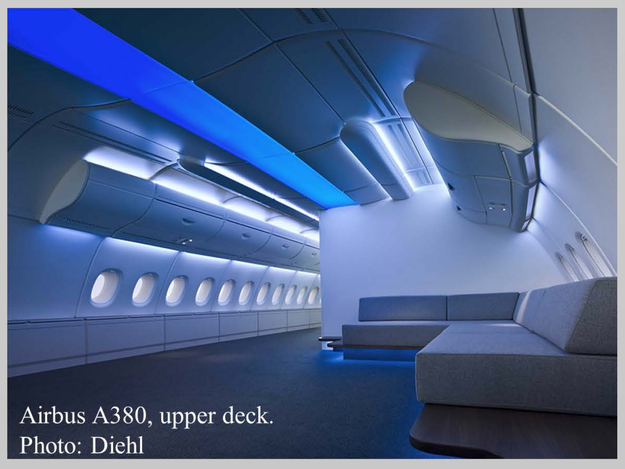
Industrial Production Processes for Nanoreinforced Composite Structures

The objective of the INCOM project is to develop techno-economically viable solutions and production methods for lightweight structures based on advanced sustainable materials for use in packaging, vehicles and aeronautical applications.

The main modules of the INCOM project are

- Nanofibrillated cellulose production / modification process
- Composites processing
- Mechanical testing, verification and modelling
- Life cycle assessment

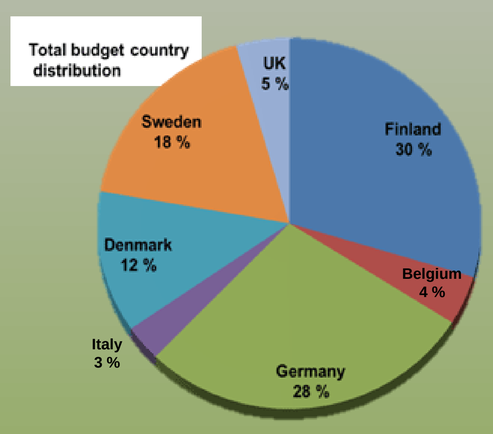
Masuko super mass colloider.
Photo: Bergius

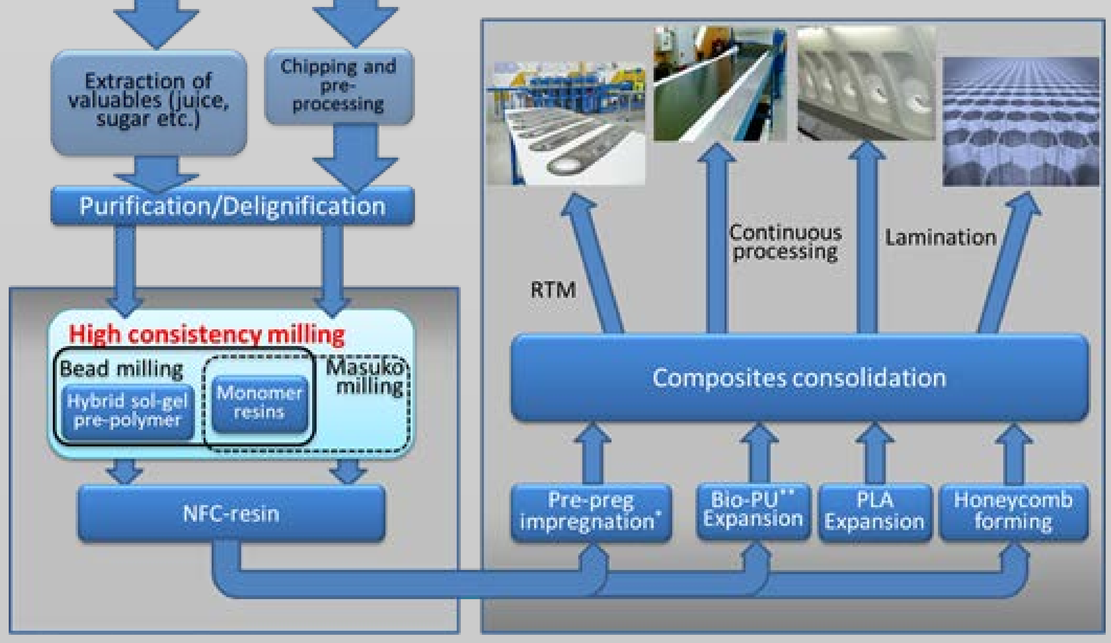


Airbus A380, upper deck.
Photo: Diehl

The consortium of INCOM project is comprised of industrial participants (eight SMEs and one large industrial participant) together with leading European institutes and universities in biocomposites and processing technology (VTT, LTU and DTU) and sol-gel development (Fh-ISC and VTT) from seven European countries. The value chain represented by the expertise of the R&D partners is coupled with the selection of the industrial partners' line of business. The whole production chain from bio-based raw materials processing to different fields of applications is included.

13 partners from Finland, Sweden, Denmark, England, Germany, Italy & Belgium





The core of the project is the manufacturing and modification of nanofibrillated cellulose. Two approaches are used in the project to maximize the chance of success. The first approach is the nanofibrillation of cellulose in a pre-polymer (monomer or oligomer) medium, allowing fibril consistencies 20 – 50 times higher than achieved when using an aqueous medium. This also avoids the problems related to incompatibility of aqueous medium and plastics as well as creating an optimal, high consistency, homogenous fibril dispersion in the resin to be used in composite structures.

The second approach is the development of a quality tool for quantifying nanofibrillation in aqueous and other media as well as the optimization of the nanofibrillation of bioresidues.

Resin with functionalised nano-reinforcement such as nanocellulose, will be produced and used in both the core and the skin of structural sandwich composites.

Three types of nanoreinforced cores are being developed to meet different demands. These are an expanded biobased PU foam core, a biobased thermoplastic foam core and a thermoplastic honeycomb core. The nanoreinforced polymer or sol-gel based coating will be used in coating of the expanded core. Particular focus is being given to rapid cure processes such as IR/UV curing as well as inline production of the sandwich structure to increase the efficiency of the manufacture of these composite structures.

During the whole development process an ecodesign approach will be used utilizing LCA already in the early stages of project. This will ensure that a path of reduced environmental impact will be followed during the development of these new industrial processes for nanocellulose reinforced composites.

This project has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 608746

Contact
Lisa Wikström
Tel. +358 40 861 4421
lisa.wikstrom@vtt.fi