Effect of Casting Section Thickness on Microstructure and Cooling Curve Morphology of Spheroidal Graphite Cast Iron

Mohd. Nadeem Bhat[1], D.M. Afzal Khan[2] and K.K. Singh[3]

[1]Research Scholar, Department of Metallurgical and Materials Engineering
National Institute of Technology, Srinagar, India-190006
[2]Professor, Department of Metallurgical and Materials Engineering
National Institute of Technology, Srinagar, India-190006
[3]Professor, Department of Foundry Technology
National Institute of Foundry and Forge Technology, Ranchi, Jharkhand India-834003
E-mail: nadeem.nit.06@gmail.com

Abstract—In current scenario the energy crisis are on the continuous rise, researchers and academicians are actively working towards a common goal of energy savings by different means. Spheroidal graphite cast iron (SGI) is one of the major alloys used for automobile and structural applications. Manufacturing industries are more focused on using lightweight components to minimize the overall energy requirements. Nevertheless, the complexity of producing thin-walled SGI products is a challenge. In this study, the solidification cooling curve morphology and microstructure of SGI with varying section/wall thickness are investigated. The results obtained from the Simulation of stepbar castings of varying section thickness shows that thick sections have longer eutectic reaction thermal arrest due release of latent heat by the formation of graphite. It was also observed that the thin sections have higher degree of undercooling. Microstructural investigations showed that the thin sections have higher hardness and strength due to higher pearlite fraction, but the amount of graphite formed in thin sections is reduced which could lead to aggravated carbide formation in SGI. Thus it is evident that, to avoid formation of carbides in thin walled SGI castings more inoculation degree is required to promote graphite formation which will ultimately suppress carbides precipitation.

Keywords: Section thickness; Simulation; Cooling Curve; Graphitization; Microstructure.