IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 1 (2A)

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JAXA'S STUDY AND TECHNOLOGY DEVELOPMENT WHICH ENABLES LUNAR ISRU ACTIVITY

Abstract

This presentation summarizes the study and technology development related to in-situ resource utilization (ISRU) led by Japan Aerospace Exploration Agency (JAXA) in accordance with "National Space Technology Strategy" formulated by Government of Japan (GOJ). In-situ productions of consumables such as water, oxygen and propellant are of the essence to establish long-term human presence on space frontiers by drastically reducing launch mass and attendant risks for periodic resupply missions of these consumables. Considering the target of in-situ propellant production defined in the Global Exploration Roadmap 2024 published by the International Space Exploration Coordination Group (ISECG), JAXA's ISRU Team set the target of annual production rates of liquid oxygen (LOX) and liquid hydrogen (LH2)

as 49.3 ton/year and 8.3 ton/year respectively at an early stage of lunar exploration. The team additionally defined sub-scale production requirements at a lunar ISRU pilot plant as ¿340 kg/year of water and ¿150 kg/year of oxygen as intermediates to produce propellant. Based on these requirements for annual production, JAXA launched a series of research programs in 2024 to investigate the technical practicability of production of water and oxygen from lunar regolith. The ongoing program ranges from technology demonstration on core technical elements to the design of integrated ISRU system for ground demonstration. The fundamental research aims to raise technical readiness level on core technologies such as water extraction from lunar regolith simulant with impurities, purification of extracted water to be processed by downstream subsystems, electrolysis to produce gaseous hydrogen and oxygen, and energy-efficient liquefaction of these gases. Optimizing the designs and operations as a whole system is essential to study the feasibility of lunar ISRU architecture given transportation cost and the limited power resources. This work is led by JAXA in cooperation with JGC Corporation, one of the world's largest total engineering companies, and Kurita Corporation, one of the leading industrial water solutions providers in the world.