INTERNATIONAL MARITIME ORGANIZATION

IMO

E

MARINE ENVIRONMENT PROTECTION COMMITTEE
59th session
Agenda item 2

MEPC 59/INF.20
7 May 2009
ENGLISH ONLY

HARMFUL AQUATIC ORGANISMS IN BALLAST WATER

Type Approval of the Hyde GUARDIAN™ Ballast Water Management System

Submitted by the United Kingdom

SUMMARY

Executive summary:	This document provides a notification to the Organization by the United Kingdom that it has type approved the Hyde GUARDIAN™ ballast water management system in accordance with the "Guidelines for approval of ballast water management systems (G8)", in compliance with regulation D-3.1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004
Strategic direction:	7.1 and 13
High-level action:	7.1.2 and 13.3
Planned output:	7.1.2.3 and 13.3.1.1
Action to be taken:	Paragraph 7
Related document:	MEPC 58/23

Introduction

1 Regulation D-3.1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments stipulates that ballast water management systems must be approved by the Administration taking into account guidelines developed by the Organization.

2 The Government of the United Kingdom wishes to notify the Committee of its decision to type approve the Hyde GUARDIAN™ ballast water management system.

3 The United Kingdom's competent authority, the Maritime and Coastguard Agency, has verified the application dossier submitted by Hyde Marine Inc. for the Hyde GUARDIAN™ and considers the system to satisfy the requirements of the Guidelines for approval of ballast water management systems (G8) adopted by

resolution MEPC.174(58). Specifically, the United Kingdom considers that the application dossier, including the Environmental Acceptability Evaluation, has demonstrated that the system does not make use of an Active Substance.

4 Testing of the Hyde GUARDIAN™ ballast water management system was undertaken in 2008. Land-based tests were undertaken by the Royal Netherlands Institute for Sea Research (NIOZ) between April and July 2008, and shipboard trials conducted on board the Princess Cruise Lines ship **M.V. Coral Princess** with testing and analysis undertaken by the University of Maryland (United States), between April and October 2008. Both land and shipboard test methodologies and results are available to be downloaded from the Maritime and Coastguard Agency's website (see paragraph 6.4).

5 The United Kingdom has delegated the type approval of ballast water management systems under Guidelines (G8) to its recognized organizations. The Type Approval Certificate for the Hyde GUARDIAN™ system has been issued on behalf of the United Kingdom Administration by the Lloyd's Register.

6 In accordance with resolution MEPC.175(58) "Information reporting on type approved ballast water management systems", the following information is provided:

.1 Approval date: 29 April 2009;

.2 Name of the Administration: Government of the United Kingdom of Great Britain and Northern Ireland;

.3 Name of the BWMS: Hyde GUARDIAN™; and

.4 A copy of the Type Approval Certificate and summary of test results can be found at the annex to this document. The full reports for the land-based testing and shipboard trials, including ecotoxicological test results, can be downloaded from the following internet site: http://www.mcga.gov.uk/c4mca/mcga07-home/shipsandcargoes/mcga-environment/dms-ballastwater.htm

Action requested of the Committee

7 The Committee is invited to note the information contained in this document.

***

ANNEX

TYPE APPROVAL CERTIFICATE AND TEST RESULTS FOR HYDE GUARDIAN™ BALLAST WATER MANAGEMENT SYSTEM

Lloyd's Register

Type Approval Certificate of Ballast Water Management System

This is to certify that the Ballast Water Management System listed below has been examined and tested in accordance with the requirements of the specifications contained in the Guidelines contained in IMO resolution MEPC.174(58). This certificate is valid only for Ballast Water Management system referred to below.

This certificate is issued to

Producer Address	Hyde Marine Inc. 28045 Ranney Parkway, Cleveland, Ohio 44145, United States of America (USA)		
Ballast Water Management System supplied:	Hyde Marine Inc.		
Under type and model designation and incorporating:	Hyde GUARDIAN™, Type HG 300, incorporating types HG 60 to HG 6000		
Ballast Water Management System manufactured by:	Hyde Marine Inc.		
To equipment/assembly drawing No:	E5868-00, Rev. J	**Date:**	undated
Other equipment manufactured by:	Benson Milieutechniek BV Arkal Filtration Systems		
To equipment/assembly drawing No:	E5868.1, Rev. A E5868.3, Rev. A	**Date:**	undated undated
Treatment Rated Capacity:	60 to 6000	**m³/h**	

A copy of this Type Approval Certificate should be carried on board a vessel fitted with this Ballast Water Management System at all times. A reference to the test protocol and a copy of the test results should be available for inspection on board the vessel. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

Limiting Conditions imposed as described in the Design Appraisal Document forms part of this certificate.
This certificate remains valid up to the expiry dated unless cancelled or revoked, or until such date where it is superseded by the requirements of the Marine Equipment Directive whichever is the earlier, provided the conditions in the attached schedule are complied with and the equipment remains satisfactory in service.

Date of issue	29 April 2009	Expiry date	28 April 2014
Certificate No.	MCA 0900032	Signed	
Sheet No	1 of 1	Name	P. F. Moyses Surveyor to Lloyd's Register EMEA A Member of the Lloyd's Register Group

Lloyd's Register EMEA London Office Lloyds Register

Note:

This certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify the nominated body named on this certificate of any modification or changes to the equipment in order to obtain a valid Certificate.

mca

Maritime and Coastguard Agency
An Executive Agency of the Department for Transport

This certificate is issued under the authority given in Merchant Shipping Notice No MSN 1735 (M+F) as amended to date.

Lloyd's Register EMEA (London Office)
LONDON DESIGN SUPPORT SERVICES
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7709 9166 Fax 020 7488 4796
Email tad@lr.org

Page	2 of 4
Document number	MCA 0900032
Issue number	1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
29 April 2009	LDSS/PAS/W002001213/PFM/O-99220

ATTACHMENT TO TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM
No. MCA 0900032

The undernoted documents have been appraised for compliance with the relevant international Conventions and UK legislation for the Type Approval of Ballast Water Management Systems for use on Merchant Ships Registered in the United Kingdom.

This Design Appraisal Document forms part of the Certificate that is issued under the authority given in the MCA merchant Shipping Notice no. MSN 1735.

APPROVED RATINGS

Model	Flow rate	Filter unit	UV unit
HG 60	60	3"x8	080620
HG 150	150	4"x4	160620
HG 250	250	4"x6	160635
HG 300	300	4"x6	160835
HG 350	350	4"x8	161235
HG 400	400	4"x8	161235
HG 450	450	4"x10	161235
HG 500	500	4"x12	201235
HG 600	600	6"x8	201235
HG 700	700	6"x10	201835
HG 800	800	6"x12	201835
HG 900	900	6"x12	201835
HG 1000	1000	6"x14	201850
HG 1250	1250	6"x16	201850
HG 1350	1350	6"x18	201850
HG 1400	1400	6"x20	201850
HG 1500	1500	6"x20	201835x2
HG 1600	1600	6"x24	201835x2
HG 2000	2000	6"x28	201850x2
HG 2500	2500	6"x32	201850x2
HG 3000	3000	6"x42	201850x3
HG 4000	4000	6"x56	201850x3
HG 5000	5000	6"x64	201850x4
HG 6000	6000	6"x80	201850x5

Filters:
Filtration grade (µm): 55

UV-C Light Source:
Size of chamber (inch): 8, 16 & 20
Number of lamps: 6, 8, 12 & 18
Lamp power (kW): 2, 3.5 & 5

Max. water pressure (bar): 10
Max. water temperature (°C): 80

Lloyd's Register

Lloyd's Register EMEA (London Office)
LONDON DESIGN SUPPORT SERVICES
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7709 9166 Fax 020 7488 4796
Email tad@lr.org

Page	3 of 4
Document number	MCA 0900032
Issue number	1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
29 April 2009	LDSS/PAS/W002001213/PFM/O-99220

APPROVAL DOCUMENTATION

Request form	07 Apr 209
Hyde Marine drawing no. E5868-00, rev. J	undated
Hyde Marine drawing no. E5868.1, rev. A	undated
Hyde Marine drawing no. E5868.3, rev. A	undated
Hyde Guardian Ballast Water Treatment System, Operation and Maintenance Manual, CGS Manual Iss. 1	undated
Hyde Guardian Filter Service and Maintenance Manual	undated
Hyde marine InLine UV System Operations and Maintenance Manual, Version 2.0	July 2008
Hyde Guardian Electrical Components by Location	undated
Hyde Marine email	08 Apr 2009
Hyde Marine letter	07 Apr 2009

TEST REPORTS

Environmental acceptability evaluation of the Hyde Guardian Ballast water Treatment System as part of the Type Approval Process, Version 2	13 Feb 2009
Royal Netherlands institute for Sea Research (NIOZ) final report of the land-based testing of the Hyde-Guardian™ system	January 2009
University of Maryland Center for Environmental Sciences report of shipboard trials of the Hyde 'Guardian' system in Caribbean Sea and Western Pacific Ocean	January 2009
Lou Baxter & Associates report	06 Mar 2009
Lou Baxter & Associates report	30 Mar 2009
Summary of the test results for the shipboard and land based trials of the Hyde GUARDIAN™ Ballast Water Treatment System	27 Apr 2009
LR Chicago visit report, ref CGO 0951042	28 Apr 2009

CONDITIONS OF CERTIFICATION

1. Within five years, the licensee must submit a report to the United Kingdom's competent authority, the Maritime and Coastguard Agency (MCA), detailing all experiences with the operation of the ballast water system, including results and analysis of any scientific research relevant to the safe operation and environmental impact of the system.

2. Notwithstanding the requirement to report before the fifth anniversary of the date of the type approval certificate the licensee is required to comply with the following additional provisions:

   2.1 The licensee must report immediately all events to the MCA leading to harm either to human health or the environment as a result of the operation of the ballast water management system.

   2.2 Any indications that the ballast water management system is not performing to the standards of the ballast water convention must be reported to the MCA including any deficiencies identified by port State control.

Lloyd's Register EMEA (London Office)
LONDON DESIGN SUPPORT SERVICES
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7709 9166 Fax 020 7488 4796
Email tad@lr.org

Page	4 of 4
Document number	MCA 0900032
Issue number	1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
29 April 2009	LDSS/PAS/W002001213/PFM/O-99220

2.3 All accidents (e.g., accidental exposure to UV) in connection with the ballast water management system must be reported immediately to the MCA.

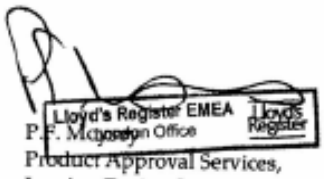
2.4 Significant changes in the construction of the ballast water management system must be reported to both the MCA and the recognised organisation that issued the type approval certificate on behalf of the MCA; if they potentially affect the efficiency of the system, they must be approved by the MCA.

2.5 The licensee must take reasonable measures to ensure that the operator of the system is familiar with the operation of the system and is capable of operating and maintaining the system in accordance with the operating manual.

2.6 If the licensee does not comply with these additional provisions, the type approval may be revoked by the MCA.

3. Details of the location of the Hyde GUARDIAN™ ballast water treatment system, and its connection into the ship's ballast system are to be shown on the ship's plans, which are to be submitted for approval.

4. The Hyde GUARDIAN™ ballast water treatment system is not approved for use in hazardous areas.



P.F. McGoogan
Product Approval Services,
London Design Support Services
Lloyd's Register EMEA/London Office
☎ +44 20 7423 1847

Part 10
Subject: Marine Equipment (MSA)
Product: Marpol Equipment (MCA)

Producer	Product	Type and Details	Standard(s)	Remarks	Cert. No.
Hyde Marine, **28045 Ranney Parkway,** **Cleveland,** **Ohio, 44145,** **United States of America (USA).**	Hyde GUARDIAN™	Ballast water treatment system using filtration and UV-C light, in accordance with the requirements of IMO resolution MEPC.174(58): Types: HG 60 to HG 6000 Flow rate (M^3/hr): 60 to 6000 Filtration grade (µm): 55 Filter unit diameter (inch): 3, 4 & 6 UV-C light source Size of chamber (inch): 8, 16 & 20 Number of lamps: 6, 8, 12 or 18 Lamp power (kW): 2, 3.5 or 5 Max. water pressure (bar): 10 Max. water temperature (°C): 80	Treatment of ship's ballast water in accordance with the requirements of IMO resolution MEPC.174(58)	Expires 28 April 2014	MCA 09000032

27 April 2009

Summary of the test results for the shipboard and land based trials of the Hyde GUARDIAN™ Ballast Water Treatment System

General

This document provides the summary of the results from the ship board and land based test trials of the Hyde GUARDIAN™ Ballast Water Treatment System conducted for the Type Approval.

Results from the shipboard trials

The three shipboard trials were conducted onboard the Princess Cruise Lines M/V *Coral Princess* from April to October 2008. Trials took place during the vessel's regular spring schedule in the Caribbean Sea, the summer schedule in the N.W. Pacific Ocean between Whittier, Alaska and Vancouver, Canada, and during the repositioning cruise from the western Pacific to the vessel's winter base in Fort Lauderdale, Florida.

The test results indicated that under the conditions encountered during the trials, the Hyde GUARDIAN™ system is seen to comply with all IMO G-8 standards relating to the elimination of biota and with respect to the issue of residual toxicity of treated water related to chemicals generated during treatment. The results from the shipboard trials are presented in Table 1.

Table 1. Summary table of results from 2008 shipboard trials of the Hyde 'Guardian' Ballast Water Treatment System aboard the M/V Coral Princess indicating compliance with IMO Ballast Water Regulations (NS indicates no published standard).

Biota analysed	Untreated, T=0 (ohallenge water)	Untreated at discharge	Treated at discharge	IMO standard	Compliance (√)/non-compliance (X) with IMO standard
Trial 1, April 5th-18th, 2008. Treatment/Ballasting at Aruba. Salinity 35.8 PSU, temperature 26.8 °C. (96h residence time)					
Zooplankton >50µm. Live counts per m^3	453±259	484±284	0	<10 per m^3	√
Phytoplankton >10µm <50µm. Live counts per mL	0.045±0.023*	0.012±0.007	0.002±0.001*	<10 per mL	√
Coliform bacteria. Counts per 100mL	<0.2	0	0	NS	NS
E. Coli. Counts per 100mL	0	0	0	<250cfu/100mL	√
Intestinal enterococcus. (cfu/100mL)	<0.2	0	0	<100cfu/100mL	√
Vibrio cholera (cfu/100mL)	0	0	0	<1cfu/100mL	√
Culturable heterotrophic bacteria. (cfu/100mL)	12.2 ± 12.9	5.0±5.7	1.0±1.7	NS	NS

Trial 2. June 30th – July 15th, 2008. Treatment/Ballasting S. of Whittier, Alaska. Salinity 31.3 PSU, temperature 13.1°C (114h residence time)					
Zooplankton >50µm. Live	15,373±6118	337± 441	0	<10 per m³	√
Phytoplankton >10µm <50µm. Live counts per mL	2.8±6.6*	2.96±5.6*	0.076±0.041*	<10 per mL	√
Coliform bacteria (cfu/100mL)	0	0	0	NS	NS
E. Coli (cfu/100mL)	0	0	0	<250cfu/100mL	√
Enterococci (cfu/100mL)	0	1.8	3.4	<100cfu/100mL	√
Vibrio choleri (cfu/100mL)	0	0	0	<1cfu/100mL	√
Culturable heterotrophic bacteria. (cfu/100mL)	90.6±65.0	94.1±68.3	148.3±94.4	NS	NS

Trial 3 September 17th-October 6th, 2008. Treatment/Ballasting S. of Long Beach CA. Salinity 33.3 PSU, temperature 24.0°C (240 h residence time)					
Zooplankton >50µm. Live counts per m³	1,391±818	18.0±13.0	0	<10 per m³	√
Phytoplankton >10µm <50µm. Live counts per mL	2.5±1.87*	1.27±0.95*	0.1±0.1*	<10 per mL	√
Coliform bacteria (cfu/100mL)	0	0	0	NS	NS
E. Coli (cfu/100mL)	0	0	0	<250cfu/100mL	√
Enterococci (cfu/100mL)	0	1.6	3.4	<100cfu/100mL	√
Vibrio choleri (cfu/100mL)	0	0	0	<1cfu/100mL	√
Culturable heterotrophic bacteria. (cfu/100mL)	44.2±44.75	6.6±7.3	2.0±6.0	NS	NS
Residual toxicity of water to mysid shrimp larvae following residence time in tanks (% mortality relative to lab. controls)	100%	100%	100%	No significant residual toxicity relative to controls	√
Residual toxicity of water to topsmelt (fish) larvae following residence time in tanks (% mortality relative to lab. controls)	90%	95.2%	100%	No significant residual toxicity relative to controls	√
Residual toxicity of water to phytoplankton following residence time in tanks (% survival relative to lab. controls)	87.4%	80.47%	80.17%	No significant residual toxicity relative to controls	√

* - Live cell numbers based on grow-out under fluorescent 'Gro-lights' in f/2 nutrient medium. Otherwise, 'live' numbers based on chloroplast integrity/color and motility (some dinoflagellates).

Whole effluent toxicity (WET) tests were conducted on treated and untreated water samples collected during the shipboard ballasting and de-ballasting procedures described in Trial 3. The

Summary of the test results for the shipboard and land based trials of the Hyde GUARDIAN™ Ballast Water Treatment System. 27 April 2009.

objective of these bioassays was to identify any residual chemical toxicity that could have resulted from UV irradiation of ballast water. The results from the WET bioassays indicated no significant differences between the toxicity of treated vs. untreated water samples at the time of discharge from the vessel.

Results from the land based trials

The land based trials were conducted by the Royal Netherlands Institute for Sea Research (NIOZ), the Netherlands, from April to July 2008.

As the result from the land-based tests it can be concluded that the present configuration of the Hyde GUARDIAN™ system was found to offer a reliable and environmentally safe cleaning of the ballast water resulting in organism numbers well below the IMO Standard D2. The summary of the test results is presented in the Table 2.

Additionally, with respect to the water chemistry a slight increase in nitrite concentration was observed during the low salinity test runs in the treated water (cf. Sharpless & Linden 2001). This apparent increase was still 50% of the natural nitrite concentrations observed during the second test series at high salinity and should therefore be considered as non hazardous. Moreover, the values were still lower than the maximum allowed concentration for drinking water (Sharpless et al. 2003).

Summary of the test results for the shipboard and land based trials of the Hyde GUARDIAN™ Ballast Water Treatment System. 27 April 2009.

Table 2. Summary table with the results of the land based trials for the Type Approval Certificate of the Hyde GUARDIAN™ system. The rows indicated with yellow shading include results from the analysis beyond the old G8 (Resolution MEPC.125(53)) requirements.

Land-based tests NIOZ	Reference & Treated			Reference			Treated			
Salinity 22.1 PSU	Intake			Discharge			Discharge			Discharge*
natural plankton	Average	Min.	Max.	Average	Min.	Max.	Average	Min.	Max.	Average
total bacteria [counts/mL]	3.3+E8	1.3+E8	8.8+E8	2.1+E8	0.73+E8	3.8+E8	2.4+E8	0.38+E8	5.2+E8	0.31+E8
E. coli [cfu/mL]	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Enterococci [cfu/mL]	< 1	< 1	<1	< 1	< 0.1	1	< 0.1	< 0.1	< 0.1	< 1
plankton <10 µm [counts/mL]	5448	235	13648	589	82	1939	<10	<10	<10	12
plankton 10-50 µm [counts/mL]	1026	304	1764	147	140	156	<10	<10	<10	2.3
plankton >50 µm [counts/m³]	20.5+E5	10.1+E5	48.8+E5	3.05+E3	617	10.8+E3	2.9	n.d.	7.3	

Land-based tests NIOZ	Reference & Treated			Reference			Treated			
Salinity 31.9 PSU	Intake			Discharge			Discharge			Discharge*
natural plankton	Average	Min.	Max.	Average	Min.	Max.	Average	Min.	Max.	Average
total bacteria [counts/mL]	4.2+E8	0.72+E8	8.3+E8	2.1+E8	0.33+E8	5.4+E8	0.88+E8	0.24+E8	1.2+E8	0.64+E8
E. coli [cfu/mL]	<0.1	< 0.1	<0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Enterococci [cfu/mL]	8.3	< 1	17	< 0.1	< 0.1	1	< 1	< 1	< 1	< 1
plankton <10 µm [counts/mL]	2388	1184	3764	290	173	632	<10	<10	<10	1.8
plankton 10-50 µm [counts/mL]	1378	814	2080	140	121	161	<10	<10	<10	1.0
plankton >50 µm [counts/m³]	1.58+E5	0.52+E5	4.11+E5	1.54+E4	0.25+E4	0.84+E4	n.d.	n.d.	n.d.	-

Summary table (average and minimum and maximum) of collected data covering the major groups of organisms at two series of 5 test-runs at a low and high salinity range, respectively. n.d.: not detectable in sample; -: no data; * numbers as determined in bottle incubations of discharge water.