Optimization of Rotational Speed for Casting Al-Si Alloy Using Centrifugal Casting

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Abstract— **An alloy is a material that has metallic properties and is formed by combination of two or more chemical elements of which at least one is a metal. Commonly, alloys have different properties from those of the component elements.In recent years aluminium alloys are widely used in automotive industries. This is particularly due to the real need to weight saving for more reduction of fuel consumption. The typical alloying elements are copper, magnesium, manganese, silicon, and zinc.Aluminium-Silicon alloys are of greater importance to engineering industries as they exhibit high strength to weight ratio, high wear resistance, low density, low coefficient of thermal expansion etc. Silicon imparts high fluidity and low shrinkage, which result in good cast ability and weldability.**

***Index Terms*—Metal Matrix Composites, Die, Sand, Centrifugal Casting Technique.**

I. INTRODUCTION

The matrix in a metal matrix composite (MMC) is usually an alloy, rather than a pure metal there are three types of such composites namely.

- Dispersion-strengthened, in which the matrix contains a uniform dispersion of very fine particles with diameters in the range 10-100µm.
- Particle-reinforced, in which particles of sizes greater than 1µm are present.
- Fiber-reinforced, where the fibers may be continuous throughout the length of the Component less than a micrometer in length and present at almost any volume Fraction from 5 to75%.

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II. MATH

The Vickers Indenter Is A 136 Degrees Square-Based Diamond Pyramid.The Impression, Produced By The Vickers Indenter Is Clearer, Than The Impression Of Brinell Indenter; And Highwood Micro Vicker's Hardness Tester Is Used For The Testing. Therefore This Method Is More Accurate. The Load, 0.1 Kgf Applied For 10 Seconds. The Vickers Number (HV) Is Calculated By The Equation 3.7

$$VHN = \frac{1.854\,P}{D^2}$$ EQUATION ….. 3.7

WHERE , P-APPLIED LOAD (KGF),

D– AVERAGE LENGTH $(D_1+D_2/2)$ OF THE IMPRESSION DIAGONAL (MM)

III. UNITS

Accordingly To The Temperature Of The Metallic Matrix During Processing The Fabrication Of Mmcs Can Be Classified Into Three Categories:-

a. Liquid Phase Processes,

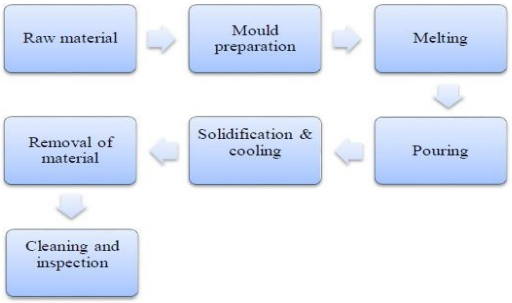
b. Solid State Processes, And

c. Two Phase (Solid-Liquid) Processes.

IV. HELPFUL HINTS

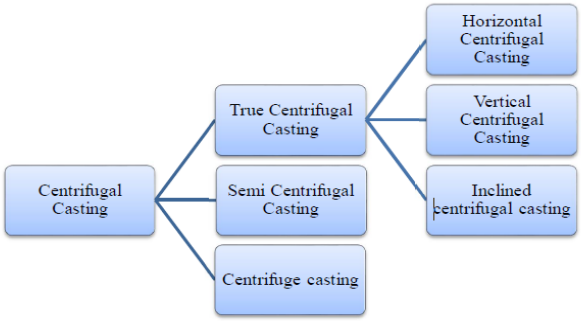
Steps in the production sequence in casting

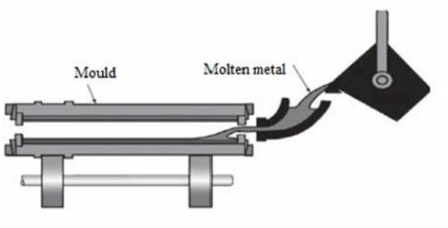
Metal casting involves pouring molten metal into a mould containing a cavity of the desired shape to produce a metal product. The casting is then removed from the mould and excess metal is removed, often using shot blasting, grinding or weldingprocesses.



Flow chart of classification of centrifugal casting

Centrifugal casting is done by pouring molten metal into a rotating mould. The centrifugal force acting on the mould helps in feeding and positioning the metal in the mould. Mould rotation is continued till after the metal is solidified. Centrifugal casting results in denser and cleaner metal as heavier metal is thrown to parts of the mould away from the centre of rotation and the lighter impurities like slag, oxides and inclusion are squeezed out to the centre. Again the Centrifugal castings machines are categorized into three basic types based on the direction of the spinning axis are as given below in the flow chart.





Horizontal centrifugal casting

Horizontal centrifugal casting is mainly used to cast pieces with a high length todiameter ratio or with a uniform internal diameter. Products include pipe, tubes, bushings, cylinder sleeves (liners), and cylindrical or tubular castings that are simple in shape.

DESIGNATION OF ALUMINIUM ALLOYS

Alloy	Main alloying element	Applications
1xxx	Pure aluminum; No major alloying additions	Electrical and chemical industries
2xxx	Copper	Aircraft components
3xxx	Manganese	Architectural applications
4xxx	Silicon	Welding rods, automobile parts
5xxx	Magnesium	Boat hulls, marine industries
6xxx	Magnesium and silicon	Architectural extrusions
7xxx	Zinc	Aircraft components

V. CONCLUSION

Metallographic preparation, sequential steps have to be performed to prepare Al-22%Si for micro structural investigation are involved careful selection of sectioning, mounting, grinding, polishing, and etching procedures is required, and each step must be optimized for each .

It is preferable to perform the grinding and polishing procedures with polishing machine. The structure of each and every Al-Si alloy product has been specifically adjusted to exhibit required properties, and thus each material will exhibit a unique behavior during preparation.

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