TechBrief

Liqui-Cel® MEMBRANE CONTACTORS

Wolsung Nuclear Power Plant in South Korea Uses Liqui-Cel® Membrane Contactors for Dissolved Oxygen Removal to Prevent Corrosion

Dissolved oxygen is a leading source of corrosion in water systems. The Korean Electric Power Institute (KEPRI) has installed Liqui-Cel Membrane Contactors in the Wolsung nuclear power plant in South Korea. The membranes have been in operation since 2000 and have successfully met the rigorous demands of the nuclear power industry.

The Wolsung unit 1 plant is a pressurized heavy water type reactor (PHWR). In this plant the membranes are used to remove dissolved oxygen from the end shield cooling system. This system re-circulates water that is used to cool the reactor wall. The cooling system is filled with carbon steel balls that are used to prevent radiation exposure to the workers during a refueling period. Dissolved oxygen is controlled in order to prevent corrosion of the piping and carbon steel balls in the system.

Historically hydrazine treatment was used to control the dissolved oxygen in the end-shield cooling system. Engineers associated with the plant investigated other technologies in an effort to overcome some of the limitations of using hydrazine.

Hydrazine reacts with dissolved oxygen to form water and nitrogen. Unreacted hydrazine decomposes to produce ammonia, nitrogen, and at high temperatures, hydrogen. The formation of hydrogen gas is a potential hazard. In addition, hydrazine is considered a health risk and the engineers wanted to limit employee exposure to the chemical.

Wolsung Unit 1: Replacing Hydrazine Injection

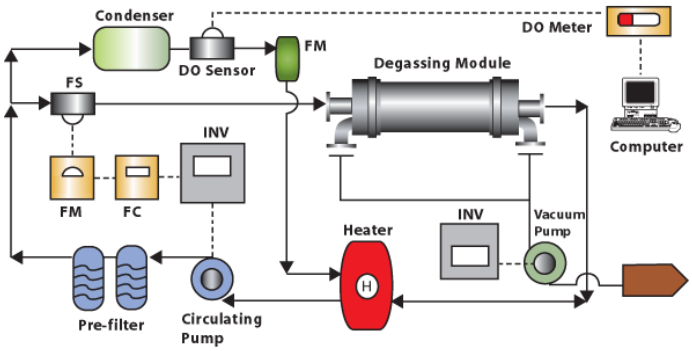
The Wolsung plant uses a combination of vacuum and nitrogen to lower the level of dissolved oxygen. In this system nitrogen gas is fed into the lumens (inside) of the membrane.

Benefits

The membrane contactors offer an efficient chemical free process for removing dissolved gasses from water. The elimination of hydrazine from the process creates a safer working environment for the employees of the plant.

To gain a better understanding of how the contactors actually work, you can view an animated product tour that demonstrates a cutaway view of the contactor.
Go to www.liqui-cel.com.

Schematic Diagram of an Experimental Loop System



Pilot Scale Equipment

Contactors in use at Wolsung NPP

Operational Parameters at Wolsung NPP

End user	Wolsung Nuclear Power Plant
Module	Liqui-Cel® 10X28-X40 Membrane Contactors
Water Flow	16m3/h (70 gpm)
Temperature	47 °C (117 F°)
Vacuum	0.11 kgf/cm2 (80 torr)
Number of Contactors	2 in series
Purpose of System	DO Removal
Operation Mode	Combination Sweep Gas and Vacuum
Efficiency	98 %

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