

Manufacturing processes of natural fibre reinforced composites in the automotive industry

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Abstract

The use of natural fibre reinforced composites in the automotive industry offers an interesting alternative to petrochemical products. In the last years, there is a 10-15% increase in the use of annual plant fibres for interior car parts in Europe. According to market observations of the nova-Institut, Germany (Karus et al. 2001, 2002) the market for these parts is dominated by Germany and Austria with about 20000 t fibres per year: Flax (*Linum usitatissimum L.*), “subtropical and tropical fibres” – Jute (*Corchorus capsularis L.* and *Corchorus olitorius L.*), Sisal (*Agave sisalana L.*), Kenaf (*Hibiscus cannabinus L.*) – and Hemp (*Cannabis sativa L.*). In the complete European automotive industry the use of the natural fibres mentioned above will achieve an amount of about 25000 t/a in 2003.

The processing technology is still dominated by pressing technique. Whereas in 1996 thermoset and thermoplastic natural fibre reinforced composites (pressmoulded) represented each 50% of the produced interior parts, the situation has changed. In 2002 70.2 % of the natural-fibre composites were produced with thermoplastic polymers (pressmoulded), 24.5 % with thermoset polymers (pressmoulded) and 4.7 % injection moulding (with cellulose fibres) (Müssig et al. 2003). The market survey (*Future trends in the automotive industry till 2005 with natural fibres*) of the nova-Institut shows, that 32% of the tier-one suppliers answered that injection moulding with natural fibres will gain in significance.

The presentation will give an overview of the techniques which are state of the art in the automotive industry to produce natural fibre reinforced composites. New technologies which are on the way to be introduced in the production and system which are on the way from research to industrial application will be described as well. The discussion includes advantages and disadvantages of the different technologies and achievable mechanical properties of the produced composites. To discuss the potential of injection moulding the data of a first round trial among processors of hemp fibre reinforced polypropylen organised by nova and FIBRE are given in the presentation.

An important step, to introduce biobased materials not only in the automotive industry but also in the consumer market, is the development of numerical models to simulate the structural properties and the processing behaviour of such materials. For this purpose the properties of the fibres must be known and simulation tools must be adapted from e.g. glass to natural fibres reinforced composites. The development of a data base for natural fibre reinforced composites will be presented.

Literature

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