Contribution ID: **132** Type: **Poster Presentation**

Predicting performance of axial pump of lox booster turbopump of staged combustion cycle based rocket engine using CFD

Wednesday 1 July 2015 09:00 (2 hours)

For manned space mission and deep space probe, reusable launch vehicles are envisaged to be utilized with high fidelity. For low cost, high impulse, long endurance mission with high execution and high reliability, hence demand to be curtailed the inert weight and thereby increasing the delivered payload. Turbopump (TP) feed system for a liquid rocket engine has the highest power to weight ratio in the entire field of turbomachinery. Thus, for designing a turbopump for a new liquid propellant rocket engine (LPRE) demands optimization of geometry based on the off-design performance at different operating regime. In this paper, CFD analysis of liquid oxygen (LOX) axial pump (LPOT) used as a booster pump for oxygen rich staged combustion cycle based rocket engine has been presented using ANSYS CFX in order to evaluate performance of the turbomachinery at different operating conditions. An implicit finite volume approach has been adopted to obtain the three dimensional flow field variables for the LOX pump. The computation technique involves the mathematical solution of the discretized three-dimensional, Reynolds Averaged Navier-Stokes (RANS) based two-equation SST (Shear Stress Transport) k-ω turbulence model over an unstructured grid. The data generated has been used to predict the performance characteristic of the axial pump for the throttling range varying from 60% to 105 % of nominal thrust value. The results have been analyzed to test the functioning of the pump at steady state and the attempts have been made to suggest suitable changes in the existing geometry of the turbopump.

Key words: CFD, Turbopump, Staged Combustion cycle, Cryogenic, Pump performance characteristics.

Author: Mr MISHRA, Arpit (Cryogenic engineering centre, Indian Institute of Technology Kharagpur, India)

Co-author: Prof. GHOSH, Parthasarathi (Cryogenic engineering centre, Indian Institute of Technology Kharagpur, India)

Presenter: Prof. GHOSH, Parthasarathi (Cryogenic engineering centre, Indian Institute of Technology Kharagpur, India)

Session Classification: C3PoE - Turbomachines and Helium Components

Track Classification: CEC-05 - Expanders, Pumps, Compressors, and Regenerators