

Casting or Turning?

INTRODUCTION

The objective of this project is to design and manufacture a cricket bail using casting process as well as cnc turning process. The main objective is to prove that casting results in porosity. This report outlines the design considerations, manufacturing process, and testing procedures involved in achieving this goal.

CHOICE OF PROCESS PARAMETERS

1. For CNC Turning:

1. Opting for the VNMT Right Hand Tool:

We've selected the VNMT Right Hand tool due to its geometry, which is ideal for achieving smooth finishes and precise cuts, especially considering our cutting direction from right to left.

2. Setting Spindle Speed to 3000 RPM:

Setting the spindle speed at 3000 RPM strikes a balance between cutting efficiency, chip formation, and tool longevity. This choice aims to optimize material removal while minimizing tool wear and heat generation.

3. Adjusting Depth of Cut to 0.2 mm:

By reducing the depth of cut to 0.2 mm, we're opting for a lighter cut, which aids in refining surface quality and decreasing cutting forces during each pass.

2. For Casting:

Aluminum Processing: To transform leftover aluminum from turning into cast-ready material, a metal-suited band-saw was used, surpassing manual cutting due to aluminum's hardness. Cut pieces were then melted in a furnace at 850°C.

Sand Types in Casting: White and green sands are used in casting. White sand is thinly applied to aid pattern removal, while green sand is compacted meticulously for optimal mold formation.

Firm Layer Formation: When green sand is added to the cope or drag, it undergoes meticulous ramming and rolling to ensure a snug fit without any air pockets. This meticulous procedure is vital for impeccable mold formation, as the green sand's adhesion must be optimal.

PROCESS

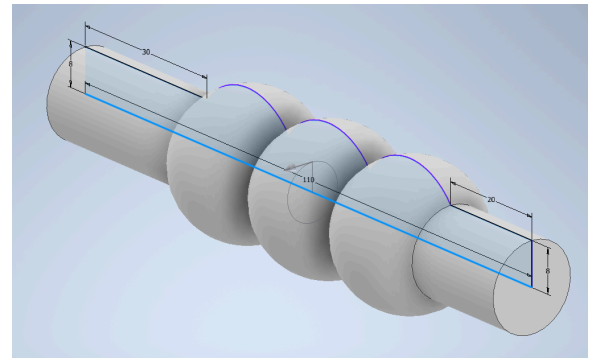
- The process began by creating CAD models of cricket bail.
 - Following the CAD design, file was then uploaded in the cnc machine for turning process.
 - For casting process, we have prepared a sand mould from wooden bail. Then, molten metal is poured into the mould and set to cool it down.
 - Once turned and Casted, the two bails were examined and density was compared.
-

LEARNING FROM THE OUTCOME

There are several learning outcomes which we came across during the whole process.

- **Porosity in Casting:** The main objective of the project was to demonstrate that casting results in porosity. This was confirmed through the examination of the casted cricket ball, where the presence of pores was observed. This highlights a limitation of the casting process, especially when compared to CNC turning, where such porosity is not a concern.
- **Surface Finish and Precision:** In terms of surface finish and precision, CNC turning proved to be superior. The careful selection of process parameters, such as tool geometry, spindle speed, and depth of cut, resulted in smooth finishes and precise cuts. This contrasts with the casting process, which may produce rougher surfaces due to the nature of sand molds and the melting and solidification of metal.
- **Process Complexity and Efficiency:** The casting process involves multiple steps, including mold preparation, metal melting, pouring, and cooling, making it more complex and time-consuming compared to CNC turning. CNC turning, on the other hand, offers a more streamlined and efficient manufacturing process, requiring fewer steps and less manual intervention.

CAD Model:



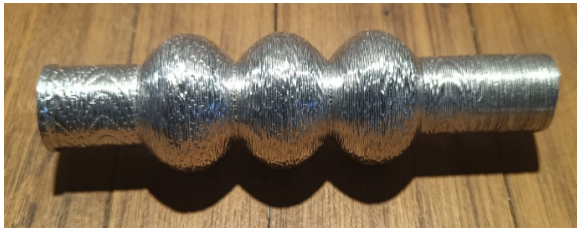
RESULT: Density measurements

Casting: 2.71 g/cm³

Turning: 2.85 g/cm³

PHOTOS OF THE CHALLENGE DONE





PEER REVIEW GRADES

| NAME | ROLL.NO | MARKS |
|------------------------|----------|-------|
| Ashmit Chokker. | 22110040 | 7 |
| Deepak Soni | 22110068 | 10 |
| Kethavath Shivaprakash | 22110120 | 9 |
| Trivedi Vatsal | 22110276 | 7 |
| Vidhi Shah | 22110286 | 7 |
| Viraj Vekaria | 22110287 | 7 |