

# Technical flax now conforms to industrial realities

Since 2009, FiMaLin®, the agro-industrial chain dedicated to technical flax for composites, has been a lightning rod for companies interested in supplies of flax fibre controlled for quality and quantity, for the composites market. FiMaLin® is committed to improving the quality and reliability of that supply even more, the better to serve manufacturers who want to develop new applications with a low environmental impact.

**D**eveloping natural-fibre applications is dependent on a highly organized supply chain that covers everything from the selection of varieties to composite part suppliers, or even to the end user (Figure 1).

The requirements of the composite industry vis-à-vis flax suppliers are very different from those of the textile industry. Therefore, technical flax must conform to a whole set of criteria, e.g. those listed in Fimalin's Technical Flax Charter. Flax cannot be qualified as technical fibre unless its production is based on specific established practices.

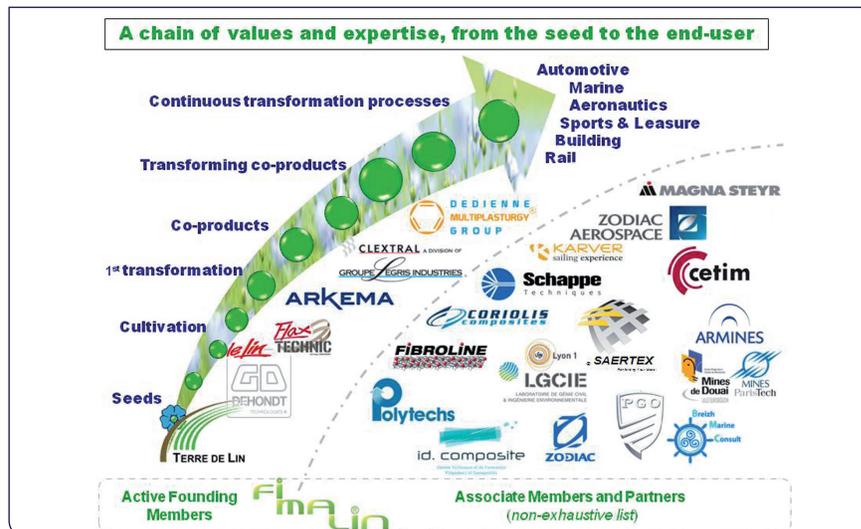


Fig. 1: The entire value chain is involved



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For example, composite manufacturers demand that the raw materials be perfectly traceable and that the fibre production be demonstrably consistent over time in terms of specific properties.

With this in mind, Fimalin developed Qualiflax®, its own verification system for these criteria. The system is based on the obligation of means and results, enabling the chain to ensure a reliable supply and consistent high-quality technical properties for the fibres. This system will be checked by one or several independent structure(s). Manufacturers can therefore safely rely on this technical flax supply when they develop their new applications (Figure 2). Parts manufacturers can make use of the associated logo and be sure that the fundamental criteria in the Technical Flax Charter and the matching specifications have been met.

In 2012, some Fimalin members carried through their demonstrator projects and marketed their industrial

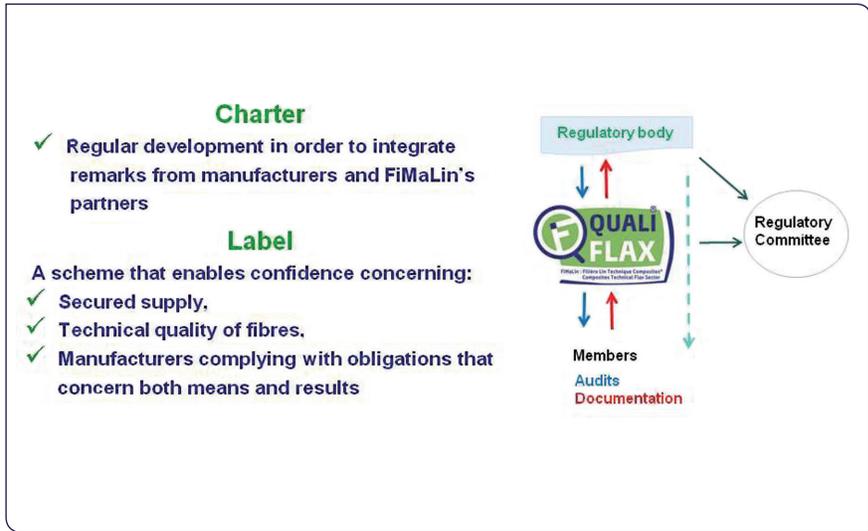


Fig. 2: From charter to seal of approval

applications. Here, we will mention two examples where the Dehondt Group's "Flax Technic" flax fibre reinforcements were used.

### Boating/sports and leisure application by Zodiac Recreational and Flax Technic – Dehondt Group

Zodiac designs, builds and markets a complete range of Rigid Inflatable Boats. The boats consist of an assembly between a rigid composite hull and an inflatable float. Both boats presented were designed along the same ecodesign guidelines. The main objective of this Ecodesign project was to reduce the ecological impact of the Bombard

AirEthic Rigid Inflatable Boat and the Zodiac Z-Concept dinghy. The AirEthic is a series-produced boat, and the Z-Concept is a concept boat that incorporates all aspects of eco-impact reduction, including recyclable thermoplastic materials, bio-sourced materials, clean processes and electric motor.

To reduce the composite hull's environmental footprint, it was decided to produce it using the RTM process with technical flax-fibre reinforcement. Bidirectional, 100% flax technical fabrics from the TwinFlax® line were chosen for the reinforcement, with an areal weight of under 250 g/m<sup>2</sup>. TwinFlax® also has good impregnating

and drapability characteristics for RTM processing. Another advantage of these reinforcements is their low environmental impact compared to glass and carbon fibre.

The AirEthic's underwater hull and deck are both RTM moulded with technical flax-fibre reinforcement. The Z-Concept's entire hull is one-step moulded, with the flax reinforcement on the deck side. These boats are Zodiac's first ecodesigned models.

Zodiac has been using composite materials for this type of boat for a long time. Composites give these boats the desired strength and low weight, along with the possibility to create complex shapes at moderate investment and production costs.

Resin transfer moulding (RTM) is an industrial production process for composite parts, chosen for its advantages compared with traditional composite processes like hand lay-up or spray-up. The main advantages are:

- a shorter production cycle,
- better part quality and reproducibility,
- lower VOC emissions,
- the possibility to integrate functions into the composite.

Flax is a bio-sourced plant fibre, so using it lowers the composite's ecological impact. It is possible to replace part of the glass fibre reinforcement with flax.

Zodiac already had considerable experience with RTM, as it was already using the process to produce other types of parts. All that needed to be done was to adapt the RTM process to the production of a larger model for the AirEthic. Once the economic and environmental appeal of the RTM process had been demonstrated, the next step was to make the necessary investments in order to launch production of the moulds.

For the technical flax reinforcements, an upstream process testing and labo-



Fig. 3: Bombard AirEthic 500 Rigid Inflatable Boat

ratory qualification step was begun. When the materials were validated technically and economically, they had to be integrated into the design of the composite parts.

The AirEthic project was launched in April 2012, and the boat was presented at the December 2012 International Boat Show in Paris. (Figure 3).

The Z-Concept project got off to a start in July 2012, and the boat was also presented at the Paris Boat Show. (Figure 4).

Over the long term, consumers' growing concerns about ecological impacts when they choose a product and the gradual toughening of regulations on production conditions will make traditional polyester materials and techniques obsolete, relegating them to bottom-of-the-line product offers.

The challenge over time is to ensure the sustainability of a local French production process that involves a high level of manual labour. There are also societal expectations that must be accommodated, and builders that fail to meet such expectations could be excluded.

Thanks to its ten years of eco-composite expertise, Flax Technic® was able to help Zodiac Recreational develop, industrialize and market these products: a win-win partnership to optimize the development time for new, innovative French applications.



Fig. 4: Zodiac Z-Concept Dinghy

## About Fimalin

The Fimalin Association was created in February 2009 in Normandy, France, at the initiative of six manufacturers: the Dehondt Group, which initiated the project, Arkema, Clextral, Dedienne Multiplasturgy Group, Terre de Lin, and the Institut Technique du Lin (Technical Flax Institute). The purpose of the association is to create, organize and promote a technical flax industry dedicated to the development (mainly in France) of ecodesigned products that incorporate high-performance flax fibre. To do so, Fimalin uses its membership base to bring together all players in the value chain, from selection of varieties to the end user. Thanks to their low weight and high performance, flax-reinforced composites are suitable for a broad range of applications, including automotive, building and construction, boating, sports & leisure, and railway.

The use of this process and these materials could be extended to all Zodiac boats, and the experience gained with these two models has shown that it is feasible for this type of boat. The principle could also be applied to most composite parts.

The key factors in the product's success:

- Ecodesign
- Production automation
- Improved quality and working conditions
- Inclusion of bio-sourced materials

## Automotive electric car applications

by PGO, Flax Technic –Dehondt Group and Emasia

Emasia is a hybrid vehicle that was ecodesigned in partnership with the Ecole des Mines from Alès (France) and the automotive builder PGO, with the use of technical flax reinforcements from Dehondt Group's Flax Technic® line. The construction of this hybrid vehicle is based on the Hemera model. Emasia has been participating since June 2012 in endurance races in France.

Dehondt Group developed the technical flax reinforcements (Nattex® and Twinflax® from the Flax Technic® line) used to make body components and parts for the passenger compartment out of composite materials from renewable resources.



Fig. 5: Emasia hybrid vehicle

The glass fibre used in the original body components is replaced by bidirectional reinforcements (Nattex® Fabrics) to make doors, spoilers, and hood.

The reinforcement used for the passenger compartment is Twinflax® T294, which has good drapability and a lower areal weight for technical parts with complex geometries, such as the centre console.

This application has many sustainable development aspects. Beyond the bio-sourced nature and surface aspect of the Flax Technic® reinforcements, the use of these products is relevant because of their low density and high mechanical properties, which helps to lower the vehicle's weight and therefore the energy consumption during use. In addition to the use of flax fibre, a partially bio-sourced unsaturated polyester from Ashland's Envirez line is used for the matrix. The parts are made using the Resin Transfer Moulding (RTM) process, procuring an optimal surface finish on both sides, better control over part thickness, and lower

harmful styrene emissions for operators.

As soon as the parts were processed, they were incorporated into the vehicle, and track tests were carried out. The vehicle competed in the French Automotive Engineers Society's June 2012 SIA Trophy, for which the rules stipulate both static and dynamic tests, and will be selected again for 2013.

It has also been entered in the Monte Carlo New Energies Rally, which will take place on 20-24 March 2013.

The key factors for the product's success:

- Optimized technical performance and low environmental impact
- Minimized pollutant releases
- Optimized disassembly and recycling operations

Many thanks to Guy MENISCUS, Technical Director PGO Automobiles and EMASIA's Team.

## FIABILIN

The fourth FiMaLin®-sponsored collaborative project and the first wide-reaching European industrial project on flax fibre for composites.

The Fiabilin project has been quality assessed under the French government's "Future Investments" (Inves-

tissements d'Avenir) programme.

## Theme

Project to organize the industrialization process for high-performance, bio-sourced thermoplastic composites reinforced with flax fibre and to promote the emergence of a dedicated technical flax value chain in France.

Four priority market segments:

- automotive
- aerospace
- boating
- building and construction

## Vision

The Fiabilin project arose out of FiMaLin's initiative to create, organize and promote a new technical flax value chain in France.

Its vision is to become:

- the backbone of the French technical flax value chain;
- the driver for a change in the industrial model towards adapting the raw material and its supply to the performance requirements of composites;
- an international showcase for French technological skills in high-performance composites.

## Goals

The Fiabilin project was formed

around a consortium of fifteen partners and will last five years (four years + one year for industrialization). Its goals are to:

- manage the supply of long flax fibres,
- harness the performance and competitiveness of composite products,
- steer the industrial system towards production of such eco-designed products.

The first industrial applications are expected to emerge within three to five years.

Seal of approval from the following competitive clusters:

- Moveo (Automotive – Normandy & Ile de France region)
- EMC2 (Aerospace – Pays de la Loire region)
- Techtera (Technical textiles – Rhône-Alpes region)

## Resources

- Total budget: 18 million euros.

## Economic spin-off

- The number of partners, the targeted industrial sectors and the potential economic spin-off make the Fiabilin project a particularly ambitious one. ■

More information: [www.fimalin.com](http://www.fimalin.com)

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## The Composites Technical Flax sector

### 100% dedicated to industry

Presentation and Exhibition of industrial applications

Regional Council Haute-Normandie, Rouen

March 28th, 2013, 9:30 am



JEC Europe 2013

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