



ARKEMA
INNOVATIVE CHEMISTRY

**CAPITAL
MARKETS
DAY 2017**

Advanced Materials

Christophe André, Executive Vice-President Advanced Materials

*It's an
extreme world*

Customers have
extreme demands

Automotive



Lighter

Higher temperature
performance

Higher production rate

Water



Microfiltration

Ultrafiltration

Miniaturization

Oil & Gas



High pressure resistance

Extreme chemical
resistance

Durability

Electronics



Miniaturization

Rapidity

Dimensional stability

Batteries



Durability

Safety

*It's an
extreme world*

We design
extreme performance

∨
RILSAN[®]
HT
RILSAN[®]
MATRIX
ELIUM[®]

∨
KYNAR[®]

∨
KYNAR[®]
RILSAN[®]
SILIPORITE[®]
KEPSTAN[™]

∨
PEBAX[®]
RILSAN[®]
SARTOMER

∨
KYNAR[®]



€1.8 bn sales



19.8% EBITDA margin
13.6% REBIT margin



€64 m R&D expenses

Key strengths

Leading positions (#1 to #3 worldwide)

World famous brands

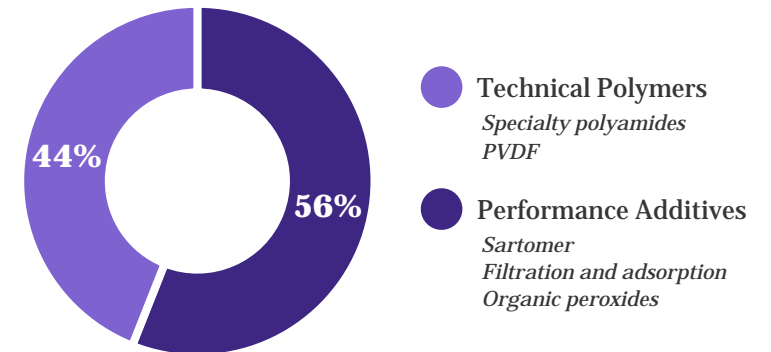
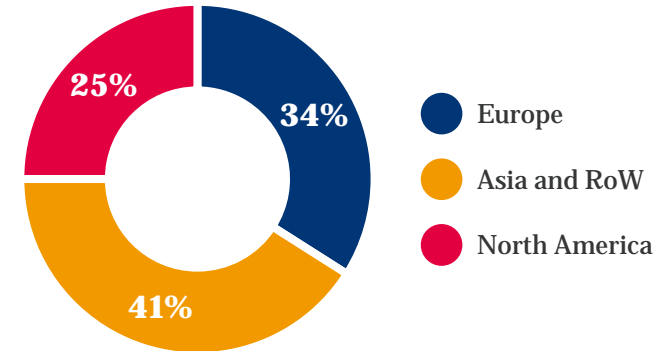
*Strong partnerships
with leading players in their markets*

*Large innovation pipeline
and strong patent culture*

Unique portfolio of bio-based solutions

World-class proprietary technologies

Sales split



Our achievements in Advanced Materials since last Capital Markets Day

Main projects achieved



Construction and start-up of new molecular sieves capacities at **Honfleur**



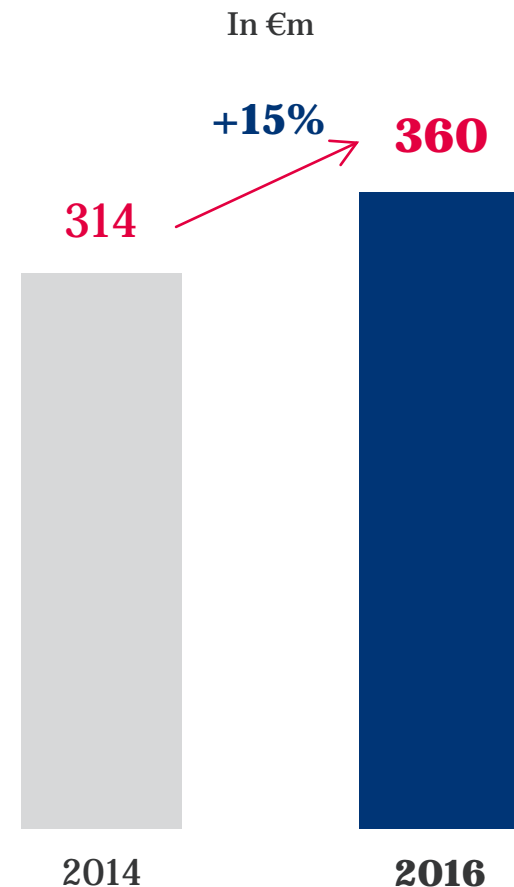
Expansion in **Asia** in **Technical Polymers** and **Organic peroxides**



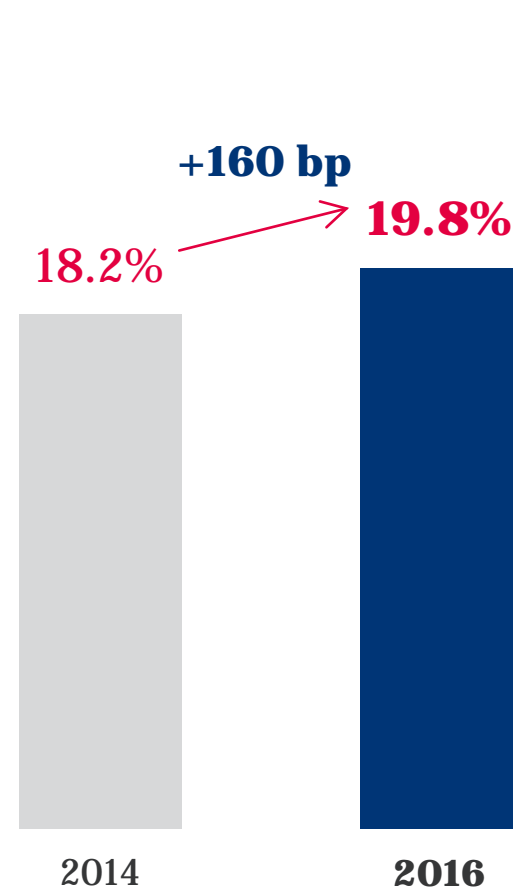
Divestment of activated carbons and filter aids (€93 m sales)

EBITDA

In €m



EBITDA margin



An innovation footprint close to our customers

490
researchers

37%
PhDs.

40%
Group patents

3.5%
R&D efforts (% of sales)



A large innovation pipeline of sustainable solutions

Rilsan® HT

Lightweight materials in automotive



Kynar®-based membranes

Hydrophilic membranes for water filtration



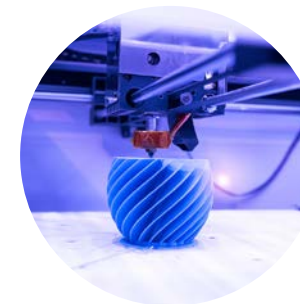
Pebax® Rnew®

Bio-based solutions for consumer applications (sports and electronics)



Sartomer N3xtDimension

3D printing



Kynar® PVDF

Separator coatings and electrode binders in lithium-ion batteries



Kynar® PVDF

Back-sheet films for photovoltaic panels



Kepstan® PEKK

For aeronautics, oil & gas and 3D printing



Molecular sieves

For medical oxygen



The leading innovative partner for extreme sustainable solutions



14% to 15%
REBIT margin



Target 5%
*organic sales growth
at end of investment plan*



4% of sales
*R&D expenses
up to 8% in certain applications*



Expand our positions in selected fast growing high value markets

Aeronautics / Automotive / 3D printing
Water treatment / Energy / Electronics / Sports



Leverage partnerships with leading players



Accelerate growth in Asia

Polyamides / Sartomer / PVDF



Broaden our product portfolio with **disruptive innovation**

PEKK / Composites / 3D printing / Elium[®]



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Water treatment / Energy / Electronics / Sports



Leverage partnerships with leading players



Accelerate growth in Asia

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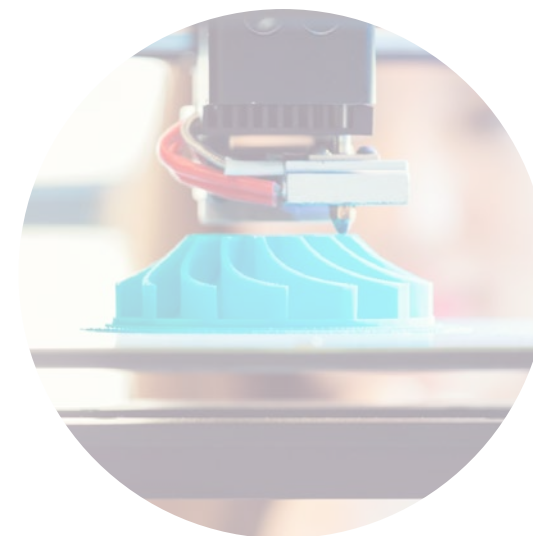
PEKK / Composites / 3D printing / Elium[®]

Automotive

Energy

Water treatment

3D printing



Lighter and cleaner vehicles
E-vehicles

New energies
Deep offshore

Clean and safe water

Freedom of design
Lighter materials
Stronger materials

By 2035, the number of cars
in the world will double
to 2 billion



Increasing needs
for **lighter, safer**
and **cleaner vehicles**

By 2023,
the global share of hybrid
and e-cars will double



Growing needs
for **electronics** and
high density batteries



A bright future for **sustainable solutions**
providing **durability** and **lower emissions**



Powertrain



*Fuel, fluid
management*



Connectors



*Alternative
fuel systems*

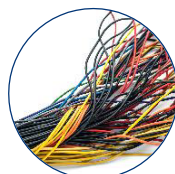


*Emission
control systems*

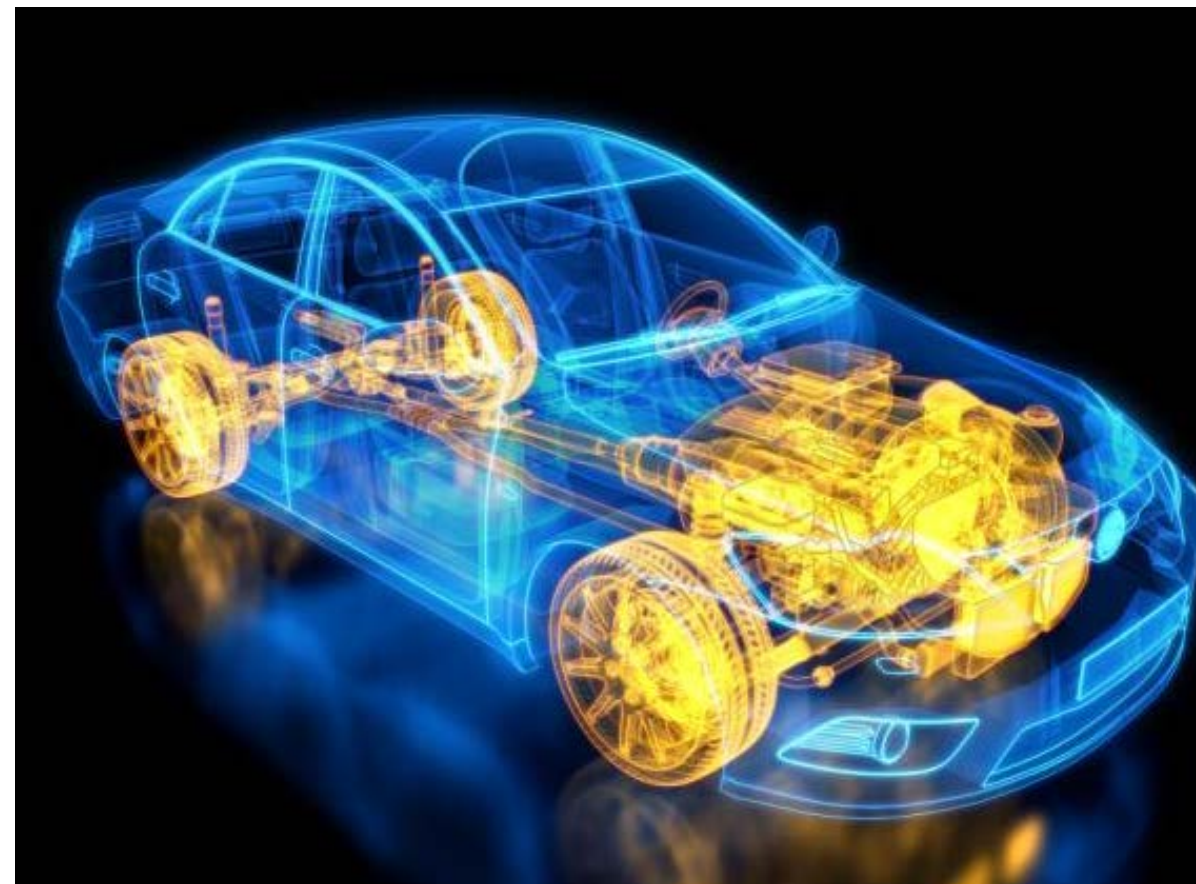
Electrics and electronics



*Binders and separator coatings
for li-ion batteries*



Wires and cables



*Arkema's solutions in a car represent today up to **2.5 kg***

*Rilsan® HT
for powertrain*



*High Temperature PA 11
for metal and rubber replacement*

More than 50% lighter

50% cost savings

Up to 70% bio-based

x5 sales since 2012

*Rilsan®
fluid management*



*High performing mono and multilayer
construction for greener cars*

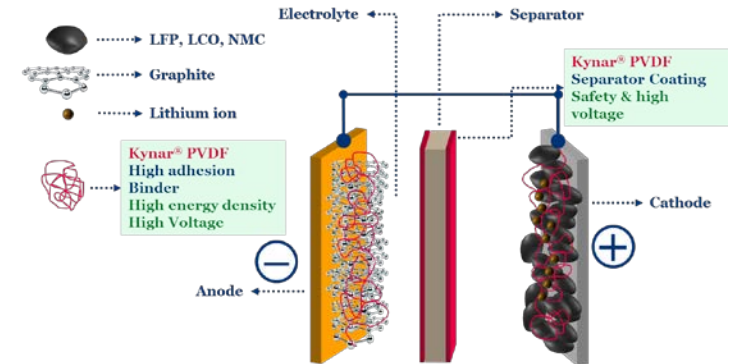
**More than 100 times
lower fuel emissions**

**Outstanding chemical resistance
(biofuels, acids, etc.)**

Flexibility – easy to work with

+50% sales since 2012

*Kynar®
for li-ion batteries*



*Separator coatings
and electrode binders*

**Higher performance
and safety**

Higher durability

Easy to process

>10% annual growth

Next generation of binders

Materials for lithium-sulfur
and lithium-air batteries



Rilsan® Matrix

For composites



Fast RTM process for Elium®

High speed process
for automotive



Automotive

Energy

Water treatment

3D printing



Lighter and cleaner vehicles
E-vehicles

New energies
Deep offshore

Clean and safe water

Freedom of design
Lighter materials
Stronger materials



80% of future
oil & gas reserves lie
~23,000 feet below
the water surface



Growing needs for
strength, durability
and **resistance**



Our solutions

Lower total installed costs and
lifetime maintenance vs steel pipe

Up to 25 years service life
in contact with oil



By 2050,
up to 25% of the world's
power consumption will be
supplied by solar power



Growing needs for
more efficient and
lasting energy solutions



Our solutions

Kynar® PVDF multilayer films to
protect solar module back-sheets

Longer lasting in
more extreme environments



KYNAR
BY ARKEMA

*For flexible pipes
and photovoltaic panels*

RILSAN
BY ARKEMA

For flexible pipes

SILIPORITE
MOLECULAR SIEVES
BY ARKEMA

For petrochemicals



1 billion people
do not have access
to clean drinking water



Huge needs for innovative solutions
in the **water filtration** market



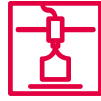
Our solutions

Kynar® PVDF for micro- and ultrafiltration
to remove bacteria and viruses

High chemical resistance over 10 year lifetime

Low energy consumption
due to durable hydrophilic properties





Faster and more precise
additive manufacturing processes



Increasing needs from **automotive, aerospace, healthcare** industries to **shorten the time from design to production** and **turn just-in-time into here-and-now**



Our solutions

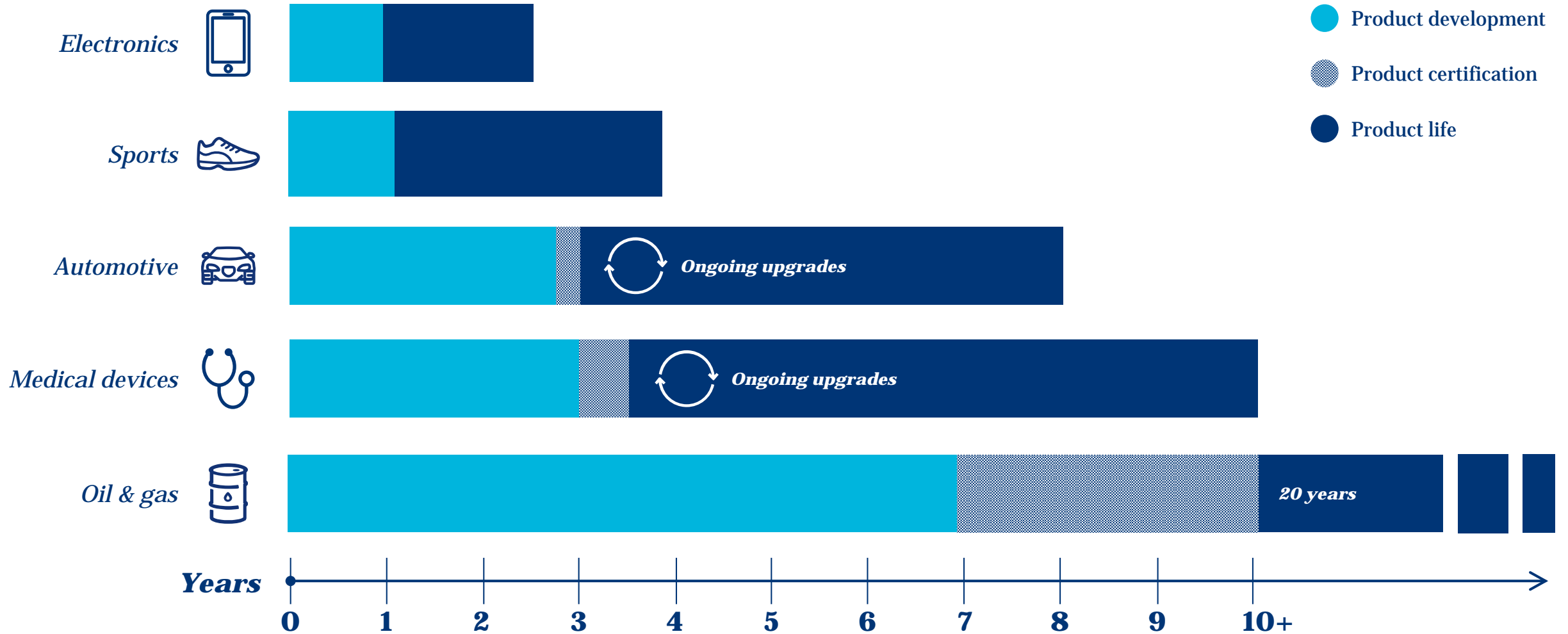
Wide range of solutions for various technologies

Lower-cost solutions compared to traditional manufacturing processes

High resolution and resistance for versatile applications



Reinforce resilience by optimizing mix of markets and lifecycles





Expand our positions in selected fast growing high value markets

Aeronautics / Automotive / 3D printing
Water treatment / Energy / Electronics / Sports



Leverage partnerships with leading players



Accelerate growth in Asia

Polyamides / Sartomer / PVDF



Broaden our product portfolio with **disruptive innovation**

PEKK / Composites / 3D printing / Elium[®]

Asia, a huge market with strong growth potential

60%
worldwide population

 **53%** *global car production*

 **77%** *global smartphone production*

 **80%** *global photovoltaic panel production*

 **3** *of 15 most innovative countries*



Growing focus on innovation and technology



2011

China

New PVDF Kynar®
plant followed by
several expansions



2012

China

Acquisition of
Casda Biomaterials
and Hipro Polymers



2013

China

New
R&D centre



2016

South Korea

New
R&D centre



China

x2
Organic peroxides
capacities



A strong momentum

Specialty polyamides



Asia

Sartomer



China

Kynar® PVDF



China



Strengthen our leadership position in specialty polyamides...

Our strengths

#1
worldwide

Unique technology in bio-based polyamides
Rilsan® PA 11 and Pebax® Rnew®

Global R&D
and manufacturing footprint

Proprietary technologies

World famous brands



Diversified end-markets

Selected examples growing on average at
+5% / year

Automotive



Lightweighting
Durability
Cost efficiency

Consumer goods sports, electronics



Lightweighting
Freedom of design
Bio-based

Oil & Gas



Resistance
Durability
Flexibility



... through a change of scale

~€300m capex over next 5 years

To support our customers' strong growth

+7% / year expected growth in Asia supported by:



Automotive



Consumer goods
Sports, electronics



3D printing

To supply our global customers locally

**New state-of-the-art
bio-based PA 11 site in Asia**

A 2nd PA 11 monomer site
after Marseille (France)

Integrated from monomers
to polymers

Start-up planned end 2021

**Expand Pebax® capacities
in Asia**

**+50% PA 11
+50% Pebax®
worldwide capacities**

>15% after tax IRR

Our strengths

#1
worldwide

Premium brand
KYNAR[®]
BY ARKEMA

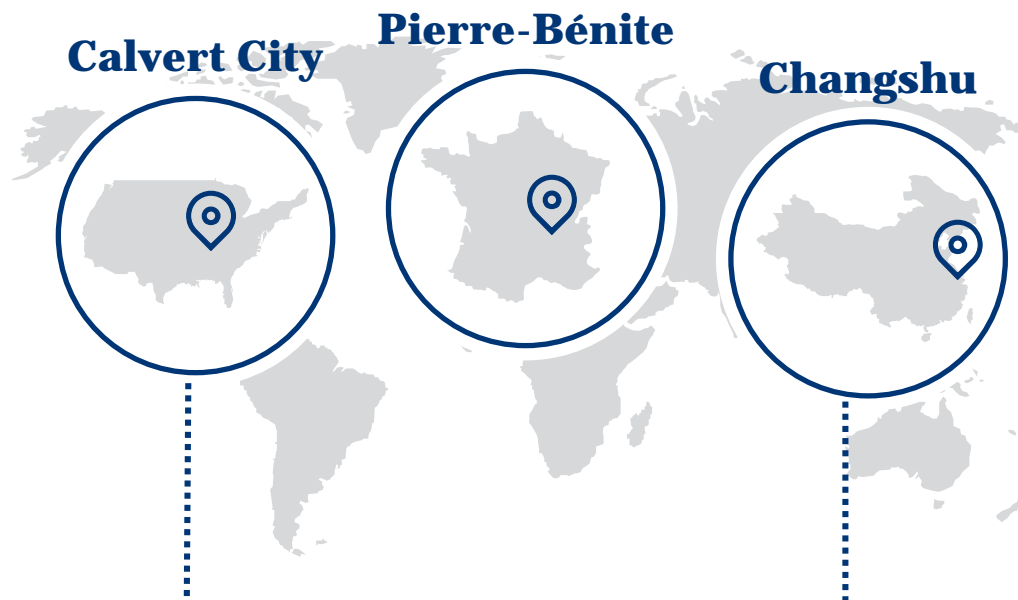
*Wide range of markets supporting
+7% average growth / year*

*Global R&D network
and world-scale units*

Unique proprietary technologies

50 years of experience

A successful stepwise expansion



**Arkema's largest
PVDF plan**

Capacity increases
in 2008 and 2010

**Plant
started in 2011**

+50% capacity started
in 2012

Our ambition

**Continuously expand
our PVDF capacities
in the 3 regions**

**+25% expansion
started in China in April 2017**

And more to come...

Our strengths

#1
worldwide

Unique know-how

Global presence to meet local customer needs

Environmentally friendly solutions

100% dry-content (no solvent)
SARBIO bio-based range
BY ARKEMA

A new range for 3D printing

N3XTDIMENSION
BY ARKEMA

Proprietary technologies

Diversified end-markets

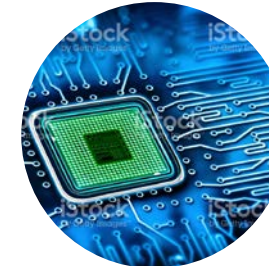
Selected examples growing on average at
+5% / year

Graphic arts



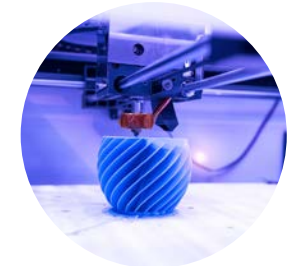
Excellence of finish
Durability

Electronics



High productivity
High purity

3D printing

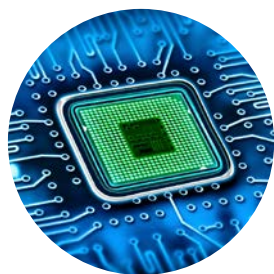


Prototyping
Durability

+30% capacity in Asia

To support the growth of our customers in fast growing high-tech, high value niches

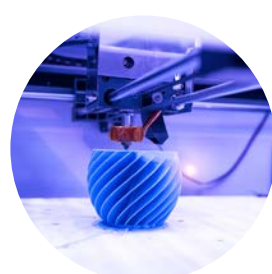
+10%/year expected growth in Asia supported by:



Electronics



Ink jet printing



3D printing

Accelerate Sartomer's growth in specialty applications

+12%/year
on average



Volumes (in thousand metric tons)



Capacity expansion at existing plant in Nansha in China

Start-up planned in 2019



Expand our positions in selected fast growing high value markets

Aeronautics / Automotive / 3D printing
Water treatment / Energy / Electronics / Sports



Leverage partnerships with leading players



Accelerate growth in Asia

Polyamides / Sartomer / PVDF



Broaden our product portfolio with **disruptive innovation**

PEKK / Composites / 3D printing / Elium[®]

3D printing



.....
*Collaboration on the new
Multi Jet Fusion™ technology*
.....

*Driving innovation through an
Open platform for materials*
.....

*Leverage unique properties of
Kynar® , Pebax® , Rilsan® , Sartomer®*

Sports



.....
*In-depth work on
Lightweighting, resistance, flexibility,
energy return...*
.....

Using Arkema's unique Pebax® material



Nike
BREAKING2



Lightweighting
Resistance
Flexibility
Energy return



Expand our positions in selected fast growing high value markets

Aeronautics / Automotive / 3D printing
Water treatment / Energy / Electronics / Sports



Leverage partnerships with leading players



Accelerate growth in Asia

Polyamides / Sartomer / PVDF



Broaden our product portfolio with **disruptive innovation**

PEKK / Composites / 3D printing / Elium[®]



Broaden our product portfolio

Well-established



***Unique range
of Technical Polymers***

Pebax®
Rilsan® PA 11
Rilsamid® PA 12
Kynar® PVDF
Orgasol®

Newcomers



***High-end
of polymers pyramid***

New composites
Kepstan® PEKK
Kynar® PVDF foams
Pebax® foams
Rilsan® HT

Future



***Breakthrough
innovations***

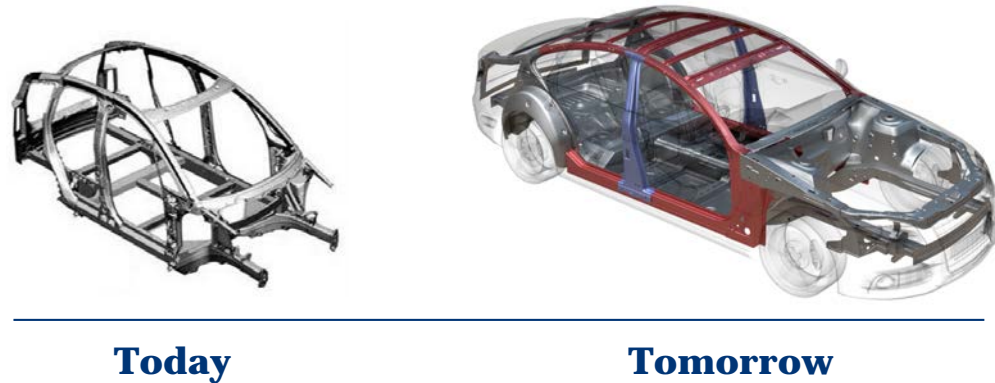
Elium®
Fast RTM
Piezoelectric polymers
Directed self assembly
...

Lightweighting in a circular economy

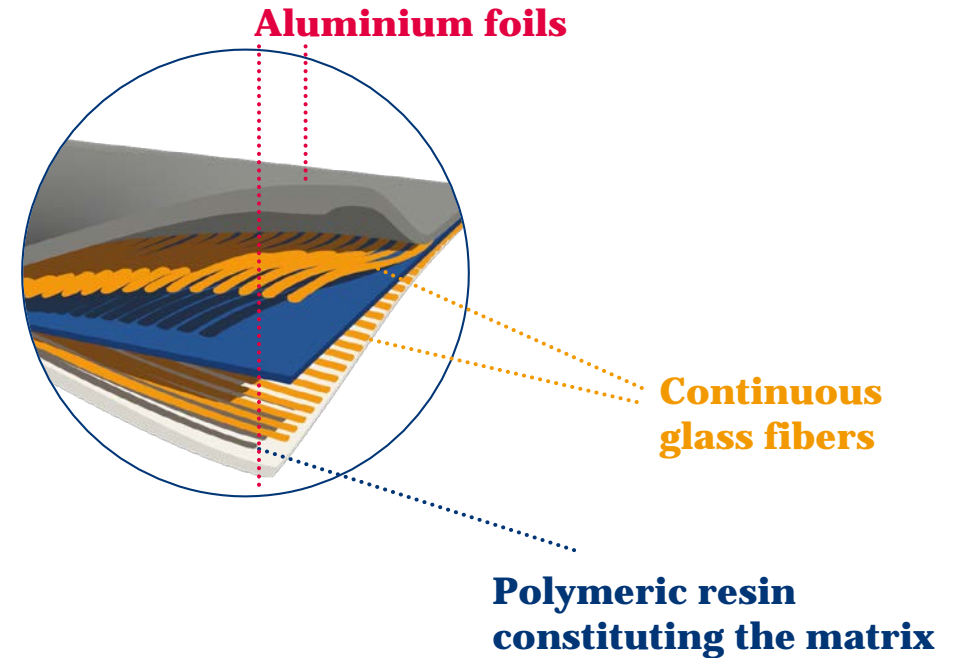
Christian Collette, Vice-President R&D

Composites, a solution of choice to replace metal and reduce weight...

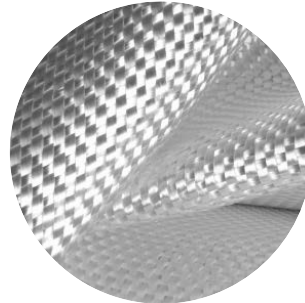
Towards more and more composites



Systems are multimaterial and complex



More composites with more complexity creates a recycling challenge



**Composite
life cycle**

Design and properties

Raw materials

***Composite part
production***

Use and end of life

Know-how to design
and predict properties

Optimization of matrix
and fibers
cost-performance balance

Productivity and assembly

Dismantling and recycling

Need for better
mechanical properties

Need for higher
automation

**Benefits from
thermoplastic
composites**

Improved fatigue
and impact properties

Larger diversity
of polymers
*15 thermoplastic
vs. 5 thermoset polymer
families*

Higher productivity

New assembly
opportunity and freedom
in parts design

Mechanical
or chemical recycling

Arkema has a deep know-how of thermoplastic composites

KEPSTAN
BY ARKEMA



Aerospace
Process cost reduced by 40%
Production rate x2 versus
thermoset
Fire resistant

KYNAR
BY ARKEMA



Oil & gas
High resistance to pressure
and chemical aggression

ELIUM
BY ARKEMA



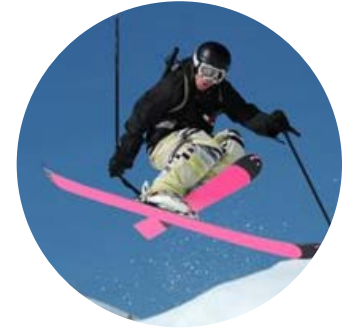
Wind energy and marine
Lower manufacturing cost
than epoxy
Promising fatigue properties
No process change

RILSAN
MATRIX
BY ARKEMA



Automotive
Corrosion free
50% weight reduction
versus steel

PEBAX
BY ARKEMA



Sports & leisure
30% increase in
vibration damping
Better impact properties

A complete range of solutions for diversified end-markets

Arkema #1 worldwide in PEKK **KEPSTAN™** BY ARKEMA

PEKK at a glance

> What is PEKK

- > Polymer offering exceptional resistance to extreme environments

> What are PEKK properties

- > Up to 390°C melting point
- > Excellent resistance to chemicals and abrasion
- > Rigid as metal, but very much lighter
- > Non-flammable, no toxic fumes
- > Can be injected or extruded

> Why PEKK is not PEEK

- > Wider product range
- > More processing technologies
- > Higher continuous use temperature

Top end of polymers pyramid

New markets



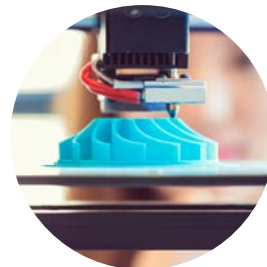
Aerospace

Replace metal and thermoset composites



Oil & gas

Reduce weight of pipes to dig deeper



3D printing

Replace metal for small series

Expand capacities

Development of the technology over the past 8 years



France

Production capacities doubled in 2016



US

Project to build a world-scale unit in Alabama with expected start-up end 2018

Piezoelectric polymers

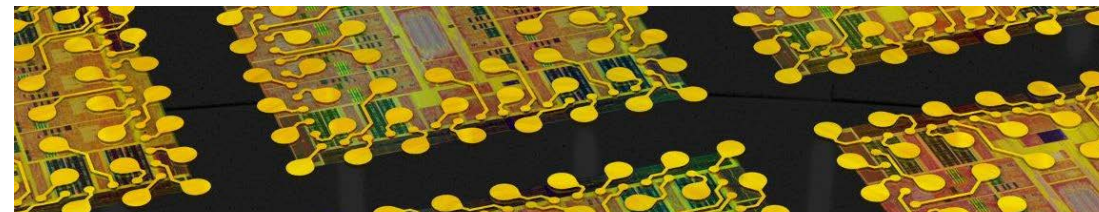
Fluorinated materials for the future



Polymers with electroactive nature, undergoing deformation under an electric current and generating an electric current under mechanical pressure

Directed self-assembly

For nanolithography



Photolithographic techniques are running into a physical limit: 20 nanometers

WE DESIGN THE FUTURE

Among several other developments,

Arkema entered the **HAPPINESS** 

European program with leading partners to develop an **automotive haptic dashboard**



Pilot at Lacq R&D centre (France)

Partnership signed with US company Brewer Science with objective to **reach 10 nanometers by 2019**
Long-term ambition to **reach 5 nanometers**

Small volumes, high margins

Recurring operating income (REBIT): is calculated as the difference between operating income and other income and expenses. It excludes the depreciation and amortization resulting from the revaluation of tangible and intangible assets as part of the allocation of purchase price of acquired businesses.

Other income and expenses: correspond to a limited number of well-identified non-recurring items of income and expense of a particularly material nature that the Group presents separately in its income statement in order to facilitate understanding of its recurring operational performance (as defined in the 2016 consolidated financial statements included in chapter 4 of the 2016 Reference Document).

EBITDA: corresponds to recurring operating income increased by the depreciation and amortization not included in other income and expenses.

Adjusted net income: corresponds to Net income – Group share adjusted for the Group share of the following items:

- other income and expenses, after taking account of the tax impact of these items,
- income and expenses from taxation of an exceptional nature, the amount of which is deemed significant,
- net income of discontinued operations,
- unrealized exchange differences on foreign currency financing for investments of an exceptional nature.

Free cash flow: corresponds to cash flow from operations and investments excluding the impact of portfolio management.

Exceptional capex: correspond to exceptional investments which are unusual in size or nature.

EBITDA to free cash conversion: corresponds to the ratio of EBITDA on the free cash flow excluding exceptional capex. Free cash flow will be restated to offset the impact of the raw material environment on changes in working capital.

Return on capital employed: corresponds to the ratio of: $(\text{REBIT} - \text{current income taxes}) / (\text{net debt} + \text{shareholders' equity})$ under current IFRS rules. All other accounting and financial indicators are defined in the 2016 consolidated financial statements included in the 2016 Reference Document.

The information disclosed in this document may contain forward-looking statements with respect to the financial condition, results of operations, business and strategy of Arkema. Such statements are based on management's current views and assumptions that could ultimately prove inaccurate and are subject to material risk factors such as among others, changes in raw material prices, currency fluctuations, implementation pace of cost-reduction projects and changes in general economic and business conditions. These risk factors are further developed in the Company's Reference Document.

Arkema does not assume any liability to update such forward-looking statements whether as a result of any new information or any unexpected event or otherwise.

Further information on factors which could affect Arkema's financial results is provided in the documents filed with the French *Autorité des marchés financiers*.

Financial information since 2005 is extracted from the consolidated financial statements of Arkema. Quarterly financial information is not audited.

The business segment information is presented in accordance with Arkema's internal reporting system used by the management.

The definition of the main performance indicators used can be found in the Glossary and in the chapter 4 of the 2016 Reference Document.