



Green Ships

Green Technologies Aboard Navy Ships



Bethesda, MD (NAVSEA Carderock - Navy) -- Scientists and engineers solve problems about waste products on board naval ships. Some ships are comparable to small cities with up to 5,000 people on board. Engineers are creating safe and sustainable disposal systems for these self-contained ships. It used to be that waste from ships was thrown overboard. Today, engineers develop new technologies for treating waste. Efforts to stop polluting harbors and oceans have increased since the 1970s.

"What we've come up with is a way to make the ship not pollute." Carlos Murillo, chemical engineer

Framework

Middle School

Standards

- NSES - B.i.1 ➤ Mixtures of substances can be separated.
- NSES - F.iii.2 ➤ Waste disposal can induce hazards.
- NSES - F.iv.2 ➤ Risks are associated with social and chemical hazards.
- STL - 5.E ➤ Technologies are used to break down waste.
- STL - 19.F ➤ Manufacturing systems separate and form materials.

Content Illustrated

- Different examples of green technologies, such as an oil separator.



Content

Life Science

- ▶ Each person on a Navy ship generates about 45 gallons of gray water and three gallons of sewage each day. Sewage is whatever is flushed down the toilet. Gray water is the water used for showering, dish washing, and laundry.
- ▶ Water with less than 15 ppm (parts per million) of oil can be discharged into the ocean.

Physical Science

- ▶ Flocculation is a chemical process to take particles out of solution.
- ▶ Oil floats on water.
- ▶ Glass and metal are inert materials.

Technology

- ▶ Waste water consists of sewage, gray water and oily waste water. Waste water cannot be disposed from a ship into the ocean. Sewage, also called blackwater, is treated using a process called flocculation to remove the sludge or concentrated waste, leaving effluent, or treated waste water, to be disposed of safely into the ocean.
- ▶ Oily waste water is water that drips off machinery and collects at the lowest part of the ship (the bilge). Oily waste water is separated by taking advantage of oil and water differences as the oily water drains into the bilge of the ship. The oil is taken from the top of the oily waste water, while the excess waste water is treated in a secondary membrane system. When the waste water has less than 15 parts per million of oil, the water is safe to dispose of into the ocean. Depending on the size of the ship, up to 50,000 gallons of oily water are treated each day.
- ▶ Glass and metal are shredded and bagged to reduce their volume, then thrown overboard in burlap bags. These inert materials sink to the bottom of the ocean so they will not wash up on shore.
- ▶ Plastics cannot go overboard. They are put in shredders, then melted and compressed into a disk which can be brought ashore and recycled.

Math

- ▶ Parts per million (ppm).

Guiding Questions

To think about as you watch:

- ▶ What waste can be recycled or processed to minimize environmental damage?

Suggested Activities

- ▶ Have students research the big challenges of recycling on board a ship.

Keywords

bilge, blackwater, burlap, contaminant, effluent, flocculation, gray water, inert, membrane, oil, oily waste water, plastic waste processor, sewage, shredder sludge, solid waste shredder

▶ *Green Ships* can be found online at www.ndep.us/Green-Ships. Visit www.ndep.us/LabTV for a list of process skills modeled in webisodes.