A Study for Dismantling Method of Bio-shield in Kori Unit 1 Nuclear Power Plant

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1. Introduction

In general, after the contaminated components and structures in reactor building are dismantled, the bio-shield concrete will be dismantled. Caused by the activated structures, it is necessary to consider dismantling technology as other activated ones like reactor pressure vessel and internals – from activation evaluation to mockup test using actual size of the bio-shield in nuclear power plant.

Under the above background, the dismantling test was performed using the mockup.

2. Dismantling Test of Bio-shield

2.1 Preparation of Mockup

The shape of the bio-shield is a rectangular parallelepiped having a hollow cylindrical shape in the middle. The typical size is 9 m length, 9 m width and 11 m height as shown in Fig. 1.

The mockup is designed and manufactured based 1/4 part of the bio-shield and actual one of width and length. Fig. 2 shows the designed and manufactured concrete mockup. The bio-shield was manufactured with concrete having about 3,000 psi compressive strength, and the rebar was installed based on the as built drawing.

2.2 Dismantling Test Plan

Because the bio-shield is activated by the neutrons, it is necessary to decontaminate and dismantle only the activated area in it. In order to develop the dismantling technology, a test plan should be set-up. Fig. 3 shows the test plan.
The activated depth to the radial direction is assumed to be about 1 m. The size of the concrete structure to be removed cutting was set to 1m in width, height and height. And cutting method is coring and wire saw. The coring and wire saw method are known to cut the rebar and concrete structure together. The reason for the need for coring is to create a path through which the wheel for wire saw cutting can be driven. All cutting operations are performed using a dry method because tritium is well soluble in water.

2.3 Test Result

Table 1 shows the result of test.

The horizontal coring is applied by dry method. As a result, the cutting speed is about 8 mm/min. The slow cutting rate is due to the work of crushing the internal core concrete using a breaker after cutting. Therefore, in order to dismantle the bio-shield of the Kori unit 1, it is necessary to develop the customized device.

The wire saw method is applicable to both pulling and pushing methods. The pushing cutting speed is slower than the pulling one. This is thought to be the effect of the shape to be cut during cutting.

Dust is collected more than 90% in total. This means that about 10% of the contaminated dust that is generated is diffused. Therefore, the customized dust collection device and the ventilation device are necessary to dismantle the bio-shield.

3. Conclusion

The dismantling test was performed using the mockup. It is confirmed that coring and wire saw methods can dismantle contaminated concrete structures. Also, in order to dismantle the bio-shield of the Kori unit 1 safely, customized device such as dust collection and ventilation and so on need to be developed.

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REFERENCES