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DESIGN AND THERMAL ANALYSIS OF 3D PRINTED ROCKET COMPONENTS

Abstract

The manufacturing of each component parts through conventional machining is complex and time consuming. Additive manufacturing(AM) reduces the weight of the components and enhances their strength, this reduces the fuel consumption of the rocket which is a financial as well as an ecological benefit. The metal 3d printing process described in this paper is through Wire Arc Additive Manufacturing(WAAM) technology. The Wire Arc Additive Manufacturing process(WAAM) offers high deposition rates at lower costs which makes it a feasible additive manufacturing process. Additive manufacturing(AM) not only reduces the manufacturing time but also saves large amount of material which in some cases, is wasted in conventional machining. The design of the components is developed using Solidworks software. The analysis of the components is performed on Ansys. The paper also includes a nozzle cooling design because without the cooling operation, most of the high powered rocket engines would melt within seconds of starting up. This paper will focus on the manufacturing of rocket components by 3d printing(WAAM), the design and the thermal analysis of 3d printed parts of the rocket. This paper also includes the material selection for 3d printed rockets, , cooling of engine nozzle, the type of propellant used, the manufacturing process the rocket(WAAM), design of rocket components and thermal analysis of the respective components.