IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Masaaki Nii
Chiyoda Corporation, Japan

Mr. Hiroki Ichida
Chiyoda Corporation, Japan

HOW TO DO ENGINEERING OF LUNAR PROPELLANT REFINING PLANT

Abstract

In recent years, the momentum for humanity to return to the moon has been getting bigger.And some private companies are aiming to develop businesses on the moon, and they are planning to build infrastructure and energy plants as commercial businesses. A moon community is now jumping out from science fiction world to realistic world. However, although a business concept or business model is often discussed, there are very few cases where the technical feasibility study of the plant itself is mentioned. Under such circumstances, we would like to present the results of our study on lunar propellant refining plants from the viewpoint of process feasibility and operation maintenance by applying our knowledge of LNG and oil refining plants in various environmental conditions around the world. Our engineering steps are as follows: (1)Study feasibility of the process of the plant based on existing technology on the earth. (2)Configure main components from the process study. (3)Consider how to apply each component in the lunar environment. (4)Consider transportation and construction of the plant on the lunar surface. The plant consists of collecting regolith, extracting water, electrolyzing the water to obtain hydrogen and oxygen, and liquefying it for storage.

The production rate of the plant is estimated from the amount of propellant listed in the space exploration scenario by JAXA. Ancillary facilities not shown in this conceptual diagram, such as communication with the Earth, systems on the Earth side, and product supply chains on the Moon, will be discussed in a separate study. From the results of our study, we clarify whether the current existing technology on the earth will be able to achieve lunar propellant plant or not, and if not, what kind of new technology will be required to be developed for lunar plant, from the viewpoint of engineering/procurement/construction and operation maintenance. With regard to new technologies that will need to be developed in the future, we will indicate necessary time frame of development, ground testing, and verification experiments on the moon, and at the same time, we will also show what kind of corporate collaboration would be required for this development. We hope that this study will activate discussion and collaboration among private companies and give a good chance for none-space-related company to get into space business world.