On-Line / Off-Line Control of Mold Filling in Liquid Composites Molding

Jeffrey M. Lawrence, Suresh G. Advani
University of Delaware

ABSTRACT

Prohibitive costs are preventing Liquid Composite Molding processes, such as Resin Transfer Molding, from gaining greater popularity. A major factor in the high costs is the manual labor involved in the process, as well as unrepeatable results. Variations inherent in the preform as well as in the cutting process can result in the flow behavior during the resin filling stage to vary from part to part. This can then result in the formation of dry spots, or resin void areas with low structural integrity. Flow control during the filling stage of Liquid Composite Molding processes have been shown to provide a greater percentage of acceptable manufactured composite parts. However, many of the current techniques have various limitations. Many off-line control approaches depend on anticipation of problems, and on-line approaches are geometrically limited and can be computationally intensive during the experiment. The present work combines off line and on-line approaches to mold filling in an attempt to eliminate their shortcomings and reduce the limitations. First, off-line computationally intensive control algorithms based on the specific part geometry and locations for the sensors and injection gates are created. Next, on-line control is initiated with the off-line parameter guidelines. The approach will be presented and illustrated with several case studies to demonstrate geometrical independence in a simulation environment. Comparison will be made between part success rate using no control, other control techniques, and the new control approach. Validation in a laboratory environment will also be attempted.