Interreg
Euregio Meuse-Rhine
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Development Fund

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Demo project #2

Hybrid yarns for functionalized composites

Lead partner: Centexbel

Wallonie
provincie Limburg
Provincie Noord-Brabant
Ministerie van Economische Zaken en Klimaat
CENTEXBEL
sirris
LIÈGE université
FLANDERS MAKE
AMI Biobased Materials
Fontys University of Applied Sciences
AMAC Advanced Materials Advisory & Consultancy

Motivations

- Hybrids yarns (thermoplastic or metalic based) have several advantages:
  - Thermoplastic: out of autoclave process (decrease the prise) / Higher recyclability / Heat sealing / Easy to stock
  - Metallic: electrical and heat conductivity, electromagnetic shielding

- Three demonstrators are planned:
  - Composite made by hybride yarn based on Glass fibre and polypropylene
  - Composite with elctromagnetic shielding layer based on basalte fibre coated with aluminium
  - 3D printing modulable mold

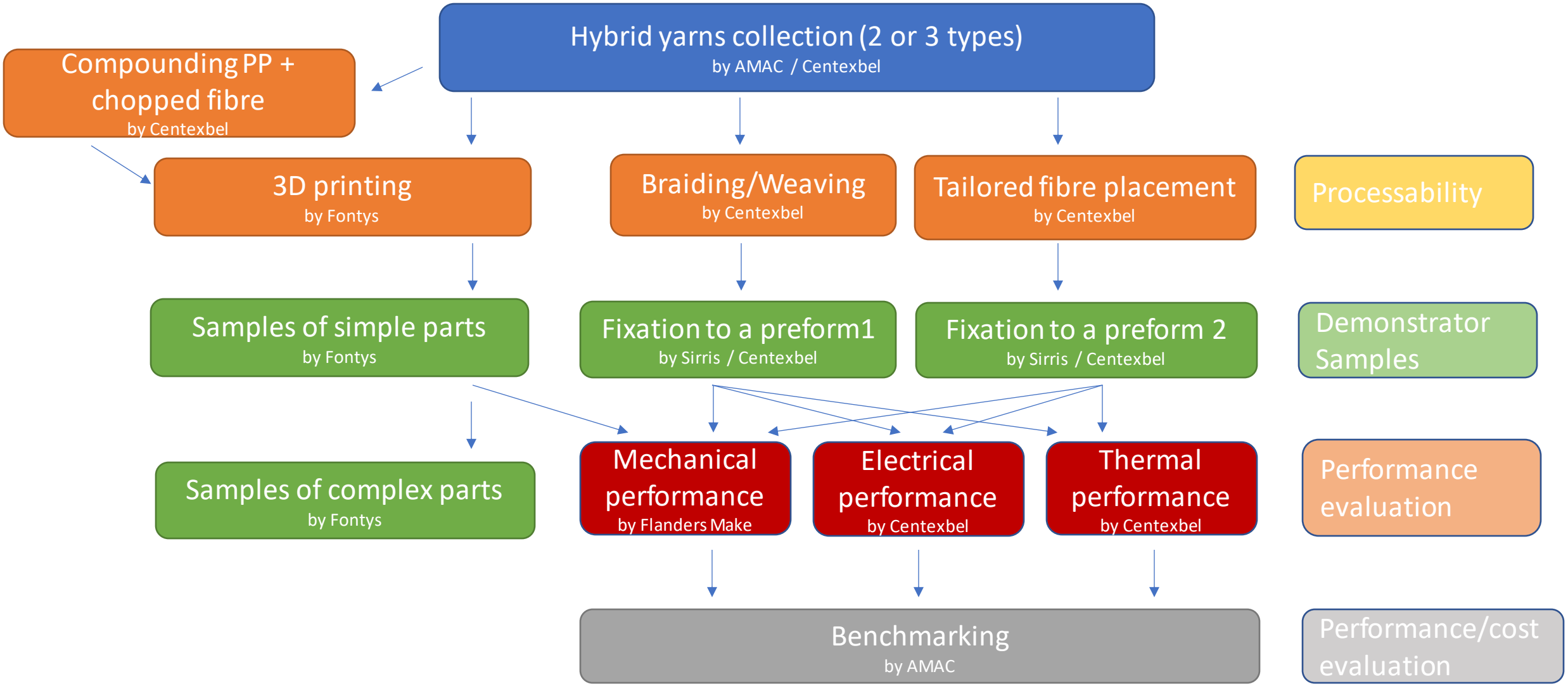
Goals of the demonstrator

- Provide some samples of composite made by using hybride yarns and compare cost/performance with classic fabrication

- Provide a cheaper solution in mold fabrication compare with current aluminium molds with the same surface aspect and cooling/heating possibility.

- Demos are dedicated to produce composite with functionnality as EM absorption, electrical conductivity, thermal conductivity

Tasks & Workplan



Current status

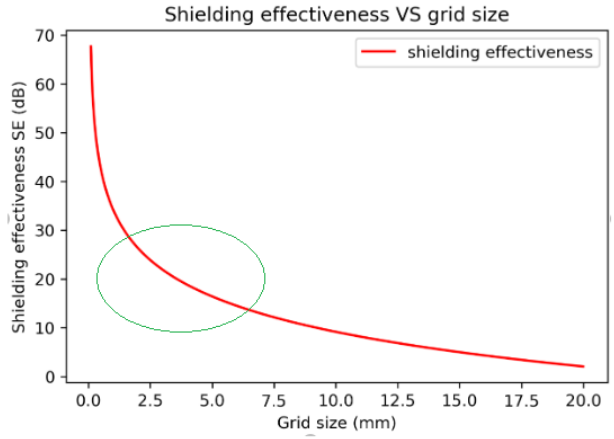
- Hybrid yarn identification:
  - Hybrid glass fibre commercially available from Jushi (Compfil)
  - Basalt fibre coated aluminium from Fibrecoat / Carbon plated with Nickel
  - Glass fibre coated polypropylene from Fibrecoat (available at semestre 2)
  - Others could be possible: Comfil products, Shappe Technics products,…

- Material processability:
  - Tailored fibre placement technics will be used to process structures with EM shielding (possibility to weave)
  - Thermo-pressing will be used as consolidation stage (autoclave could be also used)
  - Balaste coated aluminum fibre must be cut to be used in additive manufacturing machine (0,3-0,5mm lenght)

Current status

- Example of Electromagnetic shielding properties: 2 GHz frequency (4G smartphone)

Type	Grade	Shielding effectiveness (dB)	Classification	Electromagnetic shielding, ES (in %)
Class I Professional use	AAAAA	SE>60 dB	Excellent	ES>99.9999%
	AAAA	60 dB≥SE>50 dB	Very good	99.9999%≥ES>99.999%
	AAA	50 dB≥SE>40 dB	Good	99.999%≥ES>99.99%
	AA	40 dB≥SE>30 dB	Moderate	99.99%≥ES>99.9%
	A	30 dB≥SE>20 dB	Fair	99.9%≥ES>99.0%
Class II General use	AAAAA	SE>30 dB	Excellent	ES>99.9%
	AAAA	30 dB≥SE>20 dB	Very good	99.9%≥ES>99.0%
	AAA	20 dB≥SE>10 dB	Good	99.0%≥ES>90%
	AA	10 dB≥SE>7 dB	Moderate	90%≥ES>80%
	A	7 dB≥SE>5 dB	Fair	80%≥ES>70%



Current status

3D manufacturing mold:

- AM Flexbot printer for composites (CEAD): combine 3D and milling to achieve the required surface finish
- PP matriw with a mix of chopped FG and FG coated aluminum: length between 0,3-0,5 mm
- Work plan in 3 steps:
  - Flat plate to measure mechanical and thermal behaviour with and without surface milling
  - flat test piece with different shape and size of cooling channels
  - 3D printed modular mold with integrated heating/colling chanels

Thank you!

DEMO #2 Leader

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