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EFFECT OF FLOATING RING SEAL CLEARANCE ON THE PERFORMANCE OF CENTRIFUGAL
PUMP USED IN LIQUID ROCKET ENGINE

Abstract

Turbopump forms an essential part of high thrust liquid rocket engines. Efficient performance of turbopump is very important in high thrust rocket engines. The performance of a pump depends upon speed, flow, geometry, surface finish and clearance between rotating and stationary parts. Floating ring seals are used in Liquid Oxygen centrifugal pumps as a neck ring, primarily to reduce the leak through the gap between rotating and stationary parts. Clearance control between rotating and stationary part is of paramount importance in the design of high performance turbomachinery. Therefore, for a better leakage performance, it is desirable to minimize the radial clearance of the seal without compromising safety aspects. Seal clearance should be finalised considering the rubbing phenomena between rotor and stator also. Several studies have been performed on evaluating the effect of floating ring seal clearance on rotodynamic characteristics of pump, whereas its effect on performance of pump is not studied widely. Present study address the effect of floating ring seal clearance on pump performance parameters, namely, head rise, efficiency and net positive suction head. The study is carried out by varying floating ring seal clearance provided on the passages of front and rear side shoulders of an impeller. Floating ring seals are tested with water as the simulating fluid on a high-speed pump test rig, specially designed for carrying out performance evaluation of pumps. Pump head rise and efficiency showed an increasing trend with reduction in floating ring seal clearance, mainly due to increase in volumetric efficiency of the pump caused by reduction in leak rate. Significant variation in the cavitation performance of the pump is not observed by varying the floating ring seal clearance.