

DEVELOPMENT OF SILICON CARBIDE REINFORCED ALUMINIUM METAL MATRIX COMPOSITE FOR HYDRAULIC ACTUATOR IN SPACE APPLICATIONS

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ABSTRACT

An actuator is a mechanical device that takes energy created by air, electricity, liquid and converts it into motion. In the present study, the design of actuator cylinder using 15-5 PH (H-1025) stainless steel is considered. The dilation, weight, time and cost of fabrication of current design is high. The final component when incorporated into the destination adds weight as a whole due to its density. The present work focussed on replacing the existing material with a SiC particle reinforced aluminium metal matrix composite to reduce weight, dilation and fabrication cost of the actuator. To achieve these objectives two step-mixing method of stir casting technique has been adopted and subsequent property analysis has been made. Aluminium alloy 6061 and silicon carbide (500 grit size) has been chosen as matrix and reinforcement material respectively. T6 heat treatment also improves the material properties. The material properties are then validated using transient structural analysis in ANSYS Workbench and the design is found successful in reducing weight of actuator. Cost analysis is conducted and actuator cylinder with Al-SiC composite material came out to be a potential substitute for the existing design.

KEYWORDS: Hydraulic Actuator, 15-5 PH (H-1025) Stainless Steel, T6 Heat Treatment, Transient Structural Analysis