A Study on Mechanical Properties on Lm6 Aluminium Alloy by Varying Magnesium (Mg) Content Using Stir Casting

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ABSTRACT: - Aluminum and aluminum alloy components usage has been increased in automotive industries due to its light weight and also of their outstanding mechanical, physical and tri biological characteristics over the other materials. These properties are obtained by addition of alloying elements. Although several casting technologies are available to manufacture such aluminum alloys, High mach inability and workability of aluminum alloys are affected by porosity formation due to gas entrapment in the melting practices. Of the many casting techniques that are available, squeeze casting has higher advantage to produce the pore free component. Squeeze casting (SC) is a generic term to specify a fabrication technique where solidification is promoted under high pressure with a re-usable die. However in this technique, present study focuses on the fabrication of the LM6 aluminum alloy and also LM6 aluminum alloy with varying magnesium content by using the squeeze casting.

1. INTRODUCTION

With the constant drive towards cost - effective, high-strength, net-shape casting methods by the transportation industry, Precision Metal Forming (PMF) has developed a new and innovative squeeze-casting process called metal compression forming (MCF). MCF integrates the deceptively simple concept of solidification of metal under direct pressure with closed die forging and low-pressure permanent-mold fill technologies. This hybrid process, therefore, combines the advantages of traditional direct squeeze casting and low-pressure permanent - mold casting. MCF offers the ability to manufacture high-strength, high-integrity castings for safety-critical applications such as structural and chassis components. The MCF process also represents a more cost-effective alternative to the currently emerging in direct squeeze casting and semisolid forming technologies. Benefits of MCF include reduced capital costs as compared to semisolid forming and indirect squeeze casting, cycle times Comparable to cold-chamber die casting, and a "multiple-on" part capability not possible with traditional direct Squeeze casting. MCF offers more flexibility in terms of cast ability and gives excellent strength-to-weight ratio.

2. OBJECTIVES

- To produce Aluminium LM6 alloy by Squeeze Casting Process.
- To fabricate Aluminium LM6 alloy with varying Magnesium content by using squeeze casting process.

3. PROBLEM DEFINITION

Aluminum alloys are broadly used as a main matrix element in composite materials. Aluminum alloys for its light weight, has been in the net of researchers for enhancing the technology. The broad use of aluminum alloys is dictated by a very desirable combination of properties, combined with the ease with which they may be produced in a great variety of forms and shapes. Now a day the light weight composite material is

Widely used in engineering field. The composite material has good characteristic of hardness, resisting wear resistance and tensile strength due to good strength and less weight the composite material play a vital role in engineering field. Discontinuously reinforced aluminium matrix composites are fast emerging as engineering material sand competing with common metals and alloys. They are gaining significant acceptance because of higher specific strength, specific modulus and good wear resistance as compared to ordinary unreinforced alloys. Reinforcing particles used in this study are silicon carbide, fly ash and Red mud particles which are added externally. Aluminium alloy (LM6) is used in Marine, Automobile, Aerospace industries.

One of the main drawbacks of this material system is that they exhibit poor tribological properties. Hence the desire in the engineering community to develop a new material with greater wear resistance and better tribological properties.

Conventional casting processes create porosity during Melting practices. Hence the mach inability and workability of Aluminium LM6 alloy has been reduced.

4. METHODOLOGY

The methodology followed in our project begins from the identification of the problem followed by the surveying of various literature journals. After completing the survey the required LM6 Aluminium alloy material is selected for the squeeze casting process. Then the material testing is done for the LM6 Aluminium alloy with varying Magnesium content in it. The Tensile test, Hardness test and Microstructure evaluation is done for the squeeze casted material and the result is analyzed.

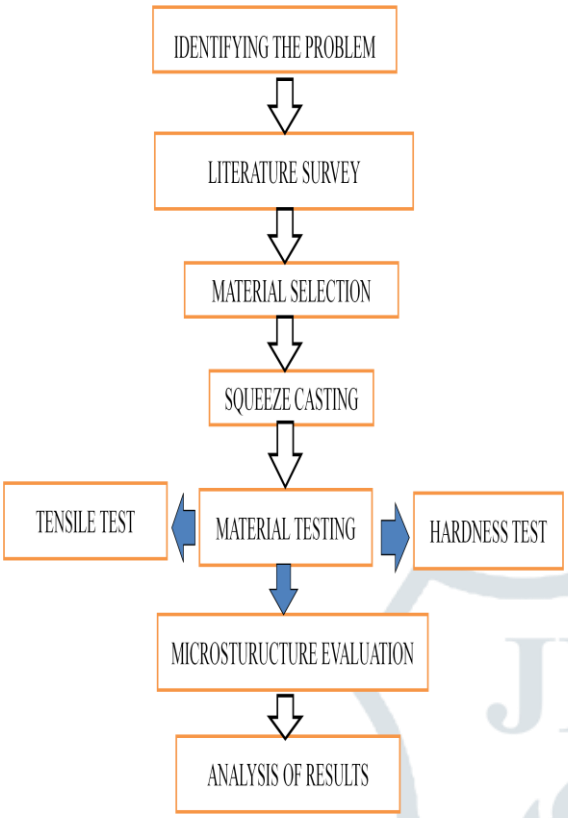

Fig 5.1 Methodology

CONCLUSION

1) Conventional casting processes create porosity during melting practices. Hence the machinability and workability of Aluminium LM6 alloy has been reduced and also one of the main drawbacks of the material system is that they exhibit poor tribological properties.
2) Hence the desire in the engineering community is to develop a new material with greater wear resistance and better tribological properties.
3) Thus, in our project we fabricate Aluminium LM6 alloy with varying Magnesium content by using squeeze casting process inorder to enhance the tribological properties of LM6Aluminium alloy and also to reduce the porosity created during melting practices for improving the machinabilty and workability of the Aluminium LM6 alloy.

REFERENCES

[1] Amin K.M, Nadeem A. Mufti "Investigating cooling curve profile and microstructure of a squeeze cast Al–4%Cu alloy" Journal of Materials Processing Technology 212 (2012) 1631– 1639

[2] Bo Lin, WeiWen Zhang , ZhaoHui Lou, DaTong Zhang, YuanYuan Li,"Comparative study on microstructures and mechanical propertiesof the heat-treated Al–5.0Cu–0.6Mn–xFe alloys prepared by gravity die casting and squeeze casting(2013) South China University of Technology, Guangzhou 510640

[3] Goh C.S, K.S. Soh , P.H. Oon , B.W. Chua " Effect of squeeze casting parameters on the mechanical properties of AZ91–Ca Mg alloys " Materials and Design 31 (2010) S50–S53

[4] Ghomashchi M.R, A. Vikhrov1 "Squeeze casting: an overview" Journal of Materials Processing Technology 101 (2000)

[5] Hajjari a E, M. Divandari "An investigation on the microstructure and tensile properties of direct squeeze cast and gravity die cast 2024 wrought Al alloy" Materials and Design 29 (2008) 1685–1689

[6] Kimuraa R , M. Yoshidaa, G. Sasakia, J. Panb, H.Fukunagac "Influence of abnormal structure on the reliability of squeeze castings" Journal of Materials Processing Technology 130–131 (2002) 299–303

[7] Liang S.M, Y.Q. Ma1, R.S. Chen1,b*,E.H. Han1,c "Effect of composition on the microstructure and mechanical properties of mg–al–zn alloys" metal and material society(2008)

[8] Oladele I.O. and J.A. Omotoyinbo"Evaluating the Influence of Ageing Temperature on the Mechanical" Properties of Al-Mg-Si Alloy1285-1292, 2011

[9] Vijian P , V.P. Arunachalam"Optimization of squeeze cast parameters of LM6 aluminium alloy for surface roughness using Taguchi method" Journal of Materials Processing Technology 180 (2006) 161–166

[10] Wenfei Mo, Liang Zhang , Guohua Wu, Yang Zhang, Wencai Liu, Cunlong"WangEffects of processing parameters on microstructure and mechanical properties of squeeze-cast Mg–12Zn–4Al–0.5Ca alloy" Shanghai Jiao Tong University,(2014) 200240