

Mathematical Modeling of SMC in the Spiral Flow Tool

Jose M. Castro
The Ohio State University

ABSTRACT

A Spiral Flow Tool is capable of simulating an extensive flow of Sheet Molding Compound (SMC) with a relatively small amount of material. This feature makes the spiral flow tool surpass the simplicity advantage of the flat plate molding, which has been used to study SMC. This extensive flow has possible effects on the glass carry and chemical reactions of the SMC. The spiral flow tool used in this research is equipped with thermocouples, pressure transducers, LVDT, and a hydraulic pressure sensor. With the data obtained from these sensors it is possible to further study the effects of the chemical reactions at various times and locations as the SMC flows through the long channel of the spiral flow tool. The flow in the spiral flow tool has been modeled. The mathematical model is based on previous work in our group, modeling the SMC as a plug flow with a lubricating layer on its surface. The mathematical model predicts the force required to mold as a function of the closing speed of the press and measurable material characteristics of SMC. An assumption of an isothermal and a non-isothermal flow is being considered. Further efforts are being made to develop methods of measuring SMC's rheological parameters using the spiral flow geometry.