Analysis and characterization of the Direct-SMC (D-SMC) process for compression moulded thermoset composite parts

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Sheet Moulding Compound (SMC) is currently being manufactured as a semi-finished product which is separate of the part production process. This separation leads to disadvantages in the manufacturing process, the corresponding logistics and also in the quality of the SMC parts. These disadvantages were the motivation for developing a one-step direct process in which the production step involving the semi-finished material is eliminated. By this means costs can be reduced and an integrated process chain from the raw material to the part is possible. The properties of the raw material, the moulding compound and the part can be determined at any time. Furthermore changes in the formulation can be made online. The content of the paper describes a process development for direct SMC technology. The process itself is characterized, with special regard to the maturation behaviour, the resulting fibre length and the machine parameter settings. By this means the achievable limits of the process will be demonstrated. Additionally the different parameters will be related to the achievable mechanical properties. Finally the integrated process chain of the Direct SMC process will be evaluated as a whole with respect to the chances and opportunities it creates. Furthermore the flexibility of the process which additionally offers the unique chance to apply silane based coupling agents on the fibre surface for improving the fibre matrix adhesion, will be demonstrated.