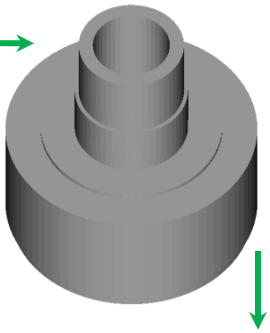
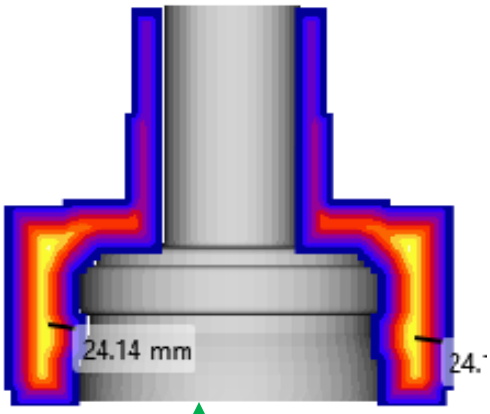
Differential Housing

Ductile Iron, Green Sand Casting

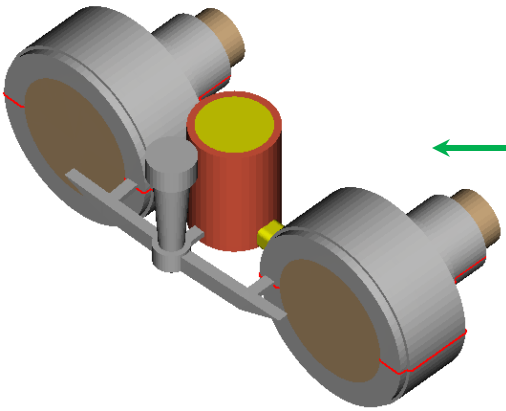
***Case*: This differential housing casting of diameter 155 mm and height 135 mm, weighing 6.6 kg was produced in a multi-cavity sand mould. Internal porosity defect was observed during machining, causing a high level of rejections.**

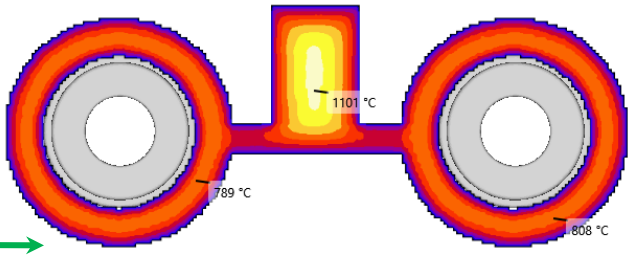




Wall thickness analysis shows a heavy section with 29 mm thickness below L-junction.

The current method design includes two castings sharing a common feeder (60 mm bottom diameter, 60 mm top diameter, and 100 mm height), with square neck of 20 X 20 dimensions. An exothermic sleeve of 6 mm thickness is also provided on the feeder.





Solidification simulation shows that the feeder neck size is inadequate, and results in shrinkage porosity exactly matching with the defect found in actual casting.

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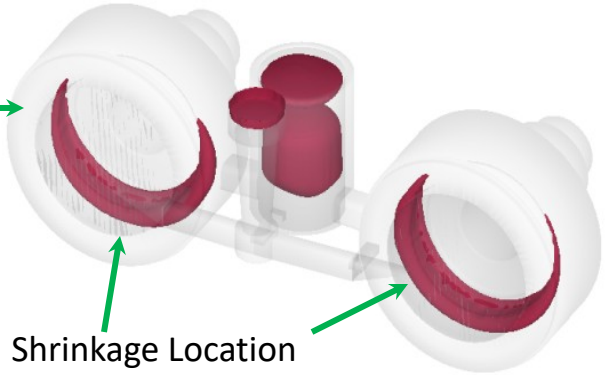
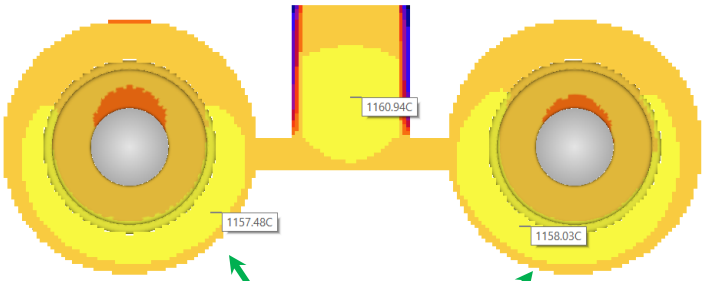
Liquid fraction analysis displays liquid metal remains inside the casting till the end of solidification. The isolated liquid metal is present in the thick regions.



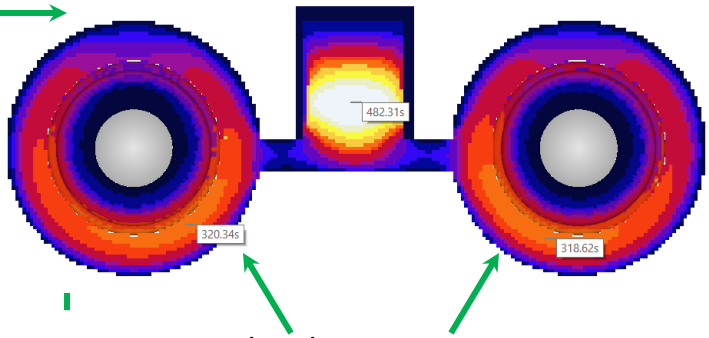
Shrinkage Location



Shrinkage Location

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 Location

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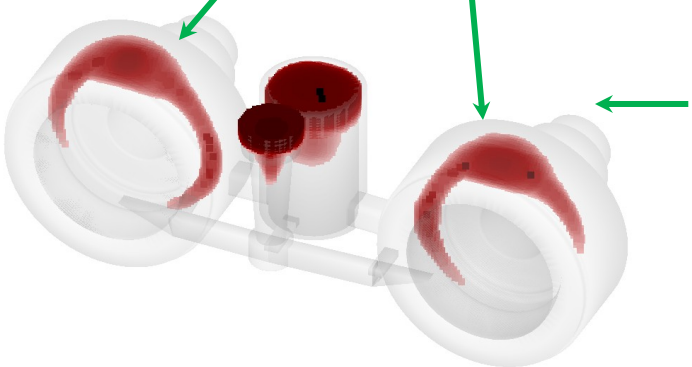

Shrinkage porosity analysis shows micro porosity observed in the different locations of casting and macro porosity at the feeders matching exactly to the shop floor defect .

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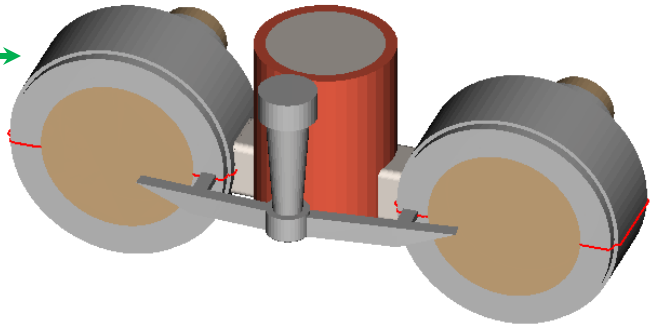
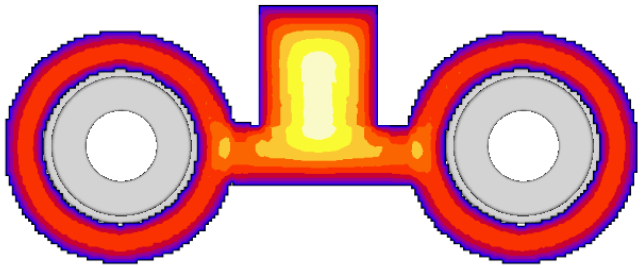
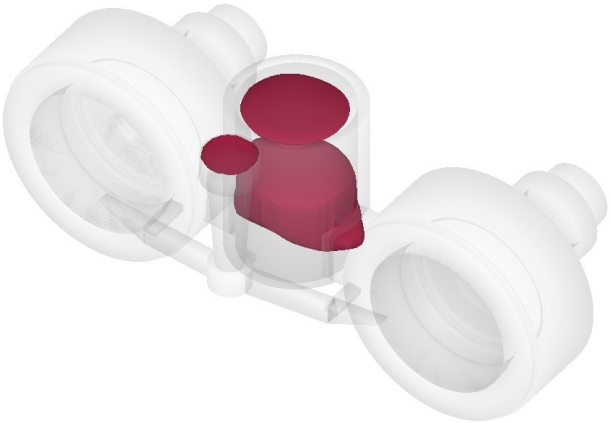
To improve quality of castings, the current methoding is modified by increasing feeder as well as neck dimensions. The modified feeder dimensions are height 120 mm , top and bottom diameter 80 mm. Also the dimensions of square neck are 40 X 40 mm.

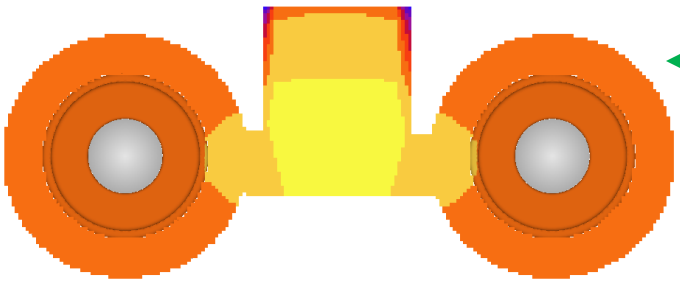


Solidification simulation shows that the neck dimensions are adequate to eliminate shrinkage defect from the casting though isolations are observed at the neck junctions.



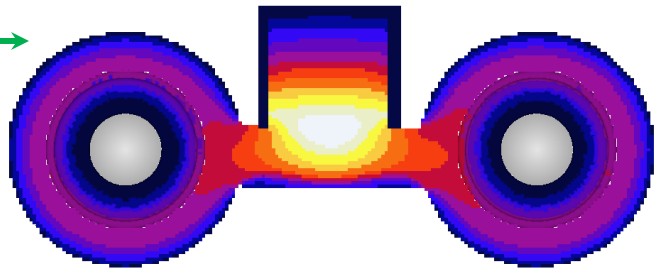


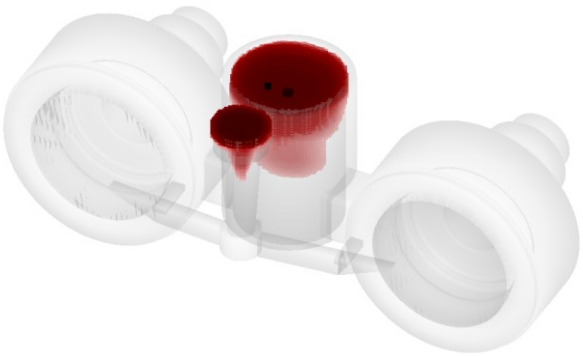
Liquid fraction analysis shows last solidifying metal present in feeder, while there is no liquid metal remaining at the end of solidification in part which gives defect free casting



Solidification temperature shows the directional solidification with hottest region in feeder and part connected to feeder at relatively lower temperature .

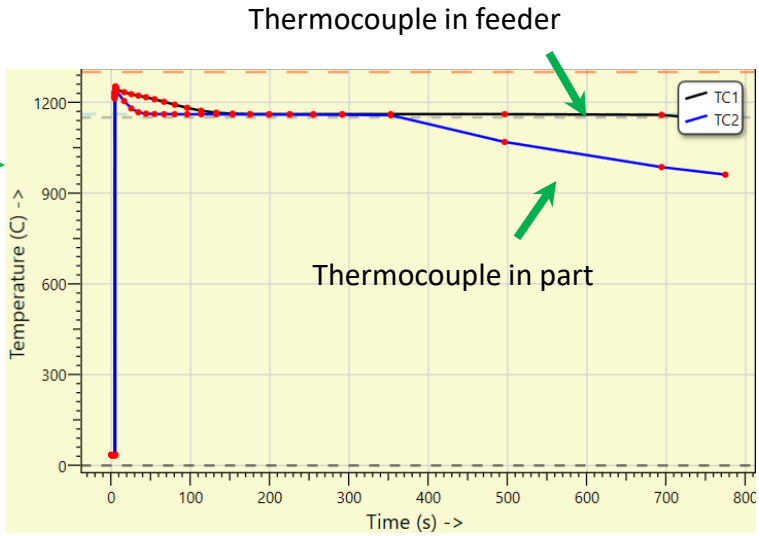
Solidification time analysis also confirms that there are no locations of castings solidifies last. Feeder is the region that will solidify art last. This is an evidence of directional solidification.





Shrinkage porosity results shows macro porosity in the feeder and there is almost no shrinkage in casting observed at locations of shop floor. Casting is free from shrinkage defect.

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



Summary: **The modified feeder and neck dimensions resulted into elimination of shrinkage defect observed at shop floor. .**