Paper ID: 30937
student

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (9)

Author: Mr. Aniket Marne
College of Engineering, Pune, India

Ms. Tanvi Katke
College of Engineering, Pune, India
Ms. Saranga Kamble
College of Engineering, Pune, India
Ms. Bhagyashree Prabhune
India
Mr. Alimurtaza Kothawala
College of Engineering, Pune, India
Mr. Abhijit Rathod
College of Engineering, Pune, India
Mr. Pradip Bobade
College of Engineering, Pune, India

EMPLOYING RAPID PROTOTYPING TO REDUCE WEIGHT AND OPTIMIZE SELECTED INTRICATE STRUCTURAL COMPONENTS OF A PICOSATELLITE

Abstract

Rapid prototyping creates a 'prototype' of the CAD model at a fast rate, building the object layer by layer, from the bottom to the top. Swayam is a 1U, low earth orbit pico- satellite and weighs 1 kg. Its payload is passive attitude stabilization, i.e. without consuming on-board power. Swayam will be launched as an auxiliary satellite on board ISRO's polar satellite launch vehicle. In Swayam, non- conducting and non- magnetic materials are needed for protectively housing components like magnet, hysteresis rods and switches from inertial and vibrational loads. Considering various factors such as strength, availability, weight and cost, acrylonitrile butadiene styrene (ABS) has been found to be suitable for these components. Tensile and hardness tests have been performed on ABS for verifying its properties. ABS does not interfere with the satellite's attitude control system. Simulations were run to check the stress levels due vibrations. Stress values so obtained were found to be less than allowable stress values. Components having irregular and intricate shapes such as antenna extension, switch cases were manufactured with ease which is not possible or extremely difficult to manufacture by any other means. These components have been designed considering various stresses to which ABS would be subjected. They have been manufactured using the fused deposition modeling (FDM) type of rapid prototyping technique. The paper explains how RPT was employed to optimize the structure and reduce weight.