

A Study of Auto Pour in Sand Casting Process

I. Nawi^{1,a}, W. A. Siswanto^{1,b}, A.E. Ismail^{1,c}

¹Department of Engineering Mechanics, Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia, Parit Raja 86400, Johor, Malaysia

^aismailn@uthm.edu.my, ^bWaluyo@uthm.edu.my, ^cemran@uthm.edu.my

Keywords: 'Sand casting, Automation, Cycle time, Productivity, Rejection rate.

Abstract. Metal Casting is a process in which molten or liquid metal is poured into a mold made of sand, metal or ceramic, to form geometrically complex parts. Auto pour process is pouring the metal liquid into the mold by automation system by a set of machine without any human intervention. This paper aims to describe the process of pouring automation in sand casting producing brake drums where several parameters are compare with manual process. The cycle time, rejection rate, dimension, chemical composition and tensile strength have been analyzed. The results shows that the cycle time is reduced 40%, rejection rate decreased 5%, tensile strength 3% higher because of better pouring process. The other parameters are the same for both manual or automatic pouring process. Conclusion of this research shows the auto pour performs significant results base on higher productivity better quality.

Introduction

In the sand casting process, a pattern is typically made of wood or metal (aluminum alloy, iron alloy, steel alloy). Mold consists of cope and drag which are upper and lower half of mold. Where the cope and drag separate is known as the parting line. Both solid and split patterns can have cores inserted to complete the final part shape. When making a pattern, it is necessary to taper the edges so the pattern can be removed without breaking the mold.

The pattern is housed in a box called the flask, and then packed with sand. A binder helps harden the sand into a semi-permanent shape. Once the sand mold is cured, the pattern is removed. This leaves a hollow space in the sand in the shape of the desired part. Two-piece molds are clamped together. Molten metal is poured into a pouring cup where it will then travel down a sprue and into the gating system. Vent holes are created to allow hot gases to escape during the pour. Ideally, the pouring temperature of the molten metal is a few hundred degrees higher than the melting point, assuring good fluidity. The temperature difference also prevents premature cooling and resulting voids and porosity. After the metal cools, the sand mold is removed and the metal part is ready for additional operations, such as cutoff and grinding. Fig.1. shows the sand casting process flow.

Sand casting is an economical process for creating rough metal parts. Raw castings are then machined into finished products or components. Sand casting is the least expensive of all the casting processes, including die and investment casting. Sand casting is used to produce a wide variety of metal components with complex geometries. These parts can vary greatly in size and weight, ranging from a couple ounces to several tons. Some smaller sand cast parts include components as gears, pulleys, crankshafts, connecting rods, and propellers. Larger applications include housings for large equipment and heavy machine bases. Sand casting is also common in producing automobile components such as, brake drums, engine blocks, engine manifolds, cylinder heads, and transmission cases [1].