Technical flax:
a real opportunity for composites

Can technical flax open the way to eco-composites by becoming the third most-used fibre after glass and carbon? The issue has been raised, and manufacturing confederation Fimalin aims to make technical flax the obvious choice in high-value-added engineering activities.

Technical flax has outstanding properties that make it inherently suitable for high-value-added applications (Figure 1). The Fimalin manufacturing confederation, which consists of six of the industry's manufacturing companies, intends to firmly establish this natural fibre in the composite sector. Fimalin also hopes to promote French flax-growing expertise and extend its leadership in that field beyond its primary focus, the textile sector.

Fig.1: Natural advantages Natural Fibres

Main advantages	Main disadvantages
Specific mechanical properties	Quality varies as a function of weather and growing location
Biodegradability	Low dimensional stability
CO2 neutral	Low thermal stability
Renewable resource	Anisotropic fibres
Production is low energy consuming	Discontinuous reinforcement

Flax, a resource that is green, inexhaustible and eminently suitable for composites

Flax is grown on more than 300,000 hectares worldwide, with China alone accounting for 100,000 hectares of that. In 2009, global production was 185,000 metric tons (MT) of scutched flax (i.e., the fibre already separated from the plant's ligneous matter), including 100,000 MT or more produced in France (Figure 2). France is the leading flax producer in Europe and worldwide, a position that can be attributed to exceptional productivity and quality that are the result of flax-growing skills passed down and improved on through the ages.

Ninety percent of the flax grown today goes to textile applications. Almost all of French and European production is sent to China for processing. While there is ample agricultural land in the world that is suitable for growing flax and technical flax, the Western European climate is particularly well-suited for the activity.

A common goal

The goal set by the Fimalin confederation is to create, organize and promote a technical-flax value chain dedicated to the development of ecodesigned products which incorporate high-performance technical flax fibre. Fimalin intends to make technical flax the third most-used reinforcement fibre for composites, after glass and carbon, in order to open the way for ecopolymers, ecocomposites and the creation of a new agroindustrial field of activity.

Fig. 2: France is by far the world's leading producer

Country	No. hectares		Scutched flax (t)		Quality
France	56.417	3	100.000	1	1
China	100.000	1	23.000	2	9
Belgium	12.030	6	18.000	3	2
Egypt	15.000	5	15.000	4	4
Belarus	68.000	2	13.000	5	5
Russia	48.000	4	11.000	6	10
Netherlands	2.272	8	4.000	7	2ex
Ukraine	4.000	7	1.500	8	7
Poland		9		9	8
Lituania		10		10	6

To do so, Fimalin mobilizes its members to bring together all the players along the value chain, from varietal selection to the end consumer. This includes growing and processing the plants, of course, but also the manufacture of roving, technical textile products, and fibre-reinforced polymer compounds. Six different types of reinforcement are already available (Fig. 3).

6 reinforcement types:

Cut-fibre reinforcement

Lintex M 06-F	Cut technical fibres
Lintex BT 2	Natural fillers
Lintex PL 10	Fibres and fillers combined

Semi-products

Lintex Compounds	Compounds with flax

Cut-fibre reinforcement

Nattex Roving	Roving
Nattex Fabrics	Fabrics

Specification sheets provided and guaranteed supply

Fig. 3: An increasingly wide range of reinforcements

More information

Fimalin is a confederation of six manufacturers that was created in February 2009. Each of the manufacturers represents a step in the technical flax value chain:

- Terre de Lin is an agricultural cooperative organization that specializes in seeds and has a genetic laboratory;
- the Institut Technique du Lin is the flax industry's research and development arm, which sets up targeted, concrete and rapidly developable research projects;
- the Dehondt group is a leader in the design, manufacturing and marketing of harvesting equipment, in processing and conditioning plant fibres, particularly textile flax;
- Legris-Industries group subsidiary Clextral is a package designer-builder of full advanced-process systems and solutions that use twin-screw extrusion technologies to combine fibres and resins for compounding purposes;
- leading French chemical company Arkema is a player in the global chemical industry. Its Performance Product division develops and manufactures resins from biomass that enable the development of completely ecodesigned products;
- Dedienne Multiplasturgy is a processor with capability in the main forming technologies for short-, long- and continuous-fibre composites. The company is tuned into the main application areas via its end-user customers.

In the way of processing tools, Fimalin utilizes technologies like injection, extrusion, infusion, forming and RTM. Flax-reinforced composites are lightweight and high-performance, making them suitable for a broad range of applications in the automotive, building, boating, sports & leisure and railway industries, among others.

To attain its objectives, Fimalin uses market needs as a basis for defining potential applications. The idea is to make use of the results of previous projects to find ways to process dedicated flax varieties, but using different fibre-processing methods from those used in the textile industry in order to meet the requirements for specific applications.

High-quality supply guaranteed

As a resource, flax may be potentially inexhaustible, but you also have to be able to guarantee composite processors a sustainable supply of high-quality fibre. To do so, Fimalin works far upstream by investing in varietal selection (Figures 4) through its member Terre de Lin, an agricultural cooperative that is equipped with a genetic laboratory. The cooperative, which has five industrial sites in Normandy, France, also works on fibre extraction, preparation, qualification and marketing. The Institut Technique du Lin (flax technical institute) is in charge of optimizing the crop management techniques, assessing varietal performance, keeping bioaggressors under control, perfecting diagnostic and decision-making tools for producers, improving harvesting and processing machinery, and also characterizing fibres.

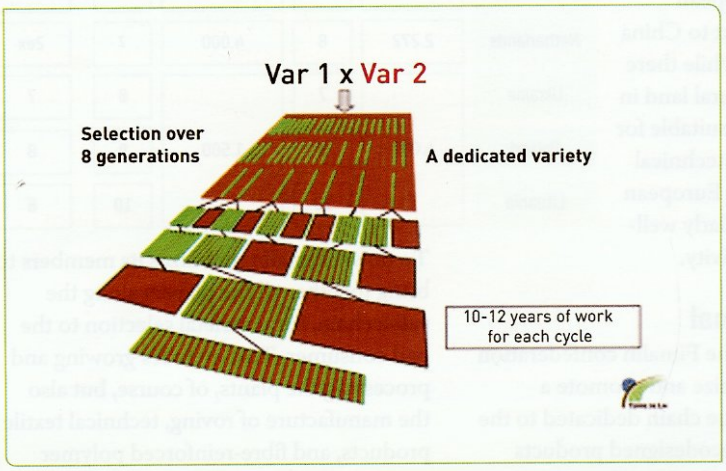

Fig. 4: Varietal selection guarantees a sustainable industry

Fimalin is the result of an initiative by technical flax professionals who are eager to diversify their markets and move to high-value-added applications. The aim of the value-chain approach is to maintain a close, consistent unity among the players along the chain, from the seeds all the way to the applications. This initiative constitutes a real opportunity to meet the demand in the composite markets for renewable products, with the outstanding properties of technical flax as a bonus (Figure 6).
After its cut-fibre projects, Fimalin is moving into the sphere of long fibres with three projects that were launched in early 2010. ■

More information:
www.fimalin.com