



PRINCESS CRUISES

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November 2, 2009

Denise Koch, Cruise Ship Program Manager
Commercial Passenger Vessel Environmental Compliance Program
Alaska Department of Environmental Conservation
410 Willoughby Avenue, Suite 303
P.O. Box 111800
Juneau, Alaska 99811-1800

RE: Update – Interim Source Reduction Evaluation Report

Dear Denise:

As per Section 1.9 of the Large Commercial Passenger Vessel Wastewater Discharge Permit number 2007DB0002, please find Princess Cruises' progress report of its Source Reduction Evaluation efforts. The information in this report pertains to various test trials performed. The test trials performed were on select vessels of the Princess Cruises fleet cruising in Alaska to establish effectiveness. Depending on the effectiveness of the trials, Princess Cruises will determine if it can be implemented fleet wide.

The additional information contained in the paragraphs below provide an update to our initial SRE and specifically address each of the questions raised by you in your letter dated September 9, 2009.

1. *Are Princess vessels still using Hepburn Bio Care products aboard the ships? Are any other environmentally friendly cleaning products used on board?*

Yes. Princess Cruises is still using Hepburn Bio Care products on its ships. The Hepburn Bio WC product has proven to be successful at allowing the ships black water pipes to be free of scale. This product has shown to work as a biological film that creates biodegradation of the waste as it flows through the piping system. By changing to Hepburn Bio WC, Princess Cruises' has eliminated the need for the use of potentially harmful products. For the elimination of both foaming and odors from the ships waste water treatment systems, Hepburn Bio ET and Hepburn Foam Fighter has been successfully implemented on each ship in Alaska. In addition to the elimination of foam, Bio ET enhances the efficiency of the MBR plants and contributes to the reduction of Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD).

Princess Cruises is also considering the future use of Hepburn Bio Clean and Bio Degreaser. Bio Clean and Bio Degreaser are non-phosphate, biodegradable, non-hazardous products used to clean all areas of the ships decks and heavy cleaning needs in the engine room.

In summary, the partnership with Hepburn Bio Care has allowed Princess Cruises' ships cruising in Alaska to make use of products that are more friendly to the environment.

An additional environmentally friendly cleaning product recently introduced as a trial on Golden Princess was Deck Clean NP. A Wilhelmsen Ships Service product that is not yet available for commercial use. This product is a newly formulated non-phosphate and non-toxic cleaner used for deck cleaning applications. According to Wilhelmsen Ships Service, this product meets the new US EPA NPDES requirements for cleaning ships open decks while in US Waters. Please see attached report of successful trial (*Attachment 1*). We look forward to using this product fleet wide when and if it becomes commercially available.

2. *Identify the average volumes of drinking water that is produced versus bunkered for 2009.*

The average calculated volumes of potable water produced versus bunkered for the 2009 Alaska Season was as follows:

PRODUCED VERSUS BUNKERED		
SHIP	PRODUCED	BUNKERED
CORAL PRINCESS	72%	28%
SEA PRINCESS	78%	22%
DIAMOND PRINCESS	53%	47%
ISLAND PRINCESS	71%	29%
GOLDEN PRINCESS	70%	30%
PACIFIC PRINCESS	65%	35%
SAPPHIRE PRINCESS	53%	47%
STAR PRINCESS	68%	32%

3. *During the 2009 season, did Princess make any operational changes to its potable water sourcing versus producing its own distilled potable water drinking water aboard each ship?*

During the 2009 season, all Princess Cruises' ships while operating in Alaska bunkered less potable water from the various ports than the amount of water produced from the ships evaporators.

Results received of the quality of potable water taken from various ports indicated that at times it had higher traces of metals then allowed by the Alaska VGP for the discharge of wastewater. Though not always possible, due to safety, stability and the necessity for additional potable water, our ships did attempt to not bunker as much potable water in ports where metals were known to be higher. From experience, it was determined that cruise ships are still required to bunker some quantity of potable water from the ports.

Normally, producing potable water on the ship is more efficient and economical then bunkering it from ports. This is dependent on the availability of the ship to make use of heat from the engines to operate the evaporators.

Princess Cruises contracted Admiralty Environmental again from June 1-7, 2009 to re-examine metals present in both port bunkered and ship evaporator produced water. The set of results concluded that copper was higher from the ship's produced water, but that nickel and zinc varied depending on the port. Please see attached report from Admiralty Environmental (*Attachment 2*).

4. *Please provide additional information regarding the newly implemented water conservation program.*

Princess Cruises' is committed to the conservation of water. Conserving natural resources such as water is very important, but because of strict water conservation measures onboard cruise ships (such as vacuum toilets), key parameters such as those in the Alaska VGP are at higher concentrations in the influent to the ships wastewater treatment system than in typical domestic wastewater found in shore side municipalities. In EPA's, March 2006 Sampling Episode Report 6505 this disadvantage is documented.

Over the past several years, Princess Cruises has undertaken a number of efforts and initiatives to reduce the consumption of natural resources. Our ISO 14001 Environmental Management System sets a target for the reduction of water consumption across our fleet. Our ships have instituted water conservation programs and actively engage all crew-members for support, which is an important part of both ISO14001 and our Planet Princess program.

This year Golden Princess created a new water conservation video, called Every Drop Counts, to emphasize simple everyday actions and their dramatic results. We believe this video does an excellent job of illustrating obvious water saving measures. The video now plays frequently on all of our ships and circulated among appropriate staff to ensure widest possible distribution.

5. *Princess indicated that efforts would be made during 2009 to determine if the ports that supply the potable water can review the types of metals in which the valves and piping materials are used to supply the bunkered potable water to the ships. What were the results of the efforts? Please be specific per port.*

Princess Cruises has not been able to influence the characteristics of the potable water supplied by the various ports that our ships use. Our agents have informed us that the ports and their water suppliers conform to the drinking water quality standards specific to their regions. If traces of metals such as zinc, copper and nickel are over the Alaska VGP discharge limits, this does not affect the basis of what is considered acceptable as far as water quality for human consumption. At this time, Princess Cruises does not believe that it has much control over the potable water supplied from the various ports for the reduction of metals below the Alaska VGP discharge limits.

6. *Princess performed an initial survey on the Golden Princess to assess the level of ammonia present in different influent streams and to reduce the level of ammonia from the Hamworthy wastewater treatment system effluent. Please verify the level of ammonia found in the different influent streams. The information contained in the April 30, 2009 letter did not match the information in Attachment 2. For example, the black water was listed as having a maximum ammonia concentration of over 2,000 mg N/l but the highest value that I saw was 1,456 mg N/l. I want to be sure that I am viewing the correct data set.*

The information contained in our April 30, 2009 letter regarding maximum ammonia concentrations in untreated black water influent came from Hamworthy's work of performing various tests and research. The maximum concentration of over 2,000 mg N / l came from other tests and not just from the Golden Princess trial. The highest ammonia concentration result for untreated black water for the Golden Princess trial was 1,456 mg N / l.

7. *Please summarize any additional finding of the Hamworthy Phase I trial and provide DEC with any details and plans for Phase II. Include information related to installation of any new equipment or conversion of existing equipment (e.g. tanks) for a new purpose.*

Summary of additional findings of the Hamworthy Phase I trial:

According to Dr. Wei Chen from Hamworthy, nitrification and denitrification are now occurring in the system as expected (though unstable). Hamworthy believes that a stable process is now underway. The technical information

gained so far is substantial and is included in Hamworthy's Progress Report No. 3 attached (*Attachment 3*). The report provides information of the trial progress, which summarizes developments confirmed during a recent visit from September 12-19, 2009.

The technical department onboard the Golden Princess is continually aware of the importance and exposure of this project. There are many operational constraints and pressures placed upon the ship's staff to perform under, especially in regards to the environmental ship systems. A qualified Hotel Engineer assigned as a full time and dedicated person to oversee this project is now onboard the Golden Princess.

On October 26, 2009, Dr. Wei Chen visited our offices providing a new presentation pertaining to additional trial progress (*Attachment 4*). In his presentation, Dr. Chen explained the principal science for the basis to the modifications made to Golden Princess. The science involved a two-step reaction known as nitrification, which has now proven to occur within the bio-reactor-stage of the MBR process.

It was concluded that the nitrification process starts up and establishes very quickly, when the trial MBR is fed from another MBR. Reports indicate that seventy to ninety percent of ammonia removal has been achieved, although the final ammonia level is not yet close to the VGP long-term limit. The nitrification process did not improve when the trial attempted to prolong the biomass age, increasing the dissolved oxygen, and reducing the plant capacity. It is suspected that the efficiency may be affected by 1) high temperature unique to shipboard applications, and/or 2) high ammonia fluctuations, and/or 3) high ammonia concentration in the wastewater influent.

Considering the extreme differences in black and grey water characteristics, it can be concluded that the significant fluctuation is a condition unique to shipboard applications. A larger mixing/balancing tank may be essential for a ship application, performing the function of an equivalent municipal sewerage system. Although such a mixing tank will not compensate the effect of a) very concentrated black water and b) sudden changes of grey water streams associated with various shipboard activities, which are unseen in a municipal sewage treatment process. Other factors such as available space within the machinery room, and free surface that may affect ship stability and safety are also major concerns. Large tanks that are not either full or empty have a extremely detrimental effect to the stability of the ship.

In summary, the nitrification process tends to reduce ammonia levels, but the reduction is still insufficient to achieve 2015 limits. The on-going data from the Golden Princess trial will continue to develop a better understanding of the nitrification process. With this better comprehension of the process, it will assist us to direct the best course of action for the remainder of our Alaska fleet.

8. *Were any changes in equipment or operations made to other Princess vessels as a result of the information that Princess learned on the Golden Princess?*

At this time no changes in equipment or operations have been made to other Princess Cruises' vessels because the results of the Golden Princess trial have been inconclusive to date.

Sincerely,



George Wright, Senior Vice President Marine Operations
Princess Cruises
24305 Town Center Drive
Santa Clarita, California 91355