

Development of Dismantling Techniques for Irradiated HANARO Instrumented Capsule (03M-06U) in IMEF

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1. Introduction

Since 1998 total fifteen(15) irradiated non-instrumented and instrumented capsules, which are irradiated under 24 MWe at HANARO, are transported to the IMEF for the PIEs such a visual inspection, cut and dismantling, specimen classification including neutron monitors. Until now, any kinds of problems were not occurred during cut and dismantling process[1,2,3,4].

But a little different phenomenon was observed and occurred during cut and dismantling process for the irradiated instrumented capsule(03M-06U), which is irradiated at CT test hole of HANARO operated about 30 MWe during about 5 days with 144 MWD. That is a kind of jamming between outer capsule pipe and inner combined structure.

In this work, the alternative development of dismantling techniques for this capsule is to be considered and discussed.

2. Experimental

The instrumented capsule was transported from HANARO pool site to IMEF by using a 10 ton shipping cask and a 11 ton truck. After transported capsule from pool to M1 hot cell as shown in Fig. 1, the capsule is transferred from M1 hot cell to M2 hot cell to cut and dismantle. The shape of capsule is cylindrical with 60 mm in outer diameter, 3 mm in thickness and approximately 1,000 mm in length as shown in Fig. 1 and Tab. 1.

The material for outer capsule is the STS316. This instrumented material capsule consists of five(5) specimen holders with many kinds of specimens, five(5) insulating materials, five(5) neutron fluence monitors and etc., and each specimen holder is combined with heater lines and thermo-couples.

The top and the bottom parts of capsule were cut by capsule cutting machine as shown in Fig. 2, specially designed for cut the HANARO fuel assembly and capsule irradiated at HANARO. The revolution of wheel and the moving speed was 200 rpm and 0.15 mm/min respectively.

It took about one(1) hour to cut completely top and bottom parts of capsule as also summarized in Tab.1.

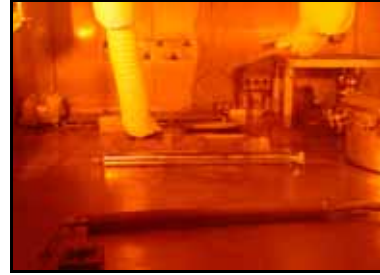


Figure 1. The appearance of 03M-06U transferred from pool to M1 Hot cell.

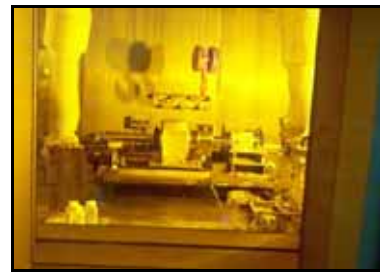


Figure 2. Cut and dismantle 02M-02K by capsule cutting machine in M2 Hot cell.

Table 1. Specification of Capsule and dismantling condition of capsule cutting machine

Items	Values	Remarks
Material of outer	STS316	
Diameter(mm)	60	
Length(mm)	≈ 1,000	
Chuck(rpm)	2.5 ~ 3.0	
Wheel(rpm)	200	
Feed speed(mm/min)	0.15	
Working time(hr)	1.0	

3. Results

3.1 Jamming between outer pipe and inner structure

After cutting the bottom and top of capsule by capsule cutting machine, the dismantling process was tried many times by using a master-slave manipulator. During this process, a little problem such a jamming between outer pipe and inner structure was occurred and observed.

3.2 Alternative cut and dismantling method

The capsule was cut again to dismantle inner structure with five(5) parts by thermal media by thermal media with outer pipe as shown in Fig. 3. But the present equipment, such a specimen holder press machine as shown in Fig. 4, installed in M5a hot cell, used for dismantling the specimens installed in the thermal media, was not designed to adapt thermal media with outer pipe. In addition to some equipment, especially CCTV camera installed in M5a hot cell, are very weak to radiation strength. To release the jamming between outer pipe and inner thermal media, all are going to cut again piece by piece to remove or reduce the outer pipe as we can.



Figure 3. Cut and dismantled thermal media with outer pipe.



Figure 4. Specimen disassembling from specimen holder by specimen press machine in M5a hot cell.

4. Summary

During the cut and dismantling process of HANARO irradiated instrumented capsule(03M-06U), a little different phenomenon like a jamming was observed and occurred. So to release jamming between outer pipe and inner thermal media, the outer pipe will be cut piece by piece by capsule cutting machine installed in M2 hot cell until the outer pipe was eliminated or reduced as we could.

It is assumed that this kind of problem was occurred following reasons:

1) This capsule has probably a problem during manufacturing process at shop before irradiation.

2) The gap between outer pipe and thermal media is not enough to meet design criteria for thermal expansion during irradiation at HANARO

5. Acknowledgment

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