

# **DIRECT-SMC – A NEW PROCESS FOR THE PRODUCTION OF FIBER-REINFORCED THERMOSET COMPONENTS THROUGH A ONE-STEP DIRECT PROCESS**

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## **Abstract**

Today, automotive body panels that meet the requirements for class A surfaces are often manufactured from Sheet Molding Compound (SMC). This process, that is based on the semi finished product SMC, results in fluctuations in SMC quality mainly due to the maturation process and therefore also component quality.

The direct process allows certain restrictions on the processing of SMC to be lifted. Because this is a continuous process in which the raw material is turned into the component within only a few minutes, it is possible to establish a control loop in order to guarantee a high and constant level of quality. The resulting reduced scrap rate as well as the lower amount of rework have a positive effect on component costs. Component costs can also be reduced by the elimination of the maturing stage as well as a shortening of the cycle time. Another advantage of the process is that it offers practically unlimited flexibility in terms of raw material selection and close-to-real-time recipe changes. Styrene emissions can be reduced because the machine technology is largely encapsulated.

This paper reviews the fundamentals of the material system, state of the art and research of the equipment and process technology in the field of manufacturing of composites based on thermoplastic (also direct processes) and thermoset resins as well as the subsequent steps of the process for the production of fiber-reinforced thermoset SMC components through a one-step direct process: Feeding and dosing of the raw materials, mixing of the resin paste, incorporation of the reinforcing fibers, accelerated maturation and viscosity increase respectively, and the microwave assisted process technology. Finally the direct process is characterized in respect of surface quality, mechanical properties, as well as the influence of fiber content and length.