

ZEQUANOX[®]

Invasive Mussel Control

Zequanox[®] is the industry's only selective and environmentally compatible molluscicide for the control of invasive zebra and quagga mussels at all stages of maturity—from veliger to adult. Zequanox delivers efficacy comparable to chemical solutions, but does not endanger employees, damage equipment, or result in harmful impacts to the environment or other aquatic organisms.



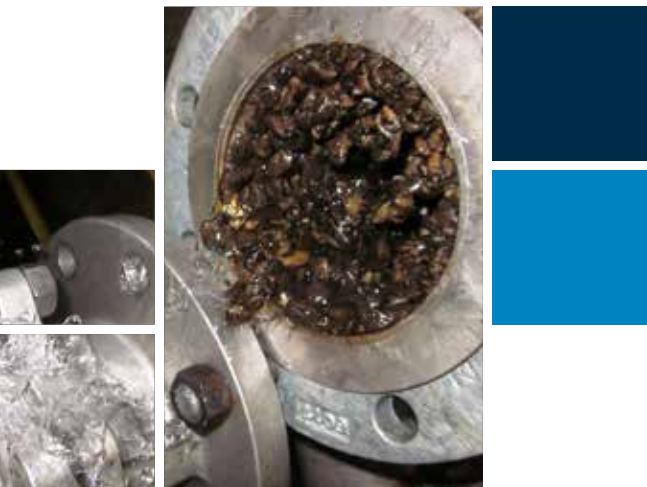
TINY MUSSELS CAUSE BIG PROBLEMS

Invasive zebra and quagga mussels are crippling power, industrial, and municipal operations by:

- Restricting water intake in pumps, process lines, cooling water systems, heat exchangers, and condensers.
- Clogging fire suppression equipment.
- Accelerating corrosion and pitting concrete and steel.
- Damaging piping, seals, valves, and other mechanical equipment.

The impact of a mussel infestation will vary, but most facility operators experience increased maintenance costs and a reduction in the lifespan of equipment and infrastructure. In manufacturing plants, mussel colonies can slow or shut down operations, and for power producers, the colonies can reduce energy generation and cause unexpected outages.

Chemicals have long been the answer for mussel control, but in order to reduce regulatory burdens and employ (and promote) more sustainable business practices, facility operators are increasingly looking for alternatives.



ZEQUANOX: A BETTER CHOICE FOR MUSSEL CONTROL

Zequanox® is a low-risk aquatic molluscicide, approved by the U.S. EPA and Health Canada PMRA, for controlling invasive zebra and quagga mussels. It offers efficacy comparable to chemical solutions, but does not endanger employees or result in harmful impacts to other aquatic organisms when used as directed.

Composed of dead cells from a naturally occurring microbe (*Pseudomonas fluorescens*), Zequanox is recognized by invasive mussels as a nonthreatening food source and is readily consumed. Once ingested, Zequanox destroys the mussel's digestive system.

Zequanox provides a number of key benefits, including:

Reduced risk—Compared with chemicals, Zequanox won't harm equipment, is better for the environment, and can help mitigate worker safety risks.

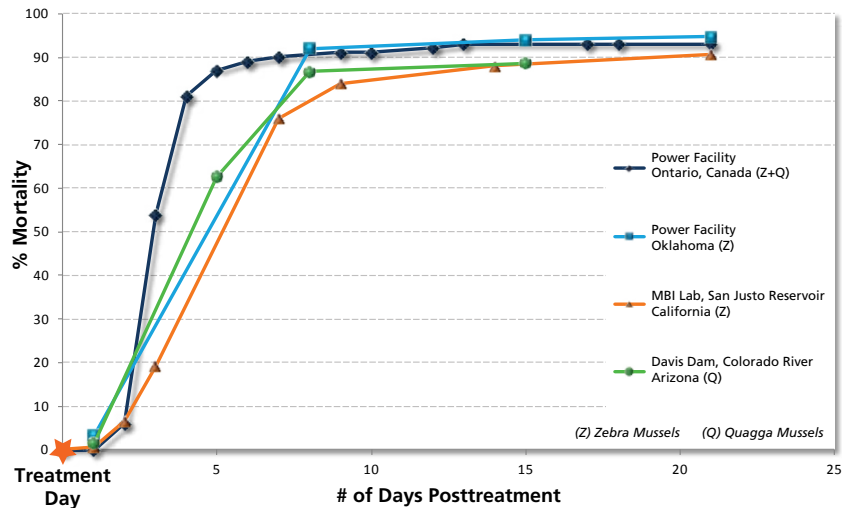
No maintenance—Unlike UV or filtration systems, Zequanox requires no capital investment, retrofit, or installation; nor does it require vigilant equipment maintenance to ensure control.

Easy to use—Zequanox is applied using standard chemical injection equipment, and applicators need only minimal personal protective equipment. Unlike chlorine, Zequanox treatments can be completed within hours (2–6 hours, depending on the type of control program employed), with virtually no interruption to normal operations. Furthermore, operators can continue working throughout the plant during Zequanox treatments.

With Zequanox, facility operators are armed with an effective, nondisruptive, and simple solution for controlling invasive mussels throughout their facilities.

PROVEN EFFECTIVE

In trials and commercial facility treatments, results show that Zequanox is highly effective—achieving greater than 90% mortality. The onset of mussel mortality typically occurs within a few days of the treatment day, but ongoing mortality can be observed for several weeks thereafter. This “progressive” mortality reduces the risk of equipment damage or operational disruption because shell debris flushes through the water system at a lower, more manageable volume.



ZEQUANOX ADVANTAGES

Minimal Regulatory Restrictions

Zequanox produces no carcinogenic substances, requires only minimal permitting, and can be used as frequently as needed for population control.

Reliable Control

Zequanox works in a broad range of water conditions and temperatures, and controls mussels at all life stages. With Zequanox, control won't be compromised by a burned-out UV bulb or a torn filter, as can happen with other methods.

No Detoxification Before Discharge

Detox before discharge is not required with Zequanox.

Low Risk to Workers

Zequanox is nonvolatile, so product applicators need only minimal personal protective equipment (PPE). In addition, personnel can continue working in the area during a treatment.

Short Treatment Times

Chemical solutions are perceived by mussels as a threat, which causes them to stop feeding. Zequanox is perceived as food and is readily consumed, thus dramatically shortening the needed treatment time to less than 6 hours, compared with days or weeks needed for chemical treatments.

Noncorrosive

Unlike chlorine and oxidizing chemicals, Zequanox has no risk of corrosion.

Environmental Compatibility

Toxicology studies demonstrate that Zequanox is safe¹ for fish, insects, crustaceans, plants and algae, and native molluscs.

No Capital Investment or Equipment to Maintain

Zequanox is applied with standard equipment, so there's no need to change any piping, nor is there any expensive capital equipment to install or maintain.

¹At application rates that produced zebra and quagga mussel mortality, no mortality was recorded among any of the non-targets.

HIGHLIGHTS

- Reliable control
- Limited permitting
- No risk of corrosion
- Treatments can occur within a shift and won't disrupt normal operations
- No need for detoxification before discharge
- No special handling or storage
- No capital equipment to purchase, install, or maintain
- Only minimal personal protective equipment needed during product application
- Minimal risk to humans, animals, and aquatic life
- Approved by the U.S. EPA and Health Canada PMRA



THE NATURAL POWER OF ZEQUANOX

In 1991, a strain of *Pseudomonas fluorescens* bacteria was found to be lethal to invasive zebra and quagga mussels (*Dreissena* species), but was not harmful to water quality or other aquatic organisms.¹ *Pseudomonas fluorescens* microbes are found in water bodies throughout North America, protecting the roots of plants from diseases, and have been used for years to protect delicate fresh fruit crops from freezing.

Zequanox is composed of dead cells of the *Pseudomonas fluorescens* microorganism. The cells contain natural compounds that are lethal to dreissenid mussels during all life stages (veliger to adult).

Extensive toxicology studies have been conducted with Zequanox. The findings demonstrate that, unlike chemical molluscicides, Zequanox is safe² for many aquatic species, including fish, insects, crustaceans, plants and algae, and native molluscs.

¹At application rates that produced high zebra and quagga mussel mortality (76%–100%), no bacteria-induced mortality was recorded among any of the non-targets, including fish, ciliates, daphnids, and bivalves. ²When used as directed. Always read and follow directions on the label.

CONTACT US TO LEARN MORE

With Zequanox, you get easy, effective mussel control, without significant capital expense, the hassles of maintaining mechanical equipment, or the risks associated with the use of harsh chemicals. Visit our website or contact us to learn how a Zequanox treatment program can help you win the war against invasive mussels.

Phone 530-750-2800 • Toll Free 877-664-4476 • Email zequanox@marronebio.com • Web www.zequanox.com