

Background:

This review includes the review of NCL Revision No. 3 Annual 2009 Reporting; dated January 15, 2010. This SRE include the Norwegian Pearl, Norwegian Star. Note that in 2009 season the Norwegian Sun was not operated in Alaska, NCL plans not to do further SRE work on the Norwegian Sun.

NCL include the following ships in the 2009 SRE: Norwegian Pearl and Norwegian Star. Both vessels are equipped with Scanship AWTS systems.

NCL is one of the few operators in Alaska that makes on "fleet scale" use of the Scan ship AWTS systems. The Scanship systems consist in five stages: drum pre-filters; a moving bed bio-reactor (MBBR), flotation units, polishing filter and UV units. The MBBR has the "capability" to remove ammonia through nitrification. NCL SRE is focusing to reduce the ammonia levels by implementation of AWTS Scanship developed process changes. Some of the changes are subject to confidentiality, and therefore are not discussed in detail.

This review discusses the 2009 actions as set in this annual report. The items are set out below.

Discussion:

NCL did not "split" for each specific fleet vessel (Class / or yard built) the specifics, the entire fleet is included (for Alaska in 2009 Norwegian Pearl and Norwegian Star). NCL is focusing on the AWTS improvement in combination with the vessel AWTS specifics.

NCL identifies in 2009 Annual SRE two Categories as identified earlier in SRE reporting, but actually this SRE Report include Appendix 3 as update. For consistency cursory review of the items and status is provided.

Category I- inflow reduction: Identification of cleaning products, pesticides etc. or other industrial products that caused the "metal loading". Shore based intake of metals (potable water), metal intake of on-board piping system. NCL has gathered and fine tuned their products to reduce this load

Action plan: on based on the results: Evaluation of alternatives, different bunkering regime. These actions are not done in 2009, NCL did identify that most piping in their vessel are non metallic. It appears that NCL is focusing completely on the reduction of Ammonia.

Category II- Technology Evaluation: In period February 2009 – April 2009 NCL made modifications to the Norwegian Star (1st) to include the following:

- Bio-reactor interior
- Area increase bio media
- Improve Oxygen process support
- Ammonia monitoring system
- Installation of organic coagulant/chemical reduction program.

A “characterization program” was done (stabilization) and evaluation of ammonia levels during several month stabilization periods of the “new” (upgraded) bio-reactors.

Evaluation started of the (Phase I) modifications during the 2009 season. The upgrade / installation work was done on the Norwegian Star, tanks were re-arranged, new bio-media was added, reduction of coagulant systems, drum screen system modifications. The latter two items were primarily installed to reduce operational costs, but there are some benefits to improve effluent quality. NCL claims that this part of the upgrade gave sampling results as good before.

Piping is installed for the “enhanced Oxygen system”, but vital components were not received during the 2009 season.

Ocean Ranger Additional Observations:

Ocean Rangers reported that the NCL lines actively were working on the system and that in the case of the Norwegian Star the Oxygen generator was not installed yet, but everything else was “ready” for the unit. As reason were noted delivery problems. The NCL did use “new” cleaners, and monitored AWTS process closely.

Conclusion:

NCL is actively working to reduce the ammonia levels, and it appears that in 2009 no “final” results could be expected when the new “oxygen system is used”. Therefore NCL waits first to see how the updated system will work on the Norwegian Star and after promising results reconfiguration on the Norwegian Pearl will undergo the same changes.

ADEC NCL Future SRE Reporting Attention Items:

@ Detailed information regarding the new system lay-out including the used chemical reduction systems would be helpful.

@Energy picture of the installed Oxygen generators is helpful. (Some vessels had these system installed Zenon system)

@ If NCL operational changes of AWTS's, use of products that could lead to pollutant reductions, the operations / procedures / products should be identified for future reference (compliance verification).

@ NCL must include in future reporting the “breakdown” of operation changes and the results (e.g. change mixing ratio's etc.)

@Technical water, boiler water, equipment wash waters, spa and pool waters are not clear addressed in SRE. The future reporting should include (if applicable) these waste streams as well.