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A REVIEW: ON THE VARIOUS FEEP THRUSTERS PRESENT IN THE INDUSTRY AND THEIR PERFORMANCE COMPARISON

Abstract

Electric propulsion is a process of accelerating the propellant with different means possible. Electric propulsion is not limited to energy as chemical propulsion but depends on the available electric power. The propellant used in electric propulsion varies with the type of ion thruster used. Field Emission Electric Propulsion (FEEP) is a type of electric propulsion that works on the principle of electrostatic acceleration. FEEP uses liquid metal as the propellant. Electrostatic electric propulsion devices generate thrust by accelerating the charge-carrying particles. Field emission refers to the process of creating a strong electric field with the applied high potential difference to create a spray of charged ions or droplets. A high potential difference of around 5kV to 10kV is applied between the emitter and the accelerator grid, this electrostatic force is balanced by the surface tension of the propellant, which gives rise to surface instabilities which leads to the deformation of the surface into a cone shape called Taylor cone. The accelerator grid accelerates the ions that are being extracted into high velocities thereby generating precise thrust. A Neutralizer is placed at the end after the accelerator grid to neutralize the accelerated ions. The thrust produced by the FEEP system, though being precise it has low thrust force, so the FEEP thrusters are primarily used for altitude control on spacecraft. At present, there are various companies and startups to manufacture FEEP thrusters to power the small satellites. These thrusters are available in different specifications and can be used according to the need, i.e., the weight of the satellite; the lifetime of a satellite, etc. In this review paper, a small analysis and comparison on the different thrusters based on their performance and usage. This will enable budding small satellite builders to choose the perfect FEEP thruster available in the market.