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C3Po1F-05: Development and preliminary testing of cryogenic pump for TVS test

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Handling cryogenic propellants in space is very difficult.

In particular, in micro-gravity, liquid and gas are not separated and mixed, so when the vent valve is opened to reduce the increased tank pressure due to external heat inflow, propellant loss occurs.

Therefore, in order to reduce propellant consumption and internal tank pressure, a thermodynamic vent system, TVS, is required to reduce internal pressure and manage temperature.

The components of TVS can be composed of a heat exchanger, internal injection/mixing, vent, pump, etc.

This paper contains the development and preliminary testing of a cryogenic pump, a TVS component.

For the TVS test, a test tank was placed in a vacuum chamber, and the TVS pump needed to be developed to be able to operate in this vacuum and cryogenic environment.

The magnetic coupler type was used to improve the sealing performance by separating the inside and outside of the tank, and the issues such as internal shaft alignment were resolved, and the applicability was examined through a flow rate/pressure confirmation test.

In the future, we plan to continuously research cryogenic fluid management technology in space environments by utilizing this TVS cryogenic pump.

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