1. Introduction

The advanced spent fuel conditioning process facility (ACPF), which was constructed with air cell, was modified to consist of an air cell and an argon cell. The argon cell was constructed in July 2016, and it has been conducting test operations so far while maintaining the argon environment. This paper introduces the current status of the construction of the argon cell system.

2. Argon Cell System

2.1 Overview

The argon cell system consists of an argon cell, a gastight door, a material transfer system, a lighting device, a remote handling system, a purifier, a cooler, a measuring sensor, a safety device, a control system, an emergency and cleaning device, etc. The argon cell was designed to minimize leakage and was constructed by isolating the first window area with the boundary between the first window and the second window to the right side of the existing ACPF air cell. Fig. 1 shows the front view of the air cell and the argon cell seen in the operating area.

![Fig. 1. Modified ACPF.](image)

2.2 Argon cell and remote handling system

Fig. 2 shows the inside of the air cell and the argon cell. An electrolytic reduction (ER) equipment was placed on the working table of the argon cell. The internal dimensions of the argon cell are 1,728 (L) x 1,990 (D) x 2,740 (H) mm (480 mm in working table height). A gastight door with an internal size of 600 (L) x 1,000 (H) mm was installed for situations during the construction and emergency operation of the argon cell. A material transfer system with internal dimensions of 600 (L) x 600 (D) x 600 (H) mm was installed between the cells as a means of transferring material between the air cell and the argon cell. A lighting device was equipped with one metal halide 250W lamp (B type) and one three-wavelength 100W lamp. A pair of master-slave manipulators (MSM) was installed on the left and right side of the shield window, respectively, and a crane was installed in the ceiling inside the argon cell.

![Fig. 2. Inside view of the air cell and the argon cell.](image)

2.3 Purification and Cooling System

The purification system consists of a circulation blower, a dry trap (purifier), a cooling system, etc. Its appearance is shown in Fig. 3. The blower forcibly circulates the argon gas, and in the purifier, Cu
removes oxygen and molecular sieve removes moisture. The heating of the heater of the ER equipment causes the temperature of the argon cell to rise. When the blower frequency increases, the temperature inside the case in which the blower is placed rises. The cooling system cools its rising temperature.

2.4 Measuring and Safety System

In order to measure the temperature inside the argon cell, temperature sensor was installed at the middle and the top. The mid-point temperature sensor has a function to block radiated heat directly from the lamp. A differential pressure gauge was installed to measure the pressure of the argon cell and the HEPA Filter. The seal pot was also installed as a pressure safety device so that the pressure in the argon cell would be reduced automatically when the pressure was exceeded. These are shown in Fig. 4.

2.5 Control and Monitoring System

The oxygen/hydrogen concentration, pressure and cooler are controlled by PLC and touch PC. In addition, various measurement signals are displayed on the PC and these data are stored in an Excel file.

2.6 Emergency and Cleaning System

In emergency situations, the valve can be operated manually to supply argon gas to the argon cell. After maintenance of the purification system, it can be cleaned with argon gas.

3. Conclusion

The argon cell system for demonstrating the technology of converting the spent fuel into metal by the electrolytic reduction process has been verified by repetitive test operation for more than 2 years.

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