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REFRESH

GEES RECYCLING

RE CREATE

RECREATE Conference: EU Composites Advantage Unveiled

Wind blades recycling : Our experience in circular economy

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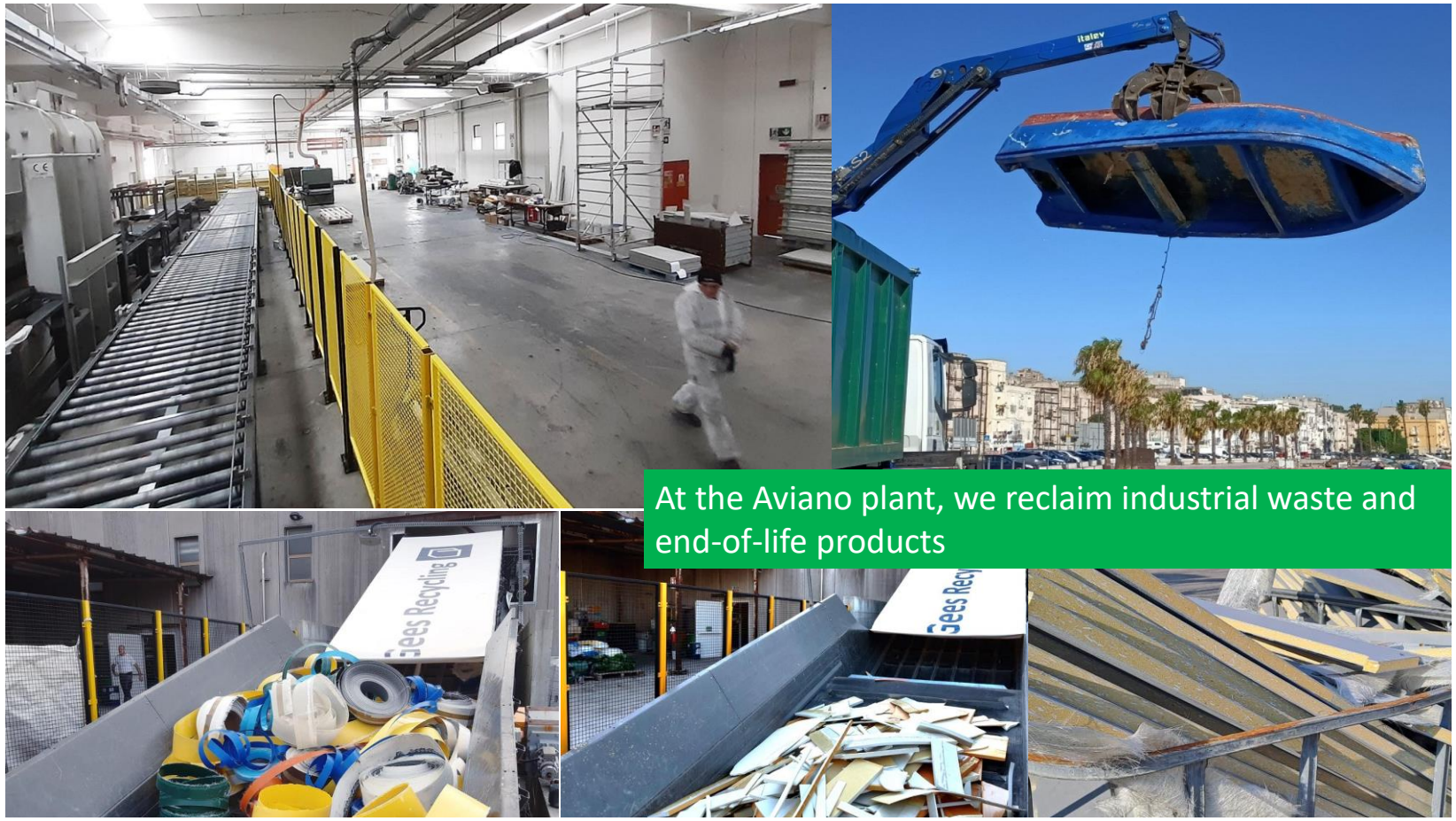
Horizon Europe
101096858

Gees Recycling has developed a mechanical recycling process for composites of any kind , rigid foams , core materials and other waste like x-linked thermoplastics



At the Aviano plant, we reclaim industrial waste and end-of-life products

We are authorised industrial recyclers with >1800 t/y processed

In operation with our EU and World Patents since 2015, Industrial operation since 2018

Gees is one of the few realities in Europe where is possible to send truckloads of composite waste to have them transformed in new products.

Wind blades : In practice the root and wing are two different products

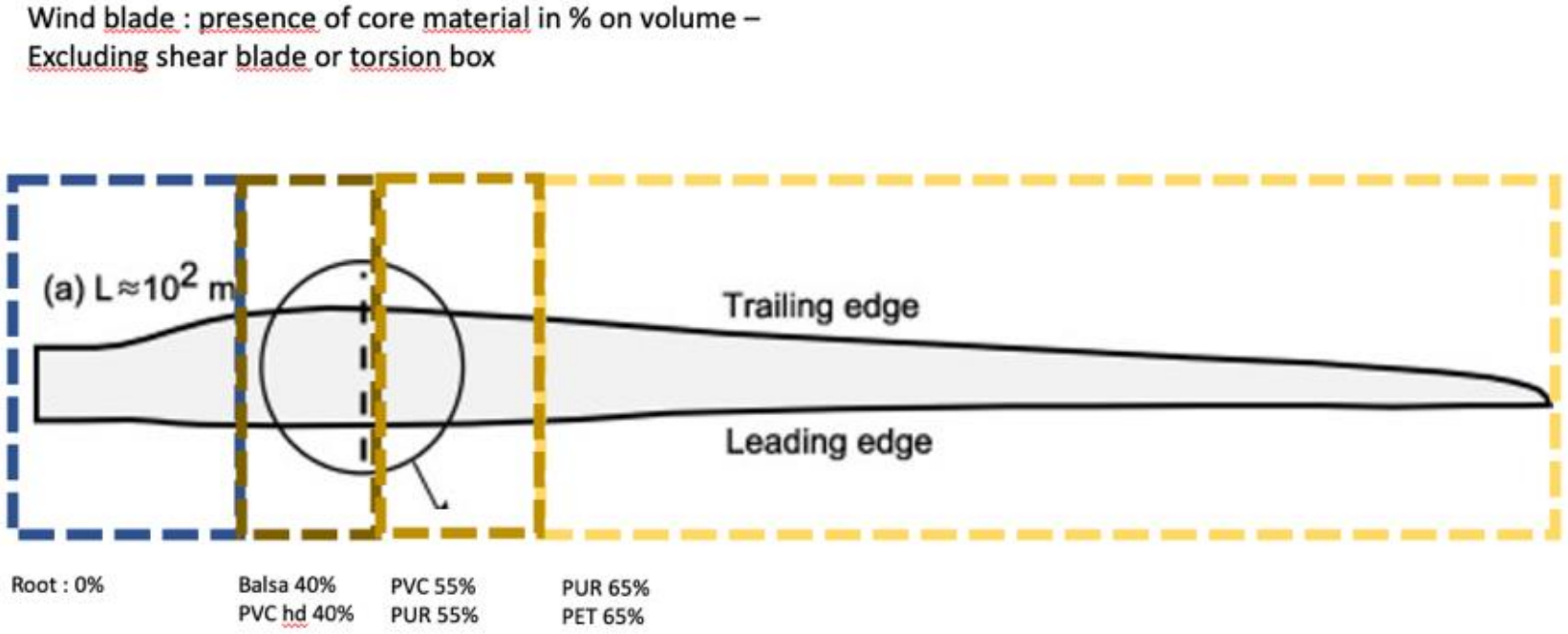


Figure 5 - Core material in blades - Giorgio Betteto

Presence of Carbon fiber in sparcaps

The core material makes the difference – also in recycling of blade

Figure 4 - Shredded and granulated blades - Gees Recycling

Left : Coarse shredding Centre : heaviest fraction Right : lightest fraction

Core Material makes

- Much less interesting – if not forbidden the use in cement kilns .
- Lower the production output by >70% in any thermochemical process like pyrolysis or solvolysis – Reactors have fixed volumetry , here the density is ¼
- Complicate (much) the process , with unwanted gases , byproducts and residues , that will change on type of CM.

Something not found in literature…

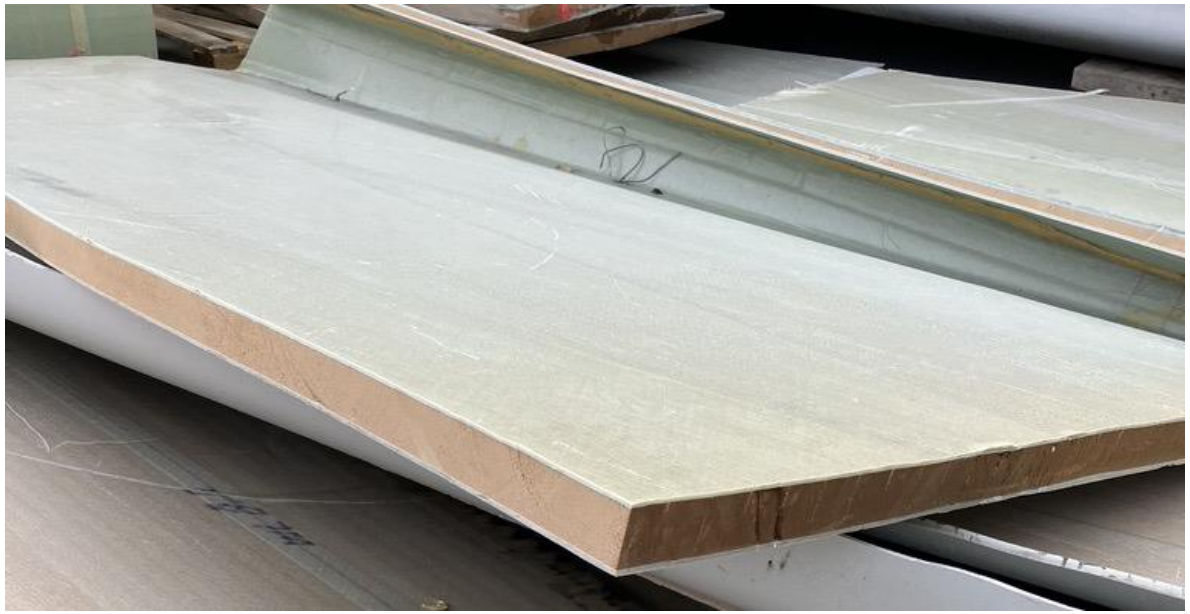


Figure 6 - Low density parts of blades - Giorgio Betteto

By volume , the core material presence in blades is significant , particularly after shredding:

Blades composition	Example Vestas V42 36 Meters						
			Specific weight after shredding				
weight of blade kg	1280		Fiberglass epoxy specific weight /S	Balsa Specific weight	Core Material specific weight		
			0,8	0,18	0,09		
Part	Material	Density	Lenght M	Weight Kg	Volume Shredded in Liters	% of volume	% of weight
Root (Blue)	Fiberglass Epoxy	1,5	5	510	637,50	**23,35%**	39,84%
Transition (brown)	Fiberglass epoxy	1,5	4	290	362,50	**13,28%**	22,66%
	Balsa / Core M	0,18	4	45	250,00	**9,16%**	3,52%
Wing connection (Light brown)	Fiberglass epoxy	1,5	27	340	425,00	**15,56%**	26,56%
	Core Material	0,09	27	95	1055,56	**38,66%**	7,42%
			Total	1280	2730,56	**100,00%**	100,00%

Table 1 - Composition of blade in volume - Gees Recycling from Wind Blade examination

These data are from our analysis , is very hard to get data from blade makers

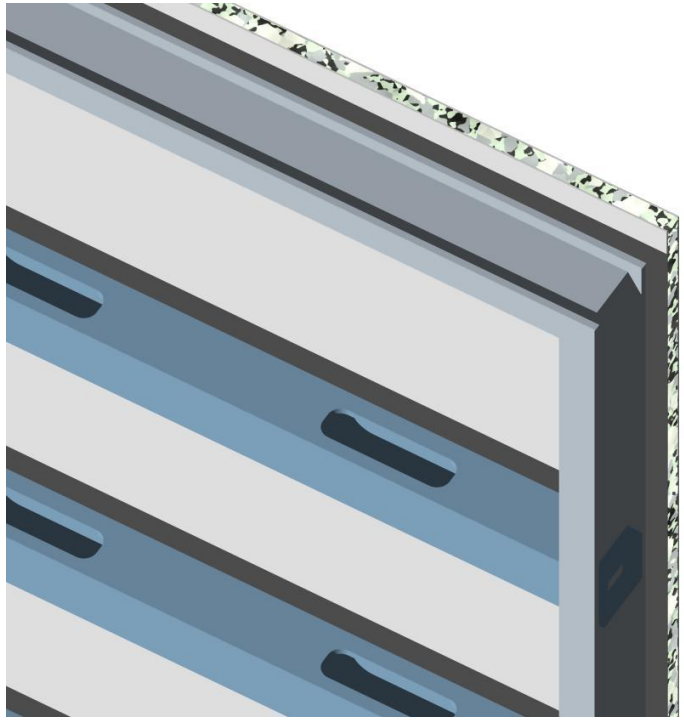
Our idea :

- Use the least interesting parts of blades , the less adapt to other recycling processes
- Transform in new materials using the RFM mechanical recycling – that was developed for composite waste regardless of resin , fiber or rigid foam type
- Exploit the low density as a value insted than a obstacle

Second part : Circular economy

Formwork panels – widely used in any reinforced concrete structure , including wind parks onshore and floating wind

Second part : Circular economy – From project to results



Formwork panels – Fully composite made – Panel from wind blades with fiberglass laminate

Reinforcing in pultruded composite with recycled content . Competitive and durable

Second part : Circular economy

Equipment Shelter

Standard dimensions 2,4 X 2 X 2,4 – 3 X 2,4 X 2,4

Outer panel in RFM recycled from wind blades

Insulation inside

Fixed structure in
Composite pultruded with recycled content

Absolutely resistent to water, weather , corrosion
Not conductive

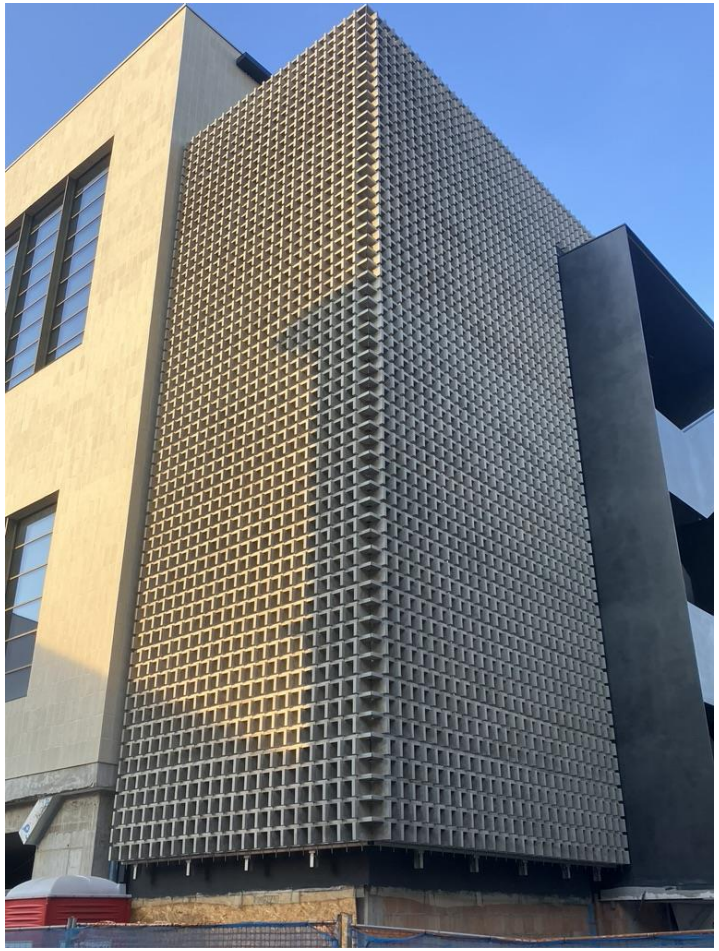
Circular economy

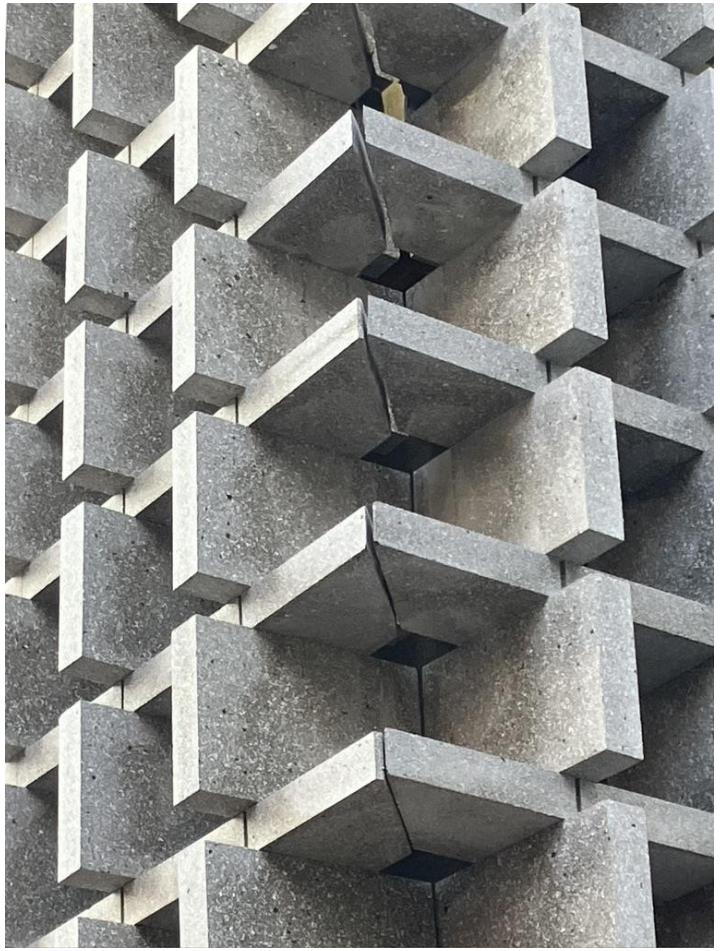
Equipment Shelter

Fully composite - >90% Recycled content

Circular economy - Building components

Recycled composites for shading facades and architectural components
40% lighter than ceramics
70% lighter than concrete
96% Recycled content





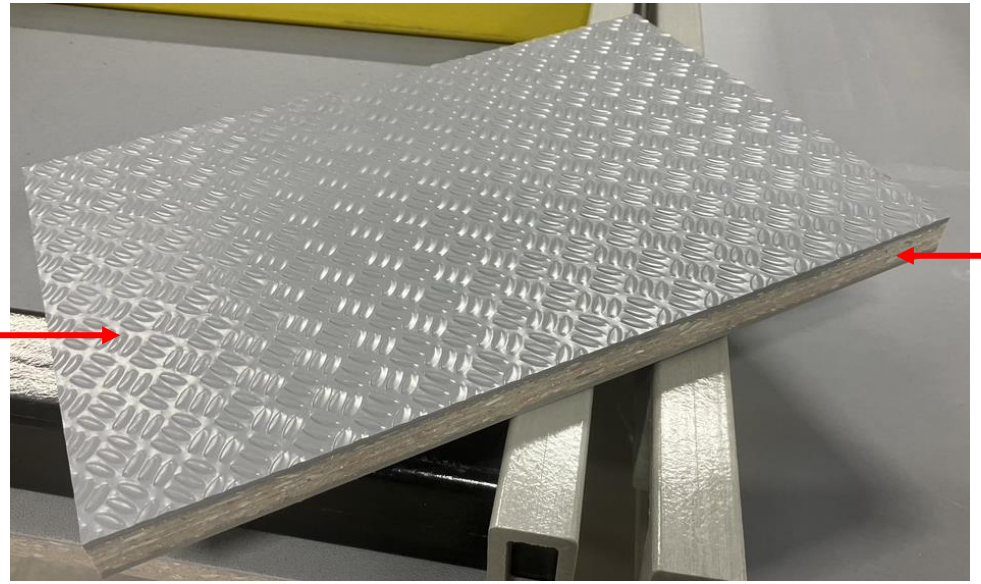
REFRESH : Synergy and cooperation as key factor

Gjenkraft

Recycled GF from pyrolysis

Glass fiber Mat

Fiberglass Laminate



GEES RECYCLING

Recycled wind blade panel as core

TOWARD A GREENER AND BLUER MORROW
ENECOLAB

Energy from dust and powders to feed the processes

Circular economy

ENECOLAB process : energy from dusts and powders to feed the recycling plants

Lab scale equipment

Pilot industrial equipment

Syngas obtained

Open to any question and request

Thanks

Giorgio Betteto

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