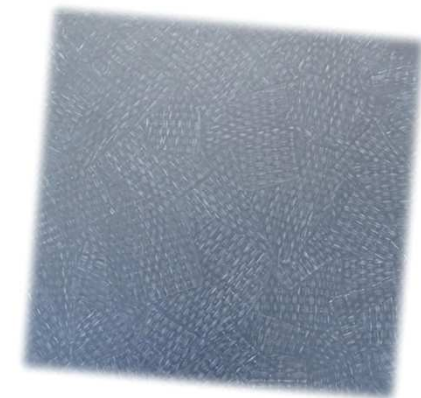


The plastics & composites : WASTE OR RESOURCES ?



THERMOSAÏC® , patented technology for recycling composite materials



Paris, May 10-11, 2016



THERMOSAİC® , patented technology for recycling composite materials

Summary

1. General information about composite materials...
2. End-life composites : technical solutions
3. Thermoset vs thermoplastic composites : which trends ?
4. Thermosaic® process : a technical / economical solution for thermoplastic composite waste ?

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1. General information about composite materials...



Transport



Design



Aeronautic



Medical

What is composite a material ?

A material made from long fiber reinforcement combined to a polymeric matrix, with high mechanical properties.



Sport/leisure



Building



Energy



Electrical equipment

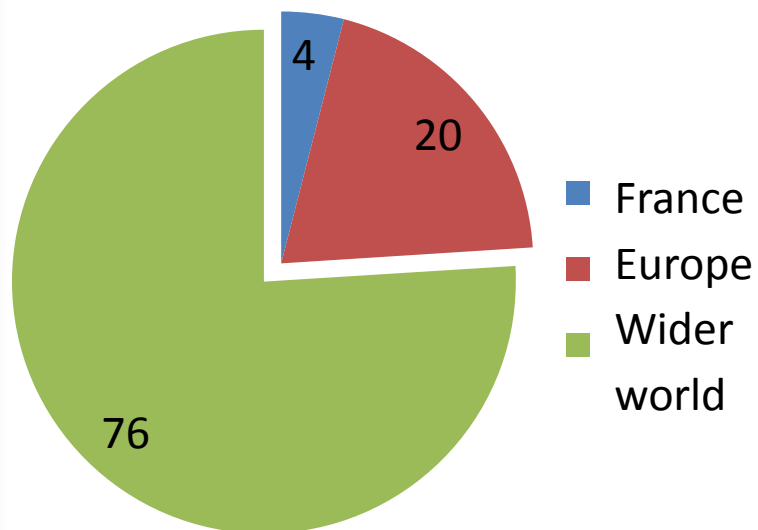


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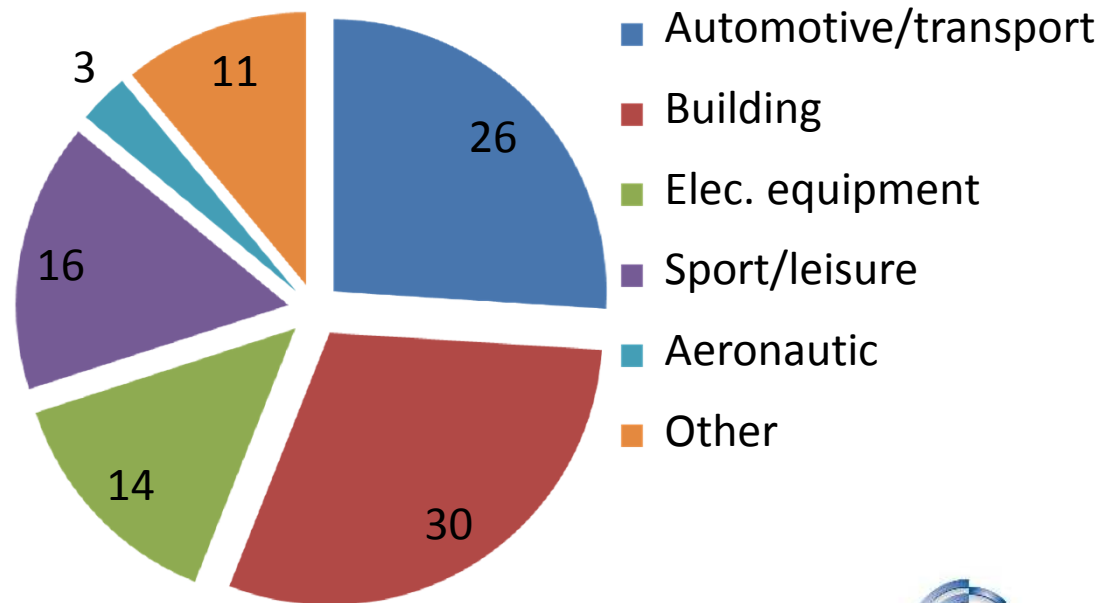
1. General information about composite materials...

World's production : 8,7 million tons/year

Geographic distribution



Breakdown by activities



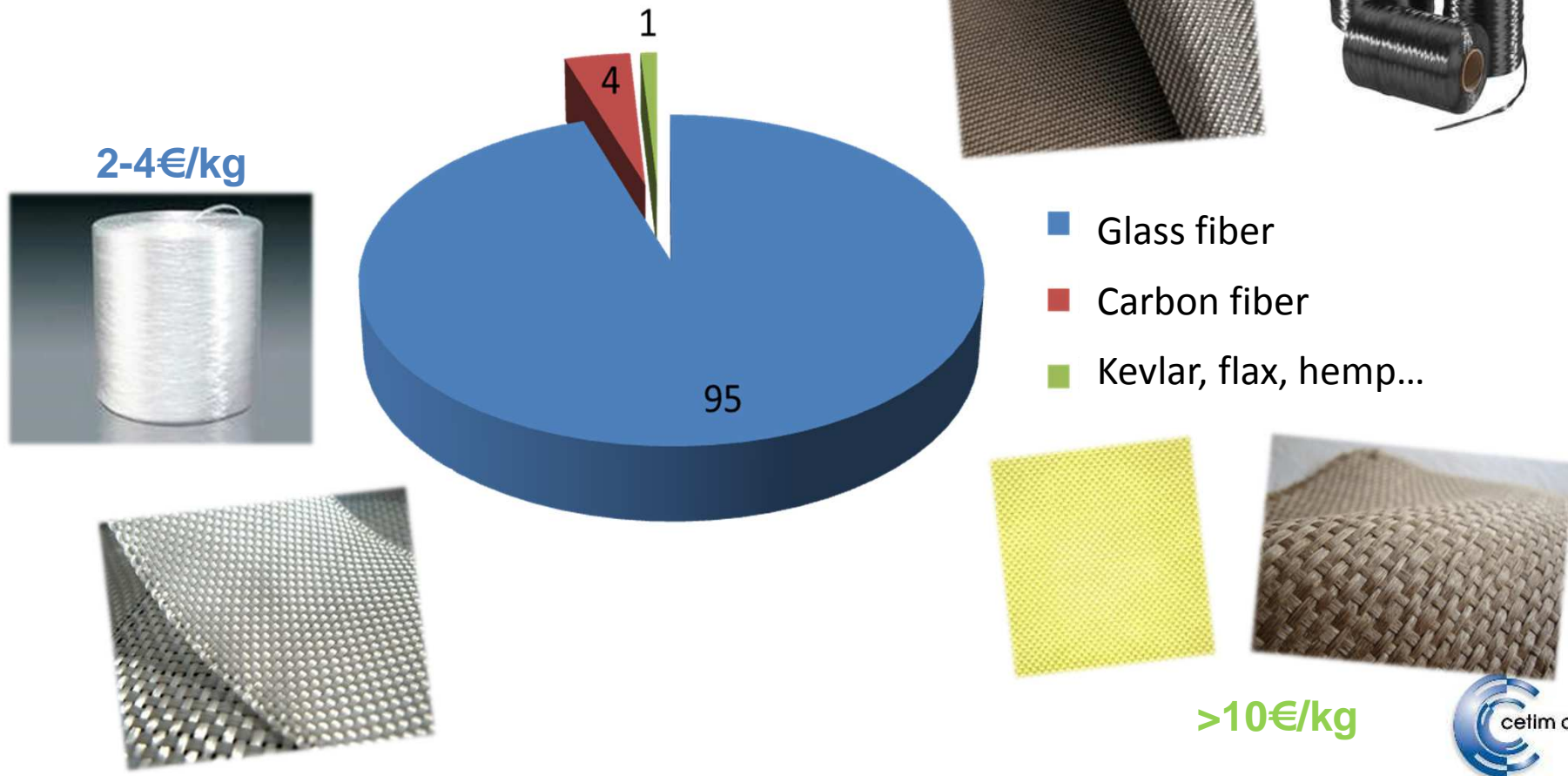
Source : JEC 2013



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1. General information about composite materials...

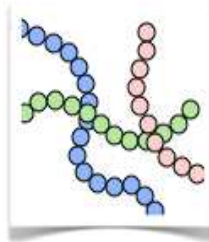
Which reinforcement ?



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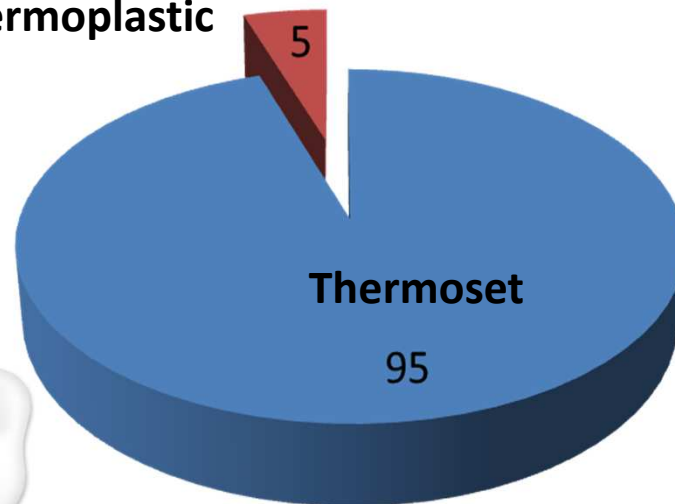
1. General information about composite materials...

Which matrix ?

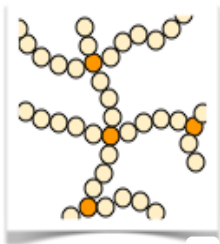


Thermoplastic = **meltable matrix** (entangled polymers)

Thermoplastic



- Thermoset (polyester, epoxy...)
- Thermoplastic (PP, PA, PEEK...)

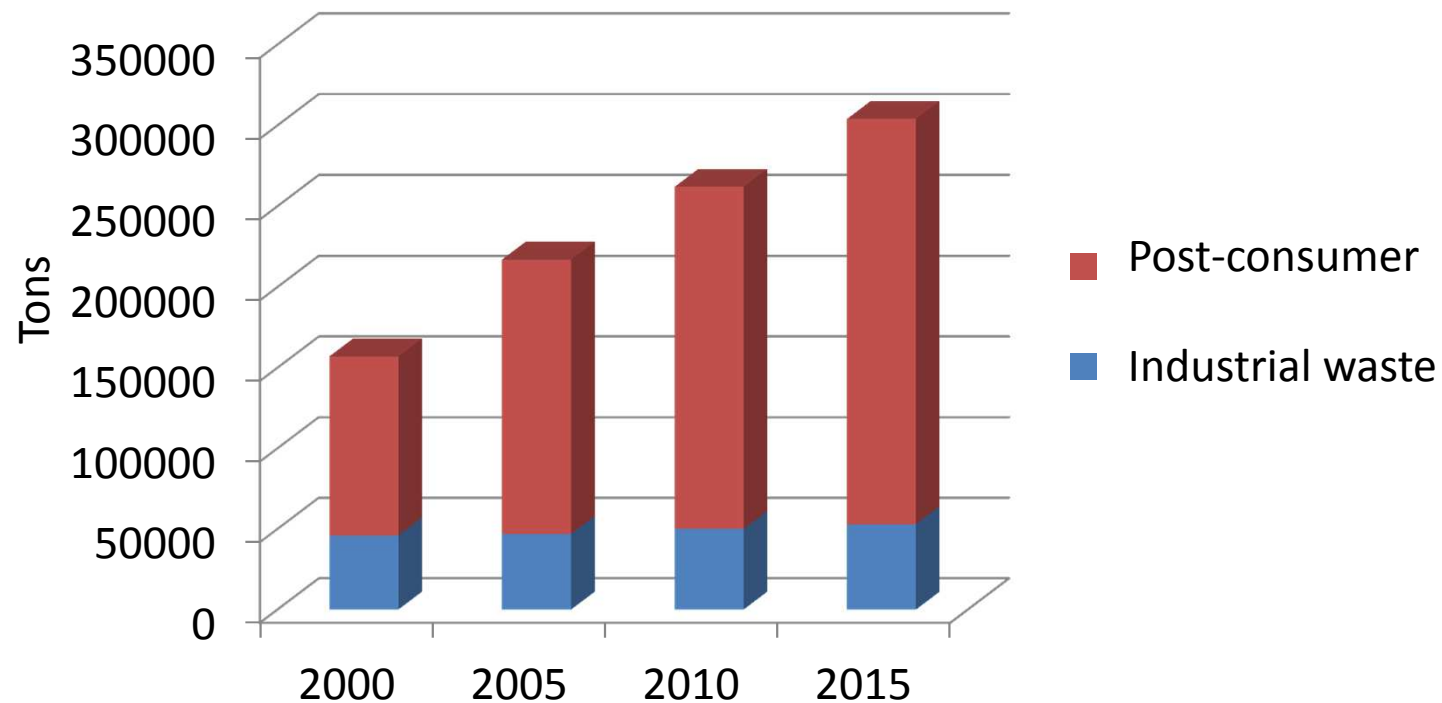


Thermoset = **Non meltable** (crosslinked polymers)

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1. General information about composite materials...

Composite waste in Europe : 0,3 million tons/year



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1. General information about composite materials...

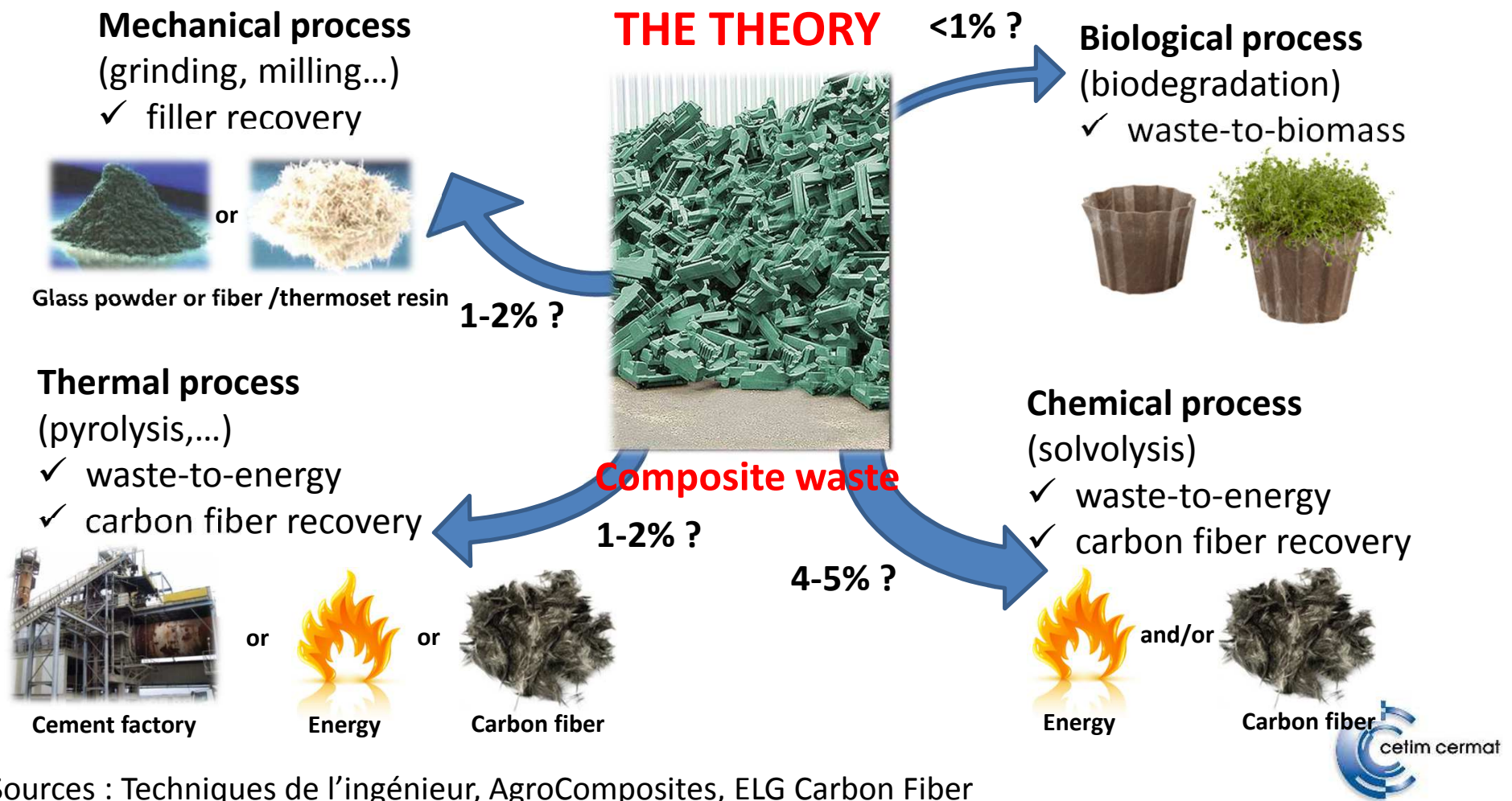
What about composite waste ?



1. A **cheap** and **non meltable** polymer (polyester), combined to a **cheap** reinforcement (glass fiber).
2. A **growing** field.

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2. End-life composites : technical solutions



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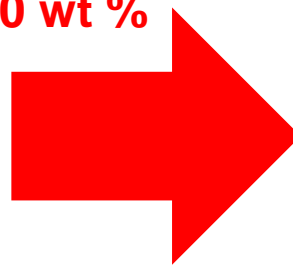
2. End-life composites : technical solutions

THE REALITY



Composite waste
(95% thermoset matrix)

90 wt %

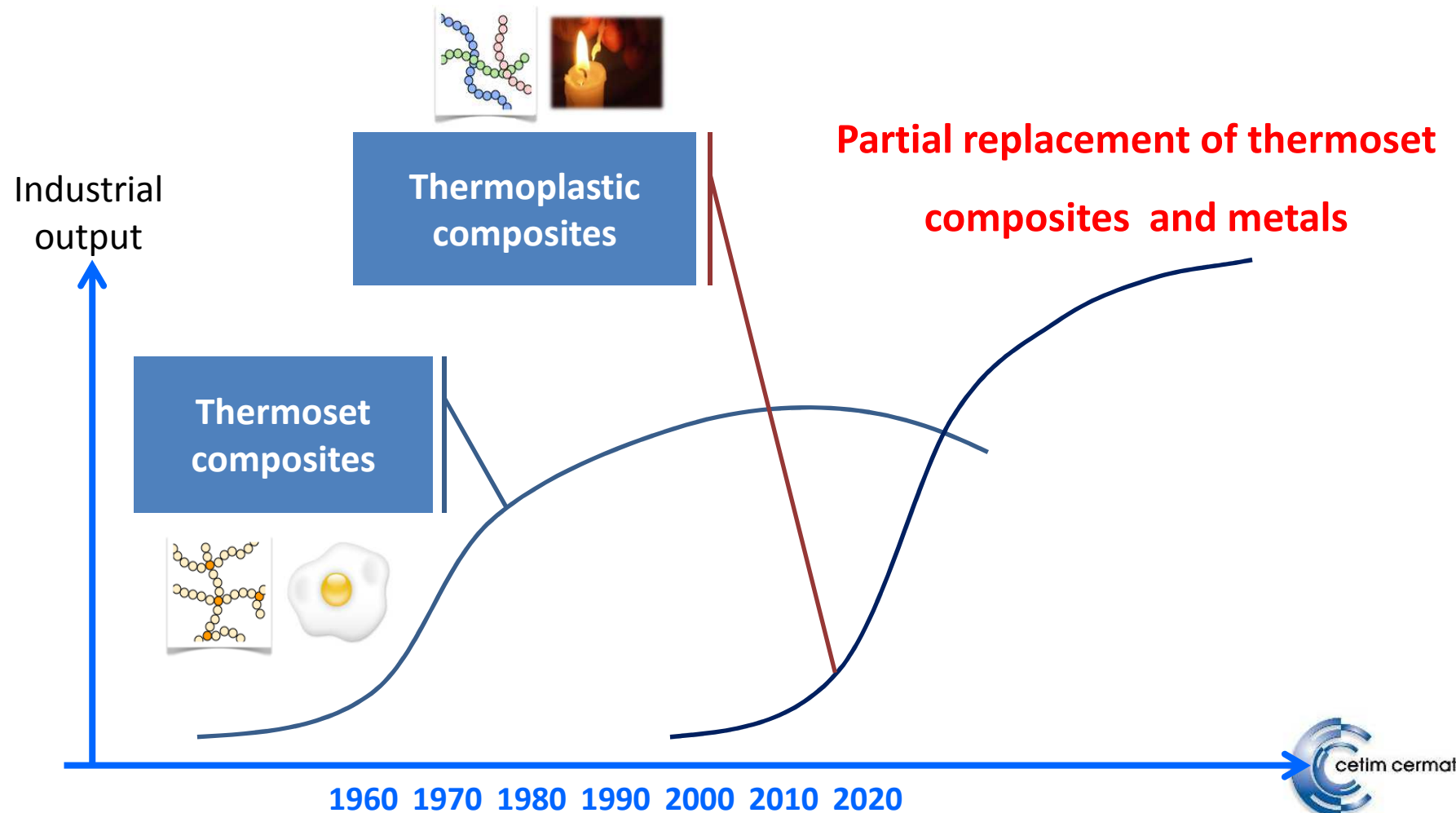


« Landfill process »

Except for carbon fiber recovery (25-30€/kg, but 4-5 wt % of the market) NO ECONOMICAL/TECHNICAL SOLUTION FOR THERMOSET COMPOSITE WASTE !

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3. Thermoset vs thermoplastic matrix : which trends ?



THERMOSAİC® , patented technology for recycling composite materials

3. Thermoset vs thermoplastic matrix : which trends ?

Thermoset matrix

Advantages :

- ✓ Cost effectiveness
- ✓ Long-life material

Disadvantages :

- ✓ VOC released while processing
- ✓ Complex mechanical assembly
- ✓ Long cycle time
- ✓ Low recyclability

Thermoplastic matrix

Avantages :

- ✓ No VOC released while processing
- ✓ Easy mechanical assembly
- ✓ Short cycle time (QSP®, Cetim)
- ✓ **Recyclability (Thermosaic®, Cetim-Cermat/Cetim)**
- ✓ Thermoplastically deformable

Disadvantage :

- ✓ Limited industrial maturity

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3. Thermoset vs thermoplastic matrix : which trends ?



IXIS® 157



Thermoplastic composite, a growing industrial offer...



Carbostamp



Celstran® CFRTP



VIZILON



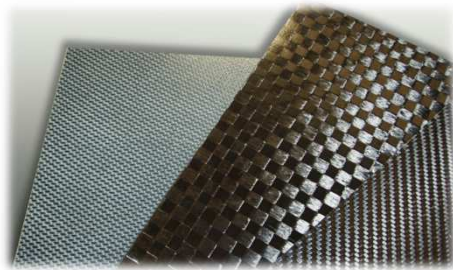
GMT
GMTex®

SymaLITE®



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3. Thermoset vs thermoplastic matrix : which trends ?

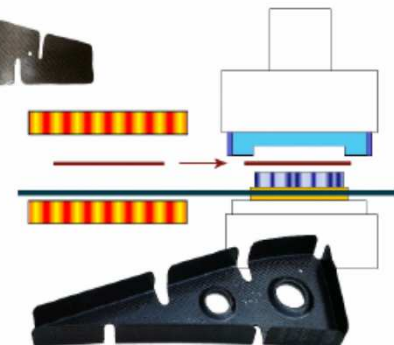
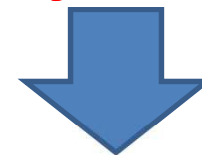


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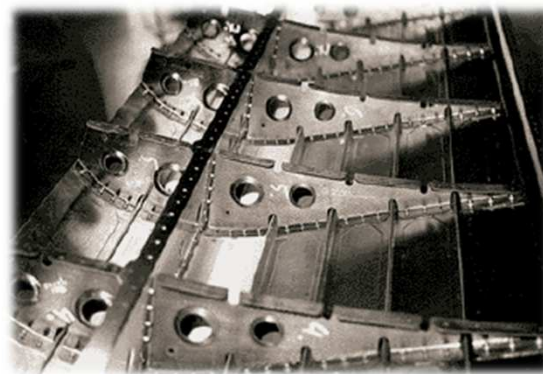


Cutting

of semi-finished products, easily formable...



Stamping



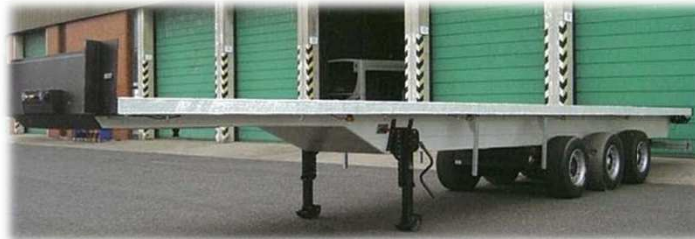
Welding

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3. Thermoset vs thermoplastic matrix : which trends ?



Boat's hull (2Win)

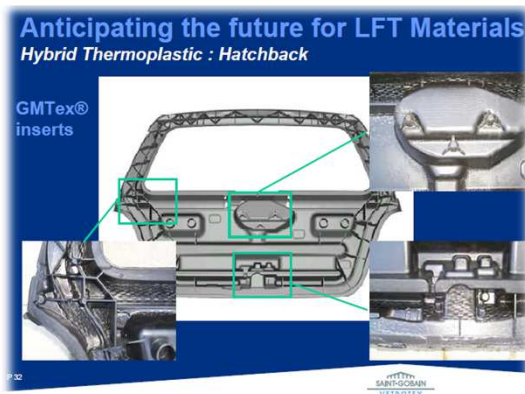


Trailer (EPL)



Bumper crash beam (CQFD)

...for a growing applications...



Tailgate (Saint-Gobain)



Side intrusion beam (DuPont)



Aircraft wing element (Fokker)

...



THERMOSAİC®, patented technology for recycling composite materials

3. Thermoset vs thermoplastic matrix : which trends ?



**...and a growing
industrial waste and
end-life products !**



THERMOAIC®, patented technology for recycling composite materials

4. Thermosaic® process : a technical / economical solution for thermoplastic composite waste ?

- ✓ High mechanical performance
- ✓ Favourable environmental balance
- ✓ Cost-effectiveness



Patented process



THERMOSAÏC®, patented technology for recycling composite materials

In partnership with



Institutional partners / financiers





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