HYUNDAI HEAVY INDUSTRIES CO.,LTD.	**HiBallast™ Ballast Water Management System**

Document 4-3. Shipboard Test Log

APPLICATION/PROJECT	Alternate Management System (AMS)
APPROVAL AUTHORITY	USCG
DOCUMENT NO.	HiB-04300-AMS
APPLICANT	Hyundai Heavy Industries Co., Ltd.
ISSUING PARTY	Engine & Machinery Research Institute / R&D Division

Rev.	Date	Reason for Issue	Prepared	Checked	Approved
0	30 Sep., 2012	Draft	T. J. Rhee	Y. G. Kim	K. N. Chung
1	30 Oct., 2012	Final	S. H. Yoon	Y. G. Kim	K. N. Chung
2					
3					
4					

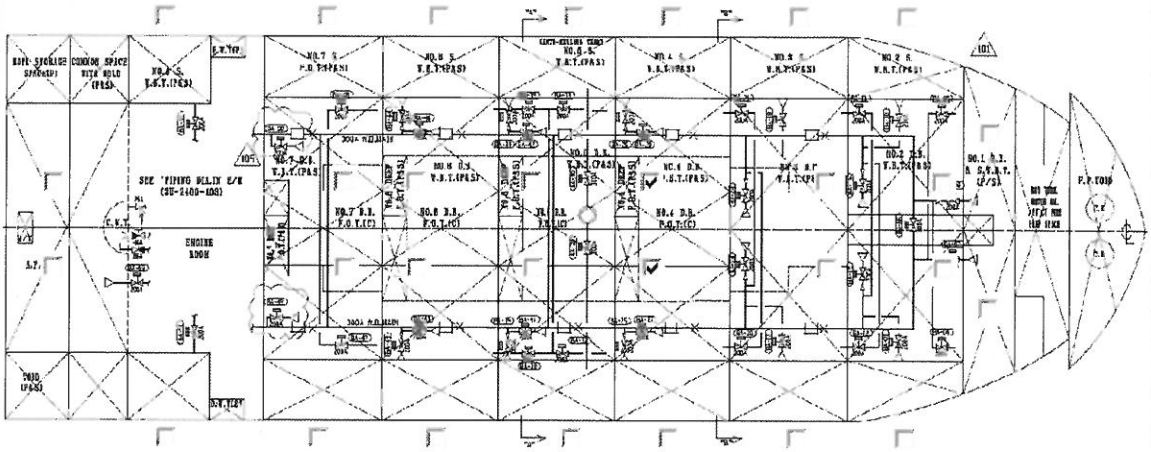
Ballast Water Management System Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	03/02/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	02/19/2011, 13:04	4.	Operation End (MM/DD/YYYY, HH:MM)	02/19/2011, 14:19

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	IMO No. 9330719, HSHI 295
7.	Gross tonnage	ton	52581	8.	Flag	Panama
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☑ Uptake ☐ Discharge to Sea ☐ Discharge to Facility		☑ Treatment	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	Hong Kong	14.	Depth	m 12
15.	Uptake Volume	m^3 770	16.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization
17.	Treated Volume	m^3 770	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3	20.	Method of Volume Estimation	Ballast water tank volume (WBT DB No. 4, total 807 m³)
21.	Volume of Ballast Water on board before operation	m^3 30	22.	Volume of Ballast Water on board after operation	m^3 800

23. General Remarks :

The treatment flow was estimated as about 620 m³/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 03/02/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	03/02/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	02/19/2011, 13:04	4.	Operation End (MM/DD/YYYY, HH:MM)	02/19/2011, 14:19

Action Information

5.	Action	☑ Uptake (Ballasting) ☐ Discharge to Sea (Deballastir ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation

6.	Location (port)	Hong Kong		7.	Depth	m	12
8.	Treated Volume	m^3	770	9.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization	
10.	Power Consumption	kW	16.8	11.	Water Salinity	PSU	32.8
12.	Water Temperature	℃	16.2	13.	Failure During Operation	☐ Yes	☑ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3	11306	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml	162
16.	Outlet Organism Conc. (> 50 um)	org./m^3	-	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml	-
18.	Treatement Efficiency (> 50 um)	%	N.A.	19.	Treatement Efficiency (> 10 and < 50 um)	%	N.A.
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml	TNTC	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml	0
				22.	*E. Coli* (Inlet Conc.)	cfu/ml	TNTC
				23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml	84
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml	-	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml	-
				26.	*E. Coli* (Outlet Conc.)	cfu/ml	-
				27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml	-
28.	Failure Category		☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other				

29. Remarks: * TNTC means Too numerous to count.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 03/02/2011

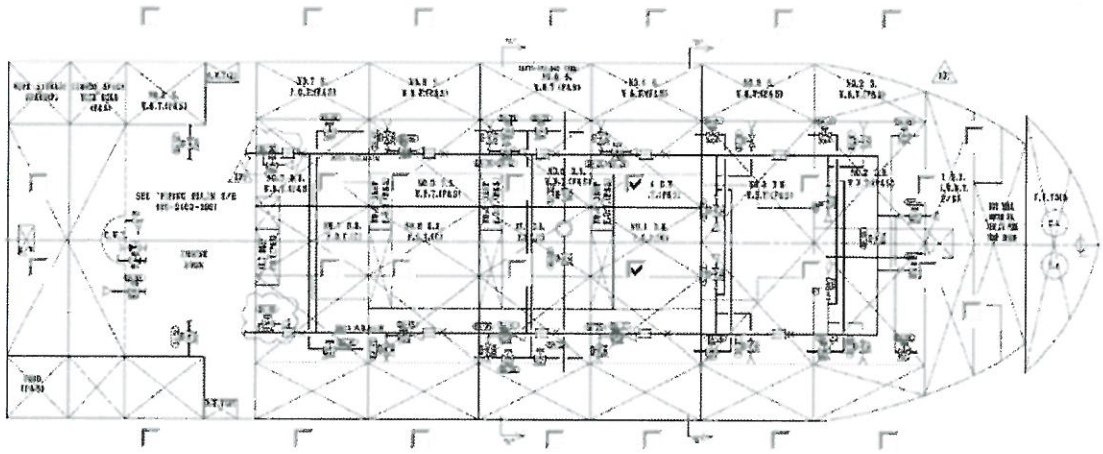
Ballast Water Management System Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	03/02/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	02/23/2011, 19:27	4.	Operation End (MM/DD/YYYY, HH:MM)	02/23/2011, 20:44

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	IMO No. 9330719, HSHI 295
7.	Gross tonnage	ton	52581	8.	Flag	Panama
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☐ Uptake ☑ Discharge to Sea ☐ Discharge to Facility		☑ Treatment	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation	
13.	Location (port)	Busan, South Korea		14. Depth	m	12
15.	Uptake Volume	m^3		16. Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization	
17.	Treated Volume	m^3	614	18. Implementation of Ballast Management Plan	☑ Yes ☐ No	
19.	Discharge Volume	m^3	614	20. Method of Volume Estimation	Ballast water tank volume (total 807 m³)	
21.	Volume of Ballast Water on board before operation	m^3	800	22. Volume of Ballast Water on board after operation	m^3	186

23. General Remarks :

The treatment flow was estimated as about 480 m³/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 03/02/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	03/02/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	02/23/2011, 19:27	4.	Operation End (DD.MM.YYYY, HH:MM)	02/23/2011, 20:44

Action Information

5.	Action	☐ Uptake (Ballasting) ☑ Discharge to Sea (Deballastir ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation

6.	Location (port)	Busan, South Korea		7.	Depth	m	12
8.	Treated Volume	m^3	614	9.	Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization	
10.	Power Consumption	kW	<1	11.	Water Salinity	PSU	33.03
12.	Water Temperature	℃	14.01	13.	Failure During Operation	☑ Yes	☐ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3	11306	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml	162
16.	Outlet Organism Conc. (> 50 um)	org./m^3	3	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml	0
18.	Treatement Efficiency (> 50 um)	%	99.97	19.	Treatement Efficiency (> 10 and < 50 um)	%	100
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml	TNTC	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml	0
				22.	*E. Coli* (Inlet Conc.)	cfu/ml	TNTC
				23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml	84
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml	1	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml	0
				26.	*E. Coli* (Outlet Conc.)	cfu/ml	0
				27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml	0
29.	Failure Category		☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☑ Other				

30. Remarks: * TNTC means Too numerous to count.

1. Zooplanktons (> 50 μm) were detected in the discharged treated water. It was not clear where the zooplanktons originated from (treated water or dead zone of piping). Because the removal efficiency of zooplanktons was below expectation, the removal efficiency should be carefully traced at next trials.

2. During sampling, the sample-water-return pump did not operate properly. The pump will be changed as a new one, which shall be tested before the next trial. The sample water flowrate was about 10 m³/hr during deballasting operations.

Checked by KOMERI	Jun-Hyuk Yang	양준혁	Date (MM/DD/YYYY) 03/02/2011

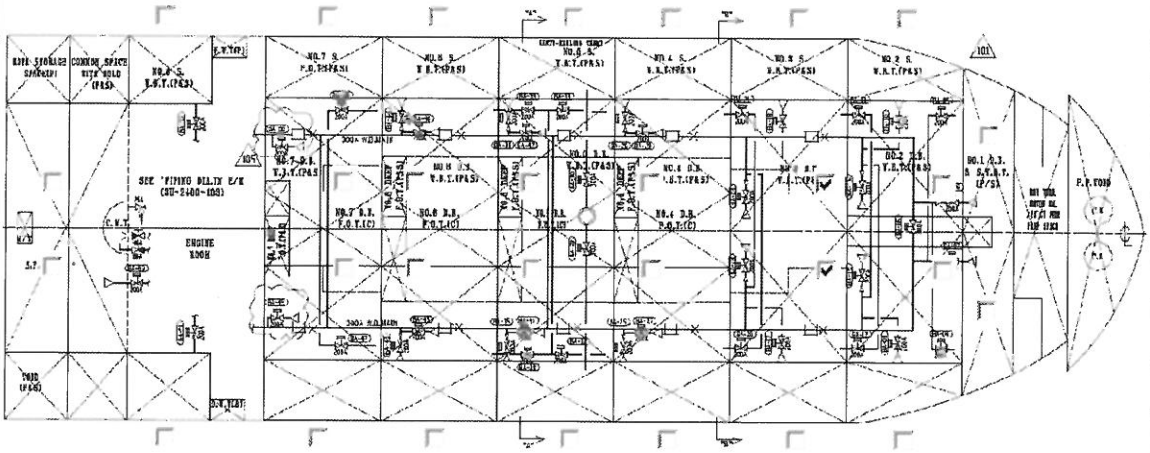
Ballast Water Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	08/19/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	08/09/2011, 05:28	4.	Operation End (MM/DD/YYYY, HH:MM)	08/09/2011, 06:39

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	9330719
7.	Gross tonnage	ton	52581	8.	Flag	PANAMA
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of ship indicating ballast tanks :



Action Information

12.	Action	☑ Uptake ☐ Discharge to Sea ☐ Discharge to Facility		☑ Treatment		☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	BUSAN, South Korea		14.	Depth (Draft)	m 13
15.	Uptake Volume	m^3	640	16.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization
17.	Treated Volume	m^3	640	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3		20.	Method of Volume Estimation	Tank level and Flow measurement
21.	Volume of Ballast Water on board before operation	m^3	N.A. (Not Available)	22.	Volume of Ballast Water on board after operation	m^3 N.A. (Not Available)

23. General Remarks :

The treatment flow was estimated as about 540 ㎥/hr.

Checked by KOMERI	Jun-Hyuk Yang	양준혁	Date (MM/DD/YYYY) 08/19/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	08/19/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	08/09/2011, 05:28	4.	Operation End (MM/DD/YYYY, HH:MM)	08/09/2011, 06:39

Action Information

5.	Action	☑ Uptake (Ballasting) ☐ Discharge to Sea (Deballastir ☐ Discharge to Facility		☑ Treatment ☐ Cleaning		☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation	
6.	Location (port)	BUSAN, South Korea		7.	Depth	m	13
8.	Treated Volume	m^3	640	9.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization	
10.	Power Consumption	kW	17.86	11.	Water salinity	PSU	34
12.	Water temperature	°C	18.7	13.	Failure During Operation	☐ Yes	☑ No
14.	Inlet Organism Conc. (> 50 um)	~~ea~~ org/m^3	30916.7	15.	Inlet Organism Conc. (> 10 and < 50 um)	~~ea~~ org/ml	151.7
16.	Outlet Organism Conc. (> 50 um)	~~ea~~ org/m^3	-	17.	Outlet Organism Conc. (> 10 and < 50 um)	~~ea~~ org/ml	-
18.	Treatement Efficiency (> 50 um)	%	N.A.	19.	Treatement Efficiency (> 10 and < 50 um)	%	N.A.
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml	TNTC	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml	0
				22.	*E. Coli* (Inlet Conc.)	cfu/ml	48.7
				23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml	7.3
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml	-	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml	-
				26.	*E. Coli* (Outlet Conc.)	cfu/ml	-
				27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml	-
28.	Treatment Efficiency	%	N.A.				
29.	Failure Category		☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other				

30. Remarks: * TNTC means Too numerous to count.

Checked by KOMERI	Jun-Hyuk Yang	양준혁	Date (MM/DD/YYYY) 08/19/2011

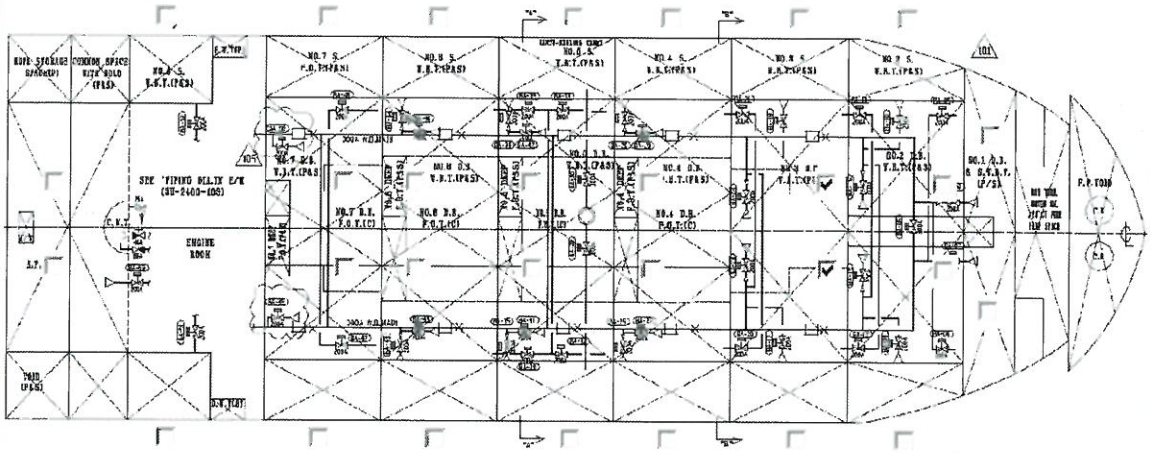
Ballast Water Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	08/19/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	08/10/2011, 14:32	4.	Operation End (DD.MM.YYYY, HH:MM)	08/10/2011, 16:11

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	9330719
7.	Gross tonnage	ton	52581	8.	Flag	PANAMA
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☐ Uptake ☑ Discharge to Sea ☐ Discharge to Facility		☑ Treatment	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	Yangshan terminal, China	14.	Depth (Draft)	m 13
15.	Uptake Volume	m^3	16.	Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization
17.	Treated Volume	m^3 640	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3 640	20.	Method of Volume Estimation	Tank level and Flow measurement
21.	Volume of Ballast Water on board before operation	m^3 N.A. (Not Available)	22.	Volume of Ballast Water on board after operation	m^3 N.A. (Not Available)

23. General Remarks : * TNTC means Too numerous to count.

The treatment flow was estimated as about 388 ㎥/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 08/19/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	08/19/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	08/10/2011, 14:32	4.	Operation End (DD.MM.YYYY, HH:MM)	08/10/2011, 16:11

Action Information

5.	Action	☐ Uptake (Ballasting) ☑ Discharge to Sea (Deballastir ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation

6.	Location (port)	Yangshan terminal, China		7.	Depth	m	13
8.	Treated Volume	m^3	640	9.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization	
10.	Power Consumption	kW	< 1	11.	Water salinity	PSU	22
12.	Water temperature	°C	27	13.	Failure During Operation	☐ Yes	☑ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3	30916.7	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml	151.7
16.	Outlet Organism Conc. (> 50 um)	org./m^3	1	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml	0
18.	Treatement Efficiency (> 50 um)	%	99.997	19.	Treatement Efficiency (> 10 and < 50 um)	%	100
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml	TNTC	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml	0
				22.	*E. Coli* (Inlet Conc.)	cfu/ml	48.7
				23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml	7.3
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml	11.2	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml	0
				26.	*E. Coli* (Outlet Conc.)	cfu/ml	0
				27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml	0
28.	Treatment Efficiency	%	N.A.				
29.	Failure Category		☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other				

30. Remarks: * TNTC means Too numerous to count.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 08/19/2011

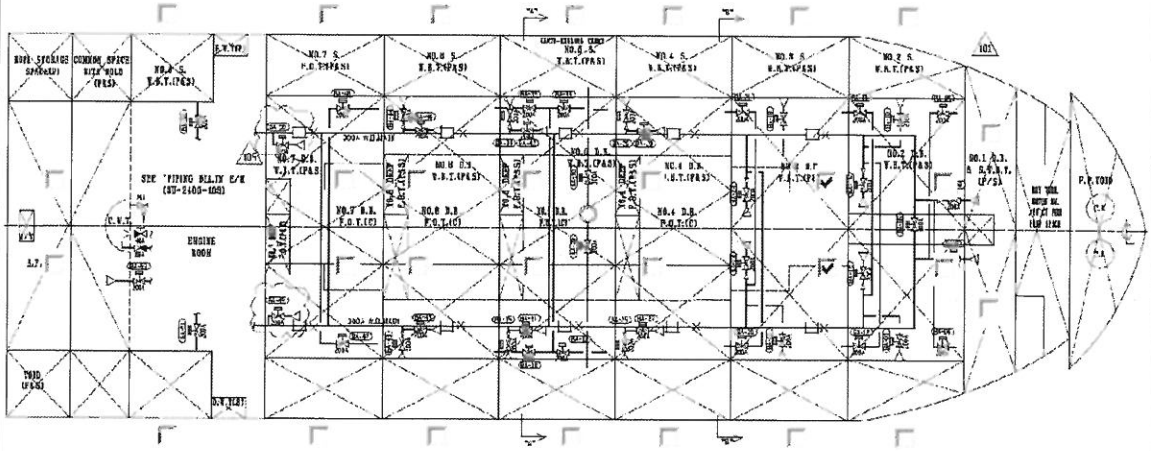
Ballast Water Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	08/19/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	08/10/2011, 23:54	4.	Operation End (DD.MM.YYYY, HH:MM)	08/11/2011, 01:05

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	9330719
7.	Gross tonnage	ton	52581	8.	Flag	PANAMA
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☑ Uptake ☐ Discharge to Sea ☐ Discharge to Facility		☑ Treatment		☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	Yangshan terminal, China		14.	Depth (Draft)	m 13
15.	Uptake Volume	m^3	640	16.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization
17.	Treated Volume	m^3	640	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3		20.	Method of Volume Estimation	Tank level and Flow measurement
21.	Volume of Ballast Water on board before operation	m^3	N.A. (Not Available)	22.	Volume of Ballast Water on board after operation	m^3 N.A. (Not Available)

23. General Remarks :

The treatment flow was estimated as about 540 m^3/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 08/19/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	08/19/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	08/10/2011, 23:54	4.	Operation End (DD.MM.YYYY, HH:MM)	08/11/2011, 01:05

Action Information

5.	Action	☑ Uptake (Ballasting) ☐ Discharge to Sea (Deballasti ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation	
6.	Location (port)	Yangshan terminal, China	7.	Depth	m 13
8.	Treated Volume	m^3 640	9.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization
10.	Power Consumption	kW 19.2	11.	Water salinity	PSU 22
12.	Water temperature	°C 27.2	13.	Failure During Operation	☐ Yes ☑ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3 34166.7	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml 141.0
16.	Outlet Organism Conc. (> 50 um)	org./m^3 -	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml -
18.	Treatement Efficiency (> 50 um)	% N.A.	19.	Treatement Efficiency (> 10 and < 50 um)	% N.A.
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml TNTC	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml 0
			22.	*E. Coli* (Inlet Conc.)	cfu/ml 4
			23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml 1.3
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml -	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml -
			26.	*E. Coli* (Outlet Conc.)	cfu/ml -
			27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml -
28.	Treatment Efficiency	% N.A.			
29.	Failure Category	☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other			

30. Remarks: * TNTC means Too numerous to count.

Checked by KOMERI	Jun-Hyuk Yang	[signature]	Date (MM/DD/YYYY) 08/19/2011

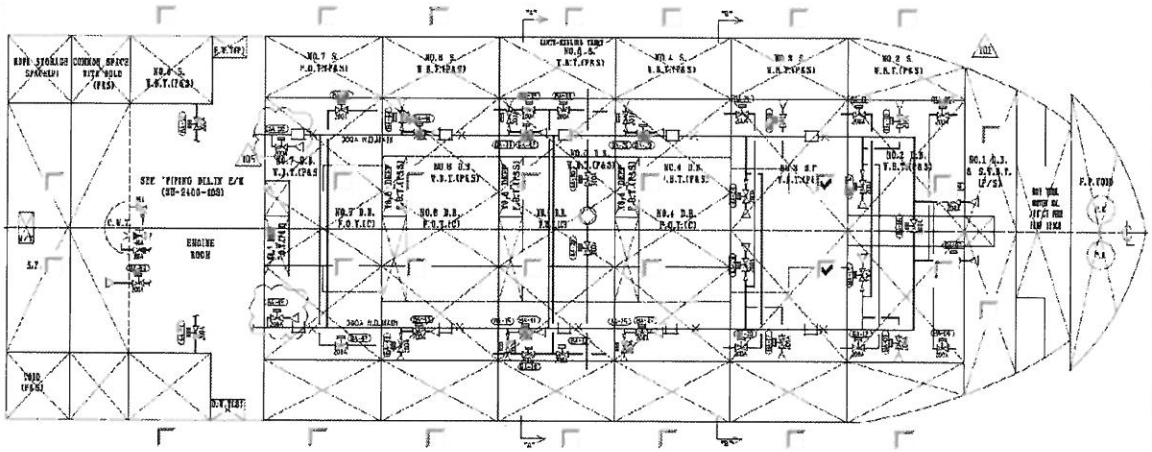
Ballast Water Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	08/19/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	08/12/2011, 14:45	4.	Operation End (MM/DD/YYYY, HH:MM)	08/12/2011, 16:15

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	9330719
7.	Gross tonnage	ton	52581	8.	Flag	PANAMA
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☐ Uptake ☑ Discharge to Sea ☐ Discharge to Facility		☑ Treatment	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	Xiamen, China	14.	Depth (Draft)	m 13.5
15.	Uptake Volume	m^3	16.	Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization
17.	Treated Volume	m^3 640	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3 640	20.	Method of Volume Estimation	Tank level and Flow measurement
21.	Volume of Ballast Water on board before operation	m^3 N.A. (Not Available)	22.	Volume of Ballast Water on board after operation	m^3 N.A. (Not Available)

23. General Remarks :

The treatment flow was estimated as about 480 ㎥/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 08/19/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	08/19/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	08/12/2011, 14:45	4.	Operation End (DD.MM.YYYY, HH:MM)	08/12/2011, 16:15

Action Information

5.	Action	☐ Uptake (Ballasting) ☑ Discharge to Sea (Deballastir ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation	
6.	Location (port)	Xiamen, China	7.	Depth	m 13.5
8.	Treated Volume	m^3 640	9.	Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization
10.	Power Consumption	kW < 1	11.	Water salinity	PSU 22
12.	Water temperature	°C 27	13.	Failure During Operation	☐ Yes ☑ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3 34166.7	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml 141.0
16.	Outlet Organism Conc. (> 50 um)	org./m^3 1.0	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml 0
18.	Treatement Efficiency (> 50 um)	% 99.997	19.	Treatement Efficiency (> 10 and < 50 um)	% 100
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml TNTC	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml 0
			22.	*E. Coli* (Inlet Conc.)	cfu/ml 4
			23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml 1.3
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml 0	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml 0
			26.	*E. Coli* (Outlet Conc.)	cfu/ml 0
			27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml 0
28.	Treatment Efficiency	% 100			
29.	Failure Category	☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other			
30.	Remarks: * TNTC means Too numerous to count.				

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 08/19/2011

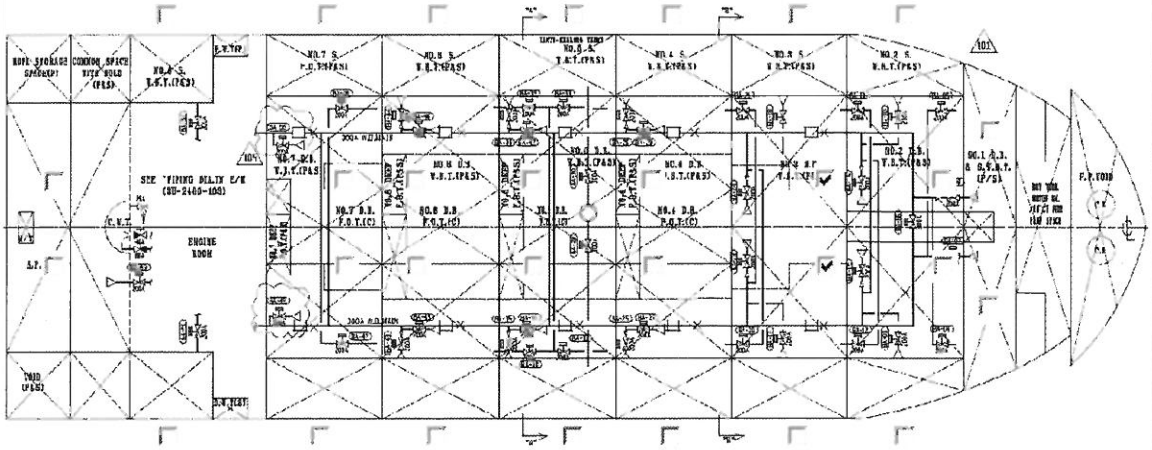
Ballast Water Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM.DD.YYYY)	10/17/2011
3.	Operation Start (MM.DD.YYYY, HH:MM)	10/10/2011, 10:30	4.	Operation End (MM.DD.YYYY, HH:MM)	10/10/2011, 11:30

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	9330719
7.	Gross tonnage	ton	52581	8.	Flag	PANAMA
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☑ Uptake ☐ Discharge to Sea ☐ Discharge to Facility		☑ Treatment	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	BUSAN, South Korea	14.	Depth (Draft)	m 9.5, 11.12
15.	Uptake Volume	m^3 600	16.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization
17.	Treated Volume	m^3 600	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3 0	20.	Method of Volume Estimation	
21.	Volume of Ballast Water on board before operation	m^3 10	22.	Volume of Ballast Water on board after operation	m^3 610

23. General Remarks :

The treatment flow was estimated as about 600 ㎥/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 10/17/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (DD.MM.YYYY)	10/17/2011
3.	Operation Start (DD.MM.YYYY, HH:MM)	10/10/2011, 10:30	4.	Operation End (DD.MM.YYYY, HH:MM)	10/10/2011, 11:30

Action Information

5.	Action	☑ Uptake (Ballasting) ☐ Discharge to Sea (Deballastir ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation	
6.	Location (port)	BUSAN, South Korea	7.	Depth	m 9.5, 11.12
8.	Treated Volume	m^3 600	9.	Treatment (Method)	☑ Filtration ☑ Electrolysis ☐ Neutralization
10.	Power Consumption	kW 19.2	11.	Water salinity	PSU 34
12.	Water temperature	·C 21	13.	Failure During Operation	☐ Yes ☑ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3 31389	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml 189
16.	Outlet Organism Conc. (> 50 um)	org./m^3 -	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml -
18.	Treatement Efficiency (> 50 um)	% N.A.	19.	Treatement Efficiency (> 10 and < 50 um)	% N.A.
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml 28	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml 0
			22.	*E. Coli* (Inlet Conc.)	cfu/ml 1
			23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml 8.7
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml -	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml -
			26.	*E. Coli* (Outlet Conc.)	cfu/ml -
			27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml -
28.	Treatment Efficiency	% N.A.			
29.	Failure Category	☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other			
30.	Remarks:				

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 10/17/2011

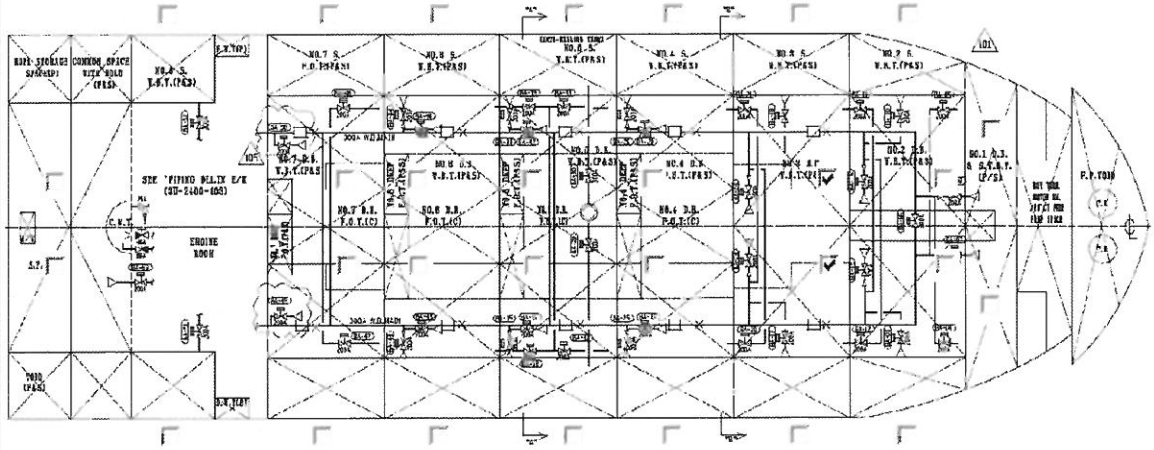
Ballast Water Operation Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	10/17/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	10/10/2011, 13:45	4.	Operation End (MM/DD/YYYY, HH:MM)	10/10/2011, 15:05

Ship Information

5.	Name of Ship	HYUNDAI UNITY		6.	IMO Number	9330719
7.	Gross tonnage	ton	52581	8.	Flag	PANAMA
9.	Total Ballast Capacity	m^3	21845.7	10.	Ballast Management Plan	☑ Applied ☐ Not Applied

11. Diagram of the ship's ballast tanks :



Action Information

12.	Action	☐ Uptake ☑ Discharge to Sea ☐ Discharge to Facility		☑ Treatment	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation
13.	Location (port)	BUSAN, South Korea	14.	Depth (Draft)	m 9.5(FWD), 11.12 (AFT)
15.	Uptake Volume	m^3 0	16.	Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization
17.	Treated Volume	m^3 520	18.	Implementation of Ballast Management Plan	☑ Yes ☐ No
19.	Discharge Volume	m^3 520	20.	Method of Volume Estimation	
21.	Volume of Ballast Water on board before operation	m^3 610	22.	Volume of Ballast Water on board after operation	m^3 90

23. General Remarks :

The treatment flow was estimated as about 390 ㎥/hr.

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 10/17/2011

Ballast Water Treatment Report

1.	Reported by	Ki-Hoon Han	2.	Report Date (MM/DD/YYYY)	10/17/2011
3.	Operation Start (MM/DD/YYYY, HH:MM)	10/10/2011, 13:45	4.	Operation End (MM/DD/YYYY, HH:MM)	10/10/2011, 15:05

Action Information

5.	Action	☐ Uptake (Ballasting) ☑ Discharge to Sea (Deballastir ☐ Discharge to Facility	☑ Treatment ☐ Cleaning	☐ Accidental Uptake ☐ Accidental Discharge ☐ Additional Operation

6.	Location (port)	BUSAN, South Korea	7.	Depth	m	9.5(FWD), 11.12 (AFT)
8.	Treated Volume	m^3 520	9.	Treatment (Method)	☐ Filtration ☐ Electrolysis ☑ Neutralization	
10.	Power Consumption	kW 1	11.	Water salinity	PSU	34
12.	Water temperature	°C 21	13.	Failure During Operation	☐ Yes	☑ No
14.	Inlet Organism Conc. (> 50 um)	org./m^3 31389	15.	Inlet Organism Conc. (> 10 and < 50 um)	org./ml	189
16.	Outlet Organism Conc. (> 50 um)	org./m^3 3	17.	Outlet Organism Conc. (> 10 and < 50 um)	org./ml	0
18.	Treatement Efficiency (> 50 um)	% 99.99044251	19.	Treatement Efficiency (> 10 and < 50 um)	%	100
20.	Heterotrophic bacteria (Inlet Conc.)	cfu/ml 28	21.	*Vibrio Cholerae* (Inlet Conc.)	cfu/ml	0
			22.	*E. Coli* (Inlet Conc.)	cfu/ml	1
			23.	*Intestinal Enterococci* (Inlet Conc.)	cfu/ml	8.7
24.	Heterotrophic bacteria (Outlet Conc.)	cfu/ml 0.9	25.	*Vibrio Cholerae* (Outlet Conc.)	cfu/ml	0
			26.	*E. Coli* (Outlet Conc.)	cfu/ml	0
			27.	*Intestinal Enterococci* (Outlet Conc.)	cfu/ml	0
28.	Treatment Efficiency	% N.A.				
29.	Failure Category	☐ Filter Unit ☐ Electrolysis Unit ☐ Neutralization Un ☐ Other				
30.	Remarks:					

Checked by KOMERI	Jun-Hyuk Yang		Date (MM/DD/YYYY) 10/17/2011