

MTA Number	MTA-MA-026		
Title			
Reduce Maintenance and Testing Using Hydrophobic Coatings for Emergency Service Water Pumps			
Description			
Emergency service water (ESW) pumps are typically kept in “stand-by” mode, in which they are exposed to stagnant water from a local source (e.g., river, sea, or other large body of water) that can result in biofouling and aquatic growth. To ensure ESW pumps are available to perform their design function and to mitigate performance issues, pump testing and cleanings are performed on a regular basis. Pumps are typically tested monthly, requiring operator labor and engineering analysis for each pump. Inspections and cleanings are performed at periodic frequencies and depend on the amount of biological build-up; these activities may require labor by underwater divers working under potentially dangerous, low visibility conditions. During pump cleanings, safety-related ESW pumps are taken out of service, which may place a plant in a limiting condition of operation depending on technical specifications. Coatings are used to protect ESW component surfaces against biological build-up and maintain the life of the equipment. Hydrophobic coatings repel water, which limits aquatic growth and reduces corrosion, extending the life of the component. Newer formulations of hydrophobic coatings do not require coating accelerators containing fluorides and chlorides, and thus meet nuclear plant chemistry limits. Hydrophobic coatings on ESW pumps have the potential to offer longer lasting lifetimes than current copper-based coatings used for biofouling, potentially allowing for deferred pump overhauls and fewer coating applications. Additional savings may be attainable by replacing current coatings in other components exposed to biological growth with hydrophobic coatings (e.g., safety-related intake canal low level water switches).			
Benefits			
Benefits Estimate	Level 1 – Savings are expected to be less than \$1 million per year. Savings include reductions in cleanings and testing, and material cost reductions compared to antifouling copper-based coatings. Additional savings may come from deferred pump overhauls due to the extended life of the hydrophobic material coating compared to current coatings. ~\$50,000 in annual net benefits (savings minus costs) was estimated for three ESW pumps in an example plant. Extent of total savings depends on the scope of hydrophobic coating application, pump material, and susceptibility to biofouling, and is therefore plant-specific.		
Benefits Description	• Reduces frequency of ESW pump cleaning and testing. Hydrophobic coatings can reduce biological growth, fouling, and corrosion, resulting in less maintenance. • Decreases personnel risks by reducing ESW cleaning and testing (i.e., reduces the frequency that commercial divers would be exposed to the potentially dangerous and near-zero visibility conditions of cleaning). • Reduces material costs compared to current coatings. Hydrophobic coatings cost less to apply. The coating specified in the business-case analysis (EPRI 3002018426) is expected to last 10-12 years, which is several years longer than the current antifouling copper-based coatings. • Potentially eliminates or decreases large equipment rental costs needed for ESW pump cleaning (e.g., crane). These savings can only be attained if a plant rents the equipment. • Potentially defers pump overhauls due to the longer expected life of hydrophobic coatings compared to current coatings.		

Costs and Schedule	
Cost	Level 3 – Initial implementation cost is less than \$1 million, which includes hydrophobic coating material and labor costs. Costs are expected to total around \$30,000 per pump, with coatings expected to last 10-12 years.
Schedule	Less than six months, which includes planning and implementation. Coating application would occur during an ESW pump overhaul and could take up to six to eight weeks, which includes shipping the pump offsite for the application and delivering it back to the site. Pump overhauls and coating applications performed on site could potentially improve on schedule.
Scope Context	Per plant, on components susceptible to biofouling. The associated business case (EPRI 3002018426) considers three ESW pumps at a two-unit plant for a 25 year period.
Risks	
- Standard project risks associated with utilizing a vendor service. - The hydrophobic coating will likely be exposed to a local freshwater source. Local environmental regulatory agencies should be consulted for their acceptance of the application. - A plant's technical specifications should be reviewed to ensure the plant's safety basis is not adversely affected while performing the pump overhauls required for hydrophobic coating application.	
Administrative Items	
Date	7/15/2021
Functional Area Where Benefits Will Be Realized	Maintenance Operations Engineering
Reference Implementation Guidance	NEI 2020 TIP Award Submittal 13 (ID: 13350687) Hydrophobic Coatings for Contamination Control: Assessing Hydrophobic Coatings for Use in the Nuclear Industry. (EPRI 3002013080) Program on Technology Innovation: Polymers in Nuclear Power Plants, Current Status and Prospects for Expansion. (EPRI 3002005332) State-of-the-Art Coatings for Balance-of-Plant Applications: A Literature Review and Technology Readiness Assessment. (EPRI 3002013203)
Industry SME	EPRI – Dylan Cimock EPRI – Dave Olack Contact: nuclearplantmod@epri.com
Previous Implementation	Please contact EPRI for implementation examples and contacts.
Implementation Enablers	N/A
SWEEP Score	- Cost - Level 3 – Implementation cost is less than \$1 million. - Savings – Level 1 – Savings are less than \$1 million per year. - Payback – Level 3 – When comparing the hydrophobic coating to current antifouling coatings, payback period is immediate. However, ESW pumps with low susceptibility to biofouling may have slower return on investment (if any). - Technical Readiness – Level 3 – This technology has already been implemented at nuclear power plants.

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	• Licensing Readiness – Level 3 – This technology has already been implemented at nuclear power plants. • Implementation Proficiency – Level 3 – The technology can be implemented by all sites, regardless of digital experience.
Applicability	All reactor types All geographic regions
Keywords	Hydrophobic coating; plant modernization; water pump; emergency service water; reduced maintenance; biofouling
Business Case Analysis Cross-Reference	Plant Modernization Business Case: Use of Hydrophobic Coatings to Reduce Maintenance Costs (EPRI 3002018426)

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NOTE

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