A new meshing methodology for faster simulation of a Body-In-White dipping process

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Simulation of complete body-in-white dipping processes demands a special mesh that is able to model complete geometrical features with the least surface cell count on the body, while representing the sheet metal thickness and ensuring mesh continuity among approximately 400 Body-in-White (BIW) components.

Currently employed semi-automatic approaches for producing such meshes are often time intensive and involve huge manual effort. Therefore, a new meshing methodology is developed in STAR-CCM+ with the help of Java automation API and pipeline meshing technology which has automated the surface meshing and connection of adjacent components.

The method presented here uses aligned meshing capabilities of STAR-CCM+ to capture all complicated geometrical features. It ensures that a good quality surface with the least possible surface cell count is obtained. This guarantees that a stable and robust computation is achieved over a long simulation time, despite using the short time step required for numerical stability. The method is able to achieve 70% reduction in pre-processing time compared to existing methodologies. Only little manual intervention from import of CAD data to volume mesh creation is needed.

In this presentation the BIW mesh produced is validated by simulating a dipping case. The resulting air pockets and flow rates are calculated from the simulation and then compared with real physical experiments. The faster time of the simulation, including pre-processing, as well as the achieved accuracy presents a strong argument for such simulations to be integrated into the ever shrinking digital automotive development cycle.

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