"Tungsten Balls Charge Method Radiation Shield System"

Mr. Yukihide Shimazu, Nuclear Plant Service Engineering Co., Ltd., Japan

The majority of conventional shielding is heavy metal sheets or plates, which takes a long time to install. Mitsubishi Heavy Industries and Nuclear Plant Service Engineering have developed a shielding based on the tungsten ball packing method and has verified its effectiveness. This method will cut back on the time for installation and removal and contribute to the reduction of exposure. The necessary area is about 1/10 the area of the lead plate shielding with a thickness of 3 cm. By using tungsten balls, which are lead-free, the method also will contribute to reducing harmful waste.

One of the characteristics of the shielding method is that it has cut back on the weight of the shielding container by adopting a hollow jacket with a specifical thickness. The system consists of a tank for storing water, which is the medium for tungsten transportation, a pump, a hopper, and a metal jacket. Filling and collection of tungsten balls out can be remote-controlled, resulting in the reduction of heavy object operation. The water pumped from the pump is mixed with tungsten balls under the hopper, and sent to the metal jacket. Only tungsten balls are held in the metal jacket, and the water is discharged. The tungsten balls of the shielding system are transported in the isolated channel, so the tungsten balls themselves are not contaminated and thus are reusable, contributing to waste reduction.

As an actual example of the application of tungsten balls, the nozzle in the lower part of the pressurizer is shown in the figure below. The metal jacket is located at the ideal position where the best shielding effect is expected, and has holes to circumvent the heater, which passes through the lower part of the pressurizer. The work hours per person by the new method are about 8 hours, about half the length by the conventional method. The collective dose, including the installation and removal of the shielding, was 8 man·mSv, about 1/7 of the conventional method.

The metal jacket is also applied to regenerative heat exchangers. Development of soft jackets is in progress to accommodate complex equipment shapes.

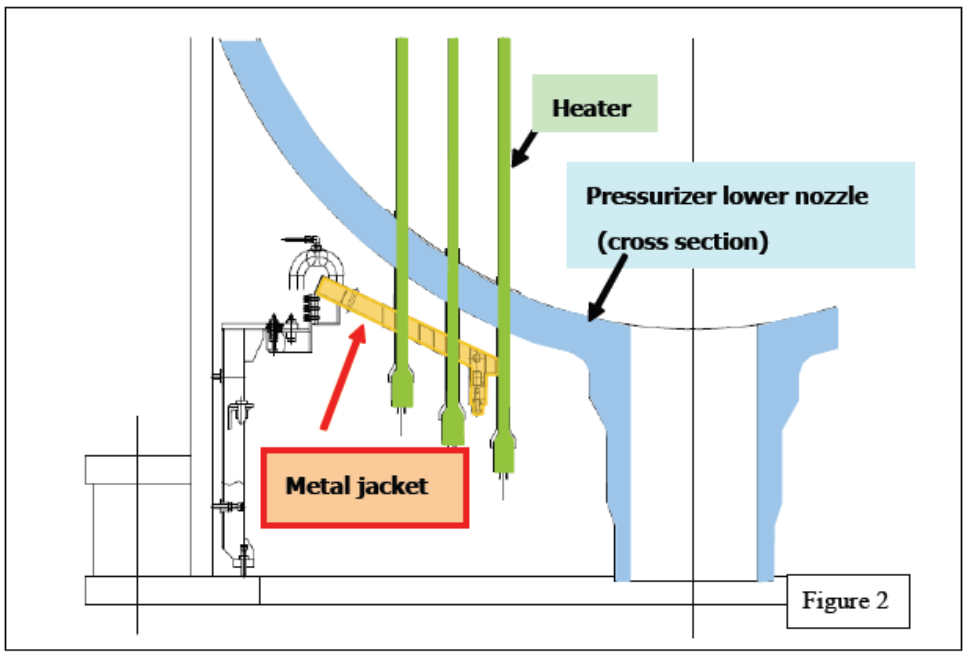

Figure 2