

ZEBRA MUSSEL CONTROL TURNKEY OPERATIONS

The following clients retain Aquatic Sciences to provide a turnkey operation for their zebra mussel control system:

- Atlas Specialty Steels
- Bayer Inc., Rubber Division
- Blue Circle Cement
- Bruce Power L.P.
- Brookfield Management Services Ltd.
- CFB Kingston
- Cameco Corporation
- Casco Inc.
- City of Hamilton
- Cytec Canada Inc.
- Dana Canada Inc.
- Detroit Edison
- Domtar Communication Papers
- Dow Chemical Canada Inc.
- Dow Chemical Ludington
- Ford Motor Company of Canada Ltd.
- Ford Motor Company, Dearborn
- General Motors of Canada Limited
- Hydro-Québec
- Imperial Oil Limited
- Inco Limited
- KoSa Canada Company
- Lafarge Canada Inc.
- Lafarge Corporation
- Legends of Niagara Golf Course
- Midland Co-generation Venture, Michigan
- Niagara Parks Commission
- Norton Advanced Ceramics of Canada Inc.
- Ontario Power Generation Inc.
- Oxy Vinyls Canada Inc.
- PetroCanada
- Rouge Steel Company Limited
- Royal Niagara Golf Course
- Shell Canada Ltd.
- St. Mary's Cement
- St. Catharines Golf and Country Club
- St. Lawrence Cement Inc.
- UCAR Inc.
- Washington Mills Electro Minerals Corporation
- Washington Mills Ltd.



INDUSTRIAL BIOFOULING CONTROL SERVICES

Aquatic Sciences is recognized as the industry leader in research and design of programs for zebra mussel control. Aquatic Sciences currently operates a number of treatment systems utilizing chemical and non-chemical options for over forty industries and water treatment facilities throughout the Great Lakes watershed. In addition, Aquatic Sciences has developed and patented a ultraviolet light technology for control of zebra mussels.

Established in 1987, Aquatic Sciences is a full service engineering and underwater inspection company that provides scientific and technical services in water resource management worldwide. Responding to industry's demand for innovative technology and protocols, Aquatic Sciences has excelled in the disciplines of underwater robotic inspections, non-destructive testing, biofouling control, water treatment toxicity analysis and fresh water management.

CHLORINATION AND DECHLORINATION TURNKEY OPERATIONS

Aquatic Sciences has helped many companies evaluate zebra mussel control options. Protocol designs, treatment strategies, installation, commissioning, time scheduling, and project budget estimates have been completed for the following clients:

- Canadian Niagara Power Company Ltd.
- Casco Inc.
- Dofasco Inc.
- Domtar Communication Papers
- ESSO Petroleum and ESSO Chemical
- Lafarge Canada Inc.
- Northern State Power Company
- Ontario Power Generation Inc.
- Terra International
- UCAR Inc.

Aquatic Sciences
www.aquaticsciences.com

Aquatic Sciences

40 Centre Drive
Quaker Centre Business Park
Orchard Park, NY 14127
716-667-3507 Tel
716-667-3509 Fax

www.aquaticsciences.com

INDUSTRIAL BIOFOULING CONTROL SERVICES

SERVICE AND PROCESS WATER SYSTEMS

Chlorination of raw cooling and service water systems remains the most frequently practiced and proven means of zebra mussel control. Methods of application and potential associated side effects are well understood. Neutralization of trace total residual chlorine (TRC) of the effluent using sodium metabisulphite is an easy and reliable method of ensuring that the aquatic environment is protected. Treatment of raw water systems using this protocol is effective, safe, and economic. There is minimal risk to the aquatic environment and the benthic community, and it does not create any potential long term environmental liabilities.

Control strategies range from:

- continuous low level chlorination of the service water during the entire reproductive season of the mussel
- single shock treatment at some time near the end of the mussel reproductive season

TREATMENT EFFECTIVENESS MONITORING

When chlorinating a water system to eradicate biofouling organisms, it is very important to assess treatment effectiveness. The use of a treatment bioassay will allow an invaluable picture of the treatment progress which can lead to reduced client cost. A bioassay involves seeding bioboxes with live juvenile mussels prior to the scheduled treatment program and utilizing these mussels to monitor the control program effectiveness while in operation.



FIRE PROTECTION SYSTEM PIPING

Fire protection systems which utilize raw water were initially overlooked when industries evaluated the potential for zebra mussel infestations within their facilities. Fire systems were thought to be a low infestation risk due to their semi-static nature and, hence, stagnant conditions. However, recent investigations have determined otherwise.



DISSOLVED OXYGEN MONITORING

In the early 1990s, ASI discovered that adequate concentrations of dissolved oxygen (DO) existed in most fire water systems at levels that would sustain zebra mussels and other aquatic life.

This research suggested that fire protection systems are often utilized for non-fire protection tasks resulting in introduction and movement of significant amounts of fresh water throughout the distribution network. The influx of fresh water results in not only the initial introduction of zebra mussel larvae, but also provides a constant source of nutrients and oxygen to existing populations. Water sprinkler heads can become especially vulnerable to failure when shell debris becomes lodged preventing operation of the flow mechanism.

Treatment of semi-static systems such as fire protection distribution networks presents different

challenges from high flow systems. The semi stagnant nature of these systems makes the use of oxidants such as chlorine an unattractive option in terms of cost and time considerations.

Zebra mussel larvae require a minimum of 18 hours contact time with chlorine to accomplish complete mortality. As chlorine dissipates rapidly, the residual in the fire protection system may not be enough to effectively control all mussel larvae. If the fire protection system is static, and dissolved oxygen levels are below the critical level for zebra mussel survival, the lack of oxygen will successfully eradicate any larvae which survived the chlorination.

Based on research conducted by Aquatic Sciences since 1990, it has been concluded that potash is an ideal option for zebra mussel control in semi-static systems such as firelines. The benefits of this control option are:

- environmentally benign
- commercially available
- inexpensive
- highly effective at variable temperatures
- a naturally occurring mineral
- has little effect on non-target organisms at the levels used in treatment

TURNKEY CONTROL PROGRAMS

INSTALLATION OF PORTABLE SYSTEMS

As an alternative to the extensive costs and effort involved in designing, implementing and operating a chlorination system and a dechlorination system for zebra mussel control, Aquatic Sciences has developed a completely portable

and turnkey system using chlorine or potash as control agents. Turnkey services include installation and operation of chemical metering skids, data loggers, chart recorders, analytical instrumentation and dechlorination systems. In addition, compliance monitoring and reporting.

A typical program includes:

- Application and acceptance of regulatory compliance requirements
- Installation of chlorination metering skids and tankage
- Installation of analytical instrumentation and loggers
- Installation of dechlorination metering systems and tankage
- Ramp-up and commissioning of chemical systems
- System operation for 2 to 3 week period
- Compliance sampling to ensure “zero chlorine discharge”
- Breakdown and demobilization
- Regulatory compliance reporting

BIOLOGICAL MONITORING SERVICES

Comprehensive biological monitoring services are conducted by Aquatic Sciences' staff. On-site personnel training of biological monitoring protocols and procedures can be provided by Aquatic Sciences for clients that choose to complete their own monitoring. Sample analysis and results are available from Aquatic Sciences' Ecological Toxicity Laboratory.

