Casting Yield Improvement and Reduction of Defects in Copper Casting using Numerical Simulation

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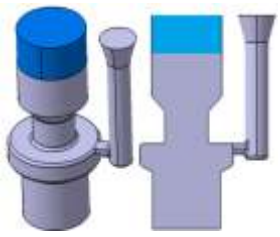
Abstract:

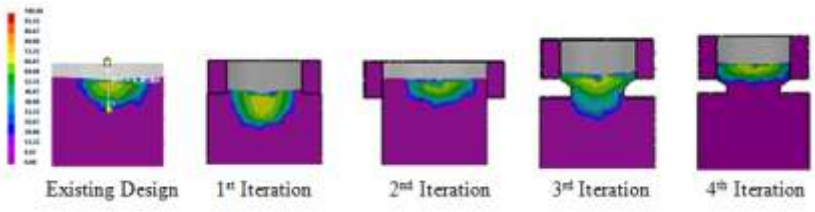
Casting quality is critically affected by solidification pattern and flow of molten metal depending on casting methods followed and material used in the process of manufacturing. The quality of casting is governed by controllable factors apart from a few uncontrollable factors. High yield and less casting defects are two important outputs any foundry is usually concerned about and major defect any foundry tries to eliminate is the shrinkage porosity. Using numerical simulation technology to develop new castings and optimize existing designs is a better way to visualize probable causes and effects for casting defects and poor yield. Casting foundries are more into simulation these days and foundry technology is fast moving to be a perfect science rather than an art. However lack of well-trained designers and analysis experts have created a huge gap in this field and bridging this gap is the future of metal casting technology as advanced analysis software's are developing these days.

In the present study carried out yield improvement and reduction of casting defects was studied and analyzed in a Phosphor Bronze casting using FEM based numerical simulation software. Clear understanding of the casting principles followed in the foundry was investigated to understand loop holes in the existing process. All the process parameters were taken in to consideration during numerical simulation and different improvised gating designs with feeding aids was simulated and compared. The best design considering ease of manufacturability was selected and the same was experimentally validated in the foundry.

The results from numerical simulation study carried out were in agreement with experimentally validated results in foundry and yield improvement of about 10% was achieved. Casting defects like blowholes and shrinkage was reduced. The importance of simulation software was emphasized in this work. The study is expected to benefit engineers and students looking forward to use simulation technology as a tool to aid foundries design and analysis of castings.



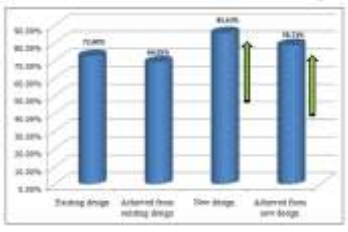
Existing design



Shrinkage porosity in feeder zone of existing design and new designs

Static test

Experimental validation of new design



Yield improvement