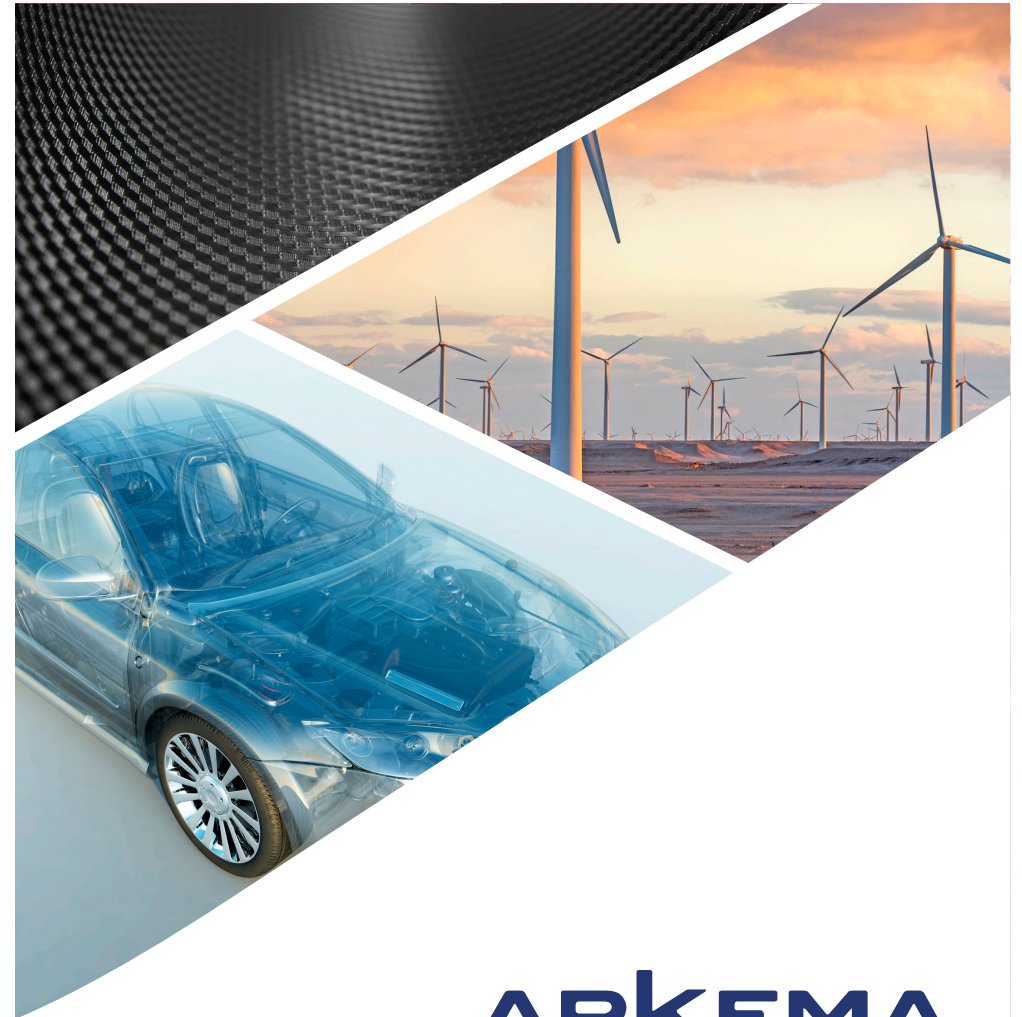




# FROM LIGHTWEIGHTING **OR** RECYCLING TO LIGHTWEIGHTING **AND** RECYCLING

THIERRY LE HÉNAFF  
CHAIRMAN AND CEO

JUNE 29TH 2017



**ARKEMA**  
INNOVATIVE CHEMISTRY



# GENERAL CONSIDERATIONS

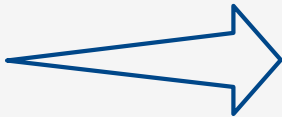
**ARKEMA**  
INNOVATIVE CHEMISTRY

# A REMARQUABLE EVOLUTION IN THE LAST 20 YEARS

Recycling pressure



**Short life time products:**  
packaging, consumer electronic, sport goods...



From LIGHTWEIGHTING **or** RECYCLING  
to LIGHTWEIGHTING **and** RECYCLING  
whatever the final object

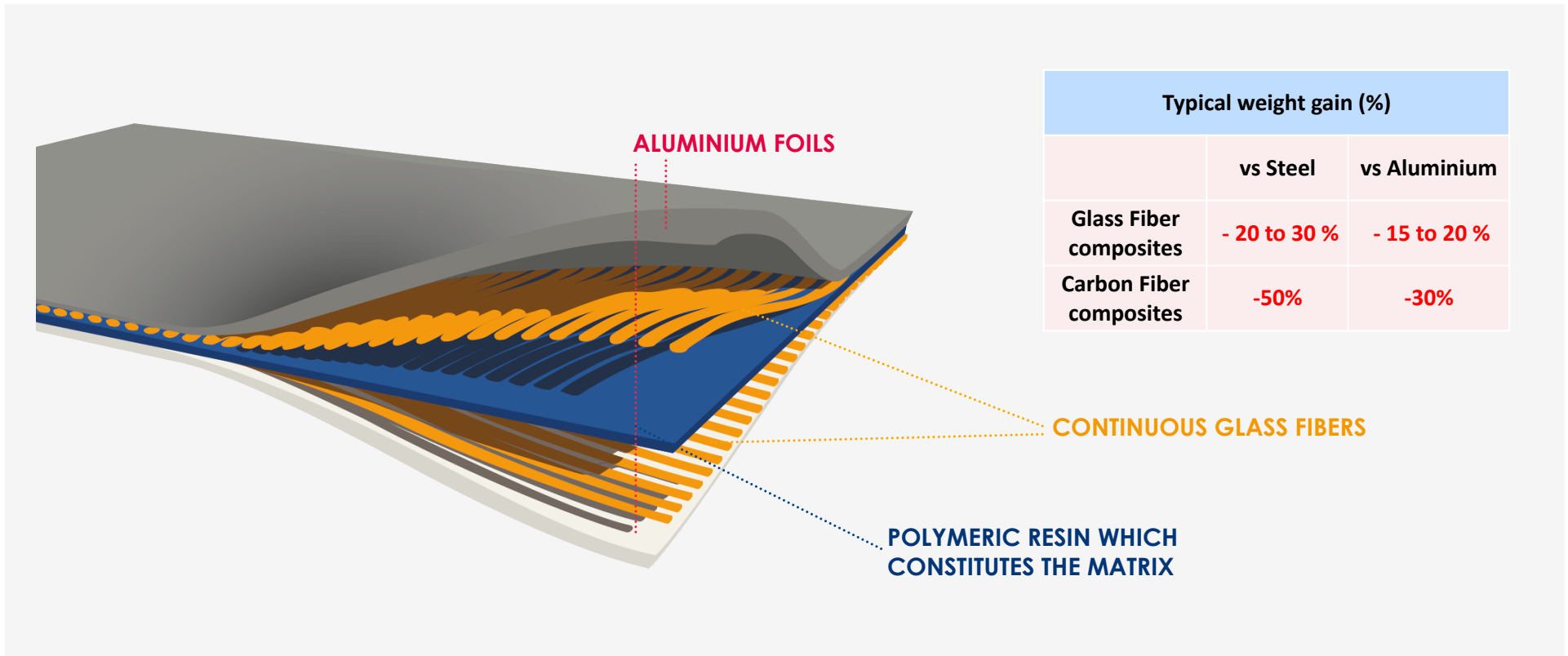


**Long lasting objects:**  
Airplanes, boats, windmills ...



Lightweighting needs

## SYSTEMS ARE MULTIMATERIAL AND COMPLEX



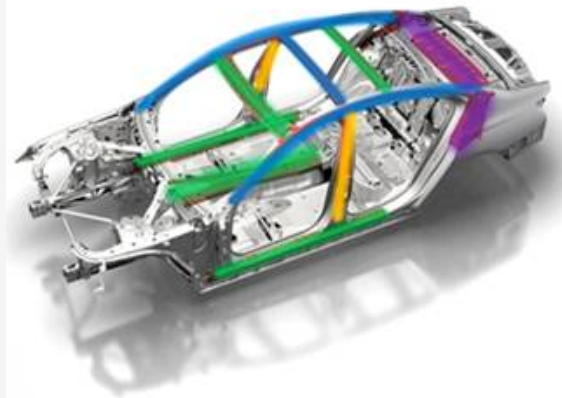
# ILLUSTRATION IN THE CAR INDUSTRY

TODAY



ALUMINIUM BODY IN WHITE  
OF AUDI A2

TOMORROW



**CFRP**  
Compression molding

**CFRP**  
RTM process

**CFRP/STEEL**  
Hybrid

**CFRP**  
SMC process



CARBON  
COMPOSITE/METAL  
HYBRID  
BODY  
IN WHITE

OF BMW 7 Series



## TEAM OF SPEAKERS

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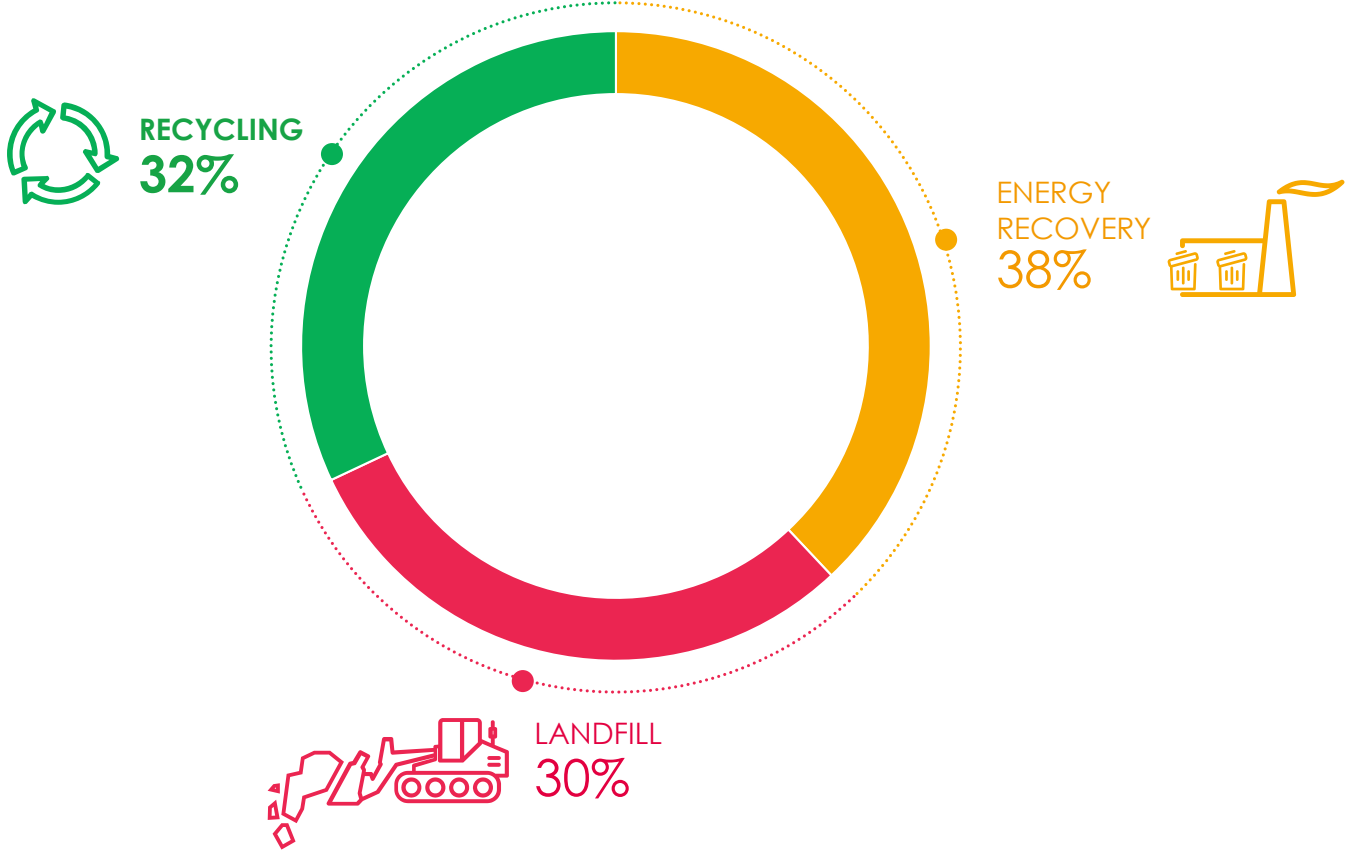
- **Thierry Le Hénaff** (CEO Arkema)
- **Sunan Ding** (Suzhou Institute of Technology)
- **Denis Hugelmann** (CEO Ecotitanium)
- **Andreas Reissner** (CCO Pyral)
- **Brett Schneider** (Senior VP Business Development Hexcel)
- **Egil Hogna** (CEO Sapa)



# « SMART, LESS AND LONGER » AT ARKEMA

**ARKEMA**  
INNOVATIVE CHEMISTRY

# PLASTIC AND COMPOSITE RECYCLING IN EUROPE





## ECO-CONCEPTION OF LIGHTWEIGHT MATERIALS IN ARKEMA



From production to recycling



Simplified designs to facilitate recycling



Strong technological partnerships

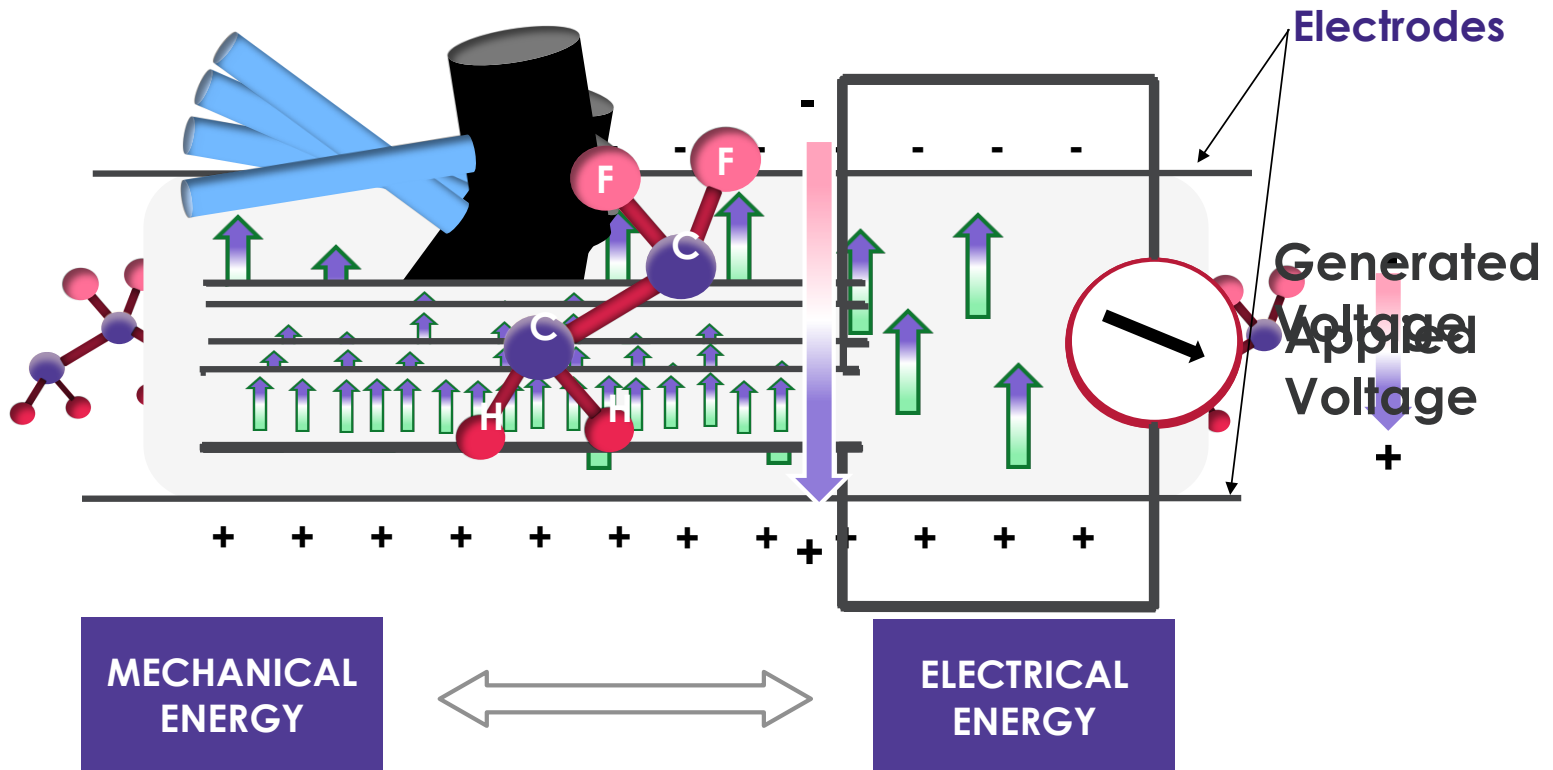
### ILLUSTRATION OF ARKEMA KNOW HOW

- 1 Smart composites by applying the right combination of material : **plastronics**
- 2 Less material used by avoiding scraps : **Fast RTM process for automotive**
- 3 Long lasting products by optimizing material , process and recycling schemes: **ELIUM® Resin for Wind blades**

# 1

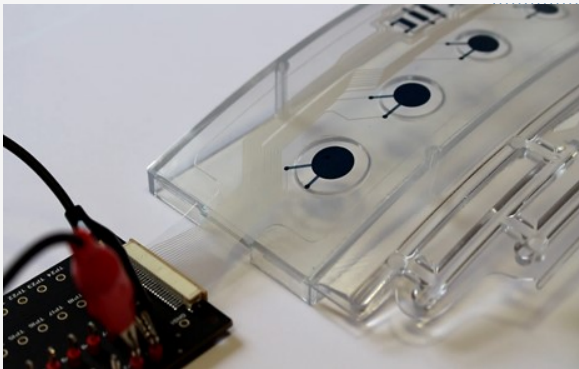
## PIEZOELECTRIC POLYMERS IN PLASTRONICS

Fluorine Gives High Polarity to Fluorinated Monomers  
for Piezoelectric Applications



# 1

## PLASTRONICS FOR SMART COMPOSITES



Overmolded sensing, sound and haptic-feedback thermoplastic functional layer

Thermoformed functionalized thermoplastic



### HAPPINESS



**ARKEMA**  
INNOVATIVE CHEMISTRY  
**PARTNERS**

**BOSCH**

*Inria*

**WALTER PACK**

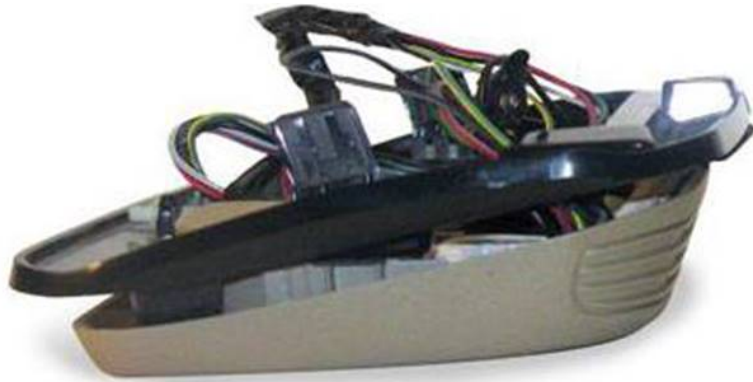


H2020 – Grant Agreement 645145



# 1




## EXAMPLE OF AN OVERHEAD CONSOLE



**STANDARD ELECTRONICS**



**PRINTED & IN-MOLD ELECTRONICS\***

-  Simplification of the assembly process
-  Reduction of weight by 70 % and cost by 50 %
-  Simplified recycling

• IDTechEx – New battlegrounds emerge for conductive inks and pastes –  
Dr. Khasha Ghaffarzadeh Aug 12, 2015

# 2

## SHORT PRODUCTION CYCLE TIMES WITH C-RTM PROCESS AND ELIUM® RESIN



More than 20% less scrap compared to classical composite processes

ARKEMA CHOMARAT  
INNOVATIVE CHEMISTRY  
Notre monde est textile

HUTCHINSON

faurecia

RENAULT



HEXION

PEI  
Pinette Emidecau Industries

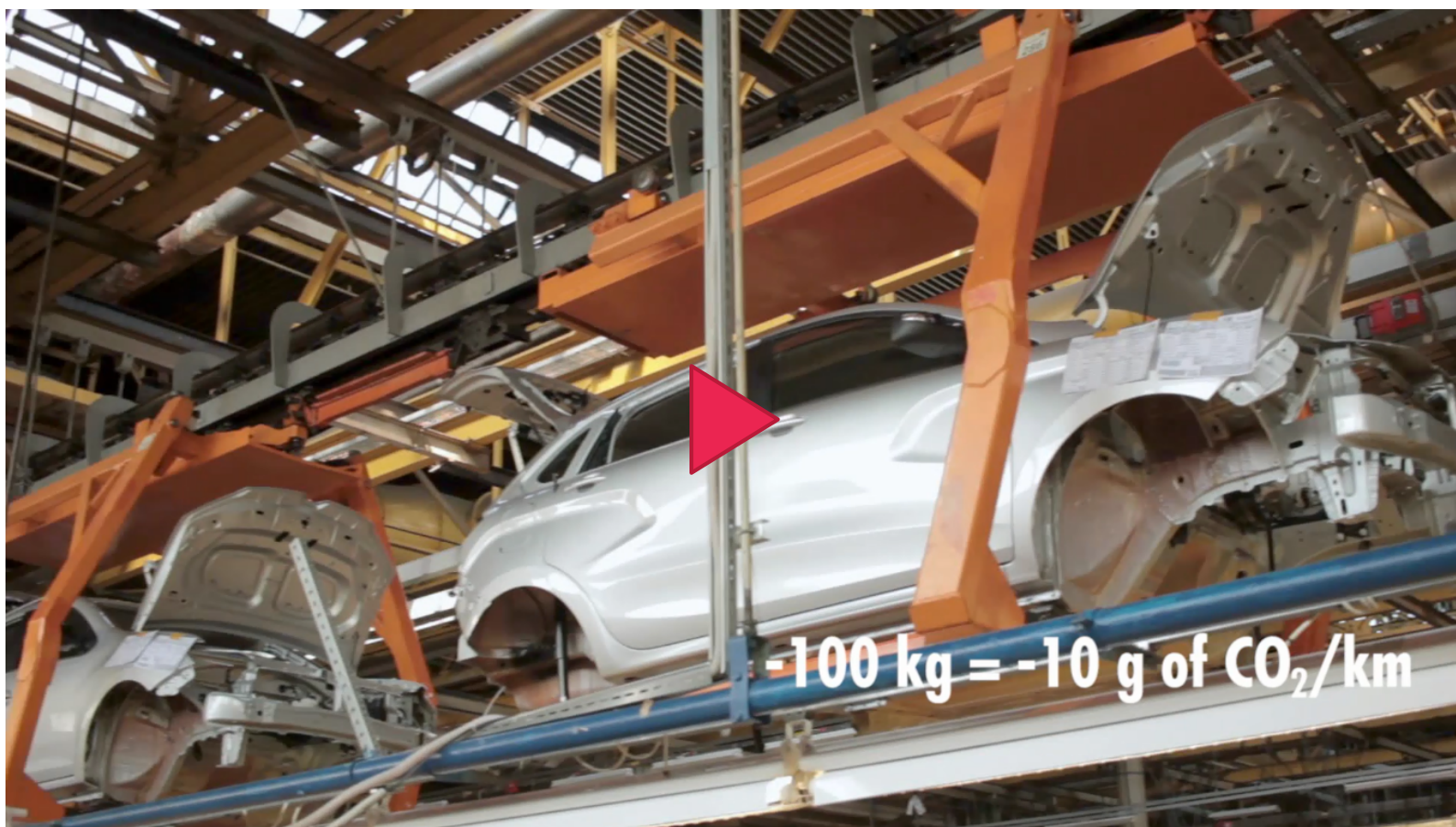
compose  
tooling expert

S.I.S.E.

IS  
INSTITUT de SOUDURE GROUPE

IRT  
INSTITUT de RECHERCHE TECHNOLOGIQUE ET PROCESS  
MATERIAUX de HAUTES PRESSIONS  
m2p

## C-RTM PROCESS WITH ELIUM<sup>®</sup> RESIN



**3**

**WIND ENERGY**



❖ **1 million tons of wind rotor blades/year at end-of-life from 2030 onwards**



**Need to introduce more sustainable solutions**

- Reduce the number of materials used to manufacture wind rotor blades
- Develop thermoplastic solutions for wind blade recyclability
- Increase lifetime of the blades (>25 to 30 years)
- Up to 25% gain in blade manufacturing productivity



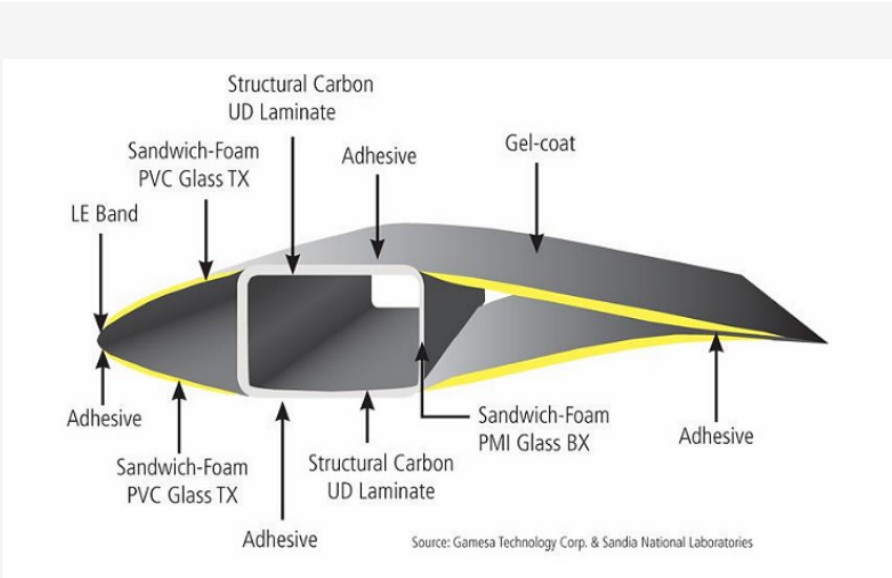
**Recyclability**

- Mechanical grinding, compounding and formulation leading to new Thermoplastic material
- Elium® composites back to monomer + fibers by thermolysis.

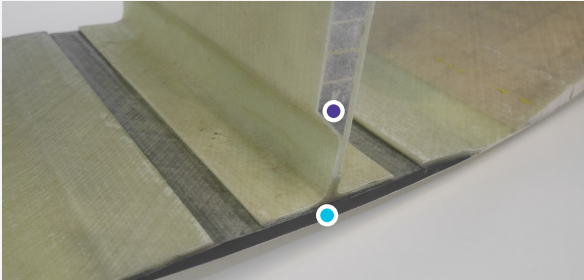
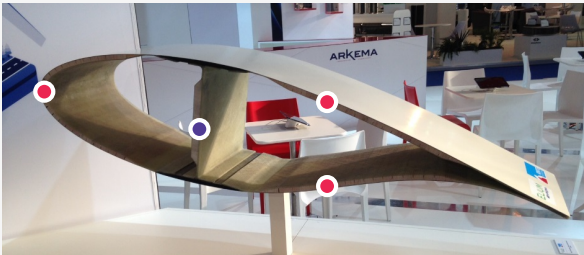
# 3

## NEW WIND TURBINE ROTOR BLADE DESIGN FOR SUSTAINABILITY

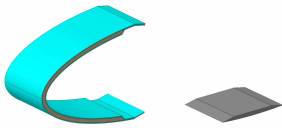
### TODAY



### TOMORROW



- Elium® GF/balsa wood sandwich skins
- Elium® GF/PET foam sandwich shear webs
- Elium® Carbon Fiber pultruded sparcap



Up to 10% weight reduction with this new technology



## RECYCLING ELIUM®

