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Processes and Practices Related to Occupational Dose

ID: 5

CHEMICAL DECONTAMINATION OF PRIMARY SYSTEMS

Keywords: CHEMICAL DECONTAMINATION; CONTAMINATION REMOVAL; DECONTAMINATION; WASTE PROCESSING; FULL SYSTEM DECONTAMINATION; LOMI; CANDECON; CANDEREM; CITROX; CORD

Description:

Chemical decontamination is one of the most cost-effective means of reducing man-rem to occupational personnel at water reactors. This is especially the case when decontamination is followed by what would otherwise be high-dose maintenance tasks. So far, decontamination of only parts of the primary systems has been carried out for commercial light water reactors, although full system decontamination with fuel in place has been successfully used at CANDU reactors for a number of years. In the past more decontamination has been carried out at BWRs (75%) than PWRs (25%). The systems most often decontaminated at BWRs are the reactor water recirculation system (RWR) and the reactor water cleanup system (RWCU). Steam generator channel heads and pumps are often decontaminated at PWRs.

The processes which are being used in recent years are the dilute processes as compared to the concentrated processes used in earlier years when waste disposal and corrosion effects were major problems. The most popular processes used today are LOMI, CAN-DECON, CITROX. All give good decontamination factors and have been successfully used. The last two utilize oxalic acid which under some conditions may induce intergranular attack on sensitized 304 stainless steel.

Other worthwhile processes are KWU's CORD process and the new CAN-DEREM process which does not make use of oxalic acid and was recently used at Indian Point 2.

PWR decontaminations are more expensive and require an additional permangnate step to remove chromium from oxide films. Recent experience has shown that maximum chromium is removed if a pH switching technique is used (alkaline permagnate followed by nitric acid permangnate).

Disposal of resultant waste can represent up to 30% of the cost of decontamination. In process selection this cost should be carefully factored in. Also certain criteria, e.g. the amount of chelant present in the waste, may be imposed by waste disposal sites. All of these factors should be taken into account. The most common technique at present is to mix and set the resin into homogeneous cement monolith. The mixture must pass a series of stability tests before approval by NRC. Methods of further waste reduction are currently being researched.

Work is also being carried out to qualify full system decontamination. Greater progress has been made in this area for BWRs. It should be a viable and particularly cost effective alternative in a few years.

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