

Towards the Modeling of Lost Core Viability in High-Pressure Die Casting: A Fluid-Structure Interaction Model with 2-Phase Flow Fluid Model

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Abstract : This paper summarizes the progress in the latest computational fluid dynamics research towards the modeling in of lost core viability in high-pressure die casting. High-pressure die casting is a process that is widely employed in the automotive and neighboring industries due to its advantages in casting quality and cost efficiency. The degrees of freedom are however somewhat limited as it has been so far difficult to use lost cores in the process. This is right now changing and the deployment of lost cores is considered a future growth potential for high-pressure die casting companies. The use of this technology itself is difficult though. The strength of the core material, as chiefly salt is used, is limited and experiments have shown that the cores will not hold under all circumstances and process designs. For this purpose, the publicly available CFD library foam-extend (OpenFOAM) is used, and two additional fluid models for incompressible and compressible two-phase flow are implemented as fluid solver models into the FSI library. For this purpose, the volume-of-fluid (VOF) methodology is used. The necessity for the fluid-structure interaction (FSI) approach is shown by a simple CFD model geometry. The model is benchmarked against analytical models and experimental data. Sufficient agreement is found with the analytical models and good agreement with the experimental data. An outlook on future developments concludes the paper.

Keywords : CFD, fluid-structure interaction, high-pressure die casting, multiphase flow

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