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Author: Mr. Abdolrahim Rezaeiha
Sharif University of Technology, Iran, rezaeiha@alum.sharif.edu

Mr. Faramarz Mankavi
Iran, f_mankavi@yahoo.com

EXPERIMENTAL OPTIMIZATION OF PREHEATING DURATION IN LOW-POWER RESISTOJET

Abstract

Resistojet thrusters accelerate propellant particles using an electrothermal mechanism. High-pressure gas coming from storage tank is directed to resistojet heat-exchanger chamber where heat is given to the propellant using heating elements. Heating elements are either externally surrounding the heat-exchanger chamber or are internally in contact with propellant flow. The latter leads to higher thermal efficiency. We have employed this heating method in development of our low-power liquified-gas resistojet. Resistojet performance is a function of propellant temperature flowing inside the nozzle. Therefore, it takes some time for the thruster to reach its optimum performance for the designed operating conditions since the thruster starts to operate and it takes some time for the heaters to reach the desired temperature and for the heat to be conducted to the flowing propellant. For the thruster to operate at optimum performance since it starts to operate, heating elements are required to be turned on prior to the thruster for a certain period of time. However, the preheating duration needs to be experimentally optimized. We have experimentally investigated the optimum preheating duration for our low-power resistojet and in the present paper, it has been reviewed. If the duration is more than required, power is being wasted from a limited power source of satellite and if the duration is less than required, the thruster will start to operate with lower performance.