

**Trip Report**  
**Environmental Soundness Work Group Meeting**  
**January 8, 2004 \* Seattle, Washington**  
**Lisa Ka'aihue**

Note: official proceedings are forthcoming from the sponsor. We should be able to get access to the full PowerPoint presentations as well.

Purpose of meeting

This meeting was sponsored by the State of Washington. Its purpose was to bring an advisory group together to evaluate the use of various biocides (SeaKleen, carbon dioxide, and ozone) for ballast water treatment consideration in the State of Washington. This particular meeting was called to learn more about and make recommendations about the use of SeaKleen.

The meeting was chaired by Jerry Joyce of the Seattle Audubon. About 21 people were in attendance in person and a few more folks on the telephone. Bad weather in the Northwest prevented folks from Portland from attending in person.

Jerry explained that the State of Washington has its own regulations to deal with ANS (Aquatic Nuisance Species) ballast water issues. The philosophical question of whether it was better to a) do no harm or b) accept the least amount of risk was not to be addressed in this group. The state of Washington has a Ballast Water Working group that deals with this question. The recommendations coming from the Environmental Soundness work group would be forwarded on the Ballast Water Working group.

Scott Smith, the ANS Coordinator for the State of Washington, then explained the ballast water management regulations in Washington. The state has the authority to develop various ballast water management plans including the authority to develop and exchange verification program. In Washington, the ballast water standards are: 95% of zooplankton must be removed and 99% of phytoplankton and bacteria. If a particular ballast water treatment system is considered BAT (best available technology), even if it does not meet the standards, the state can approve the system.

Scott stressed the need to develop partnerships to come up with an end product. Partners included representatives from state governments, federal government, IMO, Port of Seattle, and environmental groups.

Three systems have already been approved by Washington under an interim approval [see attached letters for two of the systems].

Randy Marshall then spoke about the Department of Ecology's role. Currently they work to support the Department of Fish and Wildlife, by running toxicity tests and making sure the biocide is not causing harm. However, there is a federal court case pending that could make the Department of Ecology's role much larger and make the whole system much more complicated. A federal court in Portland is looking at ballast water discharge under

NPDES permits. If ballast water is required to be under an NPDES permit, then all aspects of ballast water will be examined, not just NIS (non-indigenous species).

Randy handed out their toxicity testing protocols for ballast water biocides. In addition to the standard testing, SeaKleen will be tested using Pacific Herring, an important species in Puget Sound.

#### What is SeaKleen and How does it Work?

The next part of the meeting was presented by Dr. Steve Culter of Garnett Inc. Dr. Culter represented the manufacturer of SeaKleen. SeaKleen is the brand name for menadione or vitamin K<sub>3</sub>. It is derived from the Black Walnut tree. Dr. Culter estimated that it costs about 15 cents to treat a metric ton of ballast water using SeaKleen. He said it was user friendly and environmentally safe. Dilution impacts toxicity. SeaKleen also degrades faster under light (UV radiation) conditions. They had not evaluated temperature effects. Menadione is already widely used in agriculture. For example, it is routinely used to feed catfish. The MSDS for SeaKleen can be found at Sigma Chemical company under menadione. Dr. Culter estimated that for the largest oil tanker, it would take a sugar-sized bag [it appeared to be about a five pound bag in one of the powerpoint slides] to treat the whole ship – parts per billion.

#### National and International Research on SeaKleen

Dr. David Wright of the University of Maryland, Center for Environmental Science presented this section. Dr. Wright said that menadione is an organic oxidant. Through his laboratory, a number of experiments were run on SeaKleen. Toxicity was found to occur at 2 parts per million and less. They also tested a variety of systems including biocides and UV onboard ships. They found that SeaKleen killed zooplankton at 5 ppm and phytoplankton at 1 ppm. These shipboard tests were run in Chesapeake Bay. He also suggested that SeaKleen may be considered for use with other technologies such as deoxygenation for maximum effect.

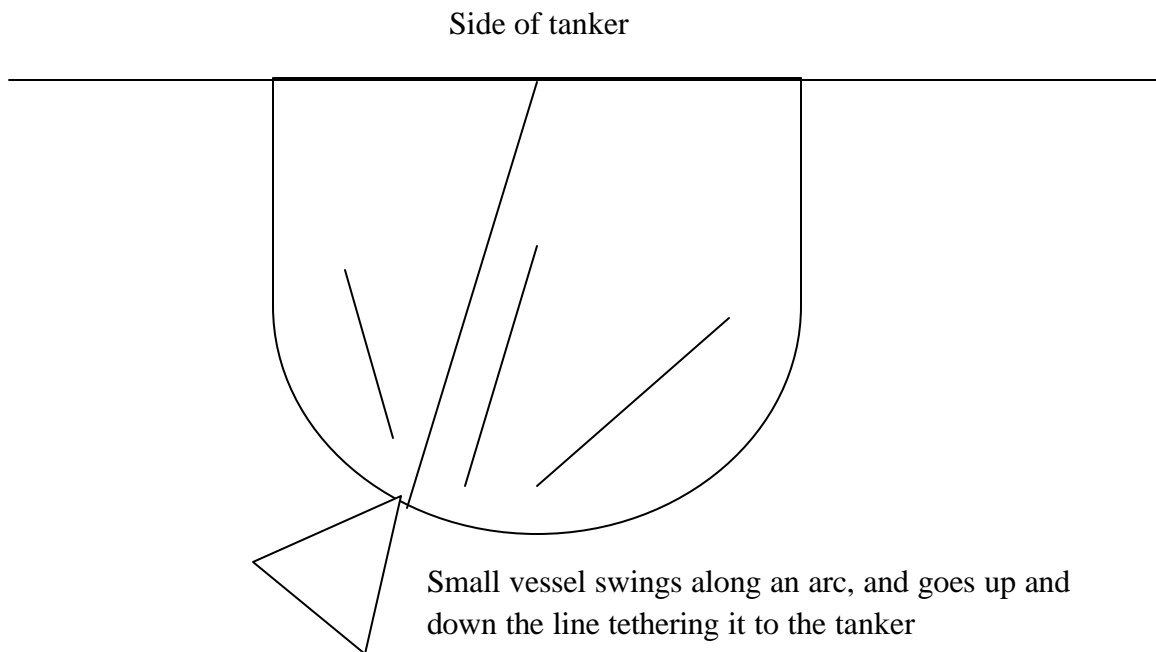
#### How do biocides mix and dilute when discharged from a ship?

Kevin Reynolds of Glosten presented a plan to evaluate the ballast water dispersion from a ship. Glosten supports the state of Washington in evaluating various systems. The point of the proposed testing was to determine how much the ballast is going to dilute as it moves further from the vessel, a critical information need in evaluating SeaKleen. They plan to look at a fifty foot perimeter around the vessel and try to determine what the plume looks like. They will use a “worst case” scenario – calm sea conditions, vessel is anchored or docked.

The testing procedures include the use of rhodamine dye, the same dye that is used by Alyeska at the Ballast Water Treatment plant. They plan to use the USCS flureometric procedures for the dye. The dye concentration target is 160 ppb. Measurements are to be made with a YSI model 650 MDS data logger.

A small boat will be tied to the larger vessel and will swing back and forth along the 50 foot perimeter, as well as go up and down the line tying the boat to the vessel. The instrument will be used to take measurements up to 70 feet.

The plum of dyed water is released just below the water line from the side of the tanker. Below is an aerial depiction of the smaller vessel's path along an arc.



#### SeaKleen Research in Washington State

Dr. Russ Herwig of the University of Washington gave an overview of recent SeaKleen research performed by U of W. He prefaced the talk by saying the University had not done a lot of research in this area, but was looking forward to evaluating SeaKleen further. Dr. Herwig is a marine water specialist and is one of the UV researchers involved in the BP sponsored UV work aboard the Tonsina. He also introduced Dr. Jeff Cordell who also works on ballast water projects at the University. Together they work on Puget Sound Ship sampling, the UV work mentioned previously, and laboratory mesocosm experiments with potential treatment systems such as UV, SeaKleen, and filtration systems.

In the SeaKleen experiments (December 2003), they used two scales: mesocosm (75 gallon fish tank) and microcosm (1 gallon jar). They used Puget Sound water at 8 degrees C and organisms that naturally live in the water. They added SeaKleen at 1 and 2 ppm. They also had controls. The location of the experiments was the USGS Marrowstone Marine Field Station. After the SeaKleen was added to the water, they saw a rapid decline in the zooplankton at five hours. They then held the same water for 48

hours; removed the dead zooplankton; and then added live zooplankton. Again, after five hours, the zooplankton was dead. They need to study this more; it may be that the 1 or 2 ppm is way too much material for the Puget Sound critters. Or it may be related to temperature; perhaps 8 degrees C is too cold for the SeaKleen to degrade. There is also no data regarding salinity effects. It was generally agreed by the group that it would be beneficial to generate degradation curves for SeaKleen related specifically to temperature and salinity.

Dr. Herwig went on to report that SeaKleen had no effect on the bacteria that was in the Puget Sound water. He also said that they are planning on further microcosm experiments using the one gallon jars. In these experiments they would use two water temperatures (8 and 12 degrees C). They would re-spike the water with zooplankton at 48, 74, and 96 hours.

The researchers have prepared a proposal to perform the next set of SeaKleen experiments aboard a ship. The platform is the Grotin, an integrated tanker barge that comes from San Francisco, to Long Beach, up to Washington, and carries a refined petroleum product. The experiments will be paired – a treated ballast tank paired with a control ballast tank. The researchers will collect water at two to three depths and collect zooplankton, phytoplankton and bacteria to determine lethality.

At a break, I asked Dr. Herwig if he would be willing to give this presentation to our NIS working group. He said he would be happy to, we just need to find a time that is open for him (he was not available for our January NIS working group meeting).

#### Panel Discussion

At this point, the group was asked to discuss biological soundness of SeaKleen, based upon the information presented, and to formulate any recommendations. The group generally agreed:

- SeaKleen is promising
- Need a degradation curve
- Need information on toxic thresholds
- Need the dilution model

Jerry said that if the group could get short-term information on some of the outstanding questions, then they could recommend interim approval for SeaKleen. He did not feel that the group was ready yet to make that recommendation. Scott said that they would push to get the dispersion study done now; but that the degradation model may take longer to work out. Fred urged to get the laboratory work done now and the on-board testing done in the spring.

Scott concluded the meeting by saying that there would be proceedings with links to powerpoints forthcoming.