

“ANALYSIS OF THE EFFECT OF MOLD SIZE VARIATIONS ON COMPRESSIVE STRENGTH, HARDNESS, AND MICROSTRUCTURE OF ALUMINUM 6061 CASTING”

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ABSTRACT

This research aims to analyze the effect of metal mold diameter variations on the mechanical characteristics and microstructure of cast Aluminum 6061. Aluminum 6061 is an alloy widely applied in automotive and construction components, yet its mechanical properties are significantly influenced by the cooling rate during the solidification process. In this study, specimens were produced using the gravity die casting method with metal mold diameter variations of 28 mm, 31 mm, 34 mm, 37 mm, and 40 mm. Testing parameters included compressive strength tests, Brinell hardness (HB) tests, and microstructure observations using ImageJ software to measure the average grain size. The results indicated that the mold dimension had a significant impact on mechanical properties and grain morphology. The highest compressive strength value was obtained in the specimen with the smallest mold diameter (28 mm) at 305.23 MPa, while the lowest value was found at the 40 mm diameter at 247.74 MPa. Consistent with the compressive strength, the highest hardness value was also achieved at the 28 mm diameter with 42.9 HB and the lowest at the 40 mm diameter with 37.4 HB. Microstructure analysis confirmed that smaller mold diameters produced faster cooling rates, triggering the formation of finer and denser grains. Conversely, increasing the mold diameter resulted in a slower cooling rate, which caused coarser grain growth and reduced the material's resistance to plastic deformation

Keywords: *Aluminium 6061, mold size, casting, metal molds*

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