

Navy Shipboard Oil Pollution Abatement (OPA) System

At a Glance

What is it?

The Navy developed the oil pollution abatement (OPA) system, which is designed to collect, treat, and monitor shipboard-generated oily wastes.

How does it work?

Oily wastewater is collected in the bilges of Navy ships in the normal course of operation. Oily waste transfer pumps move the bilgewater to the Oily Waste Holding Tank (OWHT). An oil-water separator (OWS) feed pump transfers the bilgewater from the OWHT to the OWS, where parallel plates use gravity to separate a fraction of the oil from the water, and direct the concentrated oil to the Waste Oil Tank (WOT) for shore-side disposal. The water fraction may or may not meet the 15 ppm overboard discharge limit, depending on the ship design, so a secondary treatment step is included on many ships. This oily wastewater membrane system (OWMS) takes the discharge from the OWS and separates additional oil and other contaminants from the water. Concentrate is sent to the WOT, and an oil content monitor (OCM) measures the oil concentration in the OWMS effluent stream. The OCM controls a diverter valve to either direct the clean effluent overboard, or circulate it back to the OWHT for additional processing.

What will it accomplish?

The OPA system enables Navy ships to operate anywhere in the world in accordance with environmental laws for overboard discharge of oily waste, and reduces shipboard manpower and offload costs.

Application:

- Fleet-wide

Point of Contact:

Richard Ruediger
215-897-7267
richard.ruediger@navy.mil



Description:

U.S. Navy vessels must limit the oil concentration in oily waste discharges to 15 parts per million (ppm), as set forth in OPNAVINST 5090.1C and Department of Defense (DOD) Regulation 4715.6-R1. Parallel-plate, oil water separator (OWS) systems are currently installed on most Navy ships, and many ships also have ultrafiltration membrane systems installed as secondary treatment.

Improved ship designs have produced “dry bilge” ships, thus reducing oily waste generation. This results in higher concentrations of bilge contaminants (detergents, AFFF, solids, etc.) and small oil droplets. Parallel-plate separators cannot consistently achieve 15-ppm effluent oil content when processing small droplets and emulsions, preventing overboard discharge. A secondary treatment system such as the oily wastewater membrane system (OWMS) helps achieve 15-ppm oil discharge, thereby reducing shoreside disposal costs and shipboard manpower requirements.

Successful demonstrations of the 5-gallons per minute (gpm), 10-gpm, and 50-gpm membrane systems, and a 3-gpm combined centrifugal OWS/OWMS, have yielded acquisitions for 5 Navy ship designs. Membranes can increase flexibility in littoral operations, since they decrease the need to hold oily wastewater. There is also a force-protection advantage, since the need to discharge to piers or barges is reduced.

Challenges and Opportunities:

- Treatment of chemically and mechanically emulsified oily wastewater
- Managing solids in oily waste to extend the operating life of treatment systems
- Increasing quantity and variety of synthetic lubricants and oils creates challenge for conventional OWS technologies