP). It joins the center of excellence in King of Prussia, Pennsylvania, which is dedicated to filament extrusion technologies, and the one in Serquigny, France, for selective sintering technologies.

# New Ideas and the Materials to Make Them

Driven by a handful of pioneering sectors, 3D printing is already a game changer for industry. Its growth depends on developing high-performance materials, of which Arkema is a major architect.

The very definition of a cutting-edge sector, aerospace is often an early adopter of new industrial standards. This was true for additive manufacturing, which offers advantages that aircraft makers recognized right away. They were especially keen to lighten the weight of some parts, thanks to the total design freedom allowed by 3D printing combined with materials whose performance is constantly improving. Likewise, automakers have invested significantly in the last few years to convert a growing number of applications to 3D printing, a perfect answer to the market's major challenges of customization, supply chain optimization, lighter components and waste reduction. The medical industry now produces dental prosthetics, hearing aids, implants and other aids using additive manufacturing and images of the patient's own body.

## A GLOBAL MARKET GROWING FULL TILT

In the Factory 4.0 era, 3D printing has spread from prototyping to small- and medium-batch production and is now moving into a wide variety of fields, including sports gear, start-up production, design, special events and marketing. According to Wohlers Associates, the global 3D printing market stood at \$7.3 billion in 2017 and is growing by over 20% annually. And that's just the start. For the automotive sector alone, U.S. research consultancy SmarTech Publishing predicts the 3D printing market will reach \$5.3 billion in revenue in 2023, rising to \$12.4 billion in 2028.

## MATERIALS: THE THREE DIMENSIONS OF A LEADING LINE OF SOLUTIONS

As 3D printers become more sophisticated, a major challenge of this revolution is to develop materials that meet manufacturers' requirements. Since the advent of 3D printers in the late 1980s, Arkema has invested heavily in materials, working with major industrial partners. We now boast a complete line of solutions covering the three main types of additive manufacturing processes. We now boast a complete line of solutions covering the three main types of additive manufacturing processes. For selective laser sintering (powder-bed fusion of fine, thermoplastic powders using a laser), Orgasol® Invent Smooth polyamide 12 provides a smooth-feel surface that has no equal. Rilsan® Invent Natural & Black polyamide 11 grades, made entirely from castor oil, deliver mechanical strength, impact resistance and toughness. For digital light processing technologies, a fast process that offers good surface quality, Sartomer's N3xtDimension® resins are a global standard. Lastly, slower but inexpensive fused deposition modeling (or fused filament fabrication) uses specific Kepstan® PEKK or Kynar® PVDF grades.

## A LONG VIEW OF R&D AND PRODUCTION

Our unmatched line allows us to work with customers to design industrial solutions that meet a wide range of specifications, including mechanical strength, heat resistance, flexibility, transparency, color and toughness. Our offering is poised to get even bigger,

thanks to a proactive R&D policy. In 2018, Arkema inaugurated a center of excellence dedicated to innovative photocure resins in Exton, Pennsylvania, a sister facility to our King of Prussia, Pennsylvania, center for filament extrusion and Serquigny, France, center for selective laser sintering (SLS). We are also developing a range of additive design services, with the help of advanced 3D modeling and process simulation applications at our Lyon, France, R&D center. Arkema endowed the Design and Modeling of Innovative Materials International Teaching and Research Chair in 2018 with French engineering school École polytechnique, notably for 3D printing. At the same time, we anticipate growth in demand. Arkema is also girding up for increasing demand by commissioning new production capacity for all materials between 2019 and 2021. Lastly, we reorganized our additive manufacturing offering in 2018, creating the 3D Printing Solutions by Arkema marketing platform to help industry find new applications.



help companies in the 3D printing market find new applications."

Guillaume de Crevoisier, Global Business Director, 3D Printing

OIL  
AND

GAS

OPTIMIZING THE VALUE CHAIN,  
FROM DEVELOPMENT  
THROUGH PRODUCTION



**Arkema is involved across the oil and gas value chain, from offshore production to refineries, to shipping and sales at the pump.**

Technical polymers, specialty additives and reagents, purification and odorant solutions are just some of our products. When combined with high-value-added services, they provide leading industry players worldwide with the means to produce and market cleaner, safer and greener energy. A brief survey below.

As we grapple with climate change, the expanding use of renewable energies and quest for energy efficiency have become major issues. Yet today's energy mix remains heavily dependent on oil and gas. One vital spur to sustainability is the continuous improvement of the industry's processes, to reduce risks and minimize impacts on the climate, environment and human health. Spurred by increasingly stringent regulations, this is now a vital requirement for producers, refiners and retailers. On top of regulatory and societal expectations, the sector's leaders are facing unprecedented technical challenges. They must produce under increasingly difficult conditions — especially in the case of offshore fields — and refine and process less pure, heavier oil that requires more advanced treatments. A longtime oil and gas industry partner, Arkema helps companies deal with these changes by providing an array of innovative products and solutions, delivered to the front line by means of high-value-added services.

**ARKEMA DRIVES PERFORMANCE ACROSS THE VALUE CHAIN**

Specific grades of Kynar® and Rilsan® performance polymers are used to strengthen and lighten flexible lines for deepwater field production, as well as to extend their lifetime. We also provide a very wide range of additives to improve the performance and longevity of processes and equipment, from bottomhole to topside installations. Examples include water and hydrocarbon separation (Prochiner® line) and protection against corrosion (Norust® line), bacteria (Bactiram® line) and the formation of mineral or organic deposits (Inipol® line). Onshore, Siliporite® molecular sieves allow us to offer custom solutions to dehydrate and purify gas or oil in refinery units, while our Careflex® service provides refiners with unique expertise to inject dimethyl disulfide (DMDS) — an additive vital to remove sulfur from fuel — into reactors. To transport gas and oil safely, Kynar® polymers are a solution of choice for a range of specific applications. They help the industry comply with local regulatory requirements — for everything from certain gas pipelines to fuel pump hoses — while our Spotleak® and Vigileak® gas odorant solutions address critical health and safety issues. Arkema's diversified solutions are the result of continuous technology watch and a push for innovation in sync with society's major changes and the industry's technical challenges. That make us a go-to partner of the oil and gas industry and, increasingly, the related biofuel sector as well.



# Our Materials and Solutions Optimize Oil Production

3

## Sulfur Removal: A Vital Product and Service

Reducing sulfur in fuel, a cause of acid rain, is a major regulatory and environmental challenge for refiners. It is done by injecting sulfiding catalysts into reactors. These catalysts need to be activated themselves using a sulfur additive, dimethyl disulfide (DMDS), of which Arkema is the world's leading producer. To make sure DMDS is injected at the proper rate and safely, Arkema offers Careflex®, the only solution of its kind in the world. Highly qualified technicians travel the globe to deliver the service onsite.

2

## Petroleum Additives: Optimizing Production and Protecting Equipment

Oil (or gas) leaving a well always contains water. So, to improve water removal, Middle Eastern and African operators inject specialty products marketed by Arkema under the Prochinor® brand into wells and certain types of surface equipment. The brand is part of a very complete line of oil industry additives. They include Norust® to limit corrosion by seawater or hydrogen sulfide (H<sub>2</sub>S), Bactiram® to kill the bacteria that produce hydrogen sulfide (H<sub>2</sub>S) and Inipol® to prevent the formation of mineral, wax, gas hydrate or other deposits that could force costly production shutdowns. With over 600 products in our portfolio that draw on robust formulation expertise, we provide custom solutions for a very wide range of applications, from bottomhole to topside equipment (separators, tanks) and refining columns.



4

## Molecular Sieves: Custom Solutions for Drying and Purification

Made from synthetic zeolite and sold as tiny beads or rods, Arkema's Siliporite® molecular sieves have a porous crystalline structure that gives them a remarkable ability to trap the water molecules or sulfur compounds in gas and oil. Their action depends on the size of their mesh (a few angstroms; an angstrom is equal to one ten billionth of a meter or 0.1 nanometers). Added to adsorption columns carrying the flows to be treated, they are vital aids in refineries, petrochemical plants and gas treatment plants. Molecular sieves are used for everything from drying natural gas (which must have less than 0.1 parts per million of water to take on a liquefied form) to separating oil fractions and purifying refining products. Regenerated after each use, they currently have a life of four to five years.

5

## Transporting Gas: You Can Smell the Safety

Natural gas, liquefied petroleum gas (LPG) and various other process gases are odorless. So early leak detection during gas transportation and distribution, a major safety concern, requires odorants based on sulfur additives. Arkema offers the world's broadest line of products globally and in strict compliance with local regulations, under the brands Spotleak® (tert-butylthiol mixtures) for natural gas and Vigileak® for LPG. In addition to supplying them, we offer customers expert, integrated service delivery. The package includes custom transportation and logistics for odorants, technical assistance, and consulting and training for both retail gas distributors and production site operators.

1

## From Well Bottom to Platform, Flexible Lines Feel the Pressure

Producing deepwater reservoirs, nowadays reaching depths of up to 3,000 meters, requires flexible lines that can withstand very high pressures over long periods in certain regions, especially offshore Brazil. The oil flows through them under pressure, at high temperature, and contains corrosive hydrogen sulfide (H<sub>2</sub>S). Since conditions rule out the use of polyethylene, we develop risers — flexible lines that tie the well to the platform — with our industrial partners. Arkema materials for the inner lining: bio-based Rilsan® polyamide 11 for difficult configurations (up to 700 bar and 65°C, for example) and Kynar® PVDF for very difficult configurations (700 bar, 130°C). Kepstan® PEKK may be added to the range later on, for extreme conditions of up to 160°C. Rilsan® is also a top choice for making umbilicals, or small-diameter flexible lines used to supply power to various systems on the seabed.

6

## 100% Bio-Based Solutions for Gas and Fuel Pipes

Rilsan® polyamide 11 offers a sustainable, high-performance option for a host of oil and gas product transportation applications, both onshore and off. Examples include long-distance gas pipelines in the United States and Australia, fuel pipelines between refineries and distribution centers, service station pump hoses and gasoline fuel lines in car engines. Kynar® is used to make reinforced thermoplastic pipes (RTP) and very tough flexible lines that are increasingly used at production sites in the United States (shale oil) and Saudi Arabia.



# Service Included, for Value-Added in Your Tank

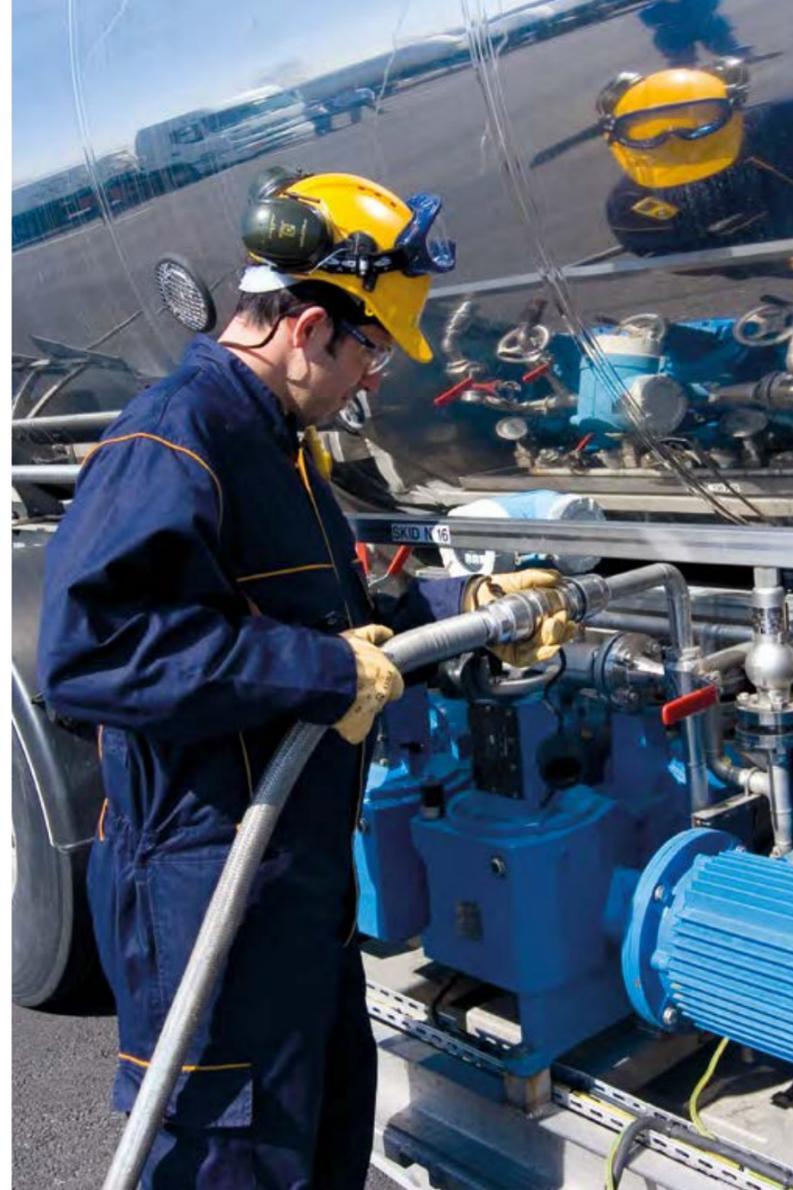
We stand out in the oil and gas markets not only for our broad portfolio of products and materials, but also for our high-value-added services.



“In the United States, Europe and Asia, our teams have dedicated fleets to deliver our gas odorants right when they’re needed, in packaging that complies with each country’s regulations,” says Peter Meyer, Global Business Manager, Gas Odorants. Arkema technicians also provide odorant technical assistance, consulting and training at end-customer businesses. “Our Odorflex® brand services, together with our outstanding product line, are vital to Arkema’s success in this market.”

### CONSULTING AND EXPERTISE

A similar approach has been taken for over 20 years to inject dimethyl disulfide (DMDS) at units to remove sulfur from oil, via Careflex®, the market-leading service package in the field. “Our technicians bring the reagent to the reactors, inject it and control the parameters throughout the process,” notes Guillaume Legouis, Global Business Manager, Careflex. “It’s an expert, fully outsourced service.” Consulting and custom services are found to varying degrees in all Arkema oil and gas sector activities, from formulating petroleum additives in dedicated labs that hew closely to each platform’s needs, to jointly designing customized molecular sieve drying solutions for all configurations, working closely with industrial partners and customers.



### RENEWABLE FUELS: APPLICATIONS OF THE FUTURE

Arkema’s solutions for the oil and gas industry are also increasingly useful in the renewable fuels sector.

- Dimethyl disulfide (DMDS) is used in biodiesel production to maintain catalyst activity. French oil giant Total, for example, uses this growing application at its biorefinery in La Mède, France.
- Molecular sieves are used in bioethanol production to separate water and ethanol.
- Polyethylene pipes do not hold up well when carrying gas produced from biomass: polyamide 11 and 12 grades are sustainable, effective alternatives whose use is spreading.



**BARRFLEX® TU: A JOINT VENTURE TO MAKE THE FLEXIBLE LINES OF THE FUTURE**  
Arkema and Barrday, a Canadian composite materials specialist, announced the creation of Barrflex® TU in September 2018. The joint venture will design and market high-performance carbon fiber and specialty polymer tapes made from polyamide grades 11 and 12, PVDF and PEKK. The joint venture will pool the partners’ complementary expertise and innovation capabilities to meet the oil and gas industry’s latest requirements: lighter materials (to replace metal) and more corrosion-resistant flexible lines for deep offshore and unconventional onshore production.



**THE HONFLEUR PLANT IN FRANCE DOUBLES ITS MOLECULAR SIEVE CAPACITY**  
In 2017, Arkema invested €57 million to double the production capacity of its molecular sieve plant in Honfleur, France. This flagship site, which exports 95% of its production to Asia, the Americas and the Middle East, added two new production lines to keep up with its customers’ growth. In partnership with Axens, it is developing a new, high-value-added activity at Honfleur: producing molecular sieves to separate isomers from xylene. The move is designed to fill a huge order for 4,000 tons of sieves from a customer in Asia building a plant to produce polyethylene terephthalate (PET), which is used to make bottles and textile fibers. More broadly, Arkema pursues a proactive innovation policy in the field of molecular sieves, filing six to eight patents a year.

## Solid Market Positions



**Prochinor®, Inipol®, Bactiram® and Norust®**  
Buoyed by an ever-expanding lineup and a portfolio of more than 600 products, Arkema is a leader in the petroleum additives market in Africa and the Middle East, as aging wells drive growth in demand.



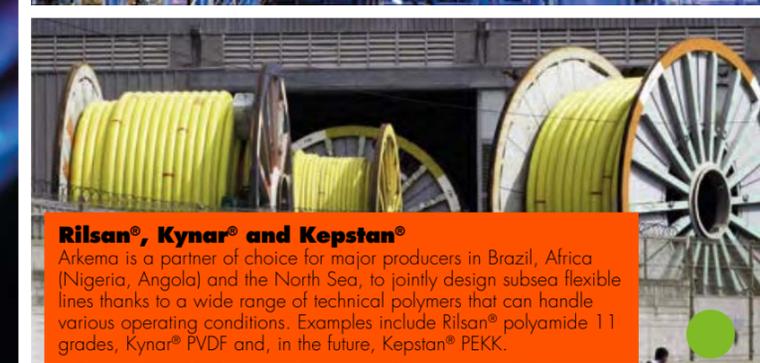
**DMDS and Careflex®**  
The undisputed global leader in dimethyl disulfide (DMDS) production, with unmatched operational know-how in the form of the Careflex® service, Arkema is keeping pace with the growth of the world refining market — estimated at 7.6 million additional barrels a day between 2017 and 2022 — and the lower sulfur cap for fuels.



**Spotleak® and Vigileak®**  
With an extensive line of natural gas and LPG odorants, plus a network in Europe, the U.S., Asia and South America recognized for its operational and technical excellence, Arkema is a leader in this moderately but steadily growing market. We also provide new solutions such as odorants for liquefied natural gas (LNG).



**Siliporite®**  
Active in the Middle Eastern, Asian and North American markets, Arkema is the world’s second-largest supplier of molecular sieve drying and purification solutions, in both the refining and petrochemical sectors.



**Rilsan®, Kynar® and Kepstan®**  
Arkema is a partner of choice for major producers in Brazil, Africa (Nigeria, Angola) and the North Sea, to jointly design subsea flexible lines thanks to a wide range of technical polymers that can handle various operating conditions. Examples include Rilsan® polyamide 11 grades, Kynar® PVDF and, in the future, Kepstan® PEKK.

# FIX & FLASH SHINES



“FIX & FLASH IS THE WORLD’S FIRST STRONG, FAST-SETTING ADHESIVE ACTIVATED BY LIGHT, ABLE TO BOND 99.9% OF ALL MATERIALS.”



Olivia Pierre,  
Bostik Global Category Manager  
for Consumer Adhesives

In an inventive twist, Fix & Flash uses LED light to cure glue fast on virtually all types of surfaces and materials. Bostik’s new, extra-strength repair glue brings a cutting-edge professional technology to consumers for the first time, for small DIY jobs, decoration and creative hobbies. Here’s how it works.

**H**ow can you tell when an innovation is a success? When customers stick with it like glue! Fix & Flash has achieved that level of popularity. French consumers voted Bostik’s latest consumer glue the “2019 Product of the Year” in the “repair glue” category just a few months after its launch. “This accolade proves that our product offers a real plus to consumers and users by making their lives easier. We’re honored by the distinction, a guarantee of quality and performance,” says a pleased Vincent Legros, Chairman and CEO of Bostik, an Arkema subsidiary.

### AN EXTRA-STRONG GLUE THAT SETS AT THE SPEED OF LIGHT

Fix & Flash is the product of a meeting between Bostik’s DIY marketing team and researchers at its Spanish start-up Afinitica. “They started by looking at the main drawback of this kind of consumer glue, the fact that people’s fingers stick together before they have time to properly position what they’re working on. The researchers wanted to make it possible for users to initiate bonding when it suited them, by exposing the item to an LED light. Our chemical wizards found a way to do that using a type of solvent-free, non-irritating, odorless glue. The result is impressively effective,” says an enthusiastic François Court, Bostik Research, Development &

Innovation Director. Fix & Flash stands out for other reasons too. “An innovative technology like this one needed to be presented and packaged differently,” comments Olivia Pierre, Bostik Global Category Manager for Consumer Adhesives. As a result, “we have a premium product with a fantastic tool: a reusable applicator nozzle and refillable tube, something no competitor offers. Plus, there’s no need for hazard pictograms. Last and most important, Fix & Flash can glue and invisibly, solidly and durably repair any kind of object and material and any type of surface, from concrete, wood and rubber to ceramic, stone, metal and glass.”

### INNOVATIVE, LONG-LASTING AND EASY TO USE

During development of Fix & Flash, a number of other potential innovations were identified. “We carved out a unique position for Fix & Flash as an all-purpose adhesive and forged a strong bond with our users through a novel advertising campaign and a strong web and social media presence. And that’s just the start,” adds Olivia Pierre. “We plan to keep growing in the French market and to sell this glue in the United Kingdom and Germany this year, before expanding to other countries such as Australia, the Philippines and Russia. This year, we’ll also kick off the international rollout of Fix & Glue, which uses the same bonding technology minus the light. It’s an easy-to-apply glue that is safe for humans and the environment, but more effective than competing glues in that segment.”

### LET YOUR IMAGINATION RUN FREE



**The ideal adhesive for all your creative projects, Fix & Flash replaces plastic glue, metal glue, wood glue and glues for many other types of materials.**

The multi-substrate adhesive inspired Bostik’s marketing team, which uploaded around 20 DIY tutorials to the <https://glue.bostik.com> site. Whether you want to fix a phone charger cable or your eyeglasses or create a mirror, light fixture or small piece of furniture, Fix & Flash lets you go wherever your imagination takes you. The website, promoted via social media and bloggers, is a big hit with the public.

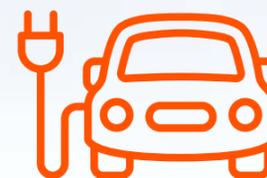
### The Fix and Flash of It

- The Fix side is a strong glue based on a next-generation cyanoacrylate known as methoxyethyl cyanoacrylate, or MECA.
- Flash is an LED light on the applicator that initiates drying of the adhesive via capillary action. This “shadow curing” technology is similar to what dentists use to bond dental braces. It means that customers can adjust and reposition the adhesive before exposing it to the light. Fifteen seconds and you’re done!

# THE VEHICLE OF THE FUTURE WILL BE ELECTRIC



**Though electric cars still make up only a tiny percentage of the global vehicle fleet, they have really revved up in the last five years,** driven by proactive policies in several key countries, with China out in front. But they'll need to overcome some obstacles — namely, the high cost of vehicles and especially their batteries' limited range and long charging times — to become a cornerstone of 21st-century low-carbon transportation. Lithium-ion technology, introduced to the automotive market in 2008, is what manufacturers are focusing on now. Arkema is very active in this global R&D push, developing next-generation electrolytes and carbon nanotube additives, as well as specific grades of Kynar® PVDF — a key lithium-ion battery component.



## 43%

**of drivers worldwide are planning to buy an electric vehicle within five years.**

(Source: Observatoire Cetelem de l'automobile, September 2018 survey)

In just four years, the number of electric vehicles (hybrid and all-electric) on the world's roads has more than quintupled, with sales reaching 2.1 million units in 2018, up 80% from 2017. Electric motors are also surging in the bus and road transportation market. Every vehicle manufacturer is now engaged in this fundamental shift, and the trend will accelerate in the years ahead. According to consulting firm Roland Berger, the global electric vehicle (EV) fleet could hit 100 million in 2035. Now concentrated in a handful of countries — China (50% of global sales), the United States, Japan, Norway, the United Kingdom, Germany, Sweden and France — EV growth is being propelled by strong incentives. These include buyer subsidies and the adoption of quotas at automakers in China and California, the lowering of new vehicle emission limits by the European Union and even, in most big cities around the world, an outright ban on first diesel and then gasoline-fueled cars by 2030.

### LITHIUM-ION BATTERIES, A GLOBAL R&D CHALLENGE

But not all indicator lights are flashing green yet. Remaining obstacles to the en masse adoption by motorists of electric vehicles include their purchase price, their range (today's models have a tough time breaking 150 kilometers, even though the 400-kilometer mark seems achievable in the short term), their charging time (usually still several hours) and access to a public charging station network. To achieve the electric mobility revolution, automakers and OEMs are investing massively to improve vehicle battery performance. Lithium-ion technology, which easily dominates today's market, is constantly being improved and is driving advanced materials R&D. And for some players, developing alternative technologies such as solid-state batteries is a key focus.

### KYNAR® PVDF FOR BETTER PERFORMANCE AND LONGEVITY

Engaged in this global race to boost the performance of EV lithium-ion technology, Arkema is making a major contribution with our specific Kynar® PVDF grades, already used successfully for 20 years in smartphone and tablet batteries. They fulfill various key functions in battery cells. In electrodes, the highly electrochemical-resistant fluoropolymers bind the active particles and conductive charges on the current collector, enabling the ions and electrons to circulate efficiently. Used as a protective coating for the separator film between the anode and cathode, they help boost battery safety and life. Kynar® materials are regularly upgraded to meet battery maker requirements and are now used widely worldwide, especially in China, where Arkema is a major supplier of CATL, a global leader in the battery market. At the same time, Arkema is developing other ways to improve lithium batteries. We're working on a new generation of electrolytes, the source of ions, and on developing carbon nanotubes used as additives in the cathode to shorten charging times. Our R&D also focuses on the more future-oriented challenges of lithium-sulfur technologies and solid-state batteries. To stay in the electric motor race, we need to stay ahead of the pack. —

# Using Our Materials to Create High-Performance Batteries

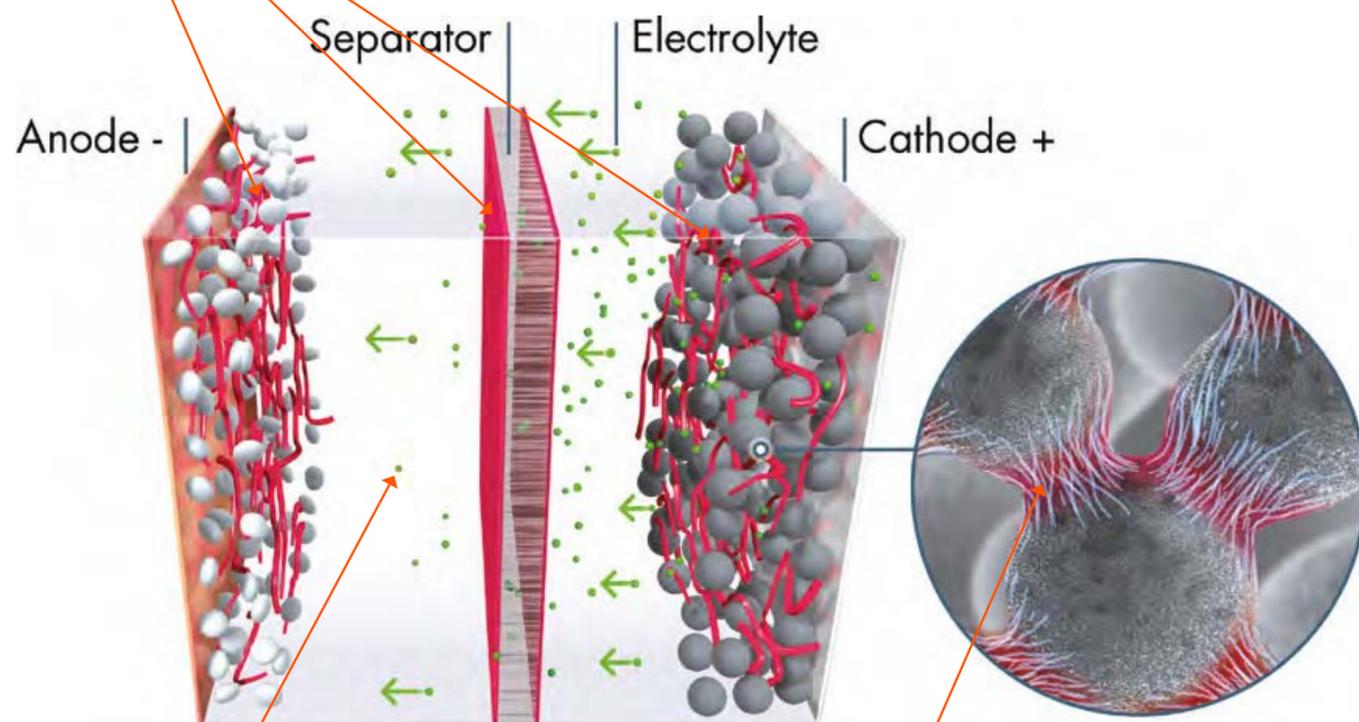
## ARKEMA PRODUCT HIDE-AND-SEEK

Used in small amounts in electrodes, **Kynar® PVDF** offers high electrochemical stability, giving it a key role as an electrode binder. It makes active particles adhere to the current collectors (metal for the cathode and graphite for the anode). The active particles' function is to attract and capture the ions during both charging and discharging. Kynar® binder is so effective that very little is needed, leaving more room for the active particles. Depending on the direction of motion, this improves either the battery's charging time or its energy efficiency and range.

**Kynar® PVDF's** resistance to high voltages and the electrolyte's solvent make it an excellent material to protect the separator film, which is subjected to very high stress during charging phases and when the vehicle is running. It extends battery life significantly while reducing energy losses and charging times by promoting optimized circulation of the ions and electrons in the electrolyte.

### More Compact Means Higher Performance

We constantly enhance our Kynar® PVDF grades' performances to reduce the amounts needed in the cell; these have gradually fallen from 8% to 1.5% of the formulation today. "This lets OEMs increase the quantity of active particles on the electrodes by the same amount, boosting the battery's energy density," explains Thomas Fine, Global Market Manager Batteries, Technical Polymers.



**2** Tapping into our cutting-edge expertise in fluorochemicals, we are developing **innovative electrolytes** (Li-FSI and Li-TDI) under the Foranext® label. They offer much better stability at high voltages than current solutions and will help to improve the battery's range, shorten its charging time and extend its life.

**3** Adding a small quantity of **carbon nanotubes** to the cathode (around 2% of the formulation) is another way to optimize performance. Arkema is one of the world's few producers of these additives with proven electrical conductive properties, which promote the migration of the electrons from the cathode to the anode, shortening battery charging time. We are currently developing a process to make the carbon nanotubes pure enough to be perfectly stable in the cell.



### LITHIUM-ION: ANATOMY OF A CELL

**Adding one improvement after another in the last several years, lithium-ion batteries are now highly sought after by electric vehicle makers.**

The batteries actually consist of hundreds of "cells" (7,000 for the latest Tesla model, for example), each of which has three components. The cathode is an aluminum plate to which active metal particles bind. The particles capture the lithium ions when the vehicle is operating. The anode is a copper plate to which graphite particles bind, capturing the lithium ions when the battery is being charged. The two electrodes are separated by a porous plastic composite (the "separator") bathed in electrolytes. The liquid solvent contains lithium salts whose ions migrate between the cathode and anode, as the battery's charging/discharging cycles alternate. Meanwhile, the electrons take the outside road.

### R&D AND PRODUCTION: A PROACTIVE STRATEGY

**A world leader in PVDF to protect separators, Arkema is also the top producer in China of the fluoropolymers used in electrodes.**

"We doubled the volume of Kynar® materials produced for both applications between 2014 and 2018, and predict strong growth in the next five years," says Thomas Fine, Global Market Manager Batteries, Technical Polymers. A proactive industrial strategy has given us very solid positions. "We're the only global producer to have PVDF production capacity on the three continents where market growth is now happening, with our Changshu plant in China, our Calvert City facility in Kentucky and the Pierre-Bénite site in France," points out Thomas Fine. Arkema stays ahead of OEM expectations through a non-stop, dedicated R&D effort. In addition to our battery center of excellence in King of Prussia, Pennsylvania, we work closely with battery makers at our technical centers in China, Japan and South Korea — the three countries in which global production of batteries and electric vehicles is now concentrated. Arkema is also the only PVDF producer to have developed processes for making "green" PVDF grades — that is, using aqueous (solvent-free) methods — for membranes and electrodes.

### ARE LITHIUM-SULFUR AND SOLID-STATE BATTERIES SOLUTIONS OF THE FUTURE?

**Although the current market for electric powertrains is overwhelmingly dominated by lithium-ion batteries, other technologies may emerge in the medium term.**

One example may be lithium-sulfur batteries, now used in drones and avionics because of their light weight.



Arkema is partnering with the specialist Oxis on R&D to improve their performance for the transportation market," says Dominique Plée, Scientific Director Batteries. We are also taking a close interest

in solid-state batteries, considered by some to be the real technology of the future. In these batteries, the liquid electrolyte is replaced by a ceramic or polymer conductive plate. It would give vehicles unparalleled range, while reducing charging times to a few minutes. It would be a truly disruptive innovation, and certain specific Arkema polymers may well play a key role in it.



## THERMOPLASTIC COMPOSITE MATERIALS

# RECYCLABLE SOLUTIONS THAT ARE TRANSFORMING INDUSTRIES



## **Lightweight, high-performance organic composite materials have spread into every industry,**

including aerospace, wind turbines, auto manufacturing and sports gear. But right now, end-of-life products containing thermoset resins can't be recycled. The current growth in thermoplastic composites, which can be melted down again, is set to be a long-term shift. And Arkema is helping to fuel that trend. Through an array of industrial partnerships, we're developing a line of solutions unlike any other in the world. One of our innovations — Elium® liquid resin — is redefining the scope of what's possible.

**M**ore than 10 million tons of organic composite materials are produced worldwide each year, according to JEC Composites, in a market that is growing 5% annually. Reinforced

with either glass or carbon fiber, polymer-matrix composite materials have been snapped up for decades by manufacturers in a wide range of industries, from shipbuilding to automaking, aerospace, wind turbines, construction and sports gear. For good reason: they deliver outstanding performance in terms of cost, mechanical strength, toughness and lightness. This last criterion is increasingly vital in transportation, where lighter parts equal fuel savings. In fact, composites make up 50% of airplanes such as the Airbus A350 and Boeing 787.

But the success of organic composites has a downside. The lion's share use thermoset matrices such as epoxy, polyester and other resins hardened permanently by polymerization. Those thermoset materials can't be recycled when products reach the end of their lives, creating a major environmental headache in the medium term. Finding composite solutions that combine recyclability with ever-better performances has therefore become a crucial issue for manufacturers in a wide range of sectors subject to regulatory pressure. Auto manufacturing, which won't adopt new materials if they aren't recyclable, is one example.

### **THERMOPLASTIC COMPOSITE MATERIALS, A TURNING POINT**

To meet the challenge, industry has for the last ten years turned to composite materials with thermoplastic matrices, that is, that can harden or soften reversibly depending on temperature. This property allows them to be recycled by remelting the polymer. Examples include polyamides, fluoropolymers such as PVDF, and polyether ketone (PEKK). Arkema, a world leader in high-performance polymers, is an engine of the boom in thermoplastic composite materials. We market an extensive line of carbon-fiber-reinforced prepreg tapes based on specific grades of Rilsan® (bio-based polyamide 11), Kynar® (PVDF) and Kepstan® (PEKK) resins. These solutions, co-designed with composite makers as part of innovative industrial partnerships, are manufactured using mature, cost-competitive processes. They offer the same — and often better — mechanical properties as thermoset resins, with a significant added bonus: parts made of thermoplastic composites can be assembled by simple heat welding, while thermoset parts require often complex bonding processes.

At the same time, our R&D teams have developed a truly revolutionary resin, Elium®, the world's first liquid thermoplastic resin that is compatible with all existing industrial processes for thermoset composites that also start with a liquid matrix. Elium® makes thermoplastics' advantages — chief among them recyclability — available to an endless array of applications. After the turning point, prepare for takeoff! —

# Elium® Liquid Resin A Breath of Fresh Air for Composite Materials

Arkema's Elium® has the versatility of a liquid resin, along with all the advantages of a thermoplastic. A disruptive innovation in the composites market, it is destined to be a game changer in a number of manufacturing fields.

1

## RECYCLABLE

Because Elium® is a thermoplastic resin, composite parts made with it can be shredded and then remelted to recover and reuse the resin. That's a decisive advantage, and Arkema is working to prove its technical and economic feasibility. We have confirmed the recyclability of small parts in the lab, and are developing a competitive recycling process for large parts. A test is under way on a 25-meter wind turbine blade weighing two and a half tons. "We're working to develop an efficient process to produce a competitive recycled resin with properties identical to those of a virgin resin," says Guillaume Clédat, who heads up Elium® development.

2

## COMPATIBLE WITH EXISTING PROCESSES

Elium® is a liquid resin, like the thermoset matrices (epoxy and polyesters) that today dominate the composites market. It can therefore be processed using any thermoset technology, without having to invest significantly in new equipment. That versatility was demonstrated through a series of pilot projects involving industrial partners for each process. They ranged from infusion (used for wind turbine blades and boat hulls) to pultrusion (production of ultra-strong rods and cables for the construction and building trades); and from prepreg tapes containing UV-set resin to the sheet molding compound or resin transfer molding processes used in the automotive industry.

3

## THERMOFORMABLE

Unlike composite parts made of thermoset resin, an Elium® composite part is easily post-thermoformable. This makes it especially well suited for extra-strong rods for building and construction. It will eventually replace commonly used metal rods, or rebars, with the added benefit of being corrosion resistant in structures exposed to harsh environments, such as offshore areas. But they already have a significant edge over the rigid, thermoset composite rebars being used today in some types of construction: they can be bent using thermoforming, making them perfect for strengthening complex structures.

4

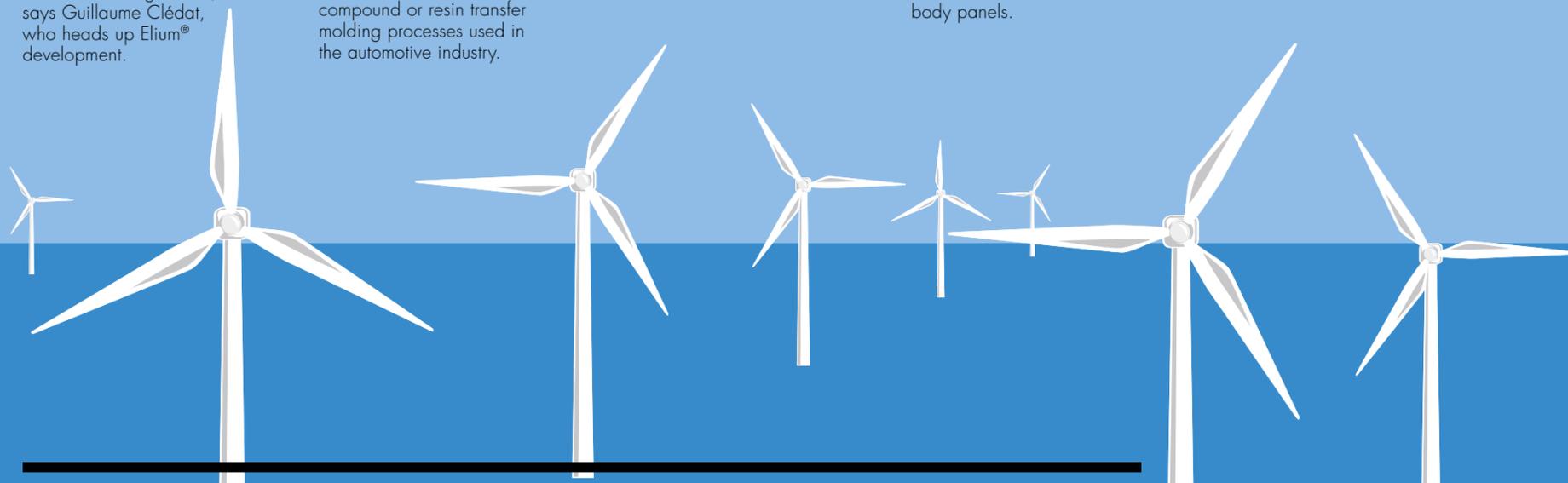
## HIGH PERFORMANCE

Composite parts made of Elium® are 30 to 50% lighter than steel parts, with no sacrifice in mechanical strength. Tests conducted by Arkema's R&D team have also proved they're more durable than thermoset composite parts and offer ten times the fatigue strength. In addition, the resin's formulation can be adjusted to fine-tune its properties, depending on the process used. For example, Elium®-based composite materials made using sheet molding compound combine an excellent surface appearance, good electrical insulation and flame-retardant properties that make them an ideal material for car body panels.

5

## PRODUCTION GAINS

Not only is Elium® easy to integrate into existing production processes, the resin improves them in important ways. Its short set times at room temperature eat up less production time and energy than thermoset resins, which require that molds be heated, for example. Depending on the application, parts can be assembled simply by heat welding.



## ENDLESS WIND TURBINE APPLICATIONS

More than 20,000 wind turbines are produced each year worldwide, with around 550,000 tons of composites going into their blades. In a market growing by 10 to 15% each year, the recyclability of Elium®-based composites, combined with their light weight, strength and toughness, is spurring strong interest among manufacturers. The different prototypes made by Arkema — from the nine-meter-long blades produced in 2017 with TPI, the top U.S. wind blade manufacturer, to the high-efficiency models designed in France for the Effiwind project — have made good on all their promises. "We forged key partnerships with top manufacturers, such as TPI and China's Sinoma, for commercial scale-up by 2023," says Guillaume Clédat, who heads up Elium® development. In addition to this booming market though, the many pilot projects we and our partners are conducting have highlighted all the potential uses of Elium® in a very wide range of applications. They include automotive structural and body parts; cable connectors and reinforced concrete rebars to replace steel in civil engineering projects; sailboat hulls and decks; and tennis rackets and hockey sticks.



# The Thermoplastic Composite Tapes of a Market Leader

Drawing on our expertise in high-performance polymers, we have partnered with the top composite specialists to develop an unparalleled line of carbon-fiber-reinforced thermoplastic prepreg tapes. These mature, cost-competitive solutions are targeted to the expectations of the most demanding markets.



**Aerospace: Kepstan® PEKK Takes Off** The extraordinary properties of Arkema's Kepstan® PEKK resins include exceptional mechanical strength and heat resistance (up to 260°C), plus a weight only half that of metal. Reinforced with carbon fibers, they create totally new possibilities for aircraft makers in their never-ending quest for lighter weight and safety. PEKK composite tapes are the result of our collaboration with Hexcel, a leading manufacturer of semi-finished composite materials for aerospace applications, and are enjoying growing success in the market. The tapes are replacing metal and thermoset composites in a number of aircraft parts, including wing leading edges, retractable shades and even the fuselage and wing components subject to the greatest stress.



**Offshore Oil: Next-Generation Composite Flexible Lines** BarrFlex TU, the joint venture created by Arkema and Barrday (see page 35), is aiming to become the top supplier of innovative composite tapes for the oil and gas industry. A replacement for some of the metal in the flexible lines, or risers, used for offshore production, these next-generation materials leverage our high-performance polymers (Rilsan® polyamide 11, Kynar® PVDF and Kepstan® PEKK) to provide the sector with lighter-weight, cheaper-to-install solutions that can withstand extreme pressures and temperatures and very aggressive corrosion.

## Automotive: Rilsan® Matrix in Pole Position for Lightweight Materials

Carmakers are subject to ever-stricter carbon emission standards. Their race to lighten parts puts composite materials in pole position. Rilsan® Matrix tape, the latest creation of Arkema R&D, is made specifically for these manufacturers. Much stronger mechanically than conventional polyamide resins, our new tape is perfect for structural parts and can withstand anti-corrosion treatments. Arkema and Coriolis, a French composite processing specialist, are conducting proof of concept for an industrial forming process to make parts from Rilsan® Matrix at a competitive cost and the pace required by the market.



# HOW WE ATTRACT TALENT

**Arkema is a fast-growing, innovative company offering great career opportunities in positions of responsibility.**

To boost our visibility and attract applicants from a variety of backgrounds, especially women, we kicked off a new employer branding campaign in 2018, along with a sponsorship contract with FIFA for the Women's World Cup France 2019™. We also implement internal programs and training to develop each and every one of our employees.

# 200

That's the number of different job descriptions Arkema offers in our main fields, including production, R&D, business, marketing, sales, finance and the supply chain. Global in scope, we hire between **1,600** and **1,700** entry-level or experienced people a year — 450 in France — looking for demanding, stimulating responsibilities.

## Arkema's New Employer Brand: Go Beyond Your Discoveries

Their names are Julie, marketing analyst, Régis, business manager, Tom, financial analyst, Aude, industrial project manager, Pierre, process engineer, and Lise, R&D engineer. Arkema's new employer branding campaign explores their rich, interesting careers and job responsibilities. You'll never look at Arkema the same way again.

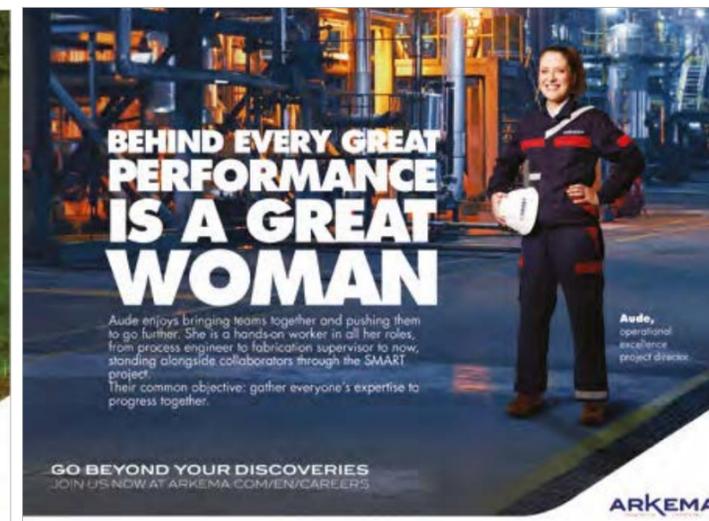
It's an innovative company, doing well and offering attractive compensation. The people I've met seem like real go-getters. I very much enjoyed our talks. But do I really belong in the chemical industry?" Ouafa Souli is familiar with reservations like this, coming from female job candidates in particular. An Arkema recruiter, she then has to explain, reassure and dispel stubborn misconceptions. "I tell them all that they can absolutely thrive in our field and have exciting careers at Arkema, without

necessarily being chemists or having pictured themselves working in the industry. We notice too that our new hires are often surprised at the level of responsibility and empowerment they're quickly given at Arkema," notes the recruiter.

### PEOPLE CAN HAVE EXCITING CAREERS AT ARKEMA WITHOUT NECESSARILY BEING CHEMISTS

"We employ women and men in a wide range of fields, including business and sales, finance, financial control, logistics, support functions,

human resources and marketing. And there are lots of bridges from one to another. That's what we mean by 'Go Beyond Your Discoveries' (see opposite), the slogan for our new employer branding campaign featuring employees, already launched in France and Europe and gradually being deployed in Asia and the United States. Don't let conventional wisdom hold you back. A classic example is the financial professional who thinks of banking first and puts industry lower on the list. Yet they should think again, because they'll never find the diversity of responsibilities



and cross-professional contacts in banking that Arkema offers. It can make their work even more rewarding and open up their horizons in the wider world." Marine Petit, also a recruiter, recites her logic regularly at business schools. When she meets students, she takes the time to overcome preconceptions. Her efforts pay off: hundreds of applicants from non-science majors hear the siren call of Arkema each year. —

### INSIGHT



"We invest in developing the talent of our employees in Arkema's 50 or so host countries. We are dedicated to coaching and supporting everyone as they build their career and in-house career plans. Opportunities to advance exist in every profession and at every reporting level."

Dominique Massoni, Vice President, Human Resources & Internal Communication Development, Arkema

# Encouraging Female Talent

The chemical industry has historically been dominated by men. At Arkema, we've long been pushing to change the status quo by hiring female talent.

"Talent is the only thing that matters." Dominique Massoni deliberately underscores the comment. "It is the only focus, the only 'bias' acceptable in Arkema's recruitment and career advancement policy," emphasizes the Vice President, Human Resources Development & Internal Communication. No distinctions are made on account of origin, age or gender, in keeping with the company's ethics and — it goes without saying — legal requirements. "Arkema hires people who are both ready to work in operations and able to think ahead to help us build the future. That being the case," continues Dominique Massoni, "there's plenty of room for

women here. Not because they're women, but because of the professional expertise and potential they have, like anyone else."

### DISPELLING STEREOTYPES

Determined to shake things up, especially among managers, Dominique Massoni was quick to enlist an expert, objective approach. Patrice Georget, a psychology and sociology researcher and consultant, leads seminars to educate French managers about perception and judgment issues. It's an innovative approach. "We're not just looking at training certain recruiters anymore. We want to reach everyone routinely tasked with developing know-how and soft skills cross-functionally. The issue," stresses the expert, "is how to manage people who are very different from one another, factoring in their personalities, experiences, cultures, training and education. Unless we're careful, we can all fall into habits and stereotypes that can lead us to adopt discriminatory attitudes without even realizing it. Becoming aware of

these perceptual and judgment biases will have consequences for how we manage and make choices. It's a way to take a step back, to heighten our discernment."

### MENTORING AS A WAY TO ACHIEVE GENDER EQUALITY

To counter the risk of a glass ceiling and support the advancement of our female employees, we have created a mentoring program for them. Volunteer mentors — male or female senior executives — are trained to coach and assist their mentees in developing their careers. First tried with 21 female managers in 2016, the initiative has since expanded to 60 women. There is no "performance contract" or subordinate relationship in the mentoring pairs. Mentors draw on their experience and offer astute advice to help their mentees, talking to them regularly about career management and opportunities offered at Arkema. —



**AWARD**

**RECOGNIZING AN ARKEMA FEMALE EXECUTIVE**  
**Arkema's General Manager EMEA, Fluorochemicals, is the grand winner of the 2018 Next Leaders Award<sup>1</sup>.**  
 "Mélanie Jourdain, age 38, is one of the few women to have full responsibility for a European income statement at a major industrial company. A graduate of the French engineering school Ecole Polytechnique, her goal as a leader is for everyone to be aware of the contribution they make."

1. An award presented by French business magazine Les Echos Executives, in partnership with Accenture Strategy, American Express and EMLyon business school.



# Women Shine in Business and Soccer

To show support for talented women as they work to succeed in areas traditionally dominated by men, Arkema in 2018 agreed to sponsor the FIFA Women's World Cup France 2019™.

There's no better way to showcase women's role in sports and the business world than to sign this global sponsorship deal with FIFA, the sport's international governing body. "Women soccer players want to shine, and to shine a spotlight on their sport, through the high-level engagement and performance they so dazzlingly demonstrate. This also corresponds to a strong Arkema commitment to performance," points out Gilles Galinier, Vice President, External Communication. Given the tie-in, we are featuring this all-women's international event in our new employer branding communications. One visual depicts one of our researchers on a soccer field: Lise just happens to work on Arkema materials used in athletic shoes.

## AN INTERNATIONAL EVENT THAT RAISES ARKEMA'S PROFILE WORLDWIDE

Our sponsorship will also display the Arkema brand to a billion television viewers watching an event broadcast in close to 180 countries. The pinnacle of women's soccer competitions will be held in France from June 7 to July 7, 2019, and will pit the world's 24 best women's soccer nations against one another in nine major cities. Arkema host countries are well represented in the tournament. Besides France, there is the reigning world champion U.S. team, in the running for a second straight title. Olympic champion Germany is also a serious contender. Other favorites are Japan, which made the finals in the last two cups, and the Netherlands, winner of the UEFA Women's Euro 2017 competition. Also worth a mention is China, the first country to qualify, in April 2018. Fans from Arkema are expected to turn out in droves. The company has a manufacturing and commercial presence and strong recruiting goals in all the countries mentioned.

 "THIS GLOBAL EVENT WILL BOOST OUR POPULARITY WITH A WIDE SEGMENT OF THE PUBLIC AND HEIGHTEN OUR EMPLOYER BRAND VISIBILITY. BUT WE ALSO HOPE IT WILL PLAY AN INDIRECT ROLE IN RAISING OUR BUSINESS PROFILE."

Gilles Galinier, Vice President, External Communication



NATIONAL SUPPORTER

## EQUALITY



"When I started 12 years ago, few women advanced to the management level. Things have changed immensely. Now the percentage of women at the Cerdato R&D center in Serquigny, France, is approaching 40%. I was inspired by an environment that encouraged me to take on a manager role. In a less supportive setting, I might have hesitated. As Business Development Director at Cerdato, I currently supervise 20 engineers and 15 technicians. But I don't think the question of gender equality should be our sole focus. A broader perception prompts us to strive for the best possible balance, especially work-life balance. We take the time here to make sure that both male and female employees get it right. Through simple, regular actions, our managers convey the value we place on balance, which is meaningful and a factor in success."

Karine Luyen, Technical Polymers Business Development Director, Europe

## EXCELLENCE

### A TALENTED WOMEN'S SOCCER PLAYER

Arkema has picked an ambassador to represent us before, during and after the competition. She is Gaëtane Thiney, an icon of the French national soccer team.

The French international soccer player alternates between the positions of attacking midfielder and striker in the Paris FC club and on the French national team. She has had a stellar run since being selected nationally by the Bleuettes (under-19 league) in 2003, with which she won the UEFA Women's Under-19 Championship.



"Choosing Gaëtane Thiney as an Arkema ambassador was a natural choice for several reasons. The soccer world universally admires and respects her. She battled hard for the opportunity to play soccer at the international level, practicing with men for years because there was no women's club she could play with. Not only does she shine in foot skills thanks to years of experience, she plays a major role in onboarding younger players on the French national women's team. An engaged personality, she also gets involved off field. Despite her status as a professional soccer player, she is also a national technical adviser with the French Football Federation, tasked with developing youth soccer. Gaëtane is also a sponsor of the French nonprofit Team Léo du souffle pour Léonie, which works on behalf of cystic fibrosis. She's a great fit with our values. When we invited her to visit us, she was enthusiastic about our products, especially Pebax®, the material that the biggest names in sports gear use in the soles of their soccer shoes. Gaëtane is the perfect embodiment of the Arkema project and allows us to pair her image as an iconic female athlete with our own."

Vincent Cottureau, FIFA Women's World Cup France 2019™ Sponsorship Manager, External Communications

# 332

That's the number of goals officially scored by Gaëtane Thiney in competition throughout her career.

58 goals in 151 selections to play for the French national women's soccer team. The seventh most picked player in the history of the French national women's soccer team.



# Diversity: Our Talented People Think Big

Ramping up in the most vibrant regions is a key component of Arkema's growth strategy. To do that, we tap local skills and expertise and pursue a policy of developing talent in each country.

## Share of Non-French Nationals Among Senior Executives Globally



**D**eploying skills and expertise worldwide enhances the performance of a multinational company like ours. We also draw on a structured system to manage talent, striking the right balance between recruiting people with potential, managing individual goals, training, retention, promotions and transfers, among other factors. "More and more, we're trying to hire locally, to drive diversity and efficiency," points out Dominique Massoni, Arkema's Vice President, Human Resources Development & Internal Communication. "In addition to having expertise in their profession, they know all about their ecosystem. They are knowledgeable about the country's culture, as well as the local market situation and regulations."

### NURTURING TALENT

"Support and coach our talent and make sure that employees grow and become more visible at Arkema, so they can use all their aptitudes here," is the job of our talent managers, such as Lan Zhao, who works in Asia. It is up to her to understand local hiring issues, identify employees and encourage transfers in a region that has around 40 sites, employs nearly 5,000 people and generates 30% of our sales. "Countries such as China, India and Malaysia are driving the growth of Arkema's activities. That's why we want to surround ourselves with new talent, to bring it along in, and even outside, the region. But it's not enough to be good at your job to grow," she adds. "You have to develop other skills, be able to move from local to regional coordination and manage a team whose members are of different nationalities. Expertise in a specific field is highly valued in Asia. You just need to round it out through experience in other fields, other positions and other regions. Talent management involves identifying high potential employees, offering them career advancement prospects and enabling them to grow at Arkema."



"SUPPORT AND COACH OUR TALENT AND MAKE SURE THAT EMPLOYEES GROW AND BECOME MORE VISIBLE AT ARKEMA, SO THEY CAN USE ALL THEIR APTITUDES HERE."



Lan Zhao, Talent Manager, Asia

### INSIGHT



"After studying law in London, I joined Arkema China's Shanghai-based legal team in 2016. At 34, I've just joined the Internal Audit Department at headquarters in France. It's a chance for me to soak up some of Arkema's DNA, get a bigger, more complete picture of our different activities and deepen my understanding of best practices at the company. In the long run, all these new experiences will be invaluable, not just for my career at Arkema, but also in helping me become a person who is more open and multicultural."

Zi Wang, Internal Auditor

# WE LOVE IT AT ARKEMA!

**Engaged, enthusiastic, talented young people** new to the company talk about their satisfaction with Arkema, its values and the opportunities they enjoy here.

### "The Resources to Act"

**Antoine Collomb-Clerc**  
Strategic Business Analyst, Bostik

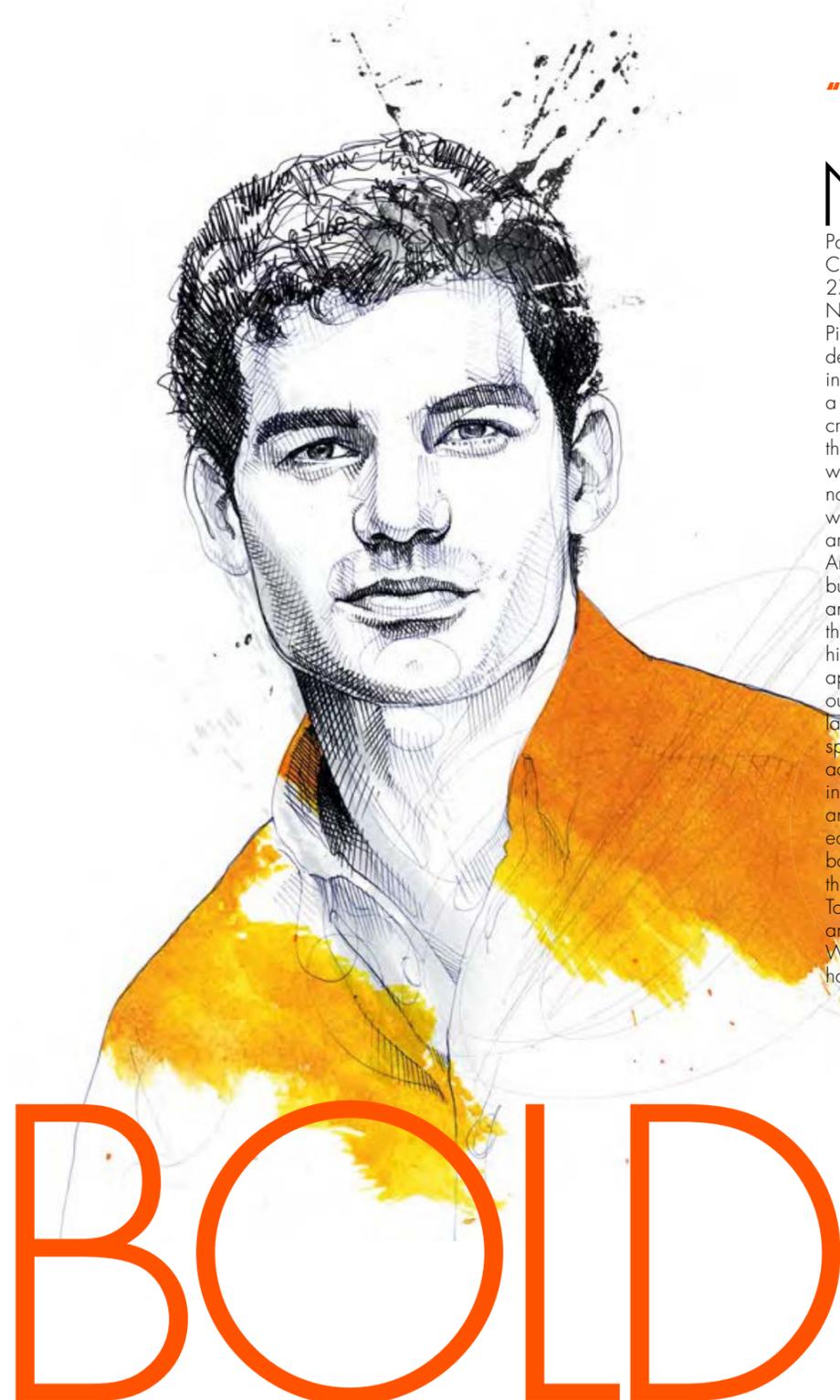
Not so long ago, Antoine Collomb-Clerc was working on experimental treatments for Parkinson's disease. With a Ph.D. in Cognitive Science in his pocket, the 27-year-old graduate of France's Ecole Normale Supérieure and Université Pierre-et-Marie-Curie took an unusual detour, jumping from academic research in biology to strategic business analysis for a major chemical producer. "The reason I crossed paths with Arkema a year ago is that the company decided to recruit people with slightly unexpected backgrounds." It's not as big a leap as it seems. "I've always worked in research and innovation, which are part of Arkema's DNA too," points out Antoine. He also added knowledge of business to his rich background by earning an MBA in Science & Management from the Collège des Ingénieurs, to enable him to take a truly multidisciplinary approach. Initially assigned to help with our digital transformation, this young talent later moved to Bostik, a key subsidiary specializing in adhesives, where he scouts acquisition targets and promotes open innovation. "The idea is to create industrial and academic partnerships across the ecosystem related to our products. I also boost sustainable innovation and advance the circular economy in what we do. Today, a whole new world of questions and challenges is opening up to us. Working at a company like Arkema means having the resources to act." —



### "Always Looking to Add to My Skills!"

**Jessie Wang**  
Process engineer, Arkema Greater China

Jessie Wang exudes a confidence, energy and determination that are impressive for a 28-year-old. A talented engineer with a freshly minted degree in chemical engineering and technology, she already has a long list of accomplishments. She started at East China University of Science and Technology in Shanghai, then headed to Germany for three years to earn her master's degree at the Otto von Guericke University Magdeburg near Berlin. "It was an invaluable experience for someone like me who'd never been outside China. It opened my eyes to a wider world and taught me to be adaptable." Back in China in 2016, Jessie joined Arkema as a process engineer at the Changshu plant, which is part of Fluorogases. "A friend had really positive things to say about the company: international but not impersonally big, with a genuine engineering culture, a strong production base in China and fast growth in Asia. My first contact with Human Resources was excellent. I met my future manager and we clicked right away." Jessie's profession satisfies her thirst to learn new things. "My intuition was spot on. The job offers a wide variety of responsibilities, including optimizing processes, analyzing risks at facilities and supporting maintenance. There's lots of varied, interesting back-and-forth with production, R&D, maintenance, safety and my peers in fluorogas plants in France and the United States." Jessie especially likes "the focus on transferring knowledge in a caring environment. Every member of my team teaches me the technical knowledge you can't learn at a university. My manager knows how to develop my professional skills. For him, even with 30 years of experience under his belt, every day is a new chance to learn. I share the same mindset: always looking to add to my skills!" —



KEY  
WORDS

BOLD





# CLOSE TO OUR STAKE- HOLDERS

**We have always pursued dialogue and openness** with our suppliers, our customers, nonprofits, schools and other stakeholders. Through transparency, engagement and solidarity, our corporate giving addresses major challenges, from sustainability and access to education to clean water and support for communities in need. We spotlight a handful of representative initiatives.

## Cultivating Wins

**Project Pragati creates a viable framework to assess the social, economic, agricultural and environmental performance of Indian growers of castor beans, the raw material we use to make our bio-based, high-performance polymers. It's a win all around for farmers, processors, manufacturers, customers and the environment.**

**T**he Hindi word *pragati* means "progress." And progress is the goal of the Gujarat farmers who grow castor beans. The region produces almost 70% of the global supply, but there's still a lot of work to do. Flashback to 2016, when Arkema, BASF, Jayant Agro-Organics Ltd., a pioneer in castor oil-based chemicals in India, and Solidaridad, an international NGO, jointly sponsor the fledgling Project Pragati. Together they will cultivate a partnership with a thousand Indian farmers, creating the world's first sustainable program to grow castor beans.

### **WORLD'S FIRST SUSTAINABLE PROGRAM TO GROW CASTOR BEANS**

Erwoan Pezron, Global Group President, Technical Polymers at Arkema, remembers. "With Procurement, we looked at how we could help farmers achieve higher yields and incomes, while making castor beans a more sustainable source to ensure stable supply." It's a critical issue for Arkema, the world's top consumer of castor oil, which is the feedstock for our high-performance, bio-based polymers. "Our Rilsan® polyamide 11 resins and Pebax® Rnew® elastomers are produced from plants and

recyclable materials," emphasizes Erwoan Pezron. "For a long time we promoted performance, without necessarily stressing this entirely unique, two-fold advantage. It's a key asset for our customers, whether they're carmakers or manufacturers of sports shoes and gear or consumer electronics." Our sales in those markets are soaring, justifying a more than 50% increase in Arkema's global production capacity. "Right from the outset, we knew that to sell this bio-based polymer's performance and sustainability we had to take an interest in castor bean farming," continues the president of the business unit. "It comes down to consistency, given that we want to make sustainable solutions a core focus of our innovation strategy."

### **2,700 FARMERS TRAINED**

We launched Project Pragati with our partners three years ago. The stated goals are to boost farmers' income through better crop yields, to improve working conditions and to protect the environment through reduced water consumption and better waste management. We have trained 2,700 farmers in best agricultural practices, and independent agencies have certified their more than 5,400 tons of production. Over 3,000 items of personal protective equipment (gloves and masks) and 3,000 pesticide storage boxes have been distributed.

The results have been so encouraging that the partners have decided to extend the program for three more years. "We estimate we'll be able to certify another 4,000 farmers," says Erwoan Pezron, who went out to see for himself on the front line. "The plants on Pragati parcels are more developed. We measured a 55% increase in crop yield over 2016, using less water and fertilizer."

### **BMW HITS THE ROAD FOR PRAGATI**

Project Pragati's impact ripples far beyond the people directly involved in it. In late 2018, at its Center of Excellence in Landshut, Germany, BMW recognized 15 of its global suppliers for their outstanding achievements in five categories, including sustainability. The automaker highlighted Arkema's bio-based polymers, used under the hood in BMW i3s and even in its key, stressing Project Pragati's role in its decision. "BMW wanted to commend our polymers' sustainability and recognize our responsible procurement process," says a pleased Virginie Delcroix, Arkema's Vice President, Sustainable Development. "They chose to single us out among their 3,000 suppliers. It shows that, besides our bio-based materials' performance, a company like BMW sees the consistency of its partners' CSR process as crucial. It's a very gratifying form of recognition for Arkema and a strong signal for everyone who is working to achieve that goal." —

"WE MEASURED A 55% INCREASE IN CROP YIELD OVER 2016, USING LESS WATER AND FERTILIZER."

**Erwoan Pezron, Global Group President, Technical Polymers at Arkema**



L'atelier 4.20 by Arkema

# Packs a Punch

"L'ATELIER 4.20 BY ARKEMA LETS VARIOUS AUDIENCES TRACE OUR ENTIRE CHAIN OF INNOVATION, FROM OUR PRODUCTS ALL THE WAY THROUGH TO OUR END CUSTOMERS' APPLICATIONS."

Gilles Galinier,  
Vice President, External Communications, Arkema



Our innovations deserved a space of their own, a contemporary venue firmly focused on education, to help people better understand and experience Arkema's ingenuity. Here's a quick peek at the 200-square-meter, high-tech showroom that explores our activities in a novel way, showcasing, spreading and sharing innovation.

"I really believe in our product," says Frédéric Cavicchi, taking a gulp of water before a spellbound audience. Just a minute earlier, the contents of his glass were completely undrinkable. Then the water was treated on the spot using Kynar® PVDF membranes that filter out ultrafine particles and even (the tiniest) bacteria.

"Another product I love is Nitroxy® molecular sieves," he continued. "These tiny beads help people with respiratory insufficiency live almost normally. They are used in medical portable oxygen concentrators that take air from a room and send it through a column of molecular sieves. The sieves separate the oxygen from the nitrogen and release a stream of up to 95% pure oxygen. Chemistry's pretty amazing, isn't it?"

### L'ATELIER 4.20 GIVES ARKEMA'S INNOVATION A STAGE

The pair of examples above are tangible illustrations of how Arkema products improve our daily lives and are moving us toward a more sustainable world. They're on display at L'atelier 4.20, which is designed to be an innovation demonstrator that itself draws on new technologies. For instance, visitors can put a

model car on a touch table to see a 3D display of some 30 Arkema products hidden within — and discover the properties of each. You've never seen anything like it. Exploring what's on offer is an entertaining experience. For example, people can watch castor beans being transformed into Rilsan® Clear, then morphing into fashion-forward eyewear. Similarly, visitors can explore new energies, electronics, lightweight materials, home efficiency and insulation, the 3D printing revolution and sports performance. The showroom also features a materials library where visitors can touch our products and compare, say, an auto part made of aluminum with one made from our Rilsan HT® bio-based thermoplastic, which is twice as light. L'atelier 4.20 is designed to be modular and open-ended and is updated regularly, mirroring Arkema's ongoing innovation.

**AN INTERACTIVE VENUE FOR AN ECLECTIC PUBLIC**

In just one year, the showroom welcomed nearly 5,000 visitors from outside the company, including current and prospective customers, partners, journalists and students, as well as major company CEOs, elected officials and the local prefect. A September 2018 event to celebrate the showroom's first anniversary featured demonstrations — molecular cuisine, experiments — and inspiring discussions focused on the future. A hundred people came to hear Arkema experts and outside speakers weigh in on the impact of innovation on materials to make daily life more convenient and comfortable and to improve athletic performance. French international rugby player Fabien Galthié was a guest. He talked about how important it is to have high-value-added technical materials in sports shoes. Our Pebax® elastomers were the star of the show.



## Mixing Young People and Music

Giving children a chance to sing Carmen, Georges Bizet's best-known opera, on a big international classical music stage is the opportunity the Théâtre des Champs-Élysées offers in its workshops teaching singing to young members of the general public. That's how 10,000 primary and middle school students in Paris and greater Paris, most of them from so-called at-risk neighborhoods, have been introduced to the classics of the opera canon. Arkema supports this cultural initiative. By becoming a sponsor of Youth Audience Participatory Opera, we're partnering on a project designed specifically for young people with little access to culture. The initiative is part of our corporate social responsibility (CSR) process focused on education and social inclusion. It meshes perfectly with the values of solidarity and responsibility Arkema advocates.



## Putting Young People on Track for Success Through Sports



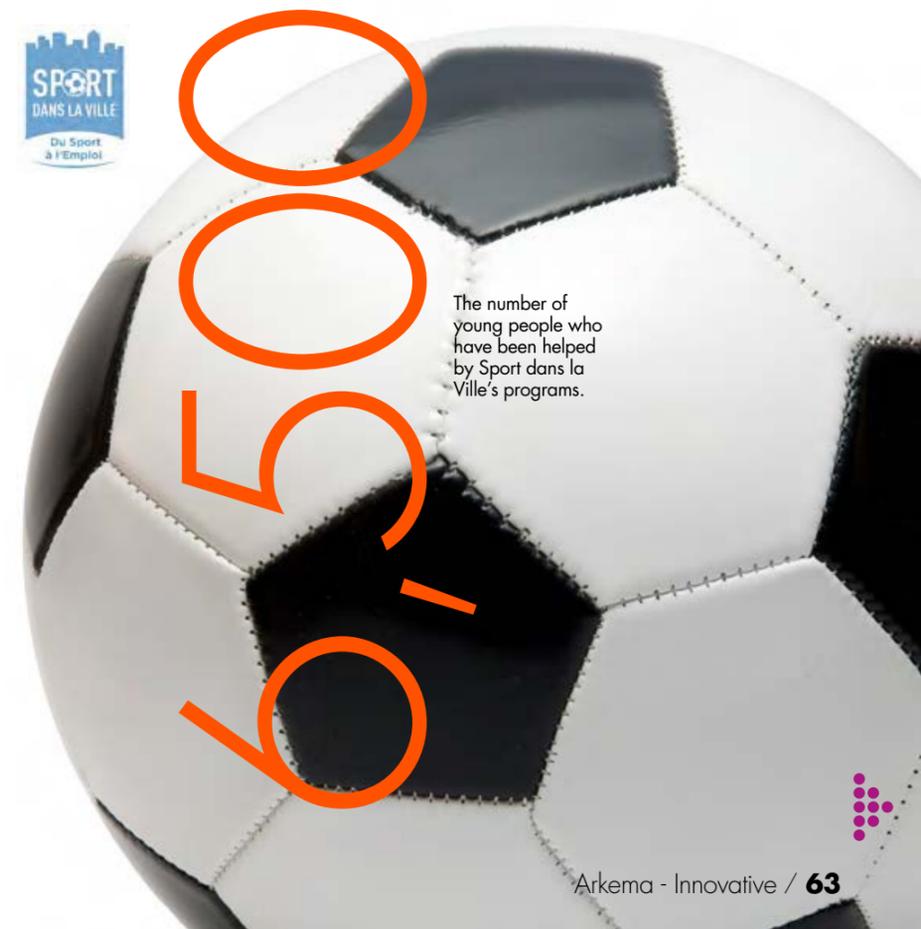
## Inspiring Chemistry Vocations



The CGénial Foundation encourages science, technology, engineering and mathematics (STEM) studies by young people and promotes related fields. It also aims to strengthen ties between the worlds of business and education. Collaboration has grown since the launch of the Arkema/CGénial partnership. 2018 was especially busy. All Arkema sites and affiliates in France answered the call. Hundreds of middle and high school teachers toured our facilities, while dozens of Arkema engineers and technicians volunteered to share their professional experience in French middle and high school classrooms. This novel initiative is part of our Common Ground® local communications and outreach program. —



Arkema is a supporter of Sport dans la Ville [Sports in the City], the main nonprofit working on inclusion through sports in France. It has been offering sports and education programs for the last 20 years to provide a springboard for low-income youth, coaching them in their academic work, career guidance and first job hunt. The nonprofit has installed scores of facilities on the ground floors of buildings. They have given thousands of girls and boys a chance to participate in sports ranging from soccer and basketball to tennis, as well as dance, free of charge. And that's not all they do. "Once we make contact, we want to instill young people with confidence in their potential, so we can put them on a better path to a job," comments Pascale Remy, Head of Global Partnerships for Sport dans la Ville. "That's especially true of the girls, who receive individual attention in choosing their career, focused on exploring sectors and trades looking to attract more women into their ranks." A thousand young girls enrolled in the L dans la Ville [Girls in the City] program to help girls get their first job, which was created to promote their development and give them the same chance at success as boys. As a sponsor-partner company, we open our doors to all participants, offering facility tours, introductions to our activities and internship opportunities. Not a bad way to attract this talented group of young people to our fields! —



The number of young people who have been helped by Sport dans la Ville's programs.

30,000

That's the number of secondary school students reached by the Engineers and Technicians in the Classroom program.



## Donating Time to Help Younger Generations

**Arkema's Common Ground® program makes a point of reaching out to the world of education and youth. Our commitment has expanded to all our host countries and is led by employee volunteers.**

Kids kick a ball around as their coach watches. They are training for an inter-school tournament. An ordinary scene in the soccer world, but for one detail: the coach is sponsored by Arkema's Casda plant near Hengshui, 250 kilometers south of Beijing. The initiative is part of an educational outreach program known as Arkema ChemArt Green Innovation Class. All of the young soccer players attend the Zhenhualu Elementary School near the Arkema site, which produces sebacic acid and castor oil derivatives. Not far away, at Liminlu Elementary School, also in Hengshui, other young students receive regular English instruction taught by Arkema employee volunteers. The theme of their classes couldn't be more relevant: environmental protection and sustainable development. The same subject is featured at another educational establishment, the Lvfeng School in Zhangjiagang, near Shanghai. Employees from Arkema's headquarters in China and the Changshu and Zhangjiagang production sites volunteer to lead various workshops, featuring a mix of environmental protection, English-language classes, everyday safety and art made using Arkema coating



"Arkema's ChemArt Green Innovation Class is an educational program launched in China in 2016 for three years. It has been so successful that we decided to extend it and continue deploying it through 2021. The idea is to provide material support and help awaken students' sense of civic duty, while encouraging their capacity for self-expression and creativity. Around 60 Arkema employees, all of them volunteering for our CSR activities, proudly offer their skills and expertise to the schools."

Daria Gong, Corporate External Communications Manager, Arkema Greater China



products. Computers and books are also donated. All these initiatives in support of education are part of the Common Ground® program pioneered in France and now active worldwide. It's a good way to cement local ties between Arkema production sites and nearby communities, using an approach based on discussion and social responsibility.

## Arkema Promotes Education

The mission of the Arkema Education Fund, created in 2016 on our tenth anniversary, is to support the hard work and commitment of employees who volunteer for educational and humanitarian causes at nonprofits, regardless of country. It is a direct outgrowth of our CSR program. Resources were donated to around 30 nonprofits supported by Arkema employees to fund facilities, scholarships, school supplies and equipment, support at-risk groups and help people with disabilities. Two iconic, award-winning projects, L'Oiseau Bleu and Proxité, are featured below.



Proxité was created in 2002 in the northern suburbs of Paris. Its goal is to build bridges between urban youth, usually isolated minors, and the work world through education-related projects. The nonprofit stands out for its decision to work with companies, such as Arkema, located near its service areas. Mentors from partner businesses commit to helping young people academically, rounding out their support by introducing them to their own professional world. Direct donations from the Arkema Education Fund also helped Proxité buy new supplies and textbooks, recruit a civic service volunteer and expand the scope of its services.



"I wanted to do something in the realm of education by donating a little of my time to at-risk youth. They need to have structure in their lives, get motivated about school and gain self-confidence. I chose Proxité's approach because it combines academic support and working professionals, at the local level. It's very much about connecting two worlds that share the same space but unfortunately still don't cross paths very much."

Benoît Girard, BPO Manufacturing, Bostik, and Proxité volunteer

L'Oiseau Bleu [Blue Bird], a nonprofit based in Normandy, supports and advises people on the autism spectrum and their families. Aid provided by the Arkema Education Fund helped set up a specialized experimental classroom for autistic children ages 6 to 12, based in a regular public school. This genuinely pioneering effort in France, christened the "Blue Nest," is designed to help students learn the basics (reading, writing, counting and social skills) by providing a full range of support focused on achieving greater independence and education. Its specialized team includes a teacher and an educator trained in autism, medical-psychological assistance, a special needs teacher's aide and a medical-social support unit with a psychomotor therapist, psychologist and speech therapist.



"The Arkema Education Fund contributed significantly to furnishing a sensory room for which we had to buy professional equipment designed specifically for autism. We wouldn't have been able to do it alone with our current funding."

Patrice Perret, Assistant Director, Cerdato R&D center, active member of L'Oiseau Bleu

# EXPERTISE AND COMPLEMENTARY BACKGROUNDS



**Thierry Le Hénaff helms Arkema with the support of the Executive Committee.** Each member oversees a business segment or several support functions.

Our top decision-making body, the Executive Committee meets twice a month to examine strategic issues and growth and development plans, including capital expenditure, new capacity, new production facilities, and acquisitions.

To implement Executive Committee decisions, Arkema is organized into nine business units, led by three executive vice presidents of operations. Our corporate departments report to four executive vice presidents and provide support for all activities and operations.

The Executive Committee also supervises the implementation of our strategy, monitors the business and financial performance of our different activities and keeps a very close eye on safety and environmental performance.

**MARIE-JOSÉ DONSION** joined Arkema's Executive Committee as Chief Financial Officer on June 1, 2018. She succeeded Thierry Lemonnier, who retired. Marie-José Donsion previously served as CFO and member of the Executive Committee for Alstom. Before that, she held various operational finance positions at Alstom in France and internationally. Born in 1971, she holds dual French-Spanish citizenship and is a graduate of ESCP Europe Business School. Marie-José Donsion has been a member of Arkema's Board of Directors and Chair of the Audit & Accounts Committee since November 2016.

**3** EXECUTIVE VICE PRESIDENTS IN CHARGE OF OPERATIONS

**THIERRY LE HÉNAFF**  
Chairman & Chief Executive Officer of Arkema

**4** EXECUTIVE VICE PRESIDENTS WITH FUNCTIONAL RESPONSIBILITIES



**MARC SCHULLER,**  
Executive Vice President, Coating Solutions, Industrial Specialties and Global Energy and Feedstock Procurement



**VINCENT LEGROS,**  
Executive Vice President, Bostik



**LUC BENOIT-CATTIN,**  
Executive Vice President, Industry



**MICHEL DELABORDE,**  
Executive Vice President, Human Resources & Corporate Communication



**CHRISTOPHE ANDRÉ,**  
Executive Vice President, Technical Polymers, Performance Additives and Sales Excellence



**BERNARD BOYER,**  
Executive Vice President, Strategy



**MARIE-JOSÉ DONSION,**  
Chief Financial Officer



# INDEPENDENT OVERSIGHT

**The Board of Directors sets Arkema's strategy and oversees its implementation.** Chaired by Thierry Le Hénaff, the Board has 12 other members, including six independent directors, six women, a director representing employee shareholders and a director representing employees.

**THIERRY LE HÉNAFF,**  
Chairman & Chief Executive Officer  
of Arkema



**YANNICK ASSOUD,**  
Chief Executive Officer  
of Latécoère S.A.



**JEAN-MARC BERTRAND,**  
Director representing employee  
shareholders



**ISABELLE  
BOCCON-GIBOD,**  
permanent representative  
of the French equity  
fund Fonds Stratégique  
de Participations (FSP)



**FRANÇOIS ÉNAUD,**  
Chairman, FE Développement SAS



**MARIE-ANGE DEBON,**  
CEO France: SEVP Group in charge  
of France, Italy and Central  
and Eastern Europe, Suez



**ALEXANDRE  
DE JUNIAC,**  
Director General  
and CEO, International  
Air Transport  
Association (IATA)



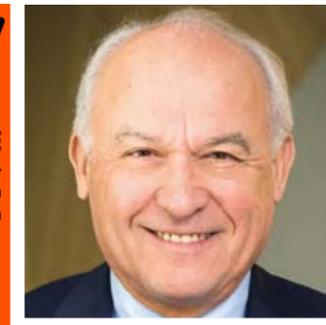
**HÉLÈNE  
MOREAU-LÉROY,**  
Project Director, Integration  
of Zodiac Aerospace, Safran



**VICTOIRE  
DE MARGERIE,**  
Executive Chairman,  
Rondol Industrie



**MARC PANDRAUD,**  
Vice Chairman of Investment  
Banking for Europe, the Middle East  
and Africa, JP Morgan



**THIERRY MORIN,**  
Chairman, Thierry Morin Consulting

**LAURENT MIGNON,**  
Chairman of the Management  
Board and CEO, BPCE



**NATHALIE  
MURACCIOLE,**  
Director representing employees



In 2018, the Board of Directors met six times, down from eight times in 2017. The attendance rate was 97%, versus 90.5% in 2017.

To strengthen its expertise, the Board of Directors has two permanent specialized committees.

**THE AUDIT & ACCOUNTS COMMITTEE**

Chaired by Marie-Ange Debon, it is made up of two other directors: Isabelle Boccon-Gibod and Héléne Moreau-Leroy. The Audit & Accounts Committee ensures 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 three other directors: François Énaud, Alexandre de Juniac and Victoire de Margerie. The Nominating, Compensation & Corporate Governance Committee makes recommendations and proposals concerning the Board, the Chairman and CEO's compensation and corporate governance best practices.



**A NEW DIRECTOR IN 2019**

The Board of Directors is nominating Ian Hudson to serve as an independent director at the next Annual Shareholders' Meeting on May 21, 2019. A British national and current chair of Carbios's Board of Directors, Ian Hudson began his career at ICI, a former U.K. multinational specializing in chemicals and related sectors. In 1998, he joined DuPont de Nemours, where for 17 years he held a number of leadership positions. He retired in 2016 after serving for more than 10 years as President, Europe, Middle East and Africa. He was a member of the Executive Committee and the Advisory Committee of the European Chemical Industry Council (CEFIC) and EuropaBio. He was also a member of the IMD Foundation Board and the Swiss-American Chamber of Commerce. His appointment will bring his many years of experience as a senior executive in the specialty chemicals industry, his cultural knowledge of the English-speaking world and his international experience to the Board of Directors.

# 2018 RESULTS AT A GLANCE

**Arkema posted a record performance in 2018**, with revenue up 5.9% and EBITDA up 6% from 2017's already excellent performance.

## Record Financial Performance

**€8,816 M**

Revenue (up 5.9% from 2017)

**€1,474 M**

EBITDA (up 6% from 2017)

**16.7%**  
EBITDA margin  
(stable versus 2017)

**€725 M**  
Adjusted net income  
(up 22.5% from 2017)

**€707 M**  
Net income –  
Group share  
(up 22.7% from 2017)

## 2018 Key Indicators

Income Statement (in € millions)	2018	2017	% change
Revenue	8,816	8,326	+5.9%
EBITDA	1,474	1,391	+6%
EBITDA margin (in %)	16.7%	16.7%	-
Recurring operating income (REBIT)	1,026	942	+8.9%
REBIT margin (in %)	11.6%	11.3%	-
Operating income	928	845	+9.8%
Adjusted net income	725	592	+22.5%
Net income – Group share	707	576	+22.7%
Adjusted net income per share (in €)	9.51	7.82	+21.6%
Balance Sheet (in € millions)	2018	2017	
Shareholders' equity	5,028	4,474	-
Net debt	1,006	1,056	-
Net debt to equity (in %)	20%	24%	-
Capital employed	6,996	6,554	-
Cash Flow (in € millions)	2018	2017	
Cash flow from operating activities	1,029	1,008	-
Free cash flow	499	565	-
Recurring and non-recurring capital expenditure	561	430	-

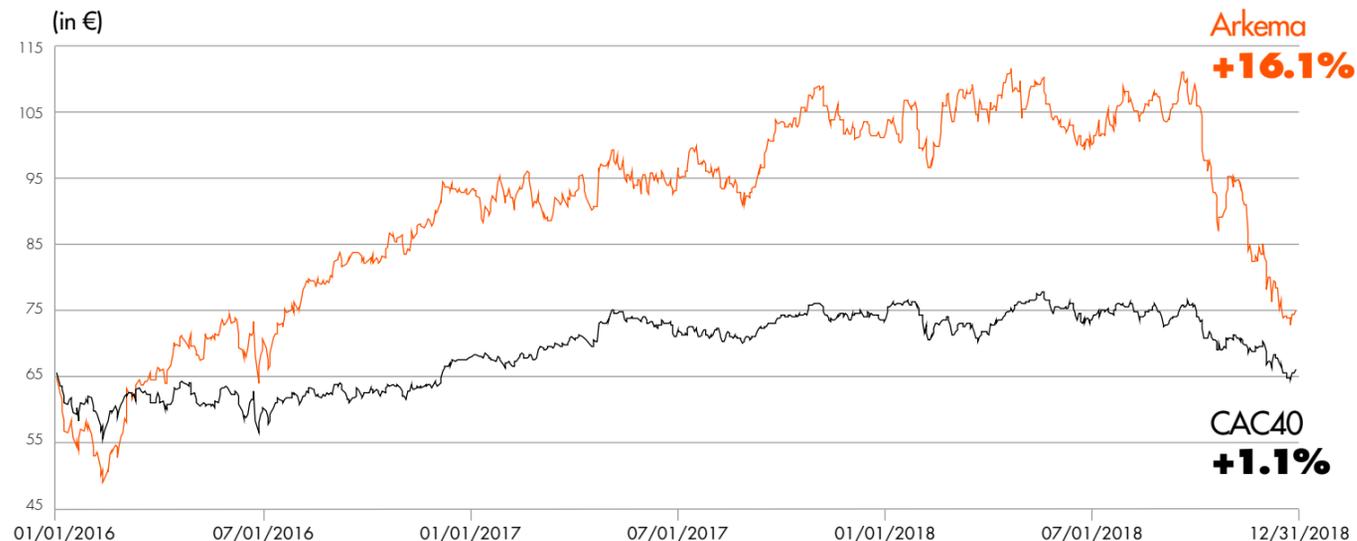
Alternative performance indicators used by Arkema are detailed in Note C.1 of the notes appended to the December 31, 2018 consolidated financial statements, in Section 5.3.3 of the 2018 Reference Document.

## Excellent Cash Generation

**€499 M**  
Free cash flow  
(€565 M in 2017)

**€1 billion**  
Net debt  
(€1,056 M in 2017)  
Net debt-to-equity ratio  
of **20%**

## Share Price Since January 1, 2016

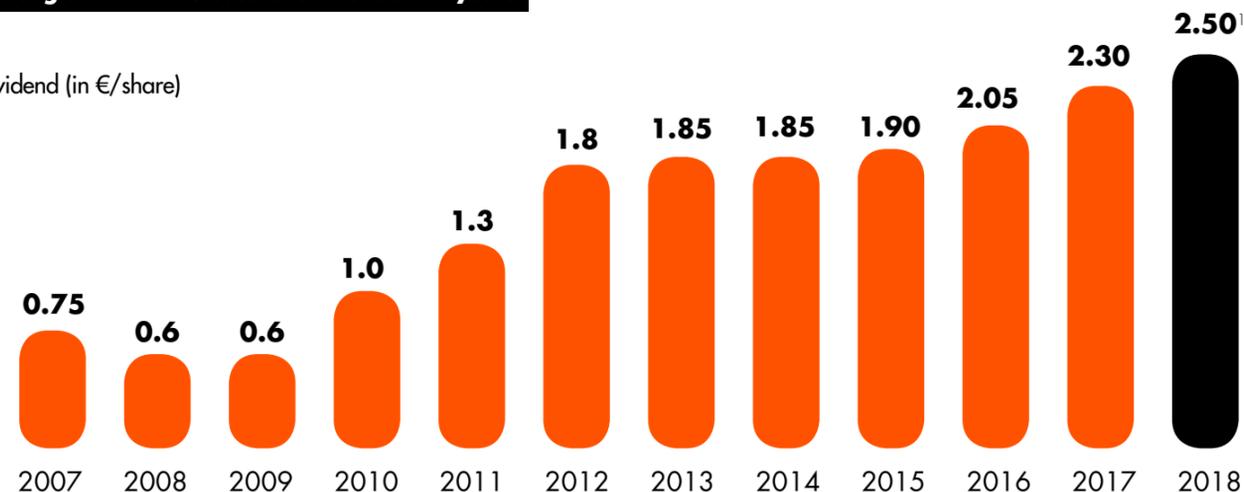


## Up 220%

The Arkema share's cumulative gain at March 31, 2019 since we were publicly listed in May 2006. Over the same period, other CAC 40 companies saw their share value rise by an average of 9%.

## Strong dividend increase over the last 12 years

Dividend (in €/share)



1. Dividend proposed to the Annual Shareholders' Meeting on May 21, 2019.

## Payout is 26%

### CONTACTS

**Individual Shareholders**  
actionnaires-individuels@arkema.com

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

### CALENDAR

**May 7, 2019**  
First-quarter results

**May 21, 2019**  
Annual Shareholders' Meeting

**August 1, 2019**  
First-half results

**October 30, 2019**  
Third-quarter results



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**External Communications Division**

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NATIONAL SUPPORTER

# TALENT NURTURED IN AND ON THE FIELD

We showcase women at our R&D centers and plants, as well as in sports arenas.

**Supporting women's aspirations**  
**#behindthedreams**



Follow us



**INNOVATIVE**

**ARKEMA**  
INNOVATIVE CHEMISTRY