

BNL ALARA Center Data Base

GERMANY

R-424

FIELD EXPERIENCE WITH FULL SYSTEM CHEMICAL DECONTAMINATION OF BWR AND PWR TYPE REACTORS USING THE CORD PROCESS

Keywords: CONTAMINATION REMOVAL; DECONTAMINATION; FULL SYSTEM DECONTAMINATION; DECONTAMINATION FACTORS; DOSE; DOSE RATE; DECOMMISSIONING; CORD; BWR; PWR; RADWASTE

Principal Investigators:

Harald Wille / Horst Bertholdt
Siemens AG/KWU
Freyeslebeinstrasse 1
D-91058, ERLANGEN
GERMANY
Phone: 49 9131 183339

Project Managers:

Horst Bertholdt / Harald Wille
Siemens AG/KWU
Freyeslebeinstrasse 1
D-91058, ERLANGEN
GERMANY
Phone: 43 9131 183131

Objectives: To demonstrate the viability of the AMDA/CORD/UV process as a highly effective, flexible and low waste generating decontamination process for the full system decontamination (FSD) of both PWR and BWR type reactors. CORD (Chemical Oxidation Reduction Decontamination) represents the process, while AMDA stands for Automated Mobile Decontamination Appliance and UV for the in situ decomposition of the decon chemicals with ultra-violet light. A comprehensive process has been under development at Siemens. It includes safe process engineering, adapted to the individual conditions in the NPP, the decontamination process control and performance and the treatment of the decon solution. At the end of each cycle the decon solution is decomposed in order to minimize the residual waste. CORD/UV utilizes permanganic acid for preoxidation and dilute dicarboxylic acid for the decontamination step. It is regenerative and produces very little waste by photochemically decomposing all decontamination chemicals at the end of each cycle. Considerable experience has been gained in carrying out the FSD of two BWRs and three PWRs.

Comments: The CORD process is a major step forward in waste reduction. The use of permanganic acid avoids the intermediate purification, neutralization and rinsing steps required by other processes, enabling a complete decontamination with several CORD/UV cycles with only one system fill of demineralized water. During the decon there is a continuous bypass purification and regeneration of the decon solution by ion exchange resins. Beside low activity concentrations during the application, this leads to a constant routing of fresh decon solution to the surfaces of the system or component treated. At the end of each cycle the resin contains the activity and the inactive corrosion products, the chemicals remain in solution. The last step of each cycle is the decomposition of the chemicals into water and carbon dioxide while removing the remaining impurities by ion exchange resin. By this procedure, the water left inside the system has the purity of demineralized water that was filled originally in the system. CORD is adaptable to the decon tasks. For systems which will be reused only the contamination layer on the surface is dissolved and removed. CORD does not require a fixed number of cycles. The number can be selected according to the final activity content required.

BNL ALARA Center Data Base

GERMANY**R-424**

Remarks: As NPP systems themselves are used, there is little additional equipment required. In 1991 CORD was applied to FSD of BR3 PWR (10 MWe) in Mol before decommissioning. Decontamination Factor (DF) was >10 and personnel dose was reduced by more than 4,000 mSv. Waste amounted to 1.3m³ of spent resin. In 1992 the BWR VAK (16 MWe) was decontaminated by CORD/UV. Dose rate was reduced from 30 mSv/h to 0.25 mSv/h. The low residual contamination will allow complete dismantling of the NPP without high personnel dose. The Swedish BWR OKG (440 MWe) was decontaminated after 22 years to allow extensive work at the bottom of the RPV. The fuel was removed during the decon. DF greater than 1000 were achieved at the bottom of the RPV. The smearable contamination was less than 4Bq/m². The four circulation loops and connected systems e.g. RHR, RWCU were decontaminated. Volume of the decon system was 160 m³, surface was 1,500 m². Waste amounted to 2.5 m³ of spent resin. Personnel dose saved was much more than 3,000 mSv. In 1994 the Loviisa PWR (447 MWe) was treated. The complete primary system, without fuel was decontaminated. 1,120 Ci were removed and a dose saving of 8,000 mSv was achieved during this outage.

References: 1. Wille, H. and Y. Sato, "Field Experience of Chemical Decontamination and Waste Reduction with the CORD Process," International Conference on Chemistry in Water Reactors, Nice, France, 1994. 2. Wille, H. and H. Bertholdt, "Full System Decontamination Experience of BWRs and PWRs with CORD," Proceedings, EPRI Radiation Field Control and Chemical Decontamination Seminar, Tampa, Florida, November 1995, available from EPRI Distribution Center, P.O. Box 23205, Pleasant Hill, CA 94523, Phone: (501)934-4212.

Duration: from: 1990 to: 1996**Funding:** N/A**Status:** In progress**Last Update:** May 7, 1996