



US Army Corps
of Engineers
Waterways Experiment
Station

Zebra Mussel Research

Technical Notes

Section 2 — Control Methods

Technical Note ZMR-2-05

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Construction Materials That Act as Deterrents to Zebra Mussel Attachment

- Purpose** This technical note describes construction materials that could be used as deterrents to zebra mussel attachment and subsequent macrofouling.
- Additional information** Contact the author of this technical note, Mr. Tim Race, (217) 373-6769, U.S. Army Construction Engineering Research Laboratory, for additional information. Dr. Ed Theriot, WES, (601) 634-2678, is Manager of the Zebra Mussel Research Program.
- Definition** A zebra mussel-resistant material is any material that resists the settlement or strong attachment of zebra mussels either because of an inherent toxicity or release properties.
- Description** Copper, silver, mercury, and zinc are toxic to the zebra mussel. The use of silver as a deterrent to zebra mussel attachment would be cost-prohibitive in most situations. Mercury is unacceptable because of its environmental effects.
- A 5-mg/L concentration of copper ions maintained for 24 hours has been shown to produce 100 percent mortality in an adult zebra mussel population. Although more expensive than many conventional construction materials, the use of copper for certain components, such as small-diameter piping, is common. Copper pipe is an acceptable material for contact with potable water. Copper may be alloyed with a variety of other metals. Of particular interest as potential mussel replants are alloys of copper and zinc such as brass. Brass may be used to make pipes, fittings, and fabricated components such as small valves. Corrosion-resistant copper-nickel alloys could be appropriate for some structural components. Copper or copper alloy pipe-in-pipe inserts could be used to retrofit existing small-diameter pipes. Cladding materials could be used to retrofit large flat areas.
- At least one manufacturer is producing plastic components and sheeting that contain an unspecified biocide claimed to repel zebra mussels. This material could be used as a cladding, and for piping, small valves, and pipe inserts. Other plastic materials have very low surface energies, analogous to the non-toxic release coatings. Reduced coefficient of friction and oil-filled ultra high molecular weight (UHMW) polyethylenes have very low surface energies.

These materials should compare favorably to nontoxic silicone release coatings. Mussels that attach to these slick materials are easily removed by mechanical cleaning or dislodged by low to moderate water velocities. When zebra mussels attach to most untreated surfaces, removal requires vigorous cleaning with brushes or use of special nozzles to create high velocity water streams.

A 5-mg/L concentration of zinc ions maintained for 24 hours has been shown to produce 5 percent mortality in an adult zebra mussel population. Steel may be coated with zinc in a hot dip process to produce galvanized steel. Virtually any steel component can be coated in this way, the only limitations being the size of the dip tank and the steel components. Galvanizing also protects steel from corrosion. The dissolution of zinc from the coating can produce a surface that is not readily infested by zebra mussels.

Recommendations The use of alternative construction materials that zebra mussels either do not attach to, or attach to weakly, should be investigated. The performance of materials such as copper and brass that are already exposed at sites likely to become infested should be evaluated. Personnel with first-hand knowledge of the zebra mussel resistance of these materials are encouraged to contact investigators involved in this research program.

As part of the Zebra Mussel Research Program, selected construction materials will be evaluated in field tests which began in May 1992. Alternative construction materials including copper, brass, bronze, aluminum-bronze, galvanized steel, and UHMW polyethylene materials, will be tested. Resistance to fouling by zebra mussels will be evaluated over a four-year period. Additional information on the effectiveness of these materials as zebra mussel replants will be reported annually.

References McMahon, R. F. 1990. "The Zebra Mussel: U.S. Utility Implications," Electric Power Research Institute Report GS-6995.