

Research Update

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Bottom Line

This scaleup research project evaluated how coatings performed in real world conditions by coating a full-sized trashrack panel with four commercially available foul-release systems and monitoring for performance as well as coating degradation. The soft silicone foul-release coatings experienced minor damage but remained effective, outperforming the more durable silicone-epoxy hybrid after 18 months of testing.

Better, Faster, Cheaper

Fouling caused by invasive species such as zebra and quagga mussels can significantly reduce flows and increase head losses. A successful foul-release coating can reduce downtime and maintenance costs associated with manual removal of fouling organisms.

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Foul-Release Scaleup: A Real World Trial of Mussel Resistant Coatings

Foul-release coatings applied on a new 10'x10' trashrack panel were put to the ultimate test at Parker Dam

Problem

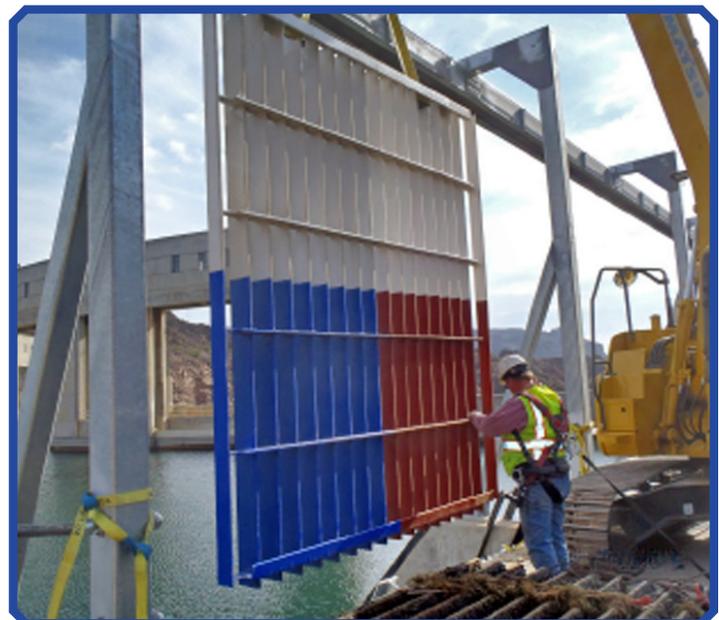
Zebra and quagga *dreissenid* mussels were first discovered in the United States in the 1980s in the Great Lakes. Since then, the mussels have spread and have been discovered in many reservoirs in the Western United States. In the Southwest's warm climate, mussels are able to reproduce at greater rates than in the Great Lakes region and Upper Mississippi River Basin. Mussels cannot only disrupt water delivery and hydropower generation functions, they create long-term economic impacts as well. Mussels attach to underwater surfaces and can clog small-diameter piping (i.e., cooling water, HVAC, and domestic water piping), reduce flow in larger diameter piping, clog fish screens, and impact intake structures.

The coatings team in the Materials and Corrosion Laboratory (formerly the Materials Engineering and Research Laboratory [MERL]) at Reclamation's Technical Service Center has been researching coatings for zebra and quagga mussel control for the past 7 years at Parker Dam on the Colorado River (Arizona/California border). Their research has included evaluating more than 100 coatings and materials to mitigate and prevent mussel attachment. The coatings study at Parker Dam identified several foul-release coating products that effectively prevented fouling. However, facility managers were skeptical that these coatings could withstand the severe service environment that includes abrasion, impacts, and scouring from entrained solids.

Solution

This Reclamation Science and Technology Program research project scaled up testing efforts to evaluate how coatings perform in actual service conditions. In 2012, a full-sized trashrack panel was fabricated and coated with four candidate commercially available foul-release coating systems:

- International Intersleek 970
- Fuji Sher-Release
- PPG Sigmaglide 890
- Seacoat Seaspeed V5



Installing the trash rack panel with four test coatings.

The panel was installed in Parker Dam's trashrack structure, which contains an automated cleaning system, whose periodic operations result in mechanical wear on the trashrack panels.

Application and Results

The research was performed onsite at Parker Dam. The trashrack panel was installed in December 2013 and inspected after 6, 12, and 18 months. A submersible camera was deployed to evaluate the degree of fouling and damage on the existing structure.

It was expected that there would be some localized abrasion damage due to contact from the automated trash rake, which runs approximately every 7 days. As expected, damage occurred on the front facing surfaces of the trashrack where the trash rake guides scraped the surface. The front surfaces of the original trashrack panels, coated with a coal tar enamel, and the new galvanized steel racks were also damaged to bare steel due to the mechanical damage from the trash rake guides. Surprisingly, after 18 months of exposure, the silicone foul-release coatings (International Intersleek 970, Fuji Sher-Release, and PPG Sigmaglidle 890) had less damage than the hard epoxy siloxane hybrid (Seacoat Seaspeed V5). The inner surfaces of the trashrack panel bars still appeared to be in good condition.



Existing trashrack heavily fouled with zebra and quagga mussels.



International Intersleek 970 after 18 months exposure.

No mussels appear to be attaching to the silicone foul-release coatings. However, a few mussels were found colonizing on the epoxy siloxane hybrid coating (Seacoat Seaspeed V5). The silicone foul-release coatings experienced wear patterns similar to the original coating. Thus, these coatings appear to be a promising solution for controlling mussels on Reclamation's infrastructure.

Future Plans

Researchers will informally inspect the test trashrack at Parker Dam to continue to monitor the condition of the trashrack and gauge long-term coating performance.

Reclamation is pursuing using commercially available silicone foul-release coatings for other infrastructure maintenance projects, including the Southern Water Delivery System near Pueblo, Colorado. Further, Reclamation is partnering with private industry and universities to test other experimental foul-release coatings using Cooperative Research and Development Agreements (CRADA) and other research partnerships.

“Silicone foul-release coatings appear to be a promising solution for controlling mussels on Reclamation’s infrastructure. When we scaled up foul-release coatings to a full-size trashrack panel at Parker Dam, we were surprised to find that despite being soft, the silicone foul-release coatings were more durable than the hard silicone epoxy.”

**Allen Skaja
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Collaborators

**Reclamation’s Lower Colorado
Region:**

- Lower Colorado Dams Office
- Parker Field Division
- Parker Dam

More Information

**[http://www.usbr.gov/research/
projects/detail.cfm?id=5270](http://www.usbr.gov/research/projects/detail.cfm?id=5270)**