

Material optimization of carbon/epoxy composite rotor for spacecraft energy storage

Abstract

An investigation to optimize the carbon/epoxy composite rotor is performed for the spacecraft energy storage application. A high speed multi-layer rotor design is proposed and different composite materials are tested to achieve the most suitable recipe. First, the analytical rotor evaluation is performed to establish a reliable numerical rotor model. Then, finite element analysis (FEA) is employed in order to optimise the multi-layer composite rotor design. Subsequently, the modal analysis is carried out to determine the rotor natural frequencies and mode shapes for a safe operational regime below 50, 000 rpm.

Keyword: Spacecraft flywheel; Energy storage; Finite element analysis