A

DISSERTATION REPORT

ON

Effect of parameters in high pressure die casting process on quality of Cylinder block

Submitted in partial fulfilment of the requirements

of the degree of

Master of Technology

(Materials Metallurgy)

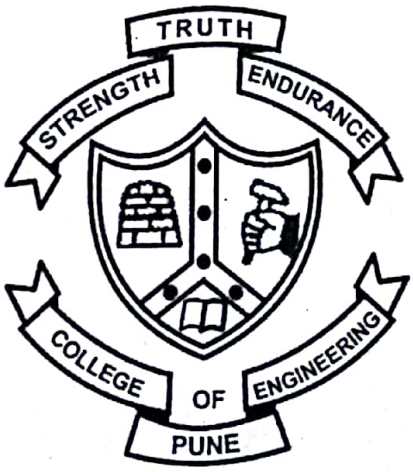
By

AMOL DIGAMBAR SHEWALKAR

(121646015)

Under the Guidance of

Dr. M. J. Rathod



DEPARTMENT OF METALLURGY AND MATERIALS SCIENCE

College of Engineering, Pune

(An Autonomous Institute of Govt. of Maharashtra)

2017-2018

Abstract

High pressure dies casting process with AlSi9Cu3 alloy is used to produce complex thin sections with high strength for different industrial parts useful in automotive, marine, aerospace, defense, telecommunication. Presence of porosity, with a coarse dendritic α-Al solid solution leads to problems such as leakage, post-machining rejection, cracking in service, blisters, and decreased mechanical properties. These defects are due to improper melt cleaning, incorrect machine parameters. In this study, the effect of process parameters on the quality of casting namely leakage and surface damages were investigated. Various analytical techniques such as Pareto analysis, W-1H analysis and product process search analysis were used. Single parameter variation experiment was performed which involved parameters such as slow shot velocity, fast shot velocity, plunger lubrication and intensification pressure. Castings were tested by using leakage test, x-ray radiography, porosity, and density measurement analysis. The metallographic analysis at specific locations which are prone to defect formation was also carried out. Results show that the leak quantity rejection is reduced from 9.30 % to 2.27 % with increasing fast shot velocity value from 5.0 m/s to 5.4 m/s while decreasing slow shot velocity from 0.8 m/s to 0.7 m/s resulted in increased leak quantity rejection from 5.71 % to 11.36 %. X-ray images showed no variation in porosity in casting due to change in casting pressure from 1180×10^5 N/m^2 to 900×10^5 N/m^2. Mixture of tip oil and granule for plunger lubrication resulted in least leak quantity rejection. However, oil present in front of the plunger tip leads to carbon entrapment in the casting.