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BP hopes ozone kills hitchhiking sea life

EXPERIMENT: Experts test hot tub technology in purifying ballast water.

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Using the same basic process that sterilizes luxury hot tubs, a team of scientists and technicians working for BP have been pumping ozone through ballast water in an Alaska oil tanker to kill hitchhiking organisms.

Three recent experiments conducted aboard the tanker Tonsina in Puget Sound may offer a breakthrough to one of the world's most intractable ecological problems: the threat posed by creatures that travel from one coast to another in ballast water and colonize new habitat when the water is discharged.

"From what I've seen so far, it looks promising," said project manager Joel Kopp, an expert in ballast water issues who coordinated studies for the Prince William Sound Regional Citizens' Advisory Council in Valdez. "I think the testing shows that ozone could be one of the tools that could be effective in treating ballast water. How effective, we'll have to see."

Ballast water is used to stabilize empty tankers on their back run to an oil port. The water is taken on after oil is delivered and is flushed out before taking on new cargo.

The unique prototype, designed by ozone specialist Nutech O3 and installed aboard the double-hulled Tonsina last year, zaps oxygenated air with 10,000 volts of electricity to produce about four pounds of ozone each hour inside the world's largest shipboard ozone generator, according to Kopp and BP officials.

The ozone then can be pumped through four miles of stainless steel pipe into 1,200 stone diffusers scattered among the tanker's 15 segregated ballast tanks. Over a three-to-seven-day voyage from the West Coast to Valdez, the process will theoretically kill all the plankton, bacteria, viruses and other tiny beasties swimming within about 12.6 million gallons of ballast. It would also kill the plankton-sized larval stages of dangerous invasive species like European green crabs.

"If this is effective, it's going to have significant impact on shipping worldwide," said

Simon Lisiecki, manager of BP's marine business development in Alaska. "All I can say right now is it looks positive."

A report will be finished in the next few months, Kopp said. But two 10-hour tests conducted in early November on one 800,000-gallon port ballast tank appeared to kill most of the tiny creatures in the water. Some larger organisms like shore crabs didn't die when suspended in cages.

"We've seen that it does kill plankton and it does kill bacteria," Kopp said. "But at what cost and how effective is it compared with other technologies?"

More testing -- intended to meet Coast Guard and scientific review standards -- could follow early next year. Additional research has been funded with \$600,000 in grants from the National Sea Grant Program and the U.S. Fish and Wildlife Service, Kopp said.

If the system ultimately proves practical and economical, BP may decide to install it on three tankers now under construction, said Neil Dunn, president of BP Oil Shipping Co. USA. The project has so far cost BP about \$3 million.

"But it needs to stand up to scrutiny," Dunn said. "Can I create enough ozone in enough time to kill all the beasts in all 15 tanks before I get to Valdez?"

Ballast water in ships has been a major cause of catastrophic biological invasions worldwide, causing extinctions and billions of dollars in economic damage. At least 7,000 different species get hauled across the ocean every day inside ships, many in the 2 million gallons of ballast water dumped each hour in U.S. ports, according to an October report on invasive species from the foundation-funded Pew Oceans Commission.

"The rate of known introductions in U.S. waters has increased exponentially since the 18th century and shows no signs of leveling off," the report stated. "In San Francisco Bay alone, for example, an average of one new introduction was established every 14 weeks between 1961 and 1995."

It's from these infested West Coast harbors that most Alaska tankers take on ballast to help stabilize their empty return trip to Prince William Sound. During about 550 voyages per year, the tankers deliver an estimated 17 million metric tons of this water to Valdez Arm in what one scientist has likened to a game of "ecological roulette."

"That one vector from the West Coast to Alaska is probably the single biggest transfer of ballast water in the United States, and most of that is to Valdez," Kopp said. "If you're going to start somewhere in the treatment of domestic ballast water, this is a big place to start."

In a five-year study conducted by the Smithsonian Environmental Research Center for the Prince William Sound council, scientists estimated that there were at least 264

billion individual bugs swimming in that water, not counting bacteria or viruses. Among them were at least 14 species nonindigenous to Alaska.

"We have not determined that any have established themselves," said the council's deputy director, Marilyn Leland. "We! also haven't determined that they haven't. The potential is there. The salinity and temperature in our water are similar to that on the West Coast."

Finding a solution has been elusive. Replacing ballast water taken from port with water from the high seas during a voyage can eliminate most organisms. But only about one-fifth of vessels arriving in U.S. ports in 1999-2000 reported exchanging ballast water on the high seas under a voluntary program outlined by the Invasive Species Act of 1996. Though Valdez-bound oil tankers from foreign ports must do this exchange, tankers on domestic runs are exempted.

Yet this ballast exchange has recently become controversial among scientists. It's never 100 percent effective, and it scatters potentially invasive species all over the sea, threatening shorelines downstream on ocean currents.

BP began developing its ozone process in the mid-1990s after Roger Gale, former president of the shipping division, came across! a reference to using ozone to purify water in hot tubs. According to Dunn and Lisiecki, Gale contacted Nutech, one of the world's leading ozone companies.

"He said, 'I've got this huge oil tanker. Have you got an ozonator that will work?'" Lisiecki said.

As designed, the process sends the ozone through the pipes into the sea water, where it creates hydrobromous acid and iodine before breaking down within seconds. The chemicals kill the species, then quickly break down too, reverting to safe bromine and iodine.

"That's the beautiful part about ozone," Lisiecki said. "You could use biocides or chemicals and all sorts of stuff, but then you've got a problem because you've got to get rid of it. The great thing about ozone is after 1.5 seconds it breaks down to what it was and you've got nothing but dead critters and sea water."

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