

A Case Study on Handling Tools of PHWR's Damaged SF

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1. Introduction

The damaged SFs at Wolsong Nuclear Power Plant are stored in the reception bay and the defective fuel storage bay connected to the reception bay through the fuel transfer system after being canned in the SF(SF) discharge room. The withdrawal of damaged SF requires designing and manufacturing tool for withdrawal and handling of damaged SF, which will be performed manually by workers on site at Wolsong NPP.

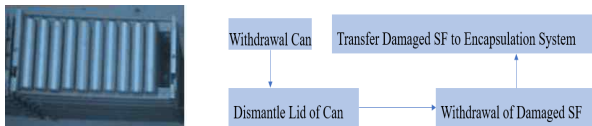


Fig 1. Damaged SF can & Withdrawal concept

To ensure safe work process and tool concepts considering the impact on nuclear power plant facilities and encapsulation tool, owner must carry out detailed design, safety verification, and fabrication of necessary tool. In order to derive a detailed procedure for damaged SF withdrawal and identify potential interference issues and requirements during this process, it is essential to first clearly identify the tool used for damaged SF withdrawal. Therefore, we reviewed the detailed work procedures for damaged SF withdrawal, examined the main tool used for each work. Based on these findings, we derived additional types of tool needed beyond the existing ones and their design concept for each tool required for the various stages of damaged SF withdrawal works.

2. Methods and Results

The withdrawal and handling of damaged SF will use newly designed tool, but for transferring the storage cans from the defective fuel storage bay to the reception bay, existing tools at Wolsong Nuclear Power Plant can be utilized. The major new tool required is mainly divided into two categories: damaged SF withdrawal tool and damaged SF handling tool. Damaged SF withdrawal tool consists of tool used to open the lid of the storage can and tool to withdraw the damaged SF from inside to outside, as well as capsule base for

ensuring safety during handling of the damaged SF. Damaged SF handling tool includes damaged SF trays that vertically stack the withdrawn damaged SF, tray hoisting tool, and vertical handling tool for handling the damaged SF in a vertical manner. Followings are the new handling tools needed by each step of the process.

2.1 Preparation Stage for Work

Capsule base tray required

2.2 Withdrawal Stage of Damaged SF

- Withdrawal tool for operation of can transfer rams
- Radiation resistant underwater camera system for damaged SF number verification
- J-tool - handling tool for fuel cans
- Tool for withdrawal from storage can to capsule base
- Vertical handling tool for removal of storage can body

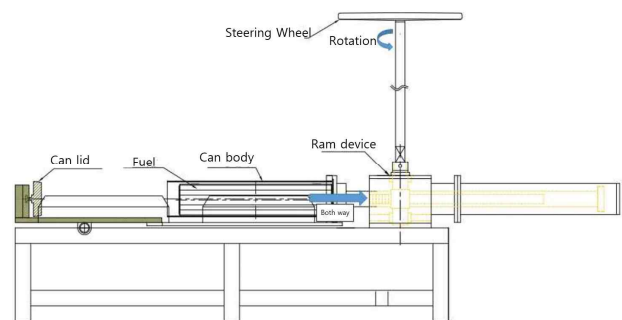


Fig 2. Can lid dismantling concept

2.3 Transfer Stage of Damaged SF

- Vertical handling tool for lifting capsule base
- Vertical handling tool for putting to damaged SF trays
- Vertical handling tool for lifting damaged SF stand from trays
- Vertical handling tool for putting withdrawn damaged SF to encapsulation tool stands

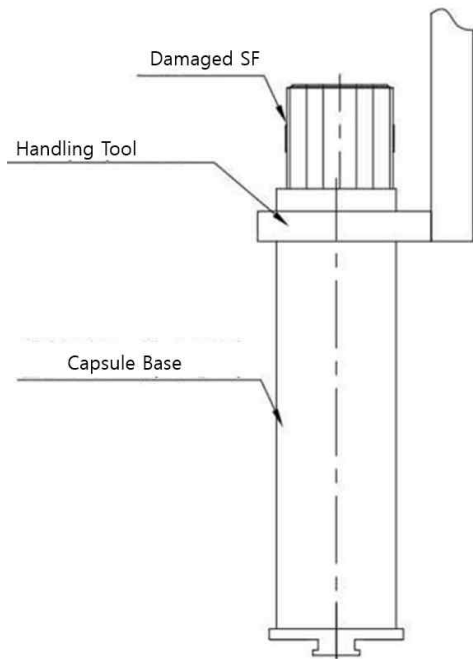


Fig 3. Handling tool concept

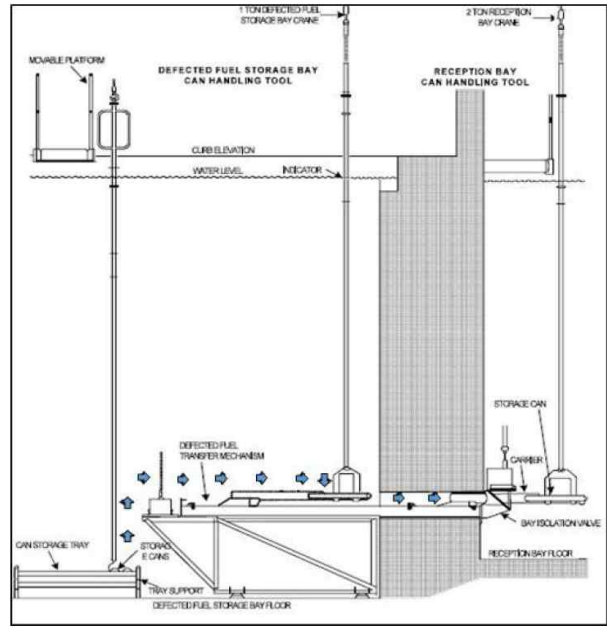


Fig 5. The Schematic diagram of can withdrawal

2.4 The Withdrawal Procedure of Damaged SF

To derive the damaged SF withdrawal and handling process, the detailed work process was analyzed from the storage can withdrawal to transfer work, reviewed interference with existing facilities or feasibility of the works. The encapsulation of damaged SF can be divided into three main processes as shown below; (1) Can withdrawal Process, which involves withdrawing the can from the defective fuel storage bay (2) damaged SF Withdrawal Process, where the lid of the can is dismantled using newly manufactured tool and the damaged SF is withdrawn; and (3) Damaged SF Transfer Process, which the withdrawn damaged SF is transferred to the encapsulation equipment [1][2].

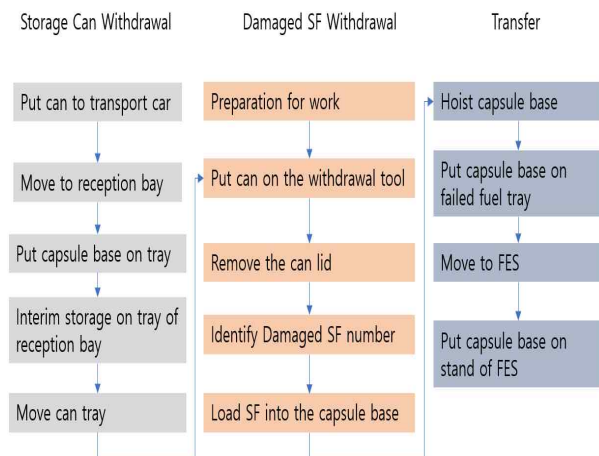


Fig 4. The Procedure of damaged SF

3. Conclusions and Future Work

To encapsulate damaged SF, detailed procedure and relevant tool for withdrawing damaged SF from storage cans to transport them to encapsulation equipment are required. In order to prevent interference with encapsulation work in reception bay, work processes and related tool secure plans must be established for damaged SF withdrawal works. Therefore, the detailed procedure for withdrawing damaged SF was reviewed, and based on this information, design concepts for withdrawal tool and handling tool needed for the process of withdrawing damaged SF were derived. In the future, KHNP will produce tools for handling damaged SF after conducting detailed designs according to the tool's design concepts that were derived above.

REFERENCES

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