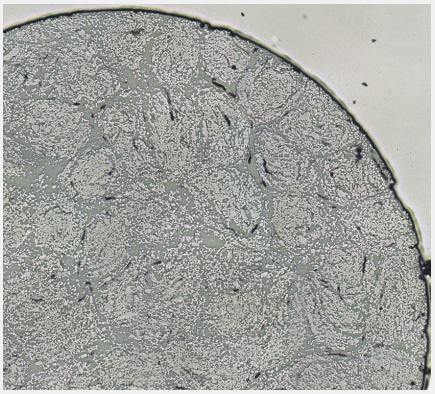
univalor
Commercialization of innovations

Helping Ideas Take Flight

Vacuum assisted pultruded thermoplastic biocomposite rods



Background

The demand for “greener” renewable fiber reinforced composites is currently booming. Indeed, natural fibers (hemp, flax, jute) offer cost savings, a reduction in density when compared to glass fibers and with increasing emphasis on environments matters, non-recyclable thermosets tend to be replaced by reusable thermoplastics. To produce high volume of composite beams for structuring applications, the most suitable manufacturing method is pultrusion. However, pultrusion of thermoplastic and natural fibers is challenging: natural fibers are spun into yarns that tends to break under high pulling forces. In addition, impregnating fibers, especially braided fibers, with a thermoplastic resin is quite difficult, often having air bubbles trapped in the composite, reducing mechanical properties of the rods. Consequently, such type of beam has not yet entered the market, though in theory it is really promising.

Technology

In a traditional pultrusion manufacturing system, fibers are mixed together and inserted into a mold open at both ends. This composite fibrous precursor is then drawn continuously through the mold by a pulling system. The intimate mixture of the polymer and fibers, i.e., impregnation, is carried out in the mold to form a composite beam of constant cross section and continuously. Here the technology is based on a two-mold system separated by a vacuum cavity. The mold geometries are evolutive until the final shaping in the last mold.

Application

The main applications are foreseen in industries where light weight, resistant, cheaper and “green” materials are on demand, mainly in automotive, aeronautics and building materials for construction and infrastructure. Marine, appliances and consumer products market segments could also take advantages of such technology.

Competitive Advantages

- Weight reduction, since natural fibers are about half the weight of fiberglass.
- Strength to weight ratio comparable to glass fiber composites
- Environmental-friendly, since natural fibers are easier to recycle, while thermoplastics are reusable.
- Use of natural fibers, cheaper than fiberglass
- Ex : Flax/PLA composite, 50% flax vol. content, Density: 1.4g/cc, Strenght:300 MPa

Patent

US Patent Application: “PULTRUDED BEAM REINFORCED WITH NATURAL FIBERS, PULTRUSION SYSTEM AND METHOD THEREFORE”

Next Steps

Proof of concept has been done in the lab with flax fibers and PLA as thermoplastics. We are looking of an industrial partner to collaborate with the team in view of taking a license on the technology.

Contact

Morgan Guitton, Jr. Eng.
Project Manager, Business Development, Sciences and Engineering
Univalor
+1 (514) 340-8510
morgan.guitton@univalor.ca

Louis Laberge Lebel, PhD
Assistant Professor
Department of Mechanical Engineering
Polytechnique Montreal
+1 (514) 340-4711 ext. 3933
louis.laberge-lebel@polymtl.ca

POLYTECHNIQUE MONTRÉAL
WORLD-CLASS ENGINEERING