Frame Housing

**Insight:** Frame housing with relatively higher complexity factor experienced internal shrinkage and cracks at the rib sections.

The cast iron frame housing of overall size 405mm x 480 mm x 169 mm weighing 27 kg was in production in a major foundry. It had a very high complexity factor and was prone to multiple shrinkage defects in various sections of the casting.

Thickness analysis of the part shows several thick regions and junctions with relatively higher complexity factor.

The current methoding included 4 side feeders of 55 mm (top) and 65 mm (bottom) diameter and height 85 mm. An Exothermic sleeves of 6 mm thickness are also placed.
Simulation of current methoding and analysis of solidification contours clearly indicates multiple isolated hot spots exactly matching the shrinkage defects found in actual casting.

Liquid fraction analysis displays liquid metal remains inside the casting till the end of solidification. The isolated liquid metal is present in the thick regions.

Solidification temperature analysis shows that high temperature isolations inside the casting which leads to the shrinkage porosity. This location clearly matches with shop floor defect locations.

Solidification time analysis also confirms the locations of castings solidifies last. This leads to shrinkage porosity defect exactly observed on the shop floor.
Shrinkage porosity analysis shows micro porosity observed in the different locations of casting and macro porosity at the feeders matching exactly to the shop floor defect.

To improve the quality, the methoding was revised to by adding one more feeder of dimensions 55 mm (top) and 65 mm (bottom) diameter and height 85 mm. Also 6 steel chills are placed at defect locations.

Liquid fraction analysis shows last solidifying metal present in feeder, while there is no liquid metal remaining at the end of solidification in part which gives defect free casting.
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Solidification temperature shows directional solidification with hottest region in feeder and part connected to feeder at relatively lower temperature.

Shrinkage porosity results show macro porosity in the feeder and there is almost no shrinkage in casting observed at locations of shop floor.

Thermocouple analysis reveals that thermocouple in part region crosses solidus temperature earlier and thermocouple at feeder crosses solidus afterwards thus feeder solidifies last.

Summary: Feeders with sleeves improved the feeding efficiency along with chills for better quality of casting.