

Study on the Dismantling technique of a Jammed State between an outer pipe and an inner combined structure for a HANARO Irradiated Instrumented Capsule (03M-06U) in IMEF

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1. Introduction

A phenomenon, a kind of jammed state between an outer pipe and an inner combined structure, was observed during the cutting and dismantling process for an irradiated instrumented capsule (03M-06U) which is operated at the HANARO CT test hole of about 30 MWe during about 5 days with 144 MWD.

Since 1999 a total of fifteen(15) non-instrumented and instrumented capsules which were irradiated at under 24 MWe at HANARO were cut and dismantled for a specimen classification including neutron fluence monitors. Until now, no problems have occurred during the cutting and dismantling process[1,2,3,4].

In this work, an alternative development of the dismantling technique for this capsule is studied and discussed.

2. Experimental

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

The shape of the capsule is cylindrical with 60 mm in outside diameter and approximately 1,000 mm in length as shown in Fig. 1 and Tab. 1.

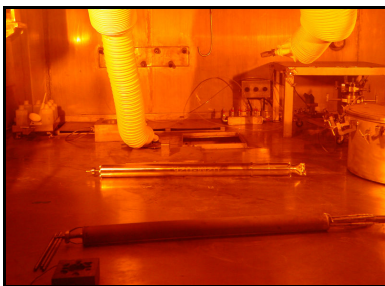


Figure 1. The appearance of 03M-06U transferred from the pool to the M1 Hot cell.

The top and the bottom parts of the capsule, which was transported to the IMEF from the HANARO pool site by a shipping cask with a truck and transferred to the M2 hot cell through the pool and the M1 hot cell, were cut by a capsule cutting machine as shown in Fig. 2, which was especially designed for cutting the HANARO fuel assembly and capsule irradiated at HANARO. The revolution of the wheel and the moving speed was 200

rpm and 0.15 mm/min respectively. It took about one(1) hour to completely cut the top and bottom parts of the capsule as summarized in Tab.1.

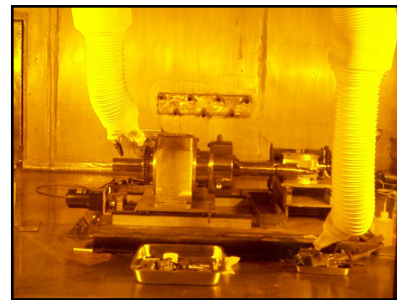


Figure 2. Cutting and dismantling 03M-06U by a capsule cutting machine in the M2 Hot cell

Table 1. Specifications of the Capsule and the dismantling condition of the 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 Jammed State between the outer pipe and the inner structure

By above the procedure, after cutting the bottom and top of the capsule by a capsule cutting machine, the dismantling process was attempted many times by using a pair of master-slave manipulators. During this process, a little problem such as a jammed state between the outer pipe and the inner combined structure occurred.

3.2 Alternative cutting and dismantling method

To dismantle the inserted test specimens from the thermal media without an outer pipe, a specimen press machine as shown in Fig. 3, installed in the M5a hot cell, is generally used. As some equipment such as a CCTV camera installed in the M5a hot cell is very weak to a radiation, it is recommended to separate the thermal

media from the outer pipe.

To release the jammed state between the outer pipe and the inner combined structure, the capsule was cut again five(5) parts thermal media by thermal media with an outer pipe as shown in Fig. 4. And they were all cut again piece by piece to remove or reduce the outer pipe as much as we can.

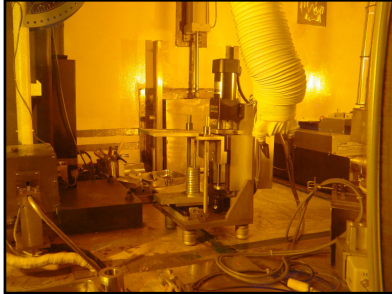


Figure 3. Specimen press machine installed in the M5a hot cell.



Figure 4. Cutting and dismantling the thermal media with an outer pipe.

4. Summary and discussion

During the cutting and dismantling process of a HANARO irradiated instrumented capsule(03M-06U), a phenomenon like a jammed state was observed. So to release the jammed state between the outer pipe and the inner combined structure, the outer pipe was cut piece by piece by a capsule cutting machine installed in the M2 hot cell until the outer pipe was eliminated or separated as much as we could.

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

- 1) This capsule probably had a problem during the manufacturing process at the shop before an irradiation.
- 2) The gap between the outer pipe and the thermal media is not enough to meet design the criteria for a thermal expansion during an irradiation at the HANARO

5. Acknowledgment

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