Enhanced Maintenance of the Supply Piping for L-Ar

*Youngkuk Jang, Seonho Noh, Hui-seok Kang, and Ilje Cho
Korea Atomic Energy Research Institute, 989-111 Daedeokdaero, Yuseong-gu, Daejon, Korea
*jangyk@kaeri.re.kr

1. Introduction

Korea Atomic Energy Research Institute (KAERI) has a Pyro-processing Integrated Inactive Demonstration facility (PRIDE) for the development of pyro-technology. In essence, the PRIDE enable integrated pyro-systems testing at engineering scales using depleted uranium or surrogates for depleted nuclear fuels. The PRIDE must maintain an inactive (argon) atmosphere due to the characteristics of processes that take place in it, such as electrochemical reduction, electrochemical refining, and electrochemical smelting. In concentrating impurities at the facility, oxygen and moisture must be lower than 50 ppm.

This paper describes the improvement in maintenance of the supply piping of liquid argon(L-Ar) in the PRIDE facility.

2. Main

2.1 Configuration of L-Ar supply piping

The L-Ar supply piping to control impurities in argon is composed of argon tanks – vaporizer – Ar cell.

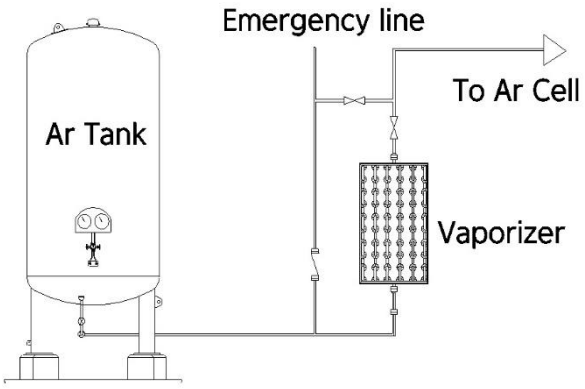

Fig. 1. Schematic diagram of L-Ar supply piping.

2.2 Enhanced maintenance of L-Ar supply piping

2.2.1 Problems. Existing installed L-Ar supply pipes are installed with regular gasket type.
This facility uses liquid argon as needed, and the characteristics of the liquid argon are frequently caused by the degradation of the gasket and deformation of the piping as shown in Fig. 2.

Fig. 2. Damaged gasket and piping.

2.2.2 Contents of improvement. To minimize the flow of oxygen and moisture into argon cell when performing maintenance on argon supply piping.

(1) Installation of additional valve

In order to minimize the flow of oxygen and moisture in the argon cell, the two valves shall be additionally installed in the end of the vaporizer to purge the piping and vaporizers of the vaporizer, as shown in Fig. 3, to minimize the inflow of oxygen and moisture from the argon cell.

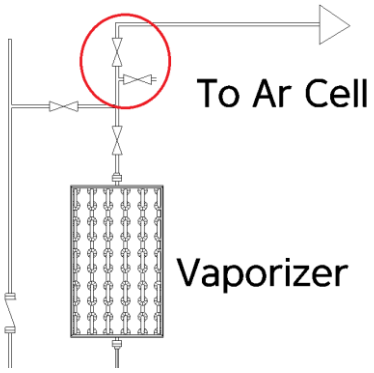

Fig. 3. Installation of additional valves.

(2) Adiabatic work of piping

To cope with rapid changeds in temperature, insulate the pipes connecting the argon tank to vaporizer with heat insulation.

(3) Use extremely low temperature gaskets

Replace with the extremely low temperature gaskets for specification in Table 1.

Table 1. Gasket specification

Temperature (℃)	Nominal thickness (mm)	Pressure (MPa)	size (mm)
-200~200	3.0	4.0	1270

3. Conclusion

It is expected to facilitate maintenance of the supply piping without increasing the degree of contamination (oxygen and moisture concentration) of the argon cell, the insulation of the piping between argon tanks and vaporizer of the argon supply piping, and the additional valves installation. It is also expected that he will create a quality inert air test atmosphere in the argon cell.

REFERENCES

[1] ANL-7959 Hot Fuel Examination Facility/North Facility Safety Report, February 1975, Argonne National Laboratory pp.75-78.

[2] The EBR-II Fuel Cycle Story, Charles E.Stevenson, American Nuclear Society pp. 42-53.