

# Effective Removal of Zebra Mussels with Amiad Screen Technology

## Introduction

The zebra mussel, native to the Black and Caspian Seas, has spread in the past few decades to waterways throughout the world mostly via ballast water. Zebra mussels, when non-indigenous to the environment, pose a serious threat to intakes of facilities that rely on fresh and brackish surface water. The mussel colonies obstruct the flow of water through the pipelines eventually causing the complete blockage of the piping system. This could be extremely dangerous if it were to happen at, for example, a nuclear power plant.

The need to eradicate zebra mussels is a growing concern, due mostly to the heavy costs incurred by facilities that rely on water drawn from lakes and rivers. The **AMIAD** solution helps these facilities cut expenses by ensuring the uninterrupted supply of mussel-free water.

Zebra mussels are a serious threat to surface water resources due to their ability to attach to underwater objects and surfaces.

## What are Zebra Mussels?

Zebra mussels are bi-valve mollusks and although known for their black-and-white stripes, other colors and patterns are common. The high reproduction rate combined with the lack of natural enemies cause the rapid infestation of these mussels in foreign ecosystems. The mussels flourish in oxygenated plankton-rich water and can even survive in dark surroundings of water lines. Fertilized eggs develop into free-swimming larvae known as veligers. The veligers remain suspended in water until the juvenile stage at which time they secrete byssal threads - a sticky substance that allows the mussels to adhere to hard surfaces such as water lines.

Groups of juvenile mussels colonize the inner surface of pipelines producing a hard substrate. As the mussels develop shells, they become the substrate for new colonies. Able to withstand high water flows, the growing layers of colonies decrease the diameter of the pipelines impeding the normal passage of water. In addition the high flow rates in water intake pipes provide a constant source of plankton for the filter-feeding mussels.

## Why are zebra mussels a threat?

Zebra mussels are notorious for their biofouling capabilities by colonizing water supply pipes. The ability to attach themselves to any hard underwater object or surface poses a serious threat to water treatment and industrial plants. These facilities spend millions of dollars annually since they must:

- ◆ Consume more energy to maintain required water flows
- ◆ Carry out costly maintenance activities (manual cleaning of pipelines) that sometimes cause plant shutdowns
- ◆ Clean chemically treated water to allow for its safe discharge

Mussels cluster in mats on top of each other, lining the inside of pipes. When these clusters become too heavy, they slough off the pipes, lodge in intakes, and constrict water flow. They reduce the available diameter of pipes needed to transport water and block strainers and screens.

The fouling and loss of intake heads, obstruction of valves, corrosion of cast iron and steel piping are common to industries as well as facilities and services that use mussel infested surface water. Some of these include the following:

- ◆ Hydroelectric and nuclear power plants
- ◆ Water treatment works. The putrid smell of decaying mussels, and buildup of methane gasses from the decaying mussel tissue cause significant taste and odor problems in drinking water.
- ◆ Aquaculture – Fish hatcheries/farms. In addition to the threat of pipe blockages, contaminated fish farms face quarantine measures to prevent the spread of zebra mussels.

The types of equipment that are vulnerable to the build up of mussel colonies include:

- ◆ Heat exchangers
- ◆ Cooling systems
- ◆ Air conditioning systems
- ◆ Condenser units
- ◆ Turbines
- ◆ Fire fighting equipment
- ◆ Small-diameter pipes
- ◆ Seals
- ◆ Valves

Farms and golf courses may also be likely targets of infestation.



Cross-section of clogged pipe

What are the most common methods for removing/ controlling zebra mussels?

<b>Methods</b>	<b>Problems</b>
Placing screens over intake pipes.	Frequent replacements necessary when screens become clogged.
Increasing flow of water at inlet to prevent zebra mussels from attaching themselves.	Some facilities are not engineered for increased flow rates.
Forcing air through intake pipes.	Not all pipes are accessible. Labor and service interruption costs are high.
Sealing intake pipes until zebra mussels exhaust all oxygen.	Not all pipes are accessible. Labor and service interruption costs are high.
Using rotary snakes and other pipe scrapers to remove zebra mussels.	Not all pipes are accessible. Labor and service interruption costs are high.
Flushing intake pipes with hot water or steam (temperatures above C 100° will kill zebra mussels).	Not all pipes are accessible. Labor, energy and service interruption costs are high.
Injecting controlled doses of potassium permanganate or chlorine into water intake pipes.	Adverse impact on environment. Labor and service interruption costs are high.

What is the AMIAD solution?

Mechanical filtration by the compact **AMIAD** filters of the mussels at the veliger stage of development- when the larvae reaches 40µm – is a proven and economical solution to water line clogging. This high capacity continuous flushing pressurized filter series, is suitable for high dirt loads at high flow rates and low working pressures.

- Removal of the veligers is accomplished via the 40µm absolute stainless steel wire-mesh screens.

The **AMIAD** filter provides a continuous supply of clean water throughout the entire self-cleaning cycle, so there are no work interruptions.

One of the most significant advantage to **AMIAD** solution is environmental. This means that no chemicals or special handling is required. Thus the water does not have to be "de-chemicalized" before reuse or discharge.



Project name: "MUD-CREEK"  
Country: State Of Michigan, USA  
Application: IRRIGATION WATER SUPPLY  
Flow rate: 900 m<sup>3</sup>/h  
Filtration Degree: 40 micron  
Water source: Lake water

Filtration of lake water prior to inserting it to the distribution canals for irrigation purposes. The water must be completely clear of Zebra Mussels and larvae in order to prevent their penetration into other water bodies.