

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion System (1) (1)

Author: Mr. Kenichi Kimoto
IHI Corporation, Japan, kenichi_kimoto@ihi.co.jp

DEVELOPMENT AND TEST OF THE LOX/LNG REGENERATIVE COOLED ROCKET ENGINE

Abstract

IHI Corporation and IHI Aerospace have been developed LOX / LNG (Liquefied Natural Gas) regenerative cooled rocket engine since 2008. This paper describes the design of the 100kN thrust level class LOX/LNG regenerative cooled rocket engine and the results of sea level firing test. The engine adopted Gas Generator Cycle because of the system robustness for LNG's behavior at super-critical condition. It will be the first practical engine with regenerative cooled chamber in the world making use of LNG or Methane as propellant. To design and develop this LOX/LNG regenerative engine, we fully applied TDM method. Features of the design process were following. Using SBD(Set Based Design method), engine system design achieve robustness, stable, long life and good performance. Also MBR(Model Based Risk Management) method of TDM gives an optimum development plan, which focuses on reducing the risk of engine development. According to the plan, design, manufacturing, tests and evaluations of all components and engine itself were proceeded. Two series of engine firing test have been conducted. In first test, the turbo pumps were driven by hydrogen gas instead of gas generator exhaust since dummy gas generator was installed in the engine. Afterwards, the second test that installed gas generator was carried out. Both test series were successful. A short term of only five years, development of regenerative cooled LOX/LNG engine puts into practical use. Applying the TDM (Total Design Management), which is studied as high-reliable and robust design approach, the engine design and development is successfully progressing.