

Concept and System Layout Study of the PRIDE Facility

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1. Introduction

KAERI has been developing a pyroprocess for a LWR spent fuel conditioning and a future reutilization in the Generation IV reactors. From 2001 to 2005, the ACP facility for an electrolytic reduction of a LWR spent fuel had been developed as shown in Figures 1 and 2. The ACP facility has been using for demonstration of the Advanced spent fuel Conditioning Process (ACP) from 2006. The ACP facility has two air-sealed type hot cells, one is for the main processes and the other is for a maintenance of the process equipment. The ACPF hot cells were designed to have an air environment. From 2007, a mock-up facility, named by the PRIDE(PyRoprocess Integrated inactive DEmonstration) facility, design for an engineering scale demonstration to cover a full pyroprocess has been developed. The conceptual design works of the PRIDE facility had been performed by the end of 2007. Basic and detailed design works will be taken in 2008 and a construction license proposal will be submitted to the government in the same year. By the end of 2009, the construction works of the PRIDE facility will have been finished. After a 2 year operation (2010 and 2011) of the PRIDE facility, the development of the Engineering Scale Pyroprocess Facility

(ESPF), having a capacity of 10 ton HM/year, starts in 2012 and the construction works will have been finished by the end of 2016. If the ESPF demonstrates a full pyroprocess by using LWR spent fuels successfully, the Korea Advanced Pyroprocess Facility (KAPF) could be developed and demonstrated to verify the final commercialization of a pyroprocess treatment of LWR spent fuels. The KAPF could have a treatment capacity of 100 ton HM/year. In parallel with a series of developments of pyroprocess facilities, safety analysis works will also be performed to confirm the integrated safeties of these several pyroprocess facilities.



Fig. 1. The working area view of the ACPF



Fig. 2. Inside View of the ACPF Process Cell

2. Concept and System Layout Study of the PRIDE Facility

For the development of an engineering scale facility covering a full pyroprocess, KAERI needs a facility which can be tested with non-irradiated fuels. In order to fulfill this necessity, the PRIDE facility has been developed. The conceptually designed PRIDE facility as shown in the figure 3 will have two sealed cells, one is for the pre-treatment processes such as a decladding and a voloxidation process the other is for the main processes such as an electrolytic reduction, an electro-refining, an electro-winning and a cathode processing, and a salt waste treatment process etc. The pre-treatment and main processes cells will be maintained with air and argon environments, respectively. For maintaining a pure argon environment in the main process cell, an argon purification and humidity control system will be equipped. Figure 4 shows the system layout of the PRIDE facility.

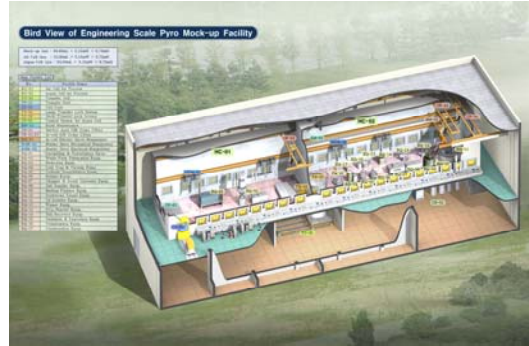


Fig. 3. Conceptual Design View of the PRIDE Facility

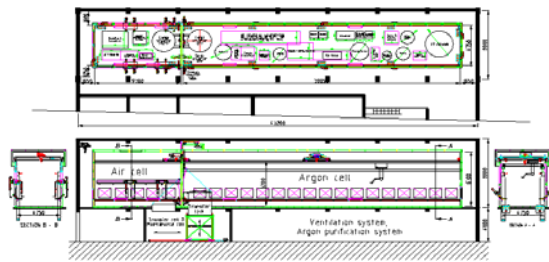


Fig. 4. System Layout of the PRIDE Facility