

# California & Ballast Water Compliance Protocols

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We are quickly approaching September 8, 2017, the date when the International Ballast Water Convention will enter into force requiring ships to manage their ballast water using methods to remove or render harmless organisms contained within their ballast water. This is in an effort to halt the spread of invasive species that have crippled many local ecosystems, both monetarily and environmentally, in some cases causing irreparable damage.

In the U.S., the regulations are already in place. Recently, the United States Coast Guard (USCG) announced that Alternate Management Systems (AMS) currently being used for managing or treating ballast water may not necessarily be type-approved and operators of those systems will have a tough time obtaining extensions to use AMS. This is in contrast with earlier years when it was relatively easy to obtain extensions as the USCG has now type-approved several ballast water treatment systems.

State regulators in the U.S. can have their own limits, some more stringent than the USCG limits, for ballast water discharge. However, state and federal agencies are working together to keep our coastlines safe from invasive aquatic species.

## California State Lands Commission Validated Indicative Sampling Tools

California State Lands Commission (CSLC) is working hard to be on the front line of this fight and much work is being done on the state's side. Out of the roughly 10,000 ship arrivals at California ports per year, typically 15% or 1,500 arrivals have intent to discharge ballast water. CSLC is mandated to board 25% of all ship arrivals. That means their field staff is inspecting ~2,500 arrivals per year performing outreach, checking log books, verifying exchange locations, etc. to ensure violations are at a minimum. CSLC is taking advantage of ship-boarding opportunities to run tests using indicative sampling tools to determine whether ballast water treatment systems are efficiently working. Indicative sampling is part of their draft compliance assessment protocol which employs a tiered approach: 1) paperwork, calibration, functionality, 2) indicative sampling, and 3) full scale testing. Expectations are that the compliance protocols will be finalized in the fall of 2017.

CSLC recently completed a validation exercise of several indicative sampling tools while developing their draft compliance assessment protocols. They evaluated the sampling tools with three different ballast water treatment systems – one UV system and two Electrochlorination systems. Chris Brown, Senior Environmental Scientist with the commission's Marine Invasive Species Program, presented the results of their validation at the March 16, 2017, ICES/IMO Ballast Water Workgroup meeting. Indicative tools would be employed when the second tier of indicative sampling is deemed necessary.

## Validation Results

In all three assessments, The Turner

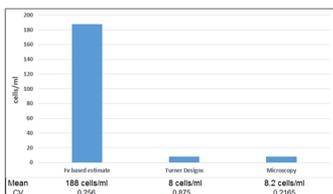


Figure 1: Test 1 – TA Test of UV System.

Designs Ballast-Check 2 results were very similar to the microscopy and flow cytometry results. Ballast-Check 2 uses specific fluorescence to estimate cell abundance as cells/ml. The other validated instruments estimate cell abundance using a variable fluorescence (Fv) measure. It seems that in certain cases the Fv-based estimate, although very repeatable, can be inaccurate when compared to microscopic and flow cytometric analyses, whereas Ballast-Check 2 is significantly more accurate though not as precise. This means triplicate samples would be ideal for obtaining more accurate results, which is practical considering results are calculated, logged, and displayed in less than a minute. The CLSC test results below indicate how

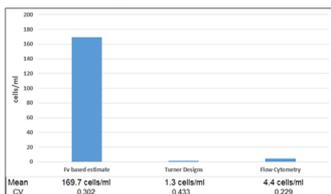


Figure 2: Test 2 – Electrochlorination Unit TA Test (Freshwater).

well the Turner Designs' Ballast-Check 2 compares with ground truth methods such as flow cytometry and microscopy relative to Fv-based estimates. Note that the very high results from the Fv-based tools in figures 1 and 2 are likely due to post-test growth of bacteria from enrichment of the test water.

Indicative sampling is being considered and evaluated to simplify the process of determining risk of exceedance of the ballast water standards. IMO port state guidance advises several years of collecting data on indicative sampling. CSLC has taken a big step forward in validating several instruments and releasing their data to show the efficacy of currently available indicative sampling tools.

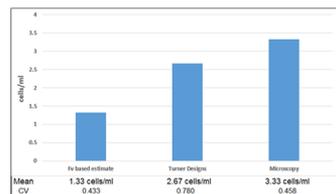


Figure 3: Test 3 – Ship Installed Operational Electrochlorination Unit.

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