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# Processes and Practices Related to Occupational Dose

**ID:** 22

## HIGH TEMPERATURE ELECTROMAGNETIC FILTRATION ON THE PRIMARY CIRCUIT OF LWR PLANTS

**Keywords:** ELECTROMAGNETIC FILTRATION; HIGH-TEMPERATURE FILTRATION; MAGNETIC FILTRATION; FILTERS; LWR; BWR; PWR; PRIMARY COOLANT CIRCUIT; WATER CHEMISTRY; PURIFICATION; COBALT REDUCTION; COBALT; EMF

### Description:

A number of studies have been carried out to investigate the use of high-temperature electromagnetic filters (EMF) to remove activated corrosion products from LWR circuits. These investigations have been directed both at PWR primary circuit filtration and processing of high temperature drains in a BWR.

One study was carried out under EPRI sponsorship at the Winfrith Steam Generating Reactor in the U.K. This 100-MW plant operates with typical BWR chemistry conditions. The objectives were to understand the influence of EMF on the rate of buildup of activity on the piping; to determine the effects of operational parameters on EMF efficiency; to study deposition phenomena before and after the filter.

EMF performance was assessed over a range of operating conditions. Particulate removal efficiency ranged from 40 to 75%. The lower figure applied during periods of ingress of Powdex ion-exchange resin. The filter was 70% efficient for cobalt associated with particulate material.

However, the particulates represent only 20% of the total soluble and insoluble cobalt, so the filter efficiency for total cobalt was only 14%. No significant reduction in cobalt-60 activity levels was found from examination of surface radiation fields before and after the filter. These results are consistent with the conclusions of a study carried out by Kraftwerk Union AG at the 900 MWe ISAR BWR in F.R. Germany. Another study was carried out in Sweden on the FORSMARK-3 and OSKARSHAMN-3 BWRs. These two BWRs have high-pressure forward pumped heater drains (FPHD) and OSKARSHAMN-3 has a magnetic filter on the high-pressure drains, upstream of the feedwater tank. The magnetic filter efficiently removed iron particles but had little effect on radiation buildup. Reactor water results indicated higher cobalt-60 and cobalt-58 levels in both plants than in older BWRs. The higher levels were attributed to higher cobalt input through the FPHDs.

It is therefore considered at the present time that EMF is not justified as a method or reducing radiation fields but may be considered as a means of reducing iron input in the primary coolant.

(For more specific information on magnetic filters for BWRs, see item 26.).

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## References and Selected Abstracts:

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2. Walter, K.H., "Improvement of the Primary Coolant Treatment in Pressurized Water Reactors by Mechanical Filtration (in German)," VGB Kraftwerkstechnic (F.R. Germany), April 1987, pp. 412-415.

3. Wegemar, B., "Influence of Forward-pumped Heater Drains and Magnetic Filtration on Water Chemistry and Radiation Buildup in BWRs," EPRI Report NP-5864, June 1988. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)