Increasing oil-shortages and rising oil prices, the environmental impact and the emission of greenhouse gases and the resulting climate change all lead to an enhanced preoccupation with the future of our oil based economy. Measures are taken to search for alternatives both in the field of energy resources and raw materials. Also in the world of the composites the search of renewable alternatives for both matrix polymers and fibre reinforcement is taking place. The vast majority of the European composite market (> 90%) is still based on the traditional “oil-based” polymers and resins and glass-fibre or synthetic oil based fibre reinforcements. A smaller amount of “Bio-composites” has already entered the market, but in general, they represent but a small percentage (20 up to 50 weight %) of renewable materials.

Europe has set forward a new goal: the development of composites based on (nearly) 100% renewable products. This implies that both the fibre reinforcement and the matrix fraction (thermoset or thermoplastic) have to be bio-based. At the same time the quality of these bio-composites needs to be upgraded so that they may compete on a technological basis with standard oil-based composites. This is crucial to increase the valorisation of these new products and to contribute to the strength of the bio-based economy that is in full expansion.

**Approach**

Although there are several possible routes to produce fully bio-based composites, NATURE WINS will focus on the development of bio-composites based on long/continuous natural fibres as reinforcement and thermoplastic biopolymers as matrix material. The scope will be narrowed further on by focussing on a production route based on blending both matrix and reinforcement in fibre form and using compression moulding as composite formation process. These restrictions in scope are essential in concentrating the research efforts to a common and focussed goal offering an important increase of potential success rate.
EUROPEAN COLLECTIVE RESEARCH PROJECT

NATURE WINS
Research for the development of fully renewable thermoplastic bio-composites

Work programme

1. Definition of the appropriate Natural Fibres (NF) (hemp and flax) as optimum fibre reinforcement material in biopolymer matrices, including fibre surface treatments for compatability with selected matrices
2. Development of Thermoplastic BioPolymer formulations (TBP) (with focus on PLA) and processing them into textile materials: fibres, multifilaments and monofilaments. Optimisation of the formulation to increase the end properties of the polymer in the final bio-composite matrix, including compatibility with the selected natural fibre.
3. Processing of NF/ and TBP fibres into blended textiles: yarns, knitted structures, woven structures and nonwovens, ready for composite production trials.
4. Processing of TBP fibres/textiles -originating from a single biopolymer family- into blended textile structures to evaluate the potentials to create “self-reinforced” composite structures.
5. Development of industrial demonstrator prototypes to prove the technical and economic feasibility of the processes and end products.
6. Full characterisation of all products generated in the different processing steps including the determination of the ecological relevance of processes and products.

In the short to medium term, the acquired know-how will result into the development of high-end bio-composites to be applied in a large range of end-markets: including automotive, construction, upholstery, sport applications, etc.

Project consortium
The project consortium is composed of 4 research centres:

- Centexbel: project co-ordinator
- Sirris
- KULeuven-MTM
- ITA-Aachen

A users committee will be installed to follow up the project and to guarantee that the project consortium will focus on relevant industrial topics. This users committee will consist of companies involved in either the production and processing of natural fibres, the production and processing of Biopolymers into textile products, the companies active in further processing of textile fibres, yarns, blends, non-wovens and fabrics, the producers of composites and companies integrating composites in their end products. They will be informed about the progress, to steer the project to increase the industrial relevance and will be offered the opportunity to assist in the project progress by supplying appropriate materials or performing relevant industrial tests. They will have the opportunity to conduct full scale tests with the materials under study to evaluate their economic and technical potential.

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End: 31 December 2012

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