METAL FILLING CHARACTERISTICS OF ALUMINIUM LOST FOAM CASTING

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To my beloved Mother, Father and Sisters

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ABSTRACT

In the present research, experimental investigation of flow pattern of lost foam casting has been conducted. For this project, the investigation has main objectives to investigate the effect of sprue position, pouring temperature and different pouring condition on flow pattern of aluminium lost foam casting. Casting in the shape of step five with five sections were produced mainly using a foam density of 16kg/m^3 and pouring was made at two different temperatures of 700^0c and 740^0c, three different sprue positions (middle, 'full', right and left) and two pouring conditions (vacuum and non-vacuum). The results obtained shown that pouring temperature (700^0c and 740^0c) do not affect flow pattern for same sprue position. However, different sprue positions got different flow pattern Timing for molten aluminium to reach latest point 18 is faster for vacuum condition if compare with non vacuum condition. It is because vacuum machine has removed trapped air to make sure free flow of liquid casting material.

ABSTRAK

Dalam kajian menunjukkan, siasatan percubaan bagi cara pengaliran aluminium (Ai) telah dijalankan. Siasatan kesan pintu penuangan berlainan, suhu penuangan, dan keadaan penuangan adalah objektif –objektif utama bagi projek ini. Acuan-acuan dalam bentul langkah seperti lima bahagian telah dihasilkan terutamanya menggunakan ketumpatan busa 16kg/m^3 dan penuangan adalah dibuat pada dua suhu yang berberbeza (700 ^0c dan 740 ^0c), tiga jenis pintu penuangan, dan dua keadaan penuangan yang berbeza. Keputusan yang diperolehi menunjukkan suhu penuangan tidak mempengaruhi cara pengaliran aluminium bagi jenis pintu penuangan yang sama. Bagaimanapun, pintu penuangan yang berbeza menunjukkan cara pengaliran aluminium adalah berlainan. Masa bagi cecair aluminium untuk mengalir sampai titik terakhir adalah lebih pendek dalam keadaan vakum jika dibandingkan dengan keadaan tidak vakum. Ini disebabkan mesin vakum telah menghisap keluar semua udara untuk memastikan kebebasan pengaliran cecair aluminium (Ai).

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INTRODUCTION

1.1 Background

Lost foam casting (LFC) is a type of investment casting process that uses foam patterns as a mold. The method takes advantage of the properties of foam to simply and inexpensively create castings that would be difficult to achieve using other casting techniques.

Weldments and complex casting assemblies can be made using this near net shape casting process. Similar to lost wax investment casting, the process uses a single ceramic coat for process step reduction. This is a value added casting method, which reduces finish machining and increases foundry yield for overall project cost advantages. Lost foam casting allows for the casting of parts that would otherwise be difficult to achieve in metal casting.

This casting process is advantageous for very complex castings that would regularly require cores. It is also dimensionally accurate, maintains an excellent surface finish, requires no draft, and has no parting lines so no flash is formed. As compared to investment casting, it is cheaper because it is a simpler process and the foam is cheaper than the wax. Risers are not usually required due to the nature of the process; because the molten metal vaporizes the foam the first metal into the mold cools more quickly than the rest, which results in natural directional solidification. Foam is easy to manipulate, carve and glue, due to its unique properties. The flexibility of LFC often allows for consolidating the parts into one integral component; other forming processes would require the production of one or more parts to be assembled.

The two main disadvantages are that pattern costs can be high for low volume applications and the patterns are easily damaged or distorted due to their low strength. If a die is used to create the patterns there is a large initial cost.

1.2 Problem Statement

In previous, many of the considerations arise for lost foam casting process. Examples consideration are pouring temperature, heat transfer and foam decomposition, coating effect and others. Simulations and experiments can help for better understanding the complex mechanisms and interplay of different process parameters in the mold filling.

1.3 Objectives of Project

To investigate the flow of molten aluminium in lost foam casting with constant pouring speed.

1.4 Scopes of Project

1. LFC (Lost Foam Casting).
2. Material to be investigated is aluminium.
3. Flow of 2 different pouring temperatures (700 ^0C , 740 ^0C)
4. Flow of 3 different position of pouring sprues.
5. Flow in vacuum and non-vacuum condition.

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