LE CENTRE TECHNOLOGIQUE
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RECYCLING Elium® GLASS FIBERS IN PMMA THERMOPLASTICS

During the past years, recycling of thermoplastics has attracted the interest of the plastics industry. The recyclability is one of the advantages of these raw materials. On the other hand, for other materials such as thermosets, the creation of an irreversible three-dimensional network makes recycling more complex. The recycling solutions are therefore different: mechanical, thermal or chemical.

The actual context is increasingly prompting industrials to work on the topic, whether on the production or on the end-of-life of wastes. Raw material's suppliers are looking for solutions to promote their products by communicating on the recyclability potentialities.

The classic way to recycle composites is mechanical grinding. Large structural parts are pre-cut into pieces and then crushed by knife mills, reaching dimensions that can be reused in extrusion processes.

In this context, CANOE platform is working on recycling this type of material, and in particular on the acrylic resin Elium® loaded with glass fibers.
CANOE has been working on the reintroduction of recycled materials from the manufacture of a wind turbine blade made with Elium® glass fibers reinforced resin:


Figure 1: A wind turbine blade made with glass fibers infused Elium® - Grinded scraps

Since Elium® resin is an acrylic base, it is therefore intuitive to mix it with compatible thermoplastic matrices such as ABS or PMMA :

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Figure 2: PMMA/Elium®/FV pellets

The pellets obtained after extrusion are homogeneous. They are valued either to produce calibrated 3D filament (ϕ=1.75mm) for FDM printer; or directly to be used on a robotic arm with a mini extruder :

Figure 3: 3D filament production – Spooling (CANOE Development)

Some samples printed with 3D filaments on D33D printer (FDM) are presented below:

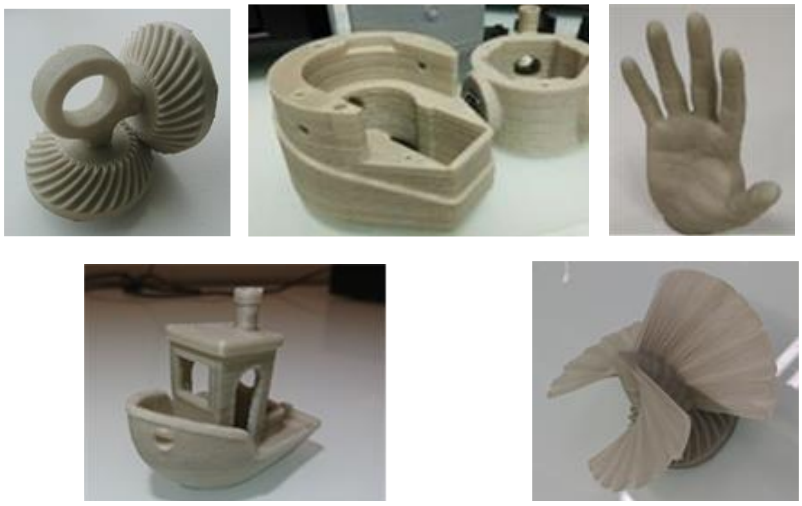

Figure 4: Example of 3D printed pieces

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The pellets can also be used into a micro extruder positioned at the head of a 6-axis robot developed by CANOE. This process has the advantage of eliminating the spinning-winding stage and allows printing of larger parts compared to standard FDM:

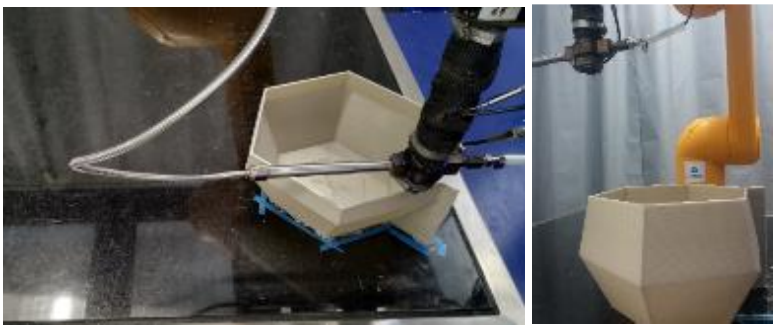

Figure 5: Vase printed from pellets by 6-axis robotic arm (CANOE development)

In addition, as part of its activities, CANOE is also developing supercritical CO_2 foaming processes and other technologies for the production of foams by continuous extrusion (Figure 6) to replace batch process. The batch process presents several limitation for scaling-up in industry (such as blowing of chemicals additives). Thus, the use of supercritical CO_2 technology is more environmentally friendly.

Figure 6: Single screw extruder (CANOE) equipped with supercritic CO2 pump

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