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IAF SPACE PROPULSION SYMPOSIUM (C4)
New Missions Enabled by New Propulsion Technology and Systems (9)

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DEVELOPMENT OF FEED CYCLE FOR ROCKET MOTOR BASED ON GEL PROPELLANT

Abstract

History of rockets has been known to the mundane world since World war II. And since then, every fragment of it has been revolutionized and enhanced. Even in today's world, every researcher in the space systems industry is trying to achieve more advancement in them. Just recently it was revealed that the Rocket Lab company is planning to design a new 8-Ton Class Reusable Rocket for Mega-Constellation Deployment. In a comparison of old space and new space, it is realized that there are many risks and constraints faced by our ultramodern rockets and spacecraft which were not there a century ago. To name few, there is space debris, reduced funding as well as the need of agility and compactness. But our space evolution is proof that there is no doubt when we say that the propulsion system and its analysis is the most salient feature for any guided missile we build today.

As the name suggests, gel propellants are semi liquid substances. The core benefits of this, in comparison to others are vast and inestimable. Just the tip of these assets gives us more stability and more control over the engine. It also gives us extensive scope of temperature variation as well as thrust modulation feature and endurance. Gel propellants have been a curious topic to research upon for a long time due to its unique traits and our research paper has it as its core. In this research paper, we are going to determine the various performance parameters of a Rocket motor. Some of these constraints include specific impulse, thrust specific fuel consumption, etc. based on the characteristics of gel propellants and comparing it with the conventional propellants, determining its merits and demerits. We plan to study the performance of gel propellants in terms of combustion efficiency and combustion behaviors using computational methods. Gel propellants are believed to have better regression rate as compared to hybrid propellants as gel propellants have low values of surface tension and viscosity as compared to hybrid propellants and higher density as compared to liquid propellants hence will give higher values of ISP, less effects due to fuel sloshing, better working in microgravity conditions and when compared with solid propellants will provide a better way to throttle and restart of engine. Gel propellant stores a great potential within themselves which can easily replace the application of liquid and solid propellants in the launch vehicles.