

Thermal-induced defects and optimization of casting process

ABSTRACT

A casting process in the general industry is prone to produce varied defective parts, which happens majorly due to the factor of thermal and flow. These factors can cause major quality problems and drop in product performance during operational condition if left untreated. Thus, this paper presents these type of problems encountered in casting by applying analytical technique to forecast the behaviors of inclusions in molten material in a mold, determining the effect of parameter and process change during pouring, and analyze the pattern and provide the best decision in regards to the process of manufacturing. The use of computer-aided tool, also known as Manufacturing Analysis (in this case, an analysis of solidification and fluidity of molten material) technologies, is developed and utilized to enable a study on reduction of thermal-based defects in manufacturing on a casting product. Assessment is made based on temperature distribution, filling and solidification time, and the presence of porosity in a sample product, while optimization is performed on the same product but with different process parameters such as gate size, location, melt temperature and such. The results are varied with improvement in one area, but might worsen in another area. Thus, the final outcome is discussed and measured for its feasibility and possibility for multiple improvement process to be integrated together.

Keyword: Casting; Casting defect; Casting simulation; Thermal and flow analysis; Casting optimization; Thermal defect