

# 26th National Symposium on Cryogenics and Superconductivity

Contribution ID : 72

## Design and analysis of Methane pump

Thursday 23 Feb 2017 at 16:00 (00h15')

### Content :

In rocket propulsion weight has a vital role on efficiency and cost of the program. Since fuel, oxidizer and delivery system contribute a major share of the total weight; so it is desirable to design an efficient fuel delivery system as well as choice of fuel. Methane has been chosen as the next generation cryogenic fluid for its certain advantages over liquid hydrogen and kerosene. Pump-fed system is a well-established preferable fuel delivery system as compared to pressure-fed system. Pump-fed system is commonly known as turbo-pump system; as it consists of turbine and pump. Pump gives the necessary pressure rise to the fuel and oxidizer while turbine acts as the prime-mover. The present work is limited to design and analysis of the pump part alone. Although pump-fed system has been successfully designed for various propellants, but the research is limited and new for methane as working fluid. Centrifugal pump is preferable to other kind of pumps because of its compact size and a wider throttling range. However, an inducer is necessary before impeller to meet the NPSH requirement of the pump. The focus of the work is to determine the throttling range of the system for operating.

### Summary :

Methane is a soft cryogen and hugely available in other planets. For inter-planetary motion if methane is used as fuel, it is possible to refill fuel at the destination point. Thus additional fuel storage for returning of the vehicle can be avoided. Further Methane is eco-friendly fuel and have acceptable specific impulse. A turbo-pump assembly is a pump powered by a turbine used to raise the fuel and oxidizer pressure. This eliminates necessity of high tank pressure and thereby thickness of tank chamber. Study is carried out to analyse of the fluid flow through the pump.

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Session classification : Technical Session 8

Track classification : Heat Transfer / Thermal Insulation / Thermal Analysis

Type : Contributory Talk