



Bromine-free Water Purification Systems

November 30, 2018

Fiscal Year 2018 Report to Congress



**Homeland
Security**

United States Coast Guard

Foreword

November 30, 2018

I am pleased to present the following report, “Bromine-free Water Purification Systems,” as prepared by the U.S. Coast Guard.

The Explanatory Statement accompanying the Fiscal Year 2018 Department of Homeland Security Appropriations Act (P.L. 115-141) directs the submission of a report detailing the feasibility, costs, and benefits of transitioning to the use of bromine-free water purification systems aboard National Security Cutters, Fast Response Cutters, and Offshore Patrol Cutters.

Pursuant to congressional requirements, this report is being provided to the following Members of Congress:

The Honorable Kevin Yoder
Chairman, House Appropriations Subcommittee on Homeland Security

The Honorable Lucille Roybal-Allard
Ranking Member, House Appropriations Subcommittee on Homeland Security

The Honorable Shelley Moore Capito
Chairman, Senate Appropriations Subcommittee on Homeland Security

The Honorable Jon Tester
Ranking Member, Senate Appropriations Subcommittee on Homeland Security.

I am happy to answer any further questions you may have, or your staff may contact my Senate Liaison Office at (202) 224-2913 or House Liaison Office at (202) 225-4775.

Sincerely,



Karl L. Schultz
Admiral, U. S. Coast Guard
Commandant





Bromine-free Water Purification Systems

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I. Legislative Language

This document responds to the language set forth in the Explanatory Statement accompanying the Fiscal Year 2018 Department of Homeland Security Appropriations Act (P.L. 115-141).

Specifically, the Explanatory Statement states:

Not later than 180 days after the date of enactment of this Act, the Coast Guard shall provide a report to the Committees detailing the feasibility, costs, and benefits of transitioning to the use of bromine-free systems aboard National Security Cutters (NSC), FRCs, or Offshore Patrol Cutters (OPC).

II. Background

U.S. Coast Guard (USCG) vessels primarily process seawater through reverse-osmosis purification systems to produce and supply potable water for consumption aboard vessels. Potable water is produced for cooking, drinking, galley cleaning, and laundry facilities. After being processed by the reverse-osmosis purification system, and before further distribution throughout the vessel, the potable water is transferred to storage tanks. Stored water provides an ideal environment for bacteria and viruses to grow. Left unchecked, these bacteria and viruses can be communicated to the crew, creating serious health and readiness concerns.

To counter the risk of waterborne illness, and maintain a safe source of drinking water, USCG vessels utilize bromine disinfection systems. This system injects trace amounts of bromine into the potable water. The heart of the system is the disposable brominating cartridge, which contains a nontoxic polybromide resin and releases pre-determined amounts of bromine into the water supply. Through a special stabilizing process, the inherent dangers of elemental bromine have been eliminated. Once expended, the cartridges can be disposed of by conventional waste streams.

III. Report

Elemental bromine is toxic and requires special hazardous materials handling, which is time-consuming and expensive. Bromine dosing systems, such as those used on USCG vessels, utilize self-contained cartridges with an inert polybromide resin. The cartridges pose little to no risk to personnel, provided that the proper precautions for handling are followed. The *Material Safety Data Sheet* for cartridge canisters states that the canisters are not required to be treated as hazardous materials or hazardous waste.

The U.S. Navy (USN) has conducted research on bromine-free disinfection systems, such as the Howell Labs Mixed-Oxidant (MiOx) Electrolytic Disinfectant Generator (EDG), to include cost information and operational and maintenance requirements. USN has installed some large MiOx EDGs on USN “big deck” amphibious assault ships and aircraft carriers. The units operate well, but require highly trained technicians and a significant amount of maintenance. The technology has not made its way to the smaller surface combatants such as USN’s Ticonderoga class of guided missile cruisers, Arleigh Burke class of destroyers, or the Littoral Combat ships. Because of the increased maintenance requirements and costs associated with bromine-free disinfection systems, USN still utilizes bromine disinfection on the overwhelming majority of its ships.

USCG has reviewed the market research and input provided by USN and has found that:

- Demilitarized units scaled to the physical size and capacity suitable for use aboard USCG vessels are not yet in production;
- The lack of commercially available off-the-shelf bromine-free units makes determining initial acquisition and start-up costs difficult to establish; and
- The health and safety risks associated with stowage, handling, and disposal of inert polybromide cartridges are relatively minor.

Based on the current state of the market and USN’s research, commercial off-the-shelf bromine-free water purification units suitable for USCG vessels are not in production and the total acquisition cost cannot be established. Therefore, the maintenance costs and benefits of transitioning to a bromine-free water purification system are undetermined.

USCG will continue to work with and follow the lead of USN when considering the use of these systems aboard USCG vessels.

IV. Abbreviations

Abbreviation	Definition
EDG	Electrolytic Disinfectant Generator
MiOx	Howell Labs Mixed-Oxidant
USCG	U.S. Coast Guard
USN	U.S. Navy