

Preliminary Study on the Repair and Transportation Methods of Spent Nuclear Fuel Assembly in KAERI

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The Post Irradiation Examination Facility (PIEF) at the Korea Atomic Energy Research Institute (KAERI) has been performing extensive research on investigating the mechanical integrity and chemical characteristics of spent fuel since 1987. The spent fuels in PIEF have been received from three different nuclear power plant sites, and are stored in PIEF pools and hot cells. The spent fuels include an intact fuel assembly (FA), damaged FAs without a top nozzle in a storage rack, intact and damaged fuel rods in a rod basket, and rod segments/specimens.

Recently, the social and political environment around KAERI has significantly changed because of the increased concerns of radiation in the local community. This is mainly due to the storage of spent fuel and radioactive waste in KAERI. Accordingly, KAERI has decided to transport all spent fuel back to the nuclear power plants. In this paper, the storage condition of intact and damaged fuel assemblies in PIEF is introduced, and the preliminary study on the repair and transportation methods of fuel assembly is discussed.

Spent fuel assembly in KAERI-PIEF

Storage condition of spent fuel assembly

- Intact Fuel Assembly.*** The intact FA from KORI unit 1, WH STD 14 x 14 (Figure 70) standard fuel assembly type, has been stored in KAERI-PIEF. The safe handling of intact FA can be achieved without an additional task because of the top nozzle. Therefore, the transport of intact FA using an open can will be adopted if there are no failed or defective fuel rods in the FA. In the case of the presence of failed or defective fuel rods in the FA, the dismantling and repair of the top nozzle is required to extract the failed or defective fuel rods. Dummy rods will be inserted instead of the extracted fuel rods to maintain the mechanical integrity of the FA. The transportation solution for failed or defective fuel rods is out of the scope of this paper.

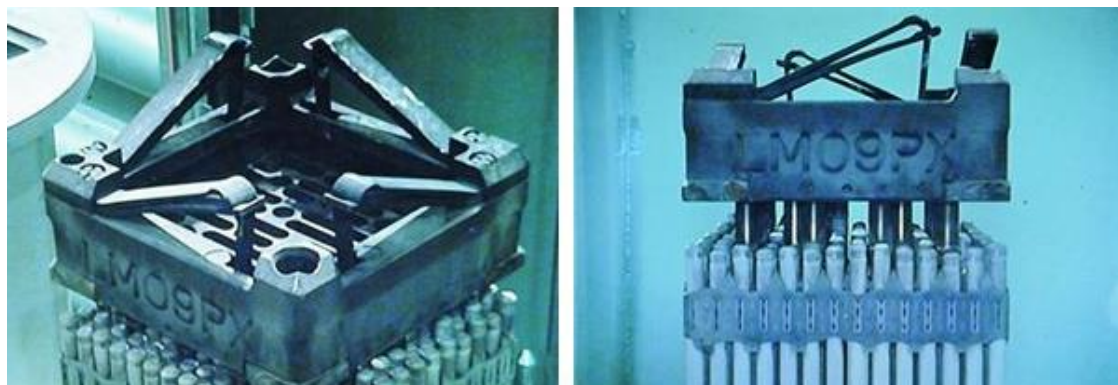


Figure 70: Intact fuel assembly with top nozzle received from KORI unit #1 (Westinghouse, WH STD 14 x 14).

- ▶ *Damaged Fuel Assembly without Top Nozzle.* Several damaged FAs without the top nozzle are stored in the PIEF pool. (Figure 71) The top nozzle of the FAs was cut to extract the fuel rods for the purpose of research in PIEF. Therefore, the top nozzle repair for the FA is the first step to achieve the handling of FAs in the pool. When the FA is repaired, the FA is moved from a storage rack to a visual inspection stand to investigate the condition of the fuel rods. At this step, the dismantling of the top nozzle is required to extract the failed or defective fuel rods from the FA. Then, the dummy rods are inserted, and the second top nozzle repair proceeds. To determine an optimum solution for the repair and transportation of damaged FAs, KAERI-PIEF has been performed the preliminary study with Korea Hydro & Nuclear Power (KHNP) and nuclear energy companies.

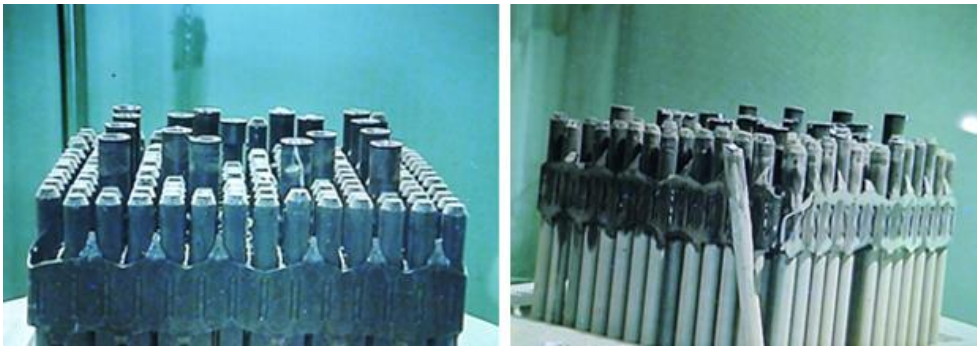


Figure 71: Examples of damaged fuel assemblies without the top nozzle received from KORI unit #1 (Westinghouse, WH STD 14 x 14).