ENHANCED MARPOL OIL POLLUTION PREVENTION
HOLLAND AMERICA LINE CASE STUDY

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ENHANCED MARPOL OIL POLLUTION PREVENTION  
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Doug Dixon, P.E., (M)¹

Abstract

Presented in this paper are a review of the current oil pollution prevention regulations and status of MARPOL Annex authorization. Also discussed are the efforts of Holland America Line to comply with the oil pollution regulations and a review of their bilge waste management equipment, procedures and internal reporting in excess of the regulations.

INTRODUCTION

The steady increase in the number of foreign and domestic vessels calling on U.S. ports is generating a closer look by regulators and the public with regard to how they handle their waste and the effect they have on the environment. Holland America Line, operator of nine cruise vessels with an additional six under construction, has enhanced its oil pollution prevention machinery, operating procedures, record keeping, training and survey arrangements in order to bring a new level of confidence in its operations in sensitive areas.

MARPOL CONVENTION

International pollution control regulations for ships are set forth by the International Maritime Organization (IMO) and found in the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, better known as MARPOL 73/78 for Annex I through V with the Protocol of 1997 covering Annex VI. See table 1.

An additional Annex was also under consideration to enact regulations for the phase out of toxic anti-fouling paints. This will be considered instead as a separate Convention at the next IMO meeting in June 1999 with the U.S. taking the lead. Conventions and Annexes come into force 12 months after the date when not less than 15 countries approve and the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world’s merchant fleet. The United States has yet to approve Annex IV (Sewage) and Annex VI (Air Pollution). Annex VII (Ballast Water) is in the draft proposal stage. See table 2.

Table 1. IMO MARPOL Annexes

<table>
<thead>
<tr>
<th>Annex</th>
<th>Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Regulations for the Prevention of Pollution by Oil</td>
</tr>
<tr>
<td>II</td>
<td>Regulations for the Prevention of Pollution by Noxious Liquid Substances in Bulk</td>
</tr>
<tr>
<td>III</td>
<td>Regulations for the Prevention of Pollution by Harmful Substances in Package Form</td>
</tr>
<tr>
<td>IV</td>
<td>Regulations for the Prevention of Pollution by Sewage from Ships</td>
</tr>
<tr>
<td>V</td>
<td>Regulations for the Prevention of Pollution by Garbage from Ships</td>
</tr>
<tr>
<td>VI</td>
<td>Regulations for the Prevention of Air Pollution from Ships</td>
</tr>
<tr>
<td>VII</td>
<td>Regulations for the Prevention of Pollution from Ballast Water (Proposed)</td>
</tr>
</tbody>
</table>

Table 2. Summary of Status of MARPOL Annexes as of 29 February 2000

<table>
<thead>
<tr>
<th>Convention</th>
<th>Entry into Force</th>
<th>No. of Contracting Countries</th>
<th>World Tonnage</th>
<th>Ratified by USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annex I</td>
<td>2-Oct-83</td>
<td>109</td>
<td>94.07%</td>
<td>Yes</td>
</tr>
<tr>
<td>Annex II</td>
<td>6-Apr-87</td>
<td>106</td>
<td>93.88%</td>
<td>Yes</td>
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<tr>
<td>Annex III</td>
<td>1-Jul-92</td>
<td>92</td>
<td>79.62%</td>
<td>Yes</td>
</tr>
<tr>
<td>Annex IV</td>
<td>No</td>
<td>76</td>
<td>43.11%</td>
<td>No</td>
</tr>
<tr>
<td>Annex V</td>
<td>31-Dec-88</td>
<td>95</td>
<td>86.46%</td>
<td>Yes</td>
</tr>
<tr>
<td>Annex VI</td>
<td>No</td>
<td>2</td>
<td>4.83%</td>
<td>No</td>
</tr>
<tr>
<td>Annex VII</td>
<td>Proposed</td>
<td>0</td>
<td>0.00%</td>
<td>No</td>
</tr>
</tbody>
</table>

¹ Principal Surveyor, Dixon Marine Surveys, Seattle, WA  
Presented at SNAME Pacific Northwest Section Meeting, March 17, 2000
OIL POLLUTION PREVENTION REGULATIONS

MARPOL Annex I, which has been adopted by the United States and implemented through the 1980 Act to Prevent Pollution from Ships 33 USC 1901-1911, has the following requirements for vessels other than tankers over 400 GRT which are administered by the USCG under 33 CFR 151.10 Oil Discharge Regulations as follows:

- Greater than 12 nautical miles from land:
  Oil Content of effluent must be less than 15 ppm (decreased from 100 ppm by 6 March 1992 MARPOL Amendment effective 6 July 1993)

- Within 12 nautical miles from land:
  Oil Content of effluent must be less than 15 ppm

- IMO Special no discharge areas:
  Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, the Gulf's from Ras al Hadd to Fasteh, Gulf of Aden and the Antarctic

The United States passed the Federal Water Pollution Control Act (FWPCA) in 1972 with reauthorization in 1985 as the Clean Water Act. Section 311(b)(3) of the Act is codified as 33 USC 1321 which governs the discharge of oil and oily mixtures in the waters of the United States as regulated under 40 CFR 110.

Various state, county and city regulations also come into effect within their jurisdiction. An example is Washington State RCW 90.48.080. The 15-ppm criteria developed on the international and national level theoretically should allow for the operation of properly maintained oily water separators in the navigable waters of the U.S. This is dependent upon interpretation of the Clean Water Act, and state and local regulations as to the definition of the harmful effects of 15-ppm oil and the sensitivity of the surrounding water such as captive freshwater and remote saltwater bays with poor tidal action.

MARPOL Annex I Regulation 20 and the USCG also stipulate under 33 CFR 151.25 that all ships over 400 gross tons shall maintain an Oil Record Book Part I for Machinery Space Operations. Entries recording time, date, quantity and method of discharge shall be made when disposing of oily residues ashore or discharging overboard machinery space bilge water. Fines for violation can be stiff. One cruise company recently agreed to pay $9.0 million after pleading guilty to eight of 11 counts of improper disposal of oily bilge water and attempts to conceal. Three more indictments for presenting false record books are still pending at $500,000 each.

USCG approved oily water separators are required to process the contents of the oily bilge water tank; discharging oil to the dirty oil tank and processed water overboard with a maximum 15 ppm oil content. The oily water system must be in accordance with 33 CFR Part 155, Subpart B, Regulations 155.330(A) and 155.350(a)(2), also 155.360 (2). Bilge, ballast, and oily water separation installations must be in accordance with USCG requirements and will be tested in accordance with 46 CFR Subpart 56.97 (class II piping).

HOLLAND AMERICA LINE CASE STUDY

Machinery Arrangement

Holland America Line has outfitted its vessels with a cascading dual oily water separation system consisting of a 50 ppm and 15 ppm oily water separator with added intermediate oily water holding tank. This exceeds the MARPOL required single 15 ppm oily water separator and single holding tank. An additional spare Oil water Indicator is also carried onboard for conversion of the 50 ppm Oily water separator in the event of a failure of the primary unit. A few of the vessels in the fleet opted for dual 15 ppm units with one vessel having three oily water separators installed.
SURVEY

At the request of Holland America Line, an independent surveyor has examined all HAL vessels for compliance with MARPOL Annex I regulations, the Clean Water Act Title 33, United States Code Sections 1251 to 1387 and the Act to Prevent Pollution from Ships, Title 33 United States Code Sections 1901 to 1915, together with the additional enhanced requirements of HAL Environmental Compliance and Waste Management Manual Chapter 6 Marine Regulation 700 - Bilge Waste Management (HAL MR-700).

A review of records at the HAL main office was also undertaken prior to and after completion of the vessel surveys for verification of corporate compliance with record keeping requirements.

Valid International Oil Pollution Prevention (IOPP) Certificates were found onboard each vessel attesting to equipment and survey in accordance with regulation 4 of MARPOL Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (Table 3).
### CORPORATE COMPLIANCE

**Record Keeping**
All crew training, certification and records required by HAL MR 700 are maintained at the HAL main office and were reviewed.

**Monthly Audit Reports**
Monthly Shipboard Audit Checklists (HAL MR-700, Form 5) and Monthly Bilge Waste Source Reports (HAL MR-700, Form 6) ensuring proper processing of bilge waste in accordance with MARPOL Annex I and HAL MR-700 are maintained at the HAL main office and were reviewed.

**Quarterly Audit Reports**
Quarterly audit reports ensuring compliance with Regulation 9 and 20 of MARPOL, the Clean Water Act, and the Act to Prevent Pollution from Ships are maintained at the HAL main office and were reviewed.

### SHIPBOARD COMPLIANCE

All shipboard audits were conducted in port as per Table 4.

### Table 3.

<table>
<thead>
<tr>
<th>Vessel/Office</th>
<th>IMO Number</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAL Main Office</td>
<td>-</td>
<td>4-Aug-99</td>
<td>Seattle</td>
</tr>
<tr>
<td>NIEUW AMSTERDAM</td>
<td>8024014</td>
<td>14-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>NOORDAM</td>
<td>8027298</td>
<td>16-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>WESTERDAM</td>
<td>8407735</td>
<td>16-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>RYNDAM</td>
<td>8919269</td>
<td>18-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>VEENDAM</td>
<td>9102992</td>
<td>18-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>STATENDAM</td>
<td>8919245</td>
<td>19-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>MAASDAM</td>
<td>8919257</td>
<td>20-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>AMSTERDAM</td>
<td>9122552</td>
<td>22-Aug-99</td>
<td>Juneau</td>
</tr>
<tr>
<td>(4) @ 84,000 tons</td>
<td>-</td>
<td>10/1999</td>
<td>New Building</td>
</tr>
<tr>
<td>ZAANDAM</td>
<td>-</td>
<td>4/2000</td>
<td>New Building</td>
</tr>
<tr>
<td>AMSTERDAM</td>
<td>-</td>
<td>10/2000</td>
<td>New Building</td>
</tr>
<tr>
<td>HAL Main Office</td>
<td>-</td>
<td>6-Oct-99</td>
<td>Seattle</td>
</tr>
</tbody>
</table>

### Table 4.
Each audit visit consisted of the following:

a. A meeting with the Master and Chief Engineer.
c. A physical review of the bilge waste management equipment including the oil water separators, oil water indicators, associated valves, piping, control and alarm systems.
d. Test operation of the equipment.
e. A review of documents and record keeping procedures.
f. A discussion of the audit results with either the Master or Chief Engineer.

A Shipboard Audit Checklist (HAL MR-700, Form 5) was developed by the HAL Department of Technical Operations to cover both the regulatory items required by U.S. and international regulations together with the enhanced compliance program developed by Holland America Line (HAL) up and above those regulations.

The following items are the requirements from the Shipboard Audit Checklist for which all vessels were in the fleet were required to comply, subject to quarterly internal audits and an annual independent audit.

Shipboard Audit Checklist (HAL MR-700, Form 5)

1. The management of bilge waste is in compliance with the requirements of MARPOL, the Clean Water Act, Title 33, United States Code, Sections 1251 to 1387 and the Prevention of Pollution From Ships, Title 33, United States Code Sections 1901 to 1915.

2. MARPOL (consolidated edition 1997) is located in the Engine Control Room (ECR).

3. Ship has a minimum of two Oily Water Separators (OWSs) that comply with MARPOL, Regulation 9.

4. Each OWS is capable of discharging processed bilge waste through an operational Oil Water Indicator (OWI) capable of detecting 15ppm.

5. Bilge waste has been discharged overboard through an OWI only while underway in accordance with MARPOL, and not in port.

6. HAL BWM policy statement regarding oil and bilge waste handling have been posted in the engine control room, local control station for bilge system and near each OWS.

7. The signature sheet in the Chief Engineer's Office acknowledging that all members of the engineering department, licensed and unlicensed, have read and/or understand MR 700 Sec.6 has been signed and in the time required.

8. HAL Bilge Waste Management Program MR 700 is maintained in the Engine Control Room.

9. Both OWSs are operational.

10. It is understood by the Master and Chief Engineer that when the OWS, OWI, or any other piece of equipment in the oily water system is not fully operational or is undergoing maintenance that precludes its use for 24 hours or longer, the Master shall be notified, and a brief explanation is placed in the Ship's Deck Log Book and the Oil Record Book.
11. It is understood by the Master and Chief Engineer that when the OWS, OWI, or any other piece of equipment in the oily water system is not fully operational or is undergoing maintenance that precludes its use for 72 hours or longer, that a Rapid Report will be sent to VPMO, DTO, and DCP.

12. All "emergency or equipment malfunction" discharges have been properly logged and appropriate notifications have been made.

13. The Chief Engineer has developed and maintains a bilge waste management program to reduce bilge waste which identifies all sources of bilge waste, tracks the amount of bilge waste generated, and establishes procedures to minimize bilge waste generation.

14. The Chief Engineer maintains a list of cleaning materials used onboard which meet the OWS manufacturers recommendations for compatibility.

15. All piping for overboard discharges of bilge waste are through the OWS or from tanks that accepted bilge waste from the OWS. These OWSs are equipped with an OWI set at 15ppm.

16. Each OWS is arranged to have the capability of discharging processed bilge waste overboard through an OWI, set at 15ppm, if the other OWS should fail to operate properly.

17. Each OWS's control system is capable of stopping any overboard discharge that exceeds 15 ppm.

18. To enable in port testing of the OWS, including the three-way valves, other control valves, the OWI, alarms and sensors, the discharge from each OWS is capable of being discharged into the bilges or bilge waste tank(s).

19. Prior to and during in port testing of the OWS, overboard discharge valves are closed and locked.

20. All OWS piping is painted orange to facilitate tracing.

21. A piping schematic of the Bilge Waste Management System is available.

22. Modifications to the OWS system have not been made without prior approval from the DTO.

23. OWS manufacturers recommended maintenance schedule is being followed.

24. Maintenance for OWS is scheduled in AMOSD.

25. Spare parts are stocked at not less than minimum levels.

26. Each OWS is equipped with an OWI capable of detecting 15 or 50 ppm of oil, as applicable. (Exception: Noordam and Nieuw Amsterdam have both OWIs set at 15ppm)

27. The OWIs are started and stopped in accordance with manufacturer's recommendations.

28. The bilge waste processing equipment is configured to process bilge waste twice before being discharged overboard through an OWI. (Exception. For the Noordam and Nieuw Amsterdam see 29.)
29. The Noordam and the Nieuw Amsterdam bilge waste processing equipment is configured with two OWSs and two OWIs set at 15ppm. Each is capable of independently processing oily bilge waste from a single oily bilge water tank.

30. When bilge waste processing is complete, the overboard discharge valves from the OWS are chained and locked.

31. Keys to overboard valves are under supervision of the Senior Watch Engineer.

32. Each OWI has been serviced and calibrated by an outside contractor within the past six months.

33. 30 days prior to operating in Alaska, each OWI has been calibrated by an outside contractor and recorded in AMOSD.

34. 30 days prior to operating in Europe, each OWI has been serviced by an outside contractor and recorded in AMOSD.

35. OWIs flush according to specified time periods.
   a. startup, 5 minutes
   b. backflushing, 15 minutes
   c. stopping, 25 minutes

36. Each OWI is tested before being placed in operation and cleaned after each use in accordance with the manufacturers recommendations.

37. The OWS’s three way valve or other control valve directs the processed bilge water overboard only when the bilge water has been processed at 15 ppm or less.

38. The OWI sample line screen is frequently cleaned to ensure proper operation of the OWI.

39. Each OWI is equipped with its own distinct alarm that is activated in the engine control room when there is a potential discharge of bilge waste containing more than 15 or 50 ppm of oil, as applicable.

40. Each OWI is fitted with its own distinct alarm to indicate its failure.

41. OWI alarms are automatically displayed and printed in the ECR.

42. OWI alarms are tested weekly and recorded in AMOSD.

43. A spare OWI set at 15 ppm and a spare OWI set at 50 ppm (except on N-ships) is onboard.

44. Each OWI has been kept closed and sealed except when being maintained or serviced.

45. For all vessels the bilge pump overboard valves shall be closed and sealed.

46. On the S-Class vessels and the Rotterdam the inboard stem rising overboard bilge pump hydraulic valves are the preferred valves to be sealed.

47. On the Westerdam and N-class vessels the hydraulically operated bilge pump overboard valves are inhibited, so that it requires two steps to open these hydraulic valves.
48. On the S-Class vessels and the Rotterdam the Rule Bilge overboard valves that are remotely operated and sealed are placed in the local control position at the hydraulic stations.

49. The remotely operated crossover valve connecting the Rule and Oily Bilge system is closed and is placed in the local control position at the hydraulic station.

50. On the S-Class vessels and the Rotterdam the controls for the hydraulically operated valves required to be in local control at the hydraulic station, are painted red, and a placard is on each door. Valve symbols on the VDU schematics are colored pink and include "Emergency Use Only" in the display.

51. On the Westerdam the crossover valves connecting the Clean Bilge and the Oily Bilge systems are closed and sealed. Hydraulically operated crossover valves are inhibited, so that it requires two steps to open these valves.

52. The remote valve handles for the eductor overboard valves are closed and sealed.

53. The emergency bilge suction valves in the sea water cooling systems are closed and sealed.

54. It is understood that only the Master or Chief Engineer can authorize opening the eductor overboard valves, bilge pump overboard valves, or the emergency bilge suction valves. No exceptions have occurred.

55. Watch Officer qualifications include the location of all hydraulic valves placed in local control.

56. Bilge system modifications have not been made without prior approval of the DTO.

57. All bilge-to-ballast crossover valves are closed and sealed.

58. On the Westerdam the hydraulically operated bilge to ballast crossover valves are inhibited so that it requires two steps to open each valve.

59. On the S-Class vessels and the Rotterdam the hydraulically controlled bilge-to-ballast crossover valves are placed in local control, controls painted red, and a placard on each door. Valve symbols on the VDU schematics are colored pink and include "Emergency Use Only" in the display.

60. It is understood that only the Master or Chief Engineer can authorize opening the bilge-to-ballast crossover valves. No exceptions have occurred.

61. Ballast system modifications have not been made without prior approval of the DTO.

62. Once per quarter all tanks that hold processed and unprocessed bilge waste are opened and examined and the following entry is made in AMOSD: date tank was examined; total volume of liquids in the tank (m3); volume of the measured oil in the tank (m3); and name of person examining the tank.

63. The dirty bilge oil tank has been opened and cleaned at least once every 7 weeks to reduce the accumulation of oil.

64. The final bilge water tank is cleaned when oil is observed in the tank.
65. Each tank holding bilge waste is fitted with its own high level alarm.

66. Tank alarms are displayed and printed in the ECR.

67. High level tank alarms are tested monthly and scheduled in AMOSD.

68. Sequentially numbered seals are accounted for in a log or spreadsheet, used in sequential order, and stored to prevent pilferage or misuse.

69. Each time a seal is removed or installed the following entries are made in AMOSD: The number of the seal removed. The date the seal was removed. The name of the individual removing the seal. The number of the new seal installed. The date the new seal was installed. Brief statement why the seal was removed. The name of the individual installing the new seal.

70. All seals are verified monthly and a record of the verification made in AMOSD.

71. Chief Engineer checks seals on each OWI and on each manually controlled bilge overboard valves, and verifies that the hydraulically operated bilge overboard valves are in their local positions every day.

72. The Oil Record Book is maintained in the Engine Control Room and is preserved for 3 years.

73. All transfers required by Annex I of MARPOL are being recorded in the Oil Record Book with the appropriate letter and number codes found in the beginning of the Oil Record Book.

74. Entries for overboard discharges include the date, beginning and ending times, volume, source (tank) locations and beginning and ending navigational coordinates.

75. Every overboard discharge and transfer of bilge waste entry has been signed by the person in charge of the transfer.

76. The overboard discharges of processed bilge waste are recorded in the Oil Record Book with the code D15.2.

77. Each Watch Engineer is signing each Oil Record Book entry that is made during his/her watch period.

78. Each page of the Oil Record Book is signed by the Master and Chief Engineer attesting that they are aware of the entries and that they believe the information recorded to be true and correct.

79. Master and Chief Engineer have signed a statement, sealed with the ship's seal, acknowledging that entries in the Oil Record Book are made under penalty of perjury.

80. The original signed and sealed statements concerning the entries in the Oil Record Book have been sent to Seattle Human Resources for tracking in CAP.

81. Tank soundings or flow meter readings are being taken at the beginning and end of each 4 hour watch and recorded in the Bilge Waste Transfer Log.
82. The Oil Record Book and the Bilge Waste Transfer Log tracks the beginning and ending tank soundings or flowmeter readings for all bilge waste transfers.

83. Each entry in the Bilge Waste Transfer Log is being signed by the person in charge of the operation.

84. The Chief Engineer has developed written instructions for completing the Bilge Waste Transfer Log.

85. The Chief Engineer reviews the Bilge Waste Transfer Log when he/she reviews the Oil Record Book.

86. Flow meters have been installed.

87. The Master's Bilge Waste Management Audit Checklists are completed and submitted to the Director, Compliance Program by the 1st of each month.

88. The Chief Engineer is sending monthly reports on sources of bilge waste and correction measures being taken/recommended to the Directors Technical Operations and Compliance Program.

89. Engineering Officers and unlicensed engineering crew and any others that handle oil waste, bilge waste, and bilge water are trained by April 1, 1999 and at least once every two years thereafter in the proper management of those waste streams.

90. Training for new employees is completed prior to their being assigned bilge waste handling duties.

91. Each employee required to have proper bilge management training has signed a certificate acknowledging he/she has received the training.

92. The original signed training certifications have been sent to Seattle Human Resources and have been entered in CAP.

93. Master, Chief Officer, Chief Engineer, and Hotel Manager have acknowledged receipt of the Compliance Agreement Summary. Ref. (AD-007-98).

94. Master, Chief Officer, Chief Engineer, and Hotel Manager have acknowledged receipt of HAL MR 700 and understand the same.

95. Masters and Chief Engineers have gone through legal training regarding business conduct on a biennial basis.
CONCLUSIONS

In all cases, all vessels were found fully compliant with International MARPOL Annex I and U.S. Oil Pollution Regulations. Minor variances from the HAL Environmental Compliance and Waste Management Manual MR 700 were noted with recommendations given. The HAL internal bilge waste management procedures were found to be in excess of the International and U.S. Regulations and standard marine practice.

Successful operation of the oily waste separating equipment was found to vary with the manufacturer and quantity of separated oil in the oily water holding tank. Preparation of oil from water in the holding tank is a result of low agitation due to proper design of filling and return pipes and degree of internal baffling. HAL took full advantage of this pre-separation of the oily waste in the holding tank by instituting periodic skimming and draining. A high level of effort was undertaken to prohibit the use of cleaning agents that promote emulsification. Minimization of water into the bilge was another key factor along with gray water that has a tendency to inhibit the oil water indicator operation.

Holland America Line is to be commended for this high level of compliance and the bilge waste management equipment, procedures and internal reporting in excess of the regulations. In particular the cascading arrangement of dual and triple 50 and 15 ppm oily water separators, oily water indicators and alarms together with increased intermediate and final oily bilge water holding capability are enhanced compliance items that help promote clean water operations.