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Station

Zebra Mussel Research Technical Notes

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A Preliminary Examination of Odor Problems Caused by Decaying Zebra Mussels

Background

An important strategy for eliminating zebra mussels is dewatering the structure and then killing the mussels by heat or desiccation (Miller, Payne, and McMahon 1992). The dead mussels decay very quickly and are likely to produce a severe odor. If zebra mussels have to be removed from a confined area (large pipes or covered lock chambers), workers could be exposed to high levels of various organic gases and low levels of oxygen.

Purpose

The purpose of this technical note is to provide information on the potential hazards of odoriferous compounds associated with decaying zebra mussels. In addition, information on air-testing devices and appropriate protective clothing for workers is presented.

Additional information

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Health concerns

Personnel working for large power facilities in the Northeast have reported that large numbers of decaying zebra mussels quickly produce an extremely foul odor. Odoriferous compounds that are likely to be produced as a result of the bacterial decomposition of organic material include methane, hydrogen sulfide, and other organic sulfur compounds. Methane is of special concern because it is extremely flammable.

If decaying zebra mussels are in a confined space without adequate ventilation, it is possible that workers could be subjected to oxygen deprivation or exposed to high levels of gases resulting from decomposition (Table 1). Section 27 of the U.S. Army Corps of Engineers Safety and Health Requirements Manual contains specific regulations concerning work in confined spaces. In these situations, air samples should be taken to determine the concentration of oxygen and hydrogen sulfide.

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Table 1
Effects of Decreased Atmospheric Oxygen

Percent Oxygen	Description
20.9	Normal air
19.5	OSHA minimum safe level
12-16	Disorientation/accelerated respiratory rate
6-10	Nausea, unconsciousness, death

Source: American National Standards Institute 1980.

The permissible exposure level for hydrogen sulfide is 20 parts per million (Code of Federal Regulations, Part 1910; dated 1991). This is the maximum level of hydrogen sulfide that a worker should be exposed to for periods of 15 min or less. Symptoms of exposure to hydrogen sulfide include eye irritation, dizziness, headache, gastrointestinal problems, photophobia, apnea, convulsions, and coma (U.S. Department of Health and Human Services 1991).

A variety of detection devices and personal monitors for these toxic gases are available. For short-term use (8 to 24 hr), personal detector tubes that measure the exposure to hydrogen sulfide and other chemicals are available, in quantities of ten, for approximately $100. These devices are clipped to clothing and provide a direct reading without the need for charts or calibration. Disposable personal oxygen monitors that sound an alarm if the oxygen level drops below the minimum safe level of 19.5 percent are available at a cost of approximately $400 each. These are also attached to clothing and can be used for up to 1 year. Battery-powered, nondisposable units for both oxygen and hydrogen sulfide can be obtained at a cost of approximately $1,000 each. Units of this type have a digital readout with alarm.

Workers should wear protective clothing if they are to work in confined, poorly ventilated spaces for long periods of time. The degree of protection required will vary with each situation. However, in cases of severe zebra mussel infestation, the use of protective suits with respirators could be required. If used by Corps personnel, respiratory devices must conform to the safety regulations for respirators listed in Engineer Manual 385-1-1, paragraph 1.07B (Department of the Army 1987).

A variety of respirators and protective clothing are available from the sources listed in Table 2. Prices range from less than $25 for disposable products to over $1,000.

Table 2
Sources of Safety Equipment

Supplier	Telephone
Clement Safety Equipment, Inc. Memphis, TN	(901) 775-3600
Forestry Suppliers, Inc. Jackson, MS	(800) 647-5368
Lab Safety Supply Personal and Environmental Safety Janesville, WI	(800) 356-0722
Mine Safety Appliances Co. (MSA) Pittsburgh, PA	(412) 967-3000

If the odor problem is severe and cleanup must be delayed, a procedure for odor modification should be implemented. Under some conditions it is possible to increase the amount of fresh air with large fans. Also, layers of sand or wood chips is a cost-effective way of reducing odor transmission by providing a temporary buffer zone between the odor source and ambient air currents.

Odor modification by the use of chemicals such as lime, ferrous sulfate, potassium permanganate, and hydrogen peroxide has been attempted with varying success in land-based dredged material disposal operations (Harrison and others 1976). The application of chemicals for the purpose of odor modification should be carefully evaluated, however. These chemicals could cause negative environmental effects if they inadvertently enter the water supply.

Case history

Personnel of Detroit Edison Power Company have conducted several zebra mussel cleanup operations in their power plant facilities. This was done by dewatering the structure and starting cleanup as the water level dropped. A rubber raft was used as a work platform, and zebra mussels were removed from exposed surfaces using high- pressure water spray (3,000 pounds per square inch). Large amounts of flying debris and particulate matter resulted. Employees wore protective suits, like those used by divers, for protection from the debris as well as the cold, wet conditions. Face shields or masks were worn for eye protection.

When cleanup was delayed, a foul odor developed very quickly. Fans and heaters were used to increase the air circulation (personal communication, Mr. Bill Kovalak, Detroit Edison, Monroe, MI). The best strategy for dealing with odor problems is prevention; cleanup should begin as soon as possible.

References

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