

Effect of mold designs on molten metal behaviour in high-pressure die casting

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Abstract. This paper presents a research study conducted in a local automotive component manufacturer that produces aluminium alloy steering housing local and global markets. This study is to investigate the effect of design modification of mold in die casting as to improve the production rate. Design modification is carried out on the casting shot of the mold. Computer flow simulation was carried out to study the flow of molten metal in the mold with respect to the mold design modification. The design parameters of injection speed, die temperature and clamping force has been included in the study. The result of the simulation showed that modifications of casting shot give significant impact towards the molten flow behaviour in casting process. The capabilities and limitations of die casting process simulation to conduct defect analysis had been optimized. This research will enhance the efficiency of the mass production of the industry of die casting with the understanding of defect analysis, which lies on the modification of the mold design, a way early in its stages of production.

1. Introduction

New technologies, cost pressures, and economic trends have all had a significant impact on the manufacturing industries. This is particularly true in the automotive component market sector, which requires various sizes, complex, tight-tolerance, high performance, and low-cost products. The use of automotive products is expected to escalate because of their promise of decreasing cost and improved efficiency. As a result, the demand for aluminium dies casting processing services and equipment is expected to grow. However, rejected parts especially during the pre-mass production are a major concern for all automotive part manufacturers. In order to improve the production rate, the design and development of a process is enhanced with advanced processing technology so that it will lower its defect rate [1]. The same goes with die casting, mold parameter changes and design modifications should have continuous development and improvement to reduce defect rate as well as improve the production rate.

A research study was undertaken in one automotive components manufacturer which produces automotive aluminium die cast steering housing intended for local and global market using high pressure die casting process. This study is to investigate the effect of design modification of mold in die casting

