



Application Note 2

Monitoring decontamination processes in Ballast Water

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Ballast water is needed to provide stability and manoeuvrability for ships that are not carrying cargo or require more stability than the cargo provides. 3000-4000 million tons p.a. of untreated ballast water are discharged from ships in ports as cargoes are loaded and it is estimated that more than 10,000 marine species each day may be transported in the ballast water and introduced into foreign ecosystems often seriously disturbing them. New regulations mean that decontamination processes are required to stop this damage.

Decontamination of ballast water using UV radiation requires the correct amount of energy to be applied for the right length of time for inactivation of the contaminating microorganisms. Under-dosing means that microbes survive the process and continue to multiply therefore contaminating the environment, while over-dosing means that energy is wasted, increasing costs.

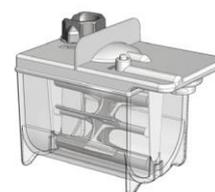
Speedy Breedy® has been designed as a portable contamination test for ballast water that's suitable for use in the field by engineers or inspectors.

Speedy Breedy® is a sensitive, precision respirometer for the rapid detection of microbial presence and bacterial contamination which is significantly faster than sending samples to the lab and waiting for the results to return.



Speedy Breedy® can be inoculated and the test started immediately after the sample is taken, meaning that Time to Detection is faster as there is no loss of time while the sample is transported to the laboratory.

Speedy Breedy® is a two chamber instrument for single or dual samples, or for running a test versus a control sample. Speedy Breedy® maintains culture conditions within purpose designed, disposable culture vessels. Samples are inoculated into the culture vessel and Speedy Breedy® closely controls growth conditions to a pre-determined protocol in order to facilitate rapid replication of microbes. Speedy Breedy® then detects the presence of contamination by measuring a pressure change (associated with microbial respiration) within the vessel. Speedy Breedy® is portable and does not require a laboratory so it can run a test at the site of the ballast processing or outfall. This means the test lends itself to use by process engineers and local auditors alike.



Speedy Breedy® can be used independently or connected to a PC. Using the PC managers can design and download protocols to Speedy Breedy® and upload experimental results for analysis, or indeed visualise tests in near real time. Speedy Breedy® also has a removable SD card for field work.

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Speedy Breedy® can be used on-site to show sterility or log reduction in microbes in ballast water following decontamination. Additionally, studies using Speedy Breedy® to monitor decontamination of ballast water by UV processing have shown that residual viable contaminants can be rapidly detected if the UV process has been under-dosed. Further, using the Time to Detection, Speedy Breedy® can determine the reduction in viable bacterial numbers under process conditions and therefore help predict the correct dose for a given ballast water sample, enabling operators to refine the process for optimal efficiency.

In the example to the right, growth as shown by a pressure event (indicated as a vertical red line) has been detected in both the left chamber (ballast water before UV treatment = green line) and the right chamber (after treatment = blue).



The detection of organisms in the right chamber indicates the dose applied did not inactivate all of the microbes although it has clearly had a significant effect. Sufficient organisms remained viable to replicate to large numbers and be detected. In both cases detection took just a few hours.

The difference in Time to Detection between the left and right chambers indicates that the number of organisms that were able to replicate following UV treatment had been reduced significantly. The time to detection correlates to the Log reduction in viable organisms, mirroring treatment efficacy.

Using Speedy Breedy® an effective UV dose can be proven as there will be no growth or pressure event. Individual tests are also coded by Speedy Breedy® to provide an audit trail.

Speedy Breedy® can be used to:

- Monitor microbial contamination in ballast water
- Monitor the efficacy of UV water treatment
- Optimize UV treatment efficiency and energy usage
- Confirm successful decontamination at minimum dose and cost
- Measure the effectiveness of disinfection of the ship's environment
- Test for contamination of drinking water or food
- Test swabs used to monitor environmental cleanliness

Where:

- Testing is required in a remote or mobile location
- Sending samples to a lab for analysis is impractical
- Results are required more quickly than can be accomplished by sending samples to a lab

Speedy Breedy® is extremely compact weighing just 2.75 kilos is portable and operates on 12V dc and mains adapters. Culture vessels are supplied sterile in protective packaging.

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