

Decontamination, Decommissioning, Remediation and Waste Management

Chemical Decontamination Solutions

Background

Westinghouse offers innovative solutions to meet customer's decontamination and effluent waste treatment needs.

The need for a chemical decontamination can vary;

- Planned maintenance activities in a high radiation area
- General guiding principles to keep dose As Low As Reasonably Achievable (ALARA)
- A dose requirement that violates plant tech specs or industry regulations

Westinghouse addressed these needs by developing a variety of chemical decontamination processes and delivery systems. Westinghouse has four different, off-the-shelf, field ready systems that target a specific size system to ensure an efficient and effective decontamination. Each system has its specific physical and cost benefit inherent in its design.

System	Application	System Volume
Mini	Small systems or components	Up to 50 gal
Intermediate	Partial or components	Up to 1,000 gal
Standard	Sub systems	Up to 25,000 gal
Full	Large systems	>25,000 gal



600 Series Pump Skid processes over 25,000 gal



Chemists performing laboratory testing

Deliverables

Westinghouse is a proven leader in chemical decontamination technologies. We are actively developing new applications that will reduce by-product wastes during the chemical decontamination process without hindering the effectiveness of the decontamination.

Applications such as the NITROX-E decontamination process were developed to remove radionuclides for sub-system dose reduction and full-system decontamination (FSD) projects. The process is continually being modified to increase its effectiveness and reduce the amount of resulting radioactive waste. Permanganic acid is now applied during the oxidation step, which reduces the amount of cation ion exchange resin needed to remove potassium ions. A future enhancement will change the way the oxalic acid is decomposed, further reducing the waste. This process was recently applied to a primary system in Germany for an FSD with better than anticipated results.

Description

Chemical decontamination is the use of chemical reagents to remove radioactivity containing corrosion products, from the internal surfaces of piping and equipment. It was developed for commercial use in the early 1980s, and has been successfully applied by Westinghouse for over 30 years.

Chemical decontamination can be used in a number of plant sub-systems and components, in PWR, BWR, and CANDU plants. Some of those plant systems include Reactor Recirculation (RRS), Reactor Water Cleanup (RWCU), Residual Heat Removal (RHR), Chemical Volume Control System (CVCS), and Primary Heat Transport System (PHTS), to name a few.

In the 1990s, Electric Power Research Institute (EPRI) licensed the Decontamination for Decommissioning (DFD) process to remove facilities, including operating nuclear power stations, from service. The EPRI DFDX is a further development of the process (the X refers to electrochemical ion exchange). Westinghouse is one of the only companies that has experience applying this decommissioning process.

Our skid mounted equipment may be operated in a recirculation mode or a once-through, flush, mode depending on the plant system and cleaning requirements. This allows for multiple location and type applications within modular packaged designs.

Benefits

Westinghouse's experience in chemical decontamination and effluent waste treatments, with all types of plant and system designs, is unparalleled in the industry. This experience ensures highly qualified, experienced personnel lead projects; performing the chemical analysis to determine the best approach, efficient progress during a project, and validation when the process is at completion. That experience allows us to choose the best chemical process for the type of system piping, specific water chemistry, and types of radionuclides that are to be removed. Below is a brief list of the processes we use:

Type	Process
Reducing chemistries	LOMI, LOMI II
	CITROX
	NITROX-E
	CANDEREM™
Oxidizing chemistries	REMCON
	Nitric Acid Permanganate (NP)
	Alkaline Permanganate (AP)
	BiOX-2
	DFD, DFDX
	Passivation



Operator/chemist in continuing training

Experience

Westinghouse has more than 30 years of global chemical decontamination and effluent waste processing experience, supporting operating and decommissioning nuclear power plants, as well as Department of Energy and National Lab sites. Our variety of processes and systems allows Westinghouse to offer customized solutions suited to a customer's specific need.

Westinghouse has performed greater than 500 chemical decontaminations, from small components to full-system decontaminations. They include

- >300 BWR system decontaminations including all operating systems, fuel pool cooling (FPC) systems, recirc pumps, moisture separators and FPC and RWCU heat exchangers
- >100 PWR chemical decontaminations including CVCS system, reactor coolant pumps and system heat exchangers
- 7 commercial decontaminations for decommissioning
- Government test reactor systems

With this expanse of broad experience we still typically achieve >90% activation removal rate; resulting in personnel risk reduction (lower PPE and protocol costs) and reducing the cost of waste disposal by enabling classification reduction.

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