



INTELLIGENT RESIN TRANSFER MOLDING USING THE RTM WORKSTATION



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MOTIVATION and OBJECTIVE

During the RTM process, disturbances like race-tracking occur. It is not predictable when the race-tracking occurs or on which edge. Race-tracking is often the reason for dry spots which make the parts unusable.

The Objective of this work is to detect the position and the strength of race-tracking during the filling of the mold and take the right control action to avoid dry spots.

ACKNOWLEDGEMENTS

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SIMULATION-BASED LIQUID INJECTION CONTROL (SLIC)

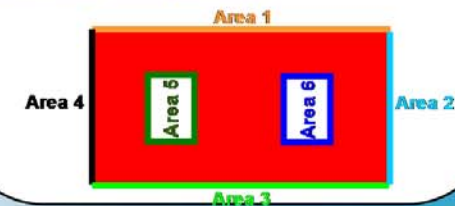
During the filling process, two different steps are passed through. In the first step, the strength of race-tracking is detected. In the second step, control action is used to open and close auxiliary gates to anticipate dry spots.

The detection of the race tracking and the determination of an optimized control action need several steps during the simulation. SLIC, a program developed by Dr. Kuang-Ting Hsiao and Prof. Suresh G. Advani needs as input the FEM model without race tracking as well as information about race tracking areas and the possible strength of race tracking. SLIC picks the optimized sensors for determining the strength of race tracking in all areas and it provides optimized control actions to fill up the mold with resin completely. The results are saved in a database that is given to the controlling computer of the RTM Workstation.

DISTURBANCES

After modeling the Geometry and creating a FEM model, possible disturbances are defined. In this work, only race-tracking is considered. As there are many possible race-tracking areas in one part and because disturbances occur in different areas from experiment to experiment, many modes have to be simulated. Race-tracking has various strengths which also increases the number of different modes.

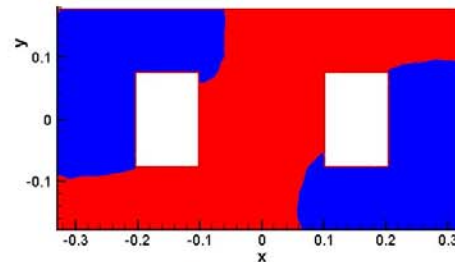
In this example, race-tracking is simulated in six different areas along all edges.



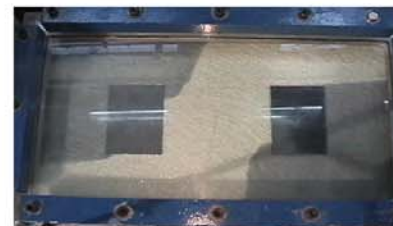
RTM WORKSTATION

The RTM Workstation provides 15 gates and 8 vents and all of them can be opened and closed separately. 23 sensors, one near every gate or vent, feed a controlling computer with information about the flow front position. A Labview™ application on the controlling computer reads the sensors and operates the gates and vents automatically. Therefore it uses the database with optimized control actions which is created during the simulation.

VALIDATION



Simulation



Experiment

SCHEMATIC

