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Generation of Natural Fibre Reinforced Thermosets by Means of a Co-rotating Twin Screw Extruder

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Co-rotating twin screw extruders provide the feasibility to a continuous production of natural fibre pellets based on thermosetting materials. The pellets obtained can be used for subsequent processing by injection molding. It is a special benefit of the co-rotating twin screw extruder to utilize a modular screw design. An optimized screw configuration combined with the use of innovative multi comb elements facilitates a homogeneous incorporation of fillers and additives as well as gentle fibre separation.

Since a stable compounding process without undesired crosslink reactions cannot be realized using conventional thermoplast dies, a new type of die has been developed. This die has self-cleaning properties and, therefore, a blockage of the die by scorched material cannot occur.

Fillers and reinforcements may influence the reaction kinetics of thermosetting matrix. As an example, under process conditions natural fibers form humic acids and, therefore, having catalytic impacts on phenole and melamine resins. The viscosity increase of the resin due to the ongoing crosslinkage impedes the fibre fibrillation. However, this catalytic impact can be prevented by appropriate fibre modification or by the addition of retardants.

The mechanical properties of the final products are strongly influenced by the morphology generated during the compounding process. An increase of material strength is achievable by improving the fibre separation and filler dispersion. Further enhancements of the mechanical properties can be obtained by increasing the fiber-matrix interactions by the application of coupling agents.