

OSART Good Practices

MAINTENANCE

Material Conditions

Gösgen, Switzerland

Mission Date; 8-25 November, 1999

Material condition within the plant is at a very high level. Equipment throughout the power plant and in outlying areas is in excellent condition. Even though no formal standards exist, the plant has achieved an exemplary standard of equipment condition and cleanliness.

The outstanding professionalism, ownership and skills exhibited by plant maintenance personnel have contributed to this excellent performance and have maintained it over the 20 years of operation. Their goal of "returning equipment to service after maintenance in a condition better than new" has paid dividends.

Mühleberg, Switzerland

Mission Date; 6-23 November, 2000

A simple and effective system to identify and control the status of existing plant fire barrier sealant at pipe and cable penetrations has been implemented at the plant.

The system consists of a standard red and yellow tag where data such as penetration number, building, elevation and room number are indicated. Over the yellow part of the tag, there is a removable white sticker with the same penetration data as on the yellow tag. When a penetration is released for work, the white sticker label is removed. The penetration remains identified by the red and yellow tag, indicating that it is open. The white stickers are then used on a specific control form for open penetrations. Once the job is finished and the penetration is resealed, the white strip is reapplied over the yellow tag indicating its return to normal status.

This system has several advantages such as good labeling and clear penetration status identification that permits a quick check during plant inspection and also is easy to control and maintain. The plant fire barrier sealant at pipe and cable penetrations were found to be very well maintained.

The material condition of the plant is outstanding even though its age is 28 years. There is long history of low maintenance backlog. The team noted that the aging management program was thorough and well implemented. The program includes a wide range of samples taken from the civil structure to test the strength in the concrete, measuring distance between reinforcement bars and their imbedded depth in the concrete. Measuring humidity and crack growth in the concrete is continually ongoing in the plant. Measuring temperature fluctuations and stratification on vulnerable components such as feed water nozzles is ongoing. The plant has an aggressive inservice inspection of components in the plant, not only parts of the pressure boundary but also components important to safety functions of the plant. As an example a 600-mm wide and 4,8 m long hole in the outer concrete of the primary containment was drilled to be able to measure the condition of the primary containment liner. As part of the aging program the plant was the first BWR to inspect and detect cracks in the core shroud (in 1990). The plant was also the first BWR to take a sample from the identified crack in the shroud to characterize the defect. Furthermore the plant measured neutron flux in the reactor during plant operation 1997 - 1998 in the pressure vessel and its internal parts to validate calculation in neutron flux received.

The records kept enable the plant to track the aging process. As a result of the good aging management, maintenance programs have been improved and many actions have been taken. Examples includes:

- reinforcements of pipe support foundations and building walls;
- reactor building external coating of reinforcement bars less deep than 18 mm;
- reactor building and main stack coating to prevent humidity in the concrete;
- replacement of stainless steel piping susceptible to IGSCC;
- injection of hydrogen to the feed water in order to mitigate consequences of IGSCC using innovative technique;
- replacement of condenser brass tubes with titanium tubes and stainless steel in the outer row;
- modification of feedwater nozzle sleeves and replacement of feedwater safe-ends;
- replacement of carbon steel piping systems with stainless steel throughout the plant;
- replacement of almost all electrical and I&C equipment, including cables;
- fire separation up-grades including replacement of existing cable penetrations and fire-doors.

In addition to the comprehensive aging program contributing to excellent material conditions, the team identified a long history of low backlog in maintenance, clearly labeled components, and an outstanding engagement of managers and supervisors frequently touring the plant and especially places where work was being performed.

Kashiwazaki 3/6, Japan

Mission Date; 1-18 Nov, 2004

Outstanding material conditions and housekeeping ensures safe operation, work implementation and may reduce doses. All plant areas visited by the team exhibited a standard of material condition that are considered outstanding in the industry. Reactor building and turbine hall is divided in separate storages and workshops and reactor building is provided with central vacuum cleaning system. Several metal wastebaskets are supplied in controlled area for flammable and nonflammable small waste to avoid temptation to leave waste drifting. Utilities management do systematic walk-downs with contractors and fast corrective actions are being started immediately when improvement needed. Reactor building and turbine hall is divided in separate storages and workshops and reactor building is provided with central vacuum cleaning system. Several metal wastebaskets are supplied in controlled area for flammable and nonflammable small waste to avoid temptation to leave waste drifting. Utilities management do systematic walk-downs with contractors and fast corrective actions are being started immediately when improvement needed.