# Automation System for the Pyroprocessing Automation Verifying Mockup

Dongseok Ryu*, Jongkwang Lee, Jonghui Han, and Seungnam Yu
Korea Atomic Energy Research Institute, 111, Daedeok-daero 989beon-gil, Yuseong-Gu, Deajeon, Republic of Korea
*sayryu@kaeri.re.kr

## 1. Introduction

Various fuel cycles replacing the classical reprocessing method have been explored at KAERI. The Pyroprocessing was studied as one option of the fuel cycles. Several pieces of electrolytic equipment are essential for the Pyroprocessing, and those used molten salt. Various experiments with the equipment have been conducted in radiation area by using simulated fuel. After the experiments, the used material, tools, or devices in the radiation area are regarded as radiation waste. The more experiments were conducted, the more waste were stacked in the radiation area. The use of molten salt made worse to increase the radiation waste, because the molten salt is highly corrosive and damages equipment. Various parts of experimental equipment have bend destroyed and disabled in the molten salt.

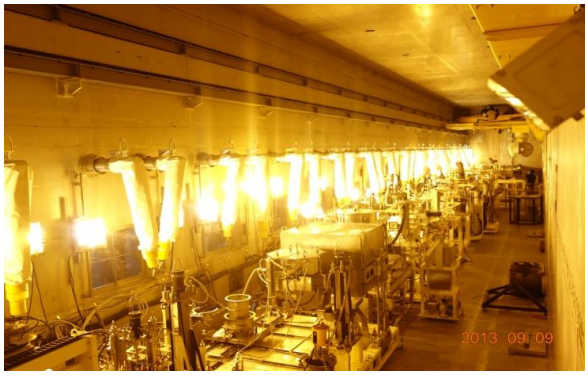


Fig. 1. conventional facilities for Pyroprocessing in radiation area.

The needs for the non-radiation experimental space were demanded only for molten salt test. The reliabilities of mechanical parts interacting with molten salt should be thoroughly examined in advance to conduct a radiation experiment. When the humidity in air is regulated as low enough to mitigate chemical reactions, The reliability of equipment against molten salt can be tested the dry air environment. A dry room is planned for the purpose, and new concept for handling of basket to immerse into molten salt was proposed. Finally, the dry room installed the automated handling device, as named Pyroprocessing Automation verifying mockup (PAVM), was designed. The remainder of this paper explains the PAVM and the automation system.

## 2. Pyroprocessing Automation Verifying Mockup

Pyroprocessing Automation Verifying Mockup (PAVM) was designed for molten salt test of the developed equipment [1]. The PAVM is designed to strictly control the humidity, and the dew point inside is designed to be under -40 degree Celsius. The space of the PAVM is planned to locate two pieces of different engineering scale equipment, so that the basket handling can be examined in between neighboring equipment. An automation system to handle the basket was designed to be installed on ceil. The figure shows 3D design of the PVAM and the automation system.

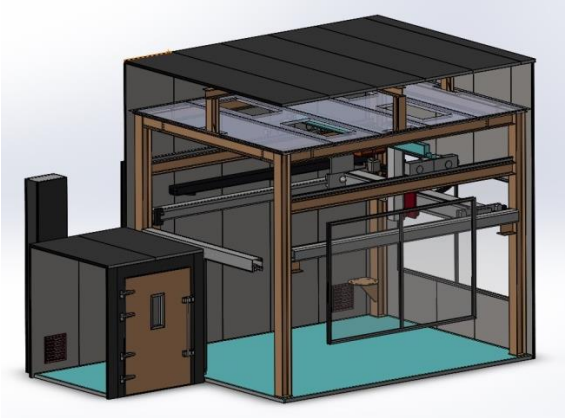

Fig. 2. 3D design of the PVAM.

## 3. Automation System in the PAVM

In the radioactive area, the experimental space is enclosed in a glove box or a processing cell, and human workers are not allowed to access into the space. Several remote systems, such as a conventional MSM (Master slave manipulator) and crane, are utilized to handle material or to control equipment.

Fig. 3. human worker controls the automation system in the PVAM.

The PAVM is different from the conventional radioactive space, and human workers can access into the experimental space, as shown in Fig 3. Therefore, MSM is not required anymore, but the crane is still useful to move heavy part or material.

The most frequent and difficult task was moving the material basket from equipment to the other [2]. An automation system is designed to dedicate the basket handling. In advance to the experiment, human worker predefines several positions to make the path for transporting the material basket, such as, an installed position on equipment, a moved position on the other equipment, and a waiting location on station. After teaching several paths, human worker easily control the automation system out of the PVAM, looking inside how the basket moves. Finally, the basket handling in the PVAM is easily accomplished under the control of one human worker.

## 4. Conclusion

The PAVM, a new experimental space for non-radioactive experiment, was designed to examine the reliability of equipment against molten salt. An automation system is designed for the PVAM. The installation of the automation system is underway.

## REFERENCES


[1] Dongseok Ryu, et al. "Needs and Goals of the Pyroprocessing Automation Verifying Mockup," Proc. of KRWS 2017 Fall, pp. 53-4, (2017).

[2] Dongseok Ryu, et al. "Example Operating Procedure for an Automation Concept of Electrochemical Process," Proc. of KRWS 2017 Spring, pp. 151-2, (2017).