

UNIT 32: Mold Filling

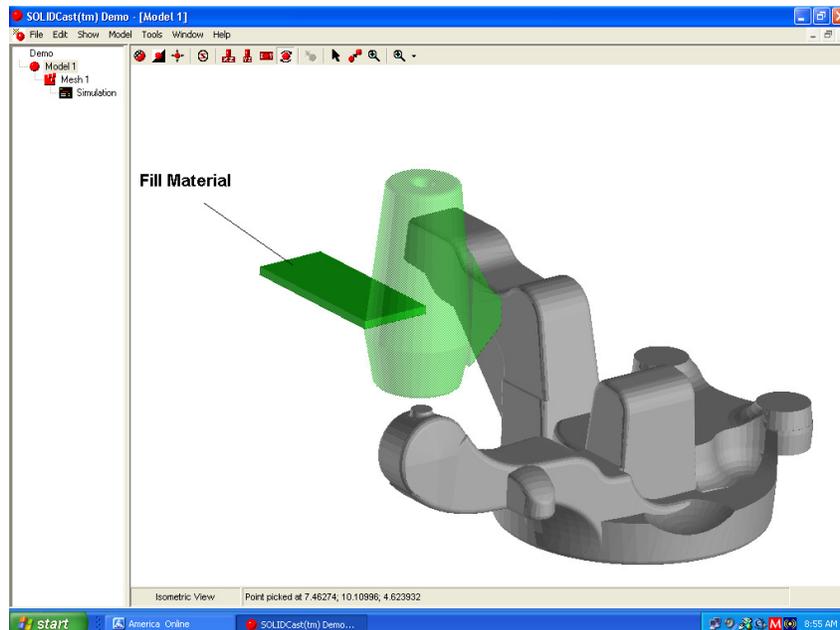
SOLIDCast can be used to simulate the filling of the mold cavity. Filling calculations are done using an order-of-fill algorithm taking the direction of gravity into account. If you have purchased the optional FLOWCast module, the system can also perform a full Computational Fluid Dynamics (CFD) analysis (meaning that metal velocity is calculated, and momentum, viscosity and pressure are taken into account).

The simplifications in the SOLIDCast fill algorithm provide for a rapid calculation for mold filling which gives a realistic starting point, in terms of temperature gradients in the casting and mold, for subsequent solidification calculations. If splashing, mold erosion or misrun defects are a problem in your foundry, you would want to run fluid flow simulations using FLOWCast. See the FLOWCast Training Workbook for full details on running fluid flow analyses.

To perform a SOLIDCast mold filling calculation, it is necessary to use the special-purpose material called Fill Material. You can make shapes out of Fill Material just as with any other material type. Where the Fill Material contacts Casting or Riser Material, the metal is assumed to begin flowing into the mold. If Fill Material is not in contact with either Casting or Riser Material a simulation error will result.

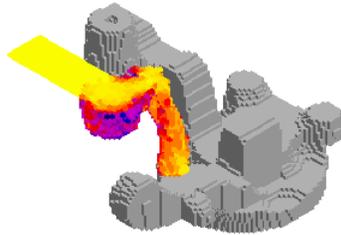
Generally, a shape of Fill Material is placed at the top of a sprue, or the entire gating system can be created of Fill Material and the filling of the casting simulated at the point where the gating system attaches to the casting. It is also possible to place inlet gates on the casting and simulate the filling of the casting cavity without creating a model of the entire gating system.

In the following example, a plate of Fill Material has been placed at the inlet location for the molten metal:

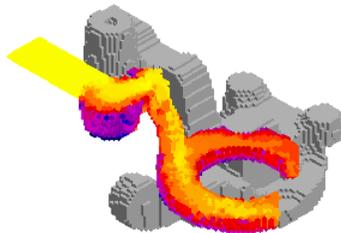


The filling of the casting will begin at this location when the simulation starts, as shown in the following sequence:

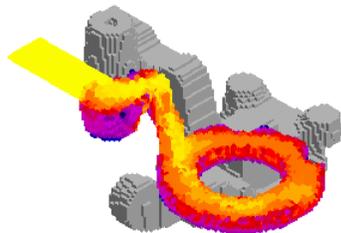
Mold Filling 9.93 % Full Time from start of fill: 1.21 Sec.
Min. Casting Temperature: 2424.68 F Max. Casting Temperature: 2551.84 F



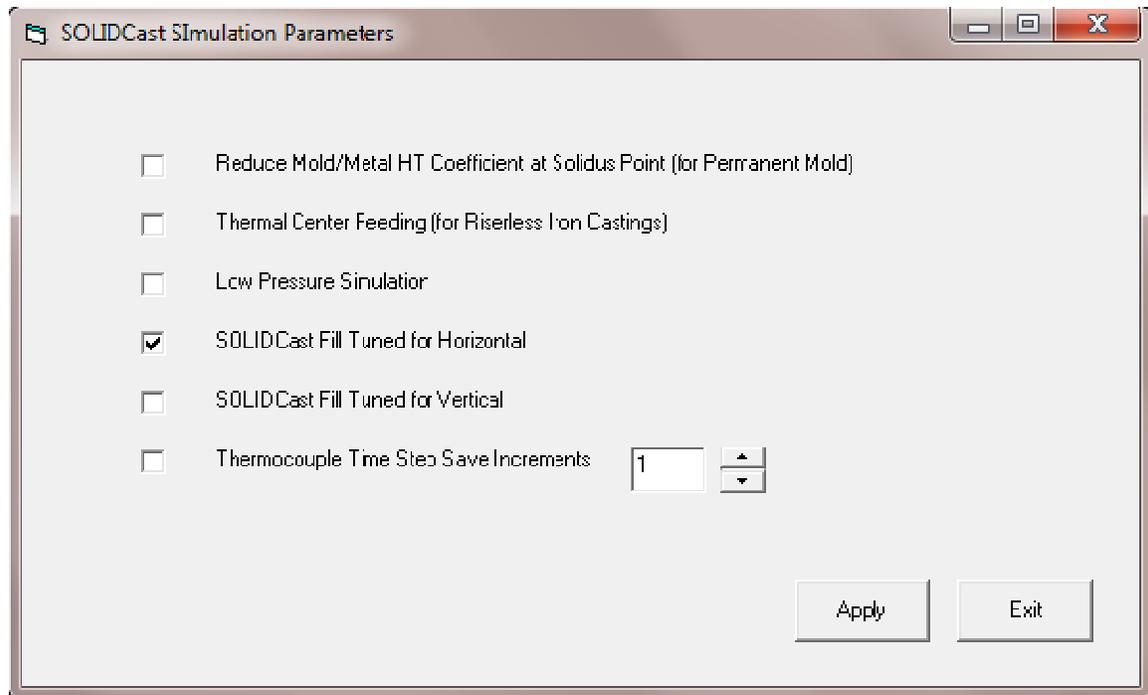
Mold Filling 19.86 % Full Time from start of fill: 2.21 Sec.
Min. Casting Temperature: 2394.95 F Max. Casting Temperature: 2552.00 F



Mold Filling 25.38 % Full Time from start of fill: 2.76 Sec.
Min. Casting Temperature: 2368.19 F Max. Casting Temperature: 2551.95 F



The behavior of the filling metal can be controlled to some extent by adjusting a parameter for either primarily vertical or horizontal flow. This is accessed by going to Tools...Simulation Parameters. You will see a window like this:



There are two entries related to the SOLIDCast filling algorithm. One box is checked if the flow is primarily in a horizontal direction, and another box is checked if the flow is primarily in a vertical direction. If no box is checked, horizontal flow is assumed.

Once a box is checked, click the Apply button. Now all simulations that use the SOLIDCast filling algorithm will use the selected parameters.

