

# Use of Simulation to Predict the Viability of Salt Cores in the HPDC Process - Shot Curve as a Decisive Criterion

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Lost Core is a technology which is becoming increasingly more popular as the need for lightweight construction increases. The advantages are obvious: Completely new components can be developed since the use of salt cores in HPDC allows for complex internal designs. In addition, combining several components makes a high degree of function integration possible. Bühler AG – Die Casting is consistently working on the further development of this process. The whole package is convincing: Along with die casting machines and systems, Bühler offers its customers support in the areas of casting development and die design.

Bühler experts are working intensively to simulate die casting with Lost Core technology. Standard simulation tools for the die casting industry, as they are available for example in Flow 3D, are used for this. The simulation opportunities for Lost Core technology thus correspond to those in standard aluminum HPDC. Simulations are used to test the gating- and venting system designs. Possible difficulties and optimizations can be recognized at an early stage in this way. It is virtually no longer necessary to make costly and time-consuming changes to the die at a later time. For the Lost Core technology, Bühler used a sample part to show that simulation makes it possible to predict whether a salt core will be destroyed during the HPDC process or will withstand the pressure of the aluminum melt.

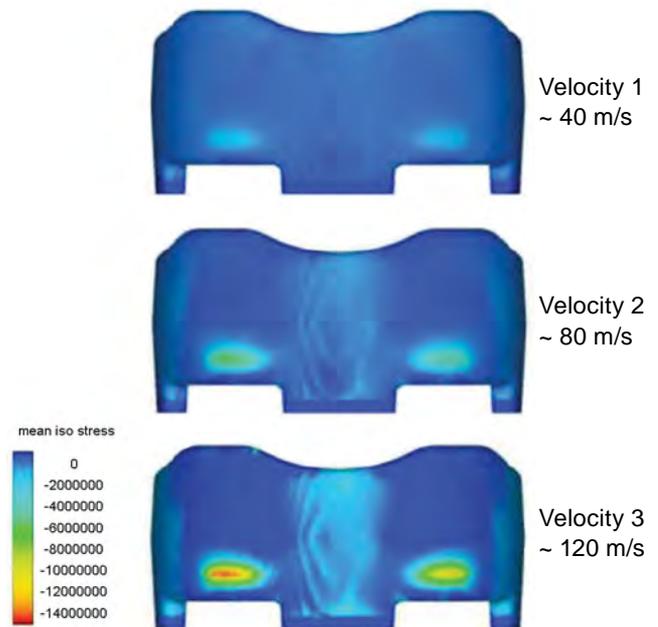


Figure 1 – Stresses occur if the liquid aluminum hits the salt core. These can be computed and subsequently displayed by means of simulation.

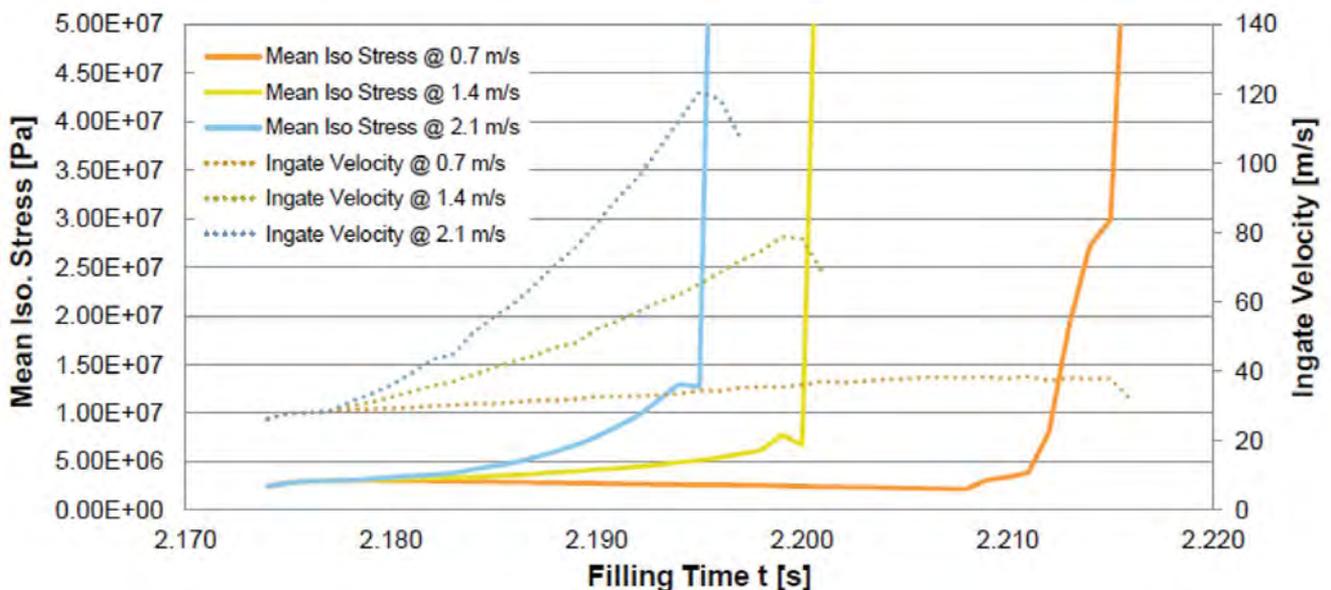


Figure 2 – The stress in the salt core during the intensification pressure phase clearly exceeds the maximum tolerated salt core stress of 20 MPa. However, since the core is already completely surrounded by melt at this point, no core failure occurs.

## Fine Adjustment of the Shot Curve as the Key to Success

Usage of Fluid Structure Interaction (FSI) simulation is helpful in this connection. It predicts the effect which the liquid aluminum will have on the salt core. The stresses occurring in the core are computed in this simulation (Figure 1). Knowledge of these stresses is important – they can, after all, cause the core to break in an unfavorable case. The FSI simulation reveals which shot parameters must be maintained to achieve a successful cast. The stresses occurring in the core and the ingate velocity, i.e. the velocity of the liquid aluminum at a point immediately before it hits the core, are displayed in a diagram (Figure 2). The maximum tolerated stress of the salt core is clearly exceeded in the intensification pressure phase. It is therefore important that the filling process is complete at the time of the pressure changeover and that the salt core is completely surrounded by melt. If this is not the case, then the salt core can break. The diagram shows first and foremost that the decisive factor for the viability of a salt core is not the ingate velocity but rather the point of pressure changeover. Various shot curves can be tested for this behavior and evaluated by means of simulation.

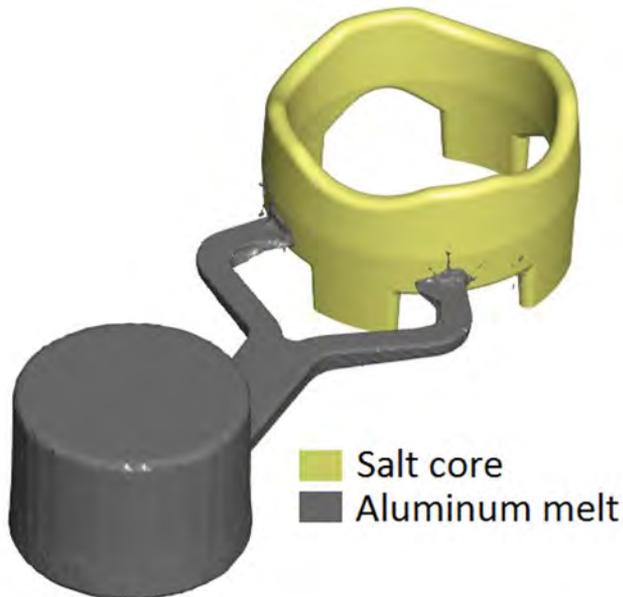


Figure 3 – Aluminum melt hitting the salt core during HPDC process.

## Bühler as a Partner

Simulation of the casting process plays an important role for efficient and quick implementation of projects for die casting components. Especially for new processes, such as Lost Core, it provides essential information for the design and optimization of the process. Bühler experts will provide this know-how as a service to its customers. The extensive knowledge about die design, simulation and the HPDC process additionally guarantees our optimal support – from the development of die casting parts up to serial production.



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