



TRANSFORMING  
THERMOSET COMPOSITE  
AND  
FIBREGLASS WASTE  
INTO  
VALUABLE RECYCLABLE PRODUCTS

- Thermoset composites
  - ◆ polymers that cure via an irreversible chemical reaction under heat and pressure; once formed they cannot be remoulded or reshaped;
  - ◆ Not : thermoplastics !
  - ◆ Advantages : insoluble and infusible high density networks;
  - ◆ Thermosets are used in large volumes all over the world for multiple sectors and thousands of applications.
  
- Fibreglass
  - ◆ Many factories all over the world (main production entities in Belgium are Lanxess and 3B Fibre Glass);
  - ◆ All composite production facilities (thermosets and thermoplastics) use fibre glass and consequently have waste streams
  
- Other : elastomers, shoes, mixed thermoplastics

### Type polymers

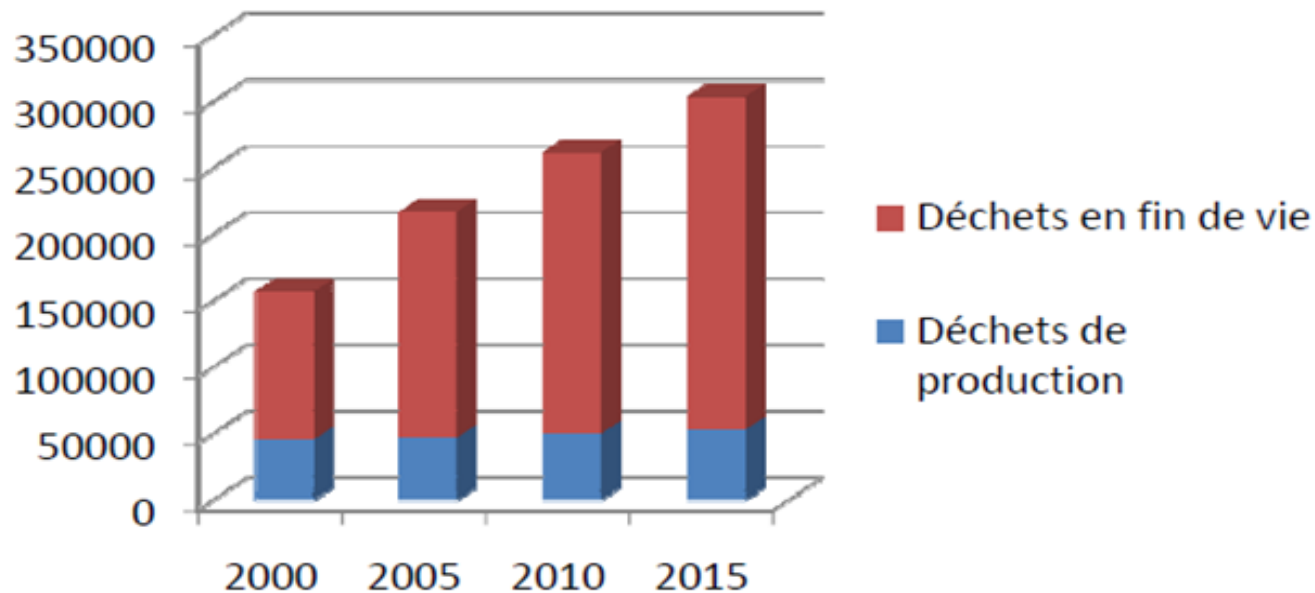
- Bis-Maleimids (BMI)
  - Epoxy (Epoxide)
  - Phenolic (PF)
  - Polyester (UP)
  - Polyimide
  - Polyurethane (PUR)
  - Melamines
- ... with or without  
reinforcement of fibres  
(carbon, glass, bio, ...)*

### Applications

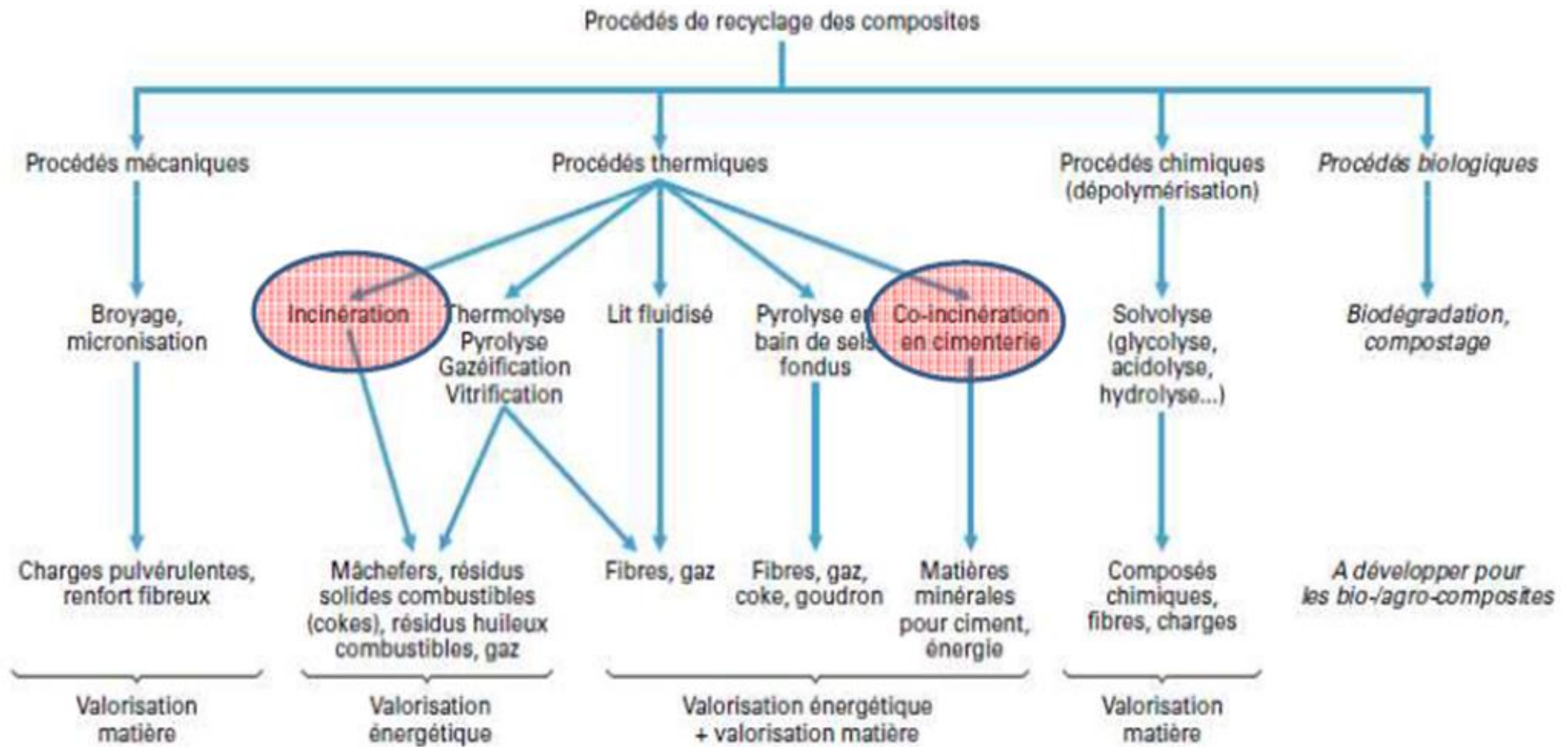
- Boats
- Wind turbine blades
- Cars
- Planes
- Pipes
- Silos
- Dishes, dinner sets
- Sport
- Construction

## Waste volumes afval (estimation)

- > 90% of thermoset waste is subject to landfill or incineration; no recycling solution
- Yearly increase of production and especially End of Life waste in thermosets;
- Many attempts over the last 20 years : mechanical grinding (used as filler); cement kiln route; pyrolysis; solvolysis, ...
- Results are disappointing as far as closed loop recycling is concerned
- No economical viable and ecological preferred solution exists today



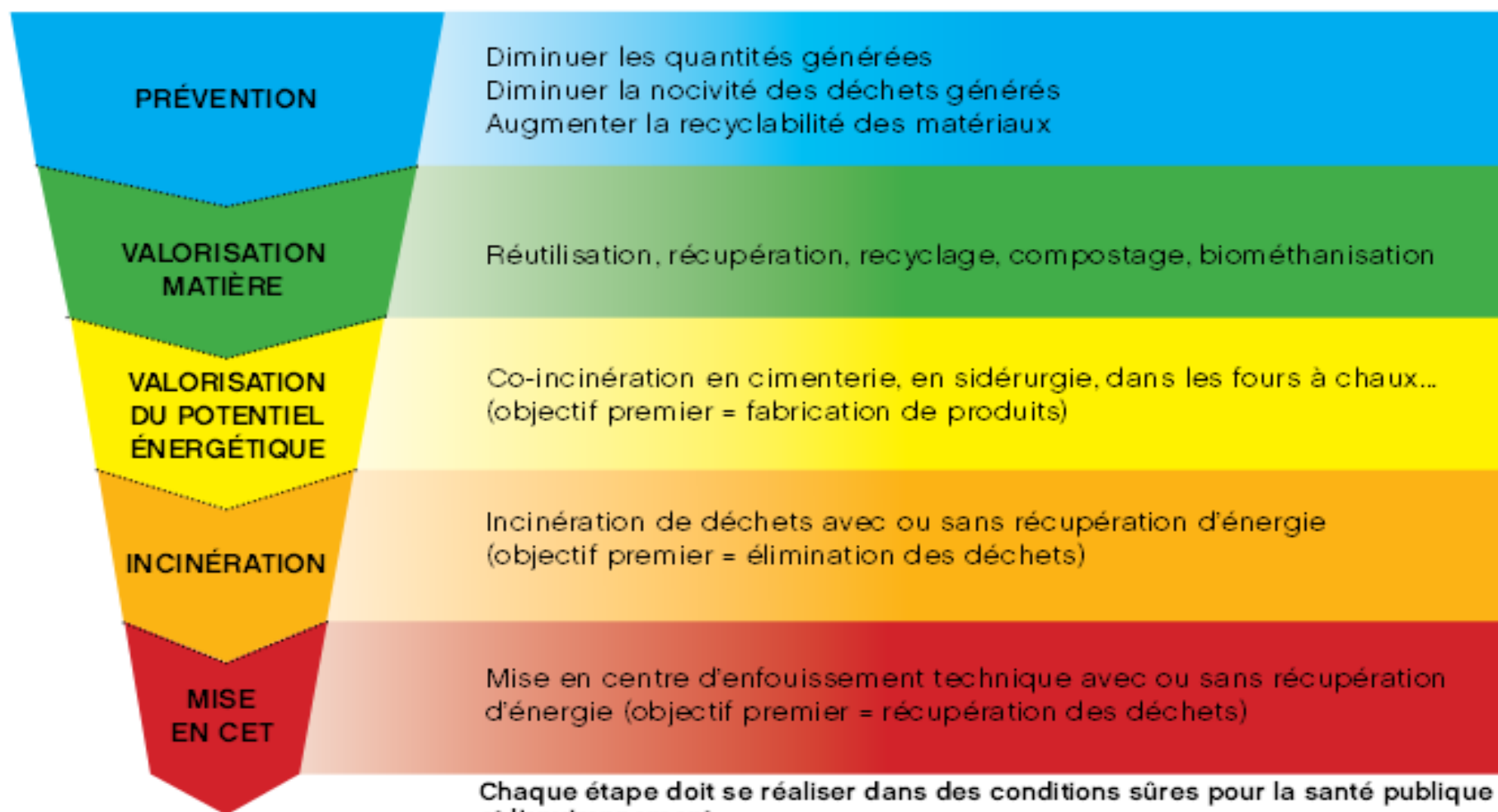
# Valorisation techniques for composite waste streams



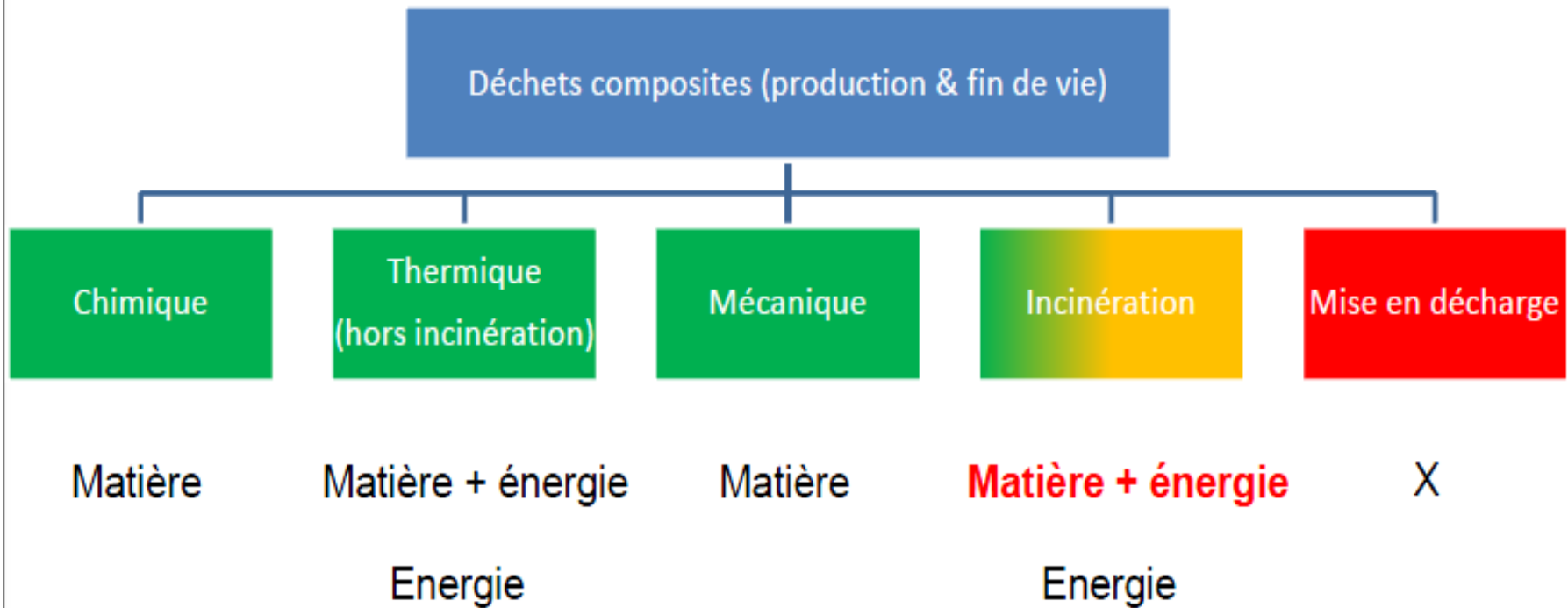
Source : Techniques de l'ingénieur



## PRIORITÉS POLITIQUES



[illustration : source : EEW 2005]



**A ce jour, 90% des déchets de production en composites à matrice thermodurcissable sont mis en décharge...**







# REPROCOVER

## Upcycling solution

- Break
- Shredder
- Dry
- Mix
- Transform
- Press



- 100% of the waste is recycled
  - 70% thermoset composite waste
  - 30% fiber glass waste
- no production waste; full recycling including dust
- cold process = CO<sub>2</sub> neutral
- output (finished products) = 100% recyclable following the same process and *ad vitam eternam*

## Material:

### *Technical and functional specifications*

- ✓ extreme hardness (Shore D = 75 and more),
- ✓ load capacity from A15 till D400,
- ✓ high anti-skid resistance,
- ✓ noise damping capabilities (5db),
- ✓ shock and temperature resistant (-70° /300° ),
- ✓ rust proof,
- ✓ no electric conductivity,
- ✓ low weight (compared with concrete) density 1.3,
- ✓ resistant to salt, petrol products and chemical detergents,
- ✓ maintenance free, long durability,
- ✓ highly isolating (lambda factor equal to 0.07),
- ✓ valueless for thieves,
- ✓ non-flammable (M1 - NF P 92-501= A1),
- ✓ low smoke density and non halogen smoke (F1),
- ✓ high fire resistance & thermic values

## MATERIAL :

### *from a product/commercial perspective*

- Challenge is to find products that are competitive with other materials regardless the fact that they are made out of recycled materials
- Only competitive with concrete, wood, plastic, rubber, metal etc if we can take advantage of a specific characteristic of the material in given circumstances.
  - eg concrete sleeper is cheap and ok but not for switches or bridges; anti skid for covers if concrete is the standard application and people need to walk on it; inflammability for level crossings in tunnels if rubber is the standard ...
- Market is only interested in price and quality; ecological element is irrelevant for procurement purposes; recycling is considered a plus once product is approved;
- New sales & distribution model based on circular economy and cradle to cradle concept
  - Use your own waste as a resource for products you need anyhow ....
- Need to find markets that are recurrent, imply large volumes and are simple/straight forward - most of these markets fall within the public sector – takes time to get in; but once in = referenced in public tenders
- We do not know yet what applications are possible – portfolio will grow but we cannot populate the world with street furniture - cfr thermoplastic recycling business

- Focus : Utility market and rail infrastructure

### ➤ UTILITY

#### 1 Water

- Manhole covers
- Hydrant + Frames
- Butterfly Water valve



## 2. Gas

- similar products as water - sizes may differ
- new products : eg cover for gas tubes above 40 cm (currently tested)

## 3. Electricity (& telecom)

- Similar products as above

### ➤ **RAIL** (Train, tram & metro)

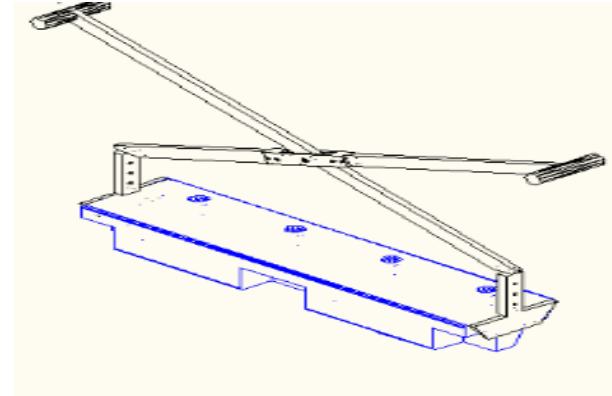
- Cable gutter + covers (different sizes)
- Level crossings
- Train sleepers
- Adjustments for stations
- Boards/floors for train waggons



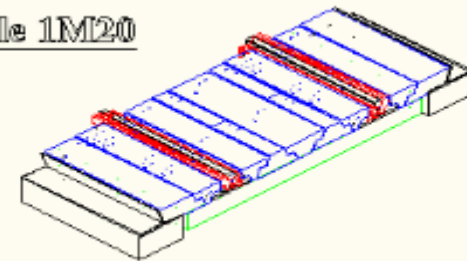


## Level Crossings

- Modular system – lego structure ; easy to install,
- No machinery, no specific equipment required,
- All traffic loads,
- Useable on all type of railway sleepers;
- Easy access to rail for maintenance purposes,
- Not burnable (A1), good fire resistance,
- High anti skid,
- Resistant to pressure and temperature changes ( - 70° /300° ),
- No electric conductivity,
- Fully recyclable,
- Competitive pricing



module 1M20

















## Cable gutters (covers)

- Currently producing covers on concrete gutters of Infrabel in different sizes
  - no loss or damage during transportation or placement;
  - half of the weight of concrete (density 1.3)
  - high anti skid
  - not burnable (A1)
  - no halogen smoke (F1)
  - different load capacity types
- Request for producing the gutters to replace concrete but also plastic ducts

