Cellulose Fibre Reinforced Composites for the Automotive Industry

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Bio-based materials and, in particular, cellulose-based fibres have been used in various industries as a reinforcing material for composites to reduce weight, cost and environmental impact. These fibres can have the added benefit of producing stiffness-to-weight ratios equivalent to those of composites reinforced with glass fibres. The use of cellulosic fibres presents a number of processing challenges that include feeding them into compounding equipment, mixing and dispersing them into the polymer matrix by thoroughly selecting the processing equipment and operating conditions in order to effectively de-bundle and uniformly distribute the fibres throughout the entire volume of a composite part. Other challenges for cellulosic fibres are their incompatibility with some thermoplastics and the processing temperature limitations determined by their propensity to thermally degrade after long exposure times. This paper presents the results obtained from the processing of two types of natural fibres used as reinforcements for polypropylene (PP) and polyamide-6 (PA6) matrices. The Direct-Long Fibre Thermoplastic (D-LFT) continuous process was used for the research work. The D-LFT experimental line consists of a 70 mm intermeshing co-rotating twin screw compounder and a 2,500 ton hydraulic press with actively controlled parallel motion system. The materials were compounded and moulded to produce parts for characterization. Different formulations using heat stabilizers, antioxidants and coupling agents were implemented with the objective of improving the intrinsic properties of the materials in order to meet industry standards. Results show the performance of cellulosic fibres in comparison with traditional glass fibre reinforced PP composites.