

Studsvik Workshop “Radiological Characterization” April 17-19, 2012

AREVA: Sampling of Reactor Pressure Vessel and Core Internals

Ralf Oberhaeuser

AREVA NP GmbH, IBRZ2-G, Paul-Gossen-Strasse 100, 91052 Erlangen, Germany
E-Mail: ralf.oberhaeuser@areva.com, Phone: +49 9131 900 91626, Fax: +49 9131 900 94052

Decommissioning and dismantling of nuclear power plants is a growing business as a huge number of plants built in the 1970s have now reached their lifetime. It is well known that dismantling a nuclear power plant means an extraordinary expense for the owner respectively operator. Beside the dismantling works for itself, the disposal of activated components and other nuclear waste is very expensive. What comes next is the fact that final disposal facilities are not available yet in most countries meaning a need for interim storage on-site in specially built facilities. It can be concluded that a special attention is paid on producing a minimal radioactive waste volume. For this, optimized dismantling and packaging concepts have to be developed. AREVA is proud of versatile experience in successfully dismantling nuclear components like core internals and reactor pressure vessel (RPV).

The basis of a well-founded and optimized dismantling and packaging concept must always be the detailed knowledge of the radiological condition of the component to be and in the best case a 3D-activation-model. For keeping the necessary sampling effort as small as possible, but simultaneously as efficient as possible, representative sampling positions are defined in advance by theoretical radiological examinations. For this, a detailed 3D-CAD-model of the components to be dismantled has proven very helpful and effective.

Under these aspects a sampling of RPV and its components is necessary to verify the theoretically calculated radiological data. The obtained results of activation and contamination are taken into account for the optimized dismantling and packaging strategy. The precise 3D-activation-model will reduce the necessary number and type of final disposal containers as security factors are minimized leading to a lower shielding effort, too. Besides, components or even parts of components may be subject of release measurement. In the end, costs can be reduced.

In this context, AREVA has developed various dedicated studies and already carried out sampling activities during the last years in different countries.

First step of work is the identification of representative sampling positions and proving the accessibility taking into account the most suitable techniques. In general, scratch, drilling and so-called shuttle as well as lens samples are available with their different advantages and disadvantages. An intensive sampling above and below the core center axis reduces the modeling uncertainties in these areas which arise from the relative distance from the neutron flux, from rescattering effects and from different materials.

After this a detailed planning of the work execution on-site provides a trouble-free and time optimized project process taking into account the relevant protection goals.

The samples are then transported to our accredited radiological laboratory for detailed analysis resulting in a respective analysis report.

In the end the customer has a precise overview over the radiological condition of its RPV and the internals to optimize the radioactive waste management.