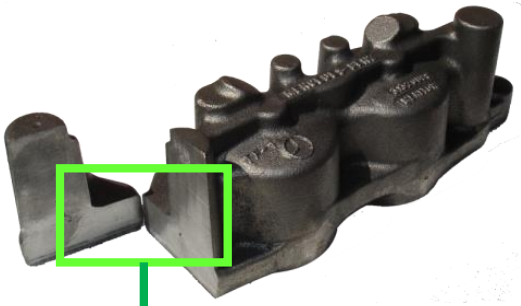
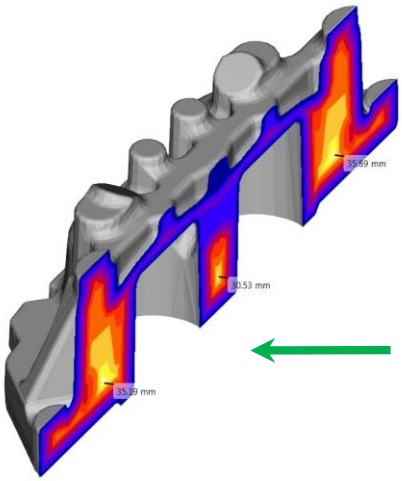
Automobile Part

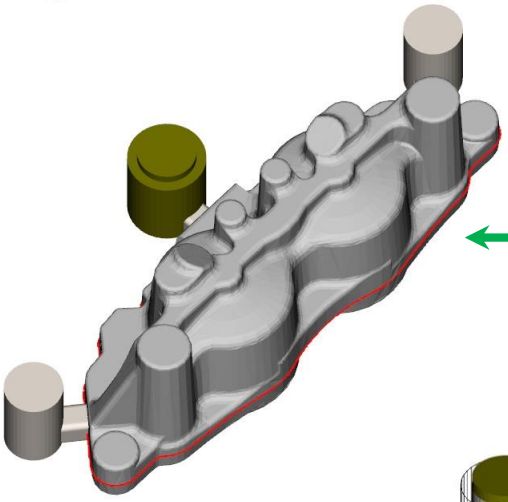
Ductile Iron, Green Sand Casting

***Case*: The ductile iron body casting has an overall size 90 mm x 300 mm x 90 mm and weighs 6 Kg. It suffered from frequent rejections due to internal shrinkage porosity at end boss.**

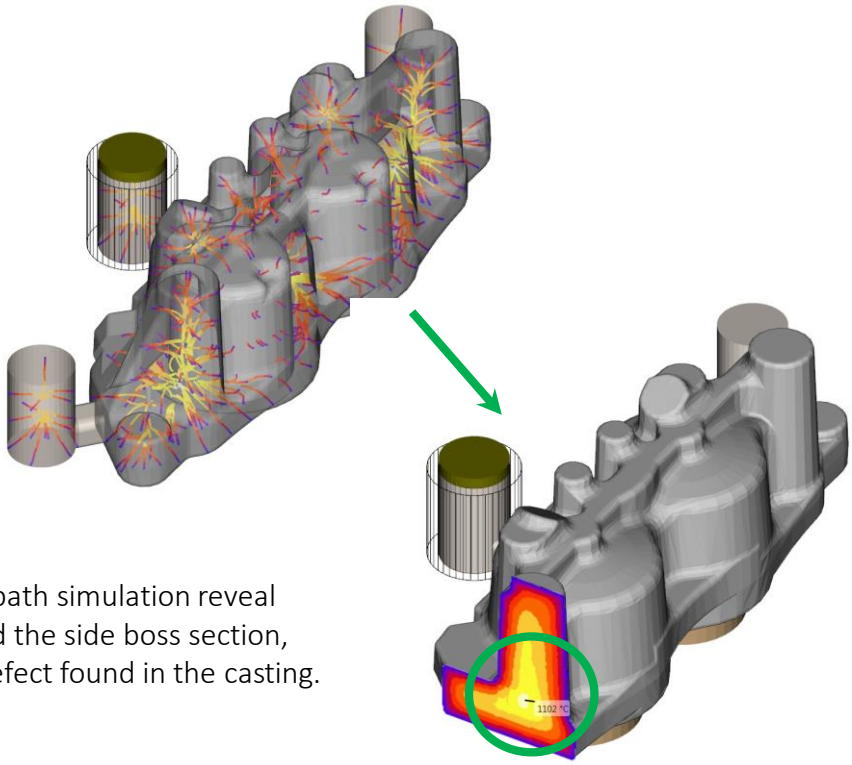




Thickness analysis of the part shows varying values with a maximum of 35 mm at the side boss and 25 mm at the central boss, connected by a thick section.



Initial methoding of the casting included three side feeders, all connected close to the thickest section to address the hot spots. An insulated sleeve is also provided to the central feeder to increase its effectiveness.



Solidification and feed path simulation reveal isolated hotspot around the side boss section, exactly matching the defect found in the casting.

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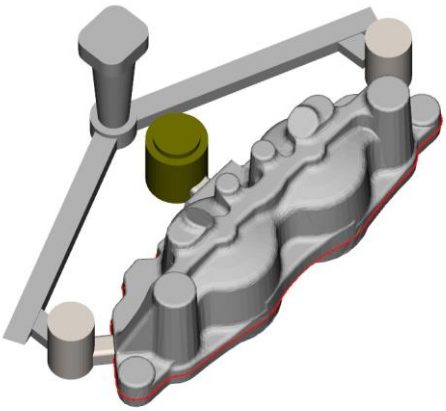
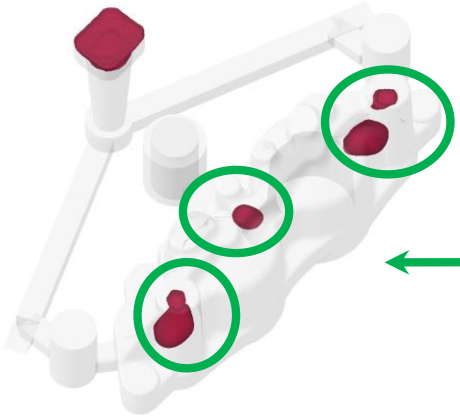
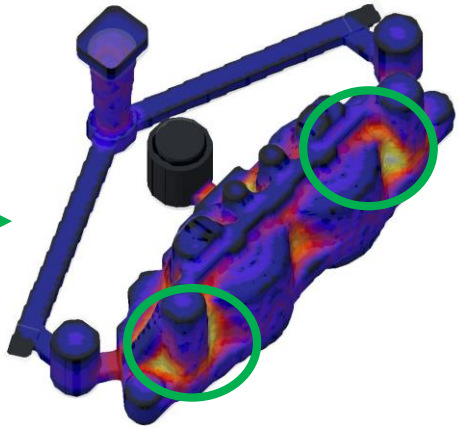
Initial gating system includes two runners and two gates connecting to side risers. Both side risers act as hot risers with the initial gating system.

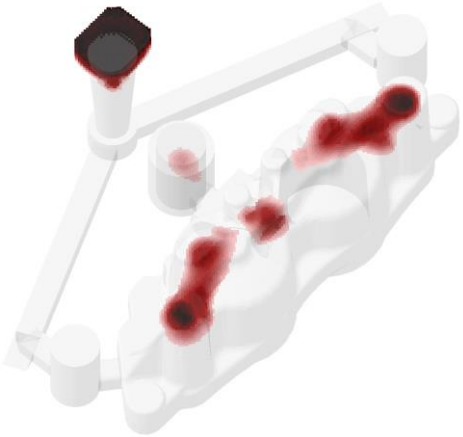




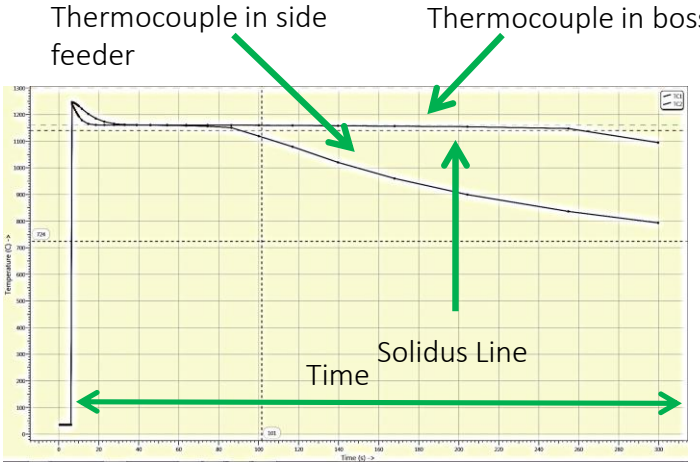
Liquid fraction analysis displays liquid metal remains inside the casting till the end of solidification. These locations can lead to shrinkage porosity.

Solidification time analysis gives locations where metal solidifies last. These locations matches with the defect in the part.





Shrinkage porosity is seen inside the bosses and matches with the defect seen in the part. The lighter colour shows micro shrinkages and darker colour shows macro shrinkages.



Thermocouple analysis reveals that boss takes much more time than the connected feeder to cross solidification line which validates the result from shrinkage porosity analysis.

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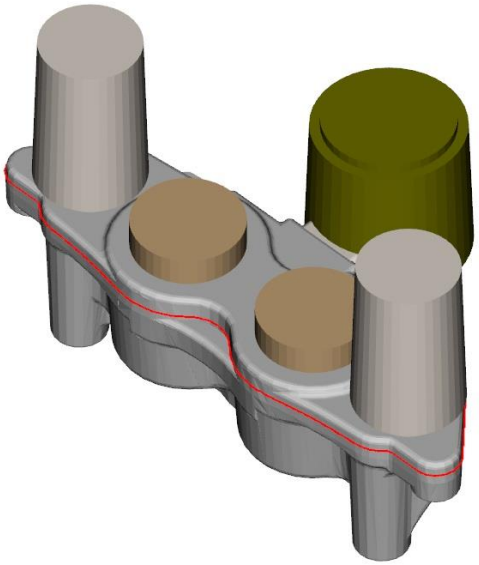
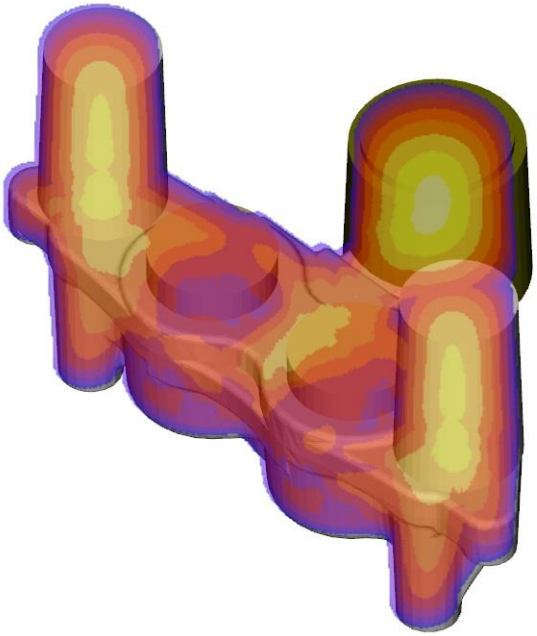
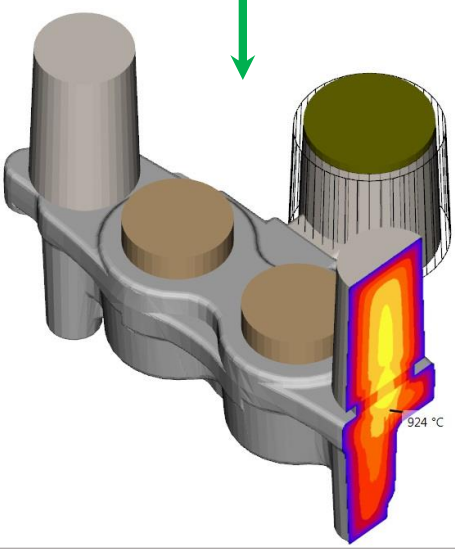
The methods design was revised by reorienting the part upside down. The two side feeders are replaced by two top feeders thus providing additional feeding pressure. A side feeder is provided to address the central thick section





The solidification map of revised methoding indicates uniform and directional solidification with entire hotspot region shifted to the feeders

A closer investigation of the critical sectional view and the feed path analysis shows the favorable temperature contour and the feed paths well connected towards the feeder.



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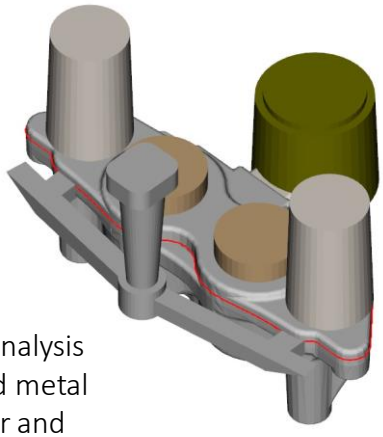
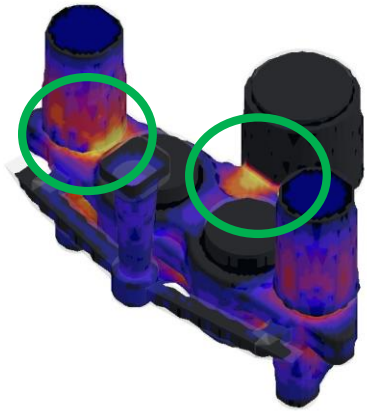
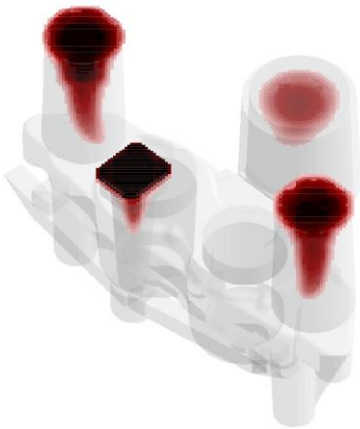
Revised gating system includes two runners and two gates. Non- pressurized gating system is used.



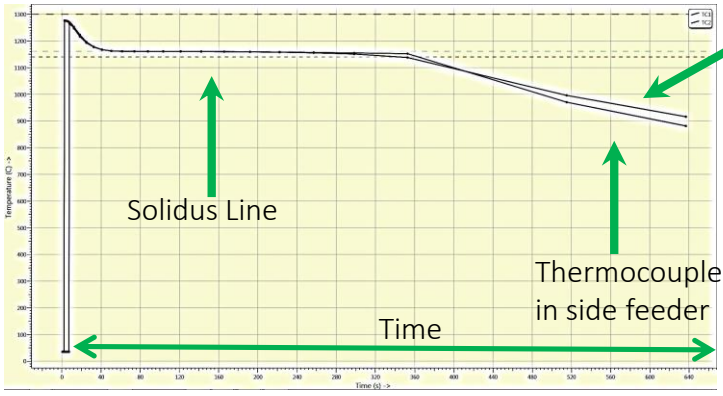
Liquid fraction analysis displays all liquid metal inside the feeder and sprue at the end of casting.

Solidification time analysis gives locations where metal solidifies last. Last solidifying metal is inside feeders.





Shrinkage porosity is observed in the feeders. Shrinkage porosity from casting is completely eliminated.



Thermocouple in boss

Thermocouple analysis supports the shrinkage porosity results. Boss takes less time to solidify then the feeder.

Summary: **The revised methoding with casting turned upside down and fed by two top feeders eliminated the shrinkage defect found in original layout without much affecting the yield.**