

MARINE ENVIRONMENT PROTECTION
COMMITTEE
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Agenda item 4

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HARMFUL AQUATIC ORGANISMS IN BALLAST WATER

Information on the type approval of the HANLA IMS Co., Ltd. EcoGuardian™ ballast water management system

Submitted by the Republic of Korea

SUMMARY

<i>Executive summary:</i>	This document contains information on the type approval certification for the EcoGuardian™ BWMS manufactured by HANLA IMS Co., Ltd
<i>Strategic direction, if applicable:</i>	2
<i>Output:</i>	2.2
<i>Action to be taken:</i>	Paragraph 27
<i>Related documents:</i>	MEPC 65/22; MEPC 75/18; resolutions MEPC.300(72) and MEPC.169(57)

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 (BWMS) must be approved by the Administration taking into account guidelines developed by the Organization.

2 The Administration of the Republic of Korea wishes to notify the Committee of its decision to type approve the EcoGuardian™ BWMS.

3 The competent authority in the Republic of Korea, the Ministry of Oceans and Fisheries, has verified the application dossier submitted by HANLA IMS Co., Ltd. for the EcoGuardian™ BWMS and considers the system to satisfy the requirements of the *Code for Approval of Ballast Water Management Systems* (BWMS Code), adopted by resolution MEPC.300(72), and *Procedure for approval of BWMS that make use of Active Substances* (G9) adopted by resolution MEPC.169(57).

4 Plan approval process was reviewed by the Korean Register (KR). Land-based test was conducted by the Busan Techno Park (BTP). Shipboard test was conducted by the Korea Marine Equipment Research Institute (KOMERI). These three testing bodies are designated by the government of the Republic of Korea. Environmental test was conducted by SGS Korea and Dt&C.

5 As requested in resolution MEPC.300(72), the Republic of Korea hereby reports the following information on the type approval of the BWMS to the Organization:

- .1 approval date: 7 September 2020;
- .2 name of the Administration: The Ministry of Oceans and Fisheries;
- .3 name of the manufacturer: HANLA IMS Co., Ltd.;
- .4 name of the BWMS: EcoGuardian™ BWMS;
- .5 a copy of the Type Approval Certificate and its enclosures (please see the annex);
- .6 a description of the Active Substances(s): Total Residual Oxidant (TRO); and
- .7 Final Approval in accordance with the *Procedure for approval of ballast water management systems that make use of Active Substances (G9)*, adopted by resolution MEPC.169(57): these are detailed in documents MEPC 65/22, paragraph 2.8, and MEPC 75/18, paragraph 4.1.

Description of the BWMS

6 The EcoGuardian™ BWMS has been designed and manufactured to meet IMO's requirements for ballast water management systems.

7 The type approval of the EcoGuardian™ BWMS ranges includes the Auto Filter Unit (AFU) series and ElectroChlorination Unit (ECU) series (with parallel) manufactured by HANLA IMS Co., Ltd.

8 During ballasting operation, the ballast water flows to the Auto Filter Unit (AFU) and Electrochlorination Unit (ECU) through ballast pumps via sea chests and/or ballast tanks. When the ballast water passes through the ElectroChlorination Unit (ECU), TRO concentration generated in this system is less than 10 mg/L as Cl₂. During deballasting operation, before discharging through overboard, the treated ballast water is neutralized by using the Neutralization Unit (NEU). The Maximum Allowable Discharge Concentration (MADC) is less than MADC. Treatment Rated Capacity (TRC) for discharging of ballast water is dependent on the capacity of the Neutralization unit (NEU).

Overview of type approval process for the EcoGuardian™ BWMS

9 Based on review of documentation required in paragraphs 1.3 and 1.4 of the annex to the BWMS Code (resolution MEPC.300(72)), inspections of the control and monitoring system during functional tests, installations at the test site including a verifying Site Acceptance Test and witnessing of commissioning test cycles, Korean Register (KR) qualified the system design to be in accordance with paragraph 4 and part 5 of the annex to the BWMS Code (resolution MEPC.300(72)). The test set-up was verified to be in accordance with paragraphs 1.5 to 1.13 of the annex to the BWMS Code (resolution MEPC.300(72)).

10 Land-based testing for the EcoGuardian™ BWMS was independently conducted by the Busan Techno Park (BTP) in the period from 4 June 2019 to 1 June 2020. The BWMS was operated by BTP during the land-based testing.

11 The EcoGuardian™ BWMS was tested in accordance with the manufacturer's performance claims, as applied within five consecutive successful test cycles in all (marine, brackish and fresh water) salinities and with challenge water characteristics as defined in paragraph 2 of the annex to the BWMS Code (resolution MEPC.300(72)). The BWMS successfully met the ballast water performance standard described in regulation D-2. Please see the annex for more information on test results.

12 BTP is certified and audited by an independent accreditation body. A Quality Management Plan (QMP), Quality Assurance Project Plan (QAPP) and test plans have been reviewed by the Korea Institute of Ocean Science and Technology (KIOST) on behalf of the Ministry of Oceans and Fisheries and found in compliance with paragraph 2 of the annex to the BWMS Code (resolution MEPC.300(72)).

13 All methods for sampling, analysis and augmentation of test water have been validated by BTP in accordance with paragraphs 2.30 and part 4 of the annex to the BWMS Code (resolution MEPC.300(72)) and to the satisfaction to the Authorities. Organisms in size class ≥ 10 to < 50 μm were enumerated employing the CMFDA/FDA vital staining methodology.

14 A System Design Limitations (SDL) evaluation was completed at first prior to the start of testing and validated by the land-based and shipboard testing, and later revised, amended and validated prior to the completion of the Type Approval Report in accordance with paragraphs 1.14 to 1.15 and part 6 of the annex to the BWMS Code (resolution MEPC.300(72)).

15 The System Design Limitations (SDL) identified and validated during land-based and shipboard testing are:

- .1 EcoGuardian™ BWMS has been found to hold limitations of ballast water temperature (ElectroChlorination Unit (ECU) feed temperature: $> 10^{\circ}\text{C}$); and
- .2 EcoGuardian™ BWMS has been found to hold limitations with respect to post-treatment holding time (marine and brackish water: not applicable/fresh water: 2 hours).

16 The shipboard testing was conducted by KOMERI in the period from 23 July 2018 to 10 March 2019 on board **M/T POLAR BRIGHT** (IMO No.: 9732395). The BWMS was operated by the ship's crew during testing in harbours and coastal waters during its trade route in the temperate (Haenam, Republic of Korea, and Antwerp, Belgium, located in the Yellow Sea and North Sea, respectively) and tropical (Singapore located in the Gulf of Thailand) zone.

17 Total five test cycles were conducted. The tests were designed to meet the requirements as defined in part 2 of the annex to the BWMS Code (resolution MEPC.300(72)). These tests along with the extended continued service of the BWMS of more than six months were designed to assess the biological efficacy (BE) and operational performance of the EcoGuardian™ BWMS while installed on board a seagoing ship. Please see the annex for more information of test results.

18 Before commencement of testing, the ship's assigned class society (KR) conducted a survey of the installation on board and verified that it was assembled in a location and configuration consistent with its final intended use. The operation and maintenance of the BWMS were according to the specifications of the manufacturer.

19 To fulfil the requirements of evaluating EcoGuardian™ BWMS's claimed minimum holding time as specified in paragraph 2.13, and to evaluate regrowth as specified in paragraphs 2.49 to 2.55, both of the annex to the BWMS Code (resolution MEPC.300(72)), the above testing was divided with three test cycles within the minimum holding time before discharge, with two test cycles with five days holding time between uptake and discharge in all (three) salinities.

20 The Ministry of Oceans and Fisheries finds that the BWMS has demonstrated the performance to the standard described in regulation D-2 with required imitation to the holding time between uptake and discharge (marine and brackish water: not applicable/fresh water: 2 hours).

21 To fulfil the requirement to evaluate effective performance in a range of ballast water temperatures in accordance with paragraphs 2.46 to 2.48 of the annex to the BWMS Code (resolution MEPC.300(72)), a validation in respect of details within HANLA IMS Co., Ltd. provided system design limitation report and subsequent supporting land-based and shipboard testing results were verified.

22 HANLA IMS Co., Ltd. provided a demonstration of scaling and vulnerability by computational fluid dynamics (CFD) covering the full range of EcoGuardian™ BWMS models. Further, HANLA IMS Co., Ltd. provided a vulnerability assessment of the EcoGuardian™ BWMS model range, showing compliance with paragraph 4.15 of the BWMS Code (resolution MEPC.300(72)) and BWM.2/Circ.33/Rev.1.

23 The identified relevant operational related the System Design Limitations (SDL) safety measures have been incorporated in EcoGuardian™ BWMS's control and monitoring system and the operational manual.

24 The assembled units forming part of type approval testing have been environmentally tested in accordance with IACS UR E10 by the ISO17025 accepted laboratories SGS Korea and Dt&C in Korea. Relevant components mounted in an identified standard configuration and which hold a valid marine type approval certificate to the same standard were not subject to further testing.

Resume

25 Following the design acceptance and the preparation of a test plan suitable for validating the claimed operating ranges of the EcoGuardian™ BWMS as specified by HANLA IMS Co., Ltd., 15 successful land-based tests in the three defined salinity ranges and five successful shipboard tests exceeding the testing period of minimum six months were conducted. The tests were independently performed by BTP & KOMERI and in accordance with the normal operating procedures of the EcoGuardian™ BWMS.

26 The issued Type Approval Certificates No. 2020-97~120 which included 24 models (Normal type 12 models & Explosion proof type 12 models) for EcoGuardian™ BWMS were issued on 7 September 2020 by the Ministry of Oceans and Fisheries, Republic of Korea. The issued Type Approval Certificates No. 2021-176~179 which included four models (Normal type two models & Explosion proof type two models) for EcoGuardian™ BWMS were additionally issued on 27 July 2021. Results of the land-based and shipboard testing are contained in the

Type Approval Certificate of representative model for EcoGuardian™ BWMS as presented in the annex to this document.

Action requested of the Committee

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

ANNEX

TYPE APPROVAL CERTIFICATE FOR HANLA IMS CO., LTD.
ECOGUARDIAN™ BALLAST WATER MANAGEMENT SYSTEM

■ 선박평형수(船舶平衡水) 관리법 시행규칙 [별지 제11호서식] <개정 2019. 7. 1.>

[제1쪽]

증서번호 제 2020-98 호
Cert. No. 2020-98



선박평형수처리설비 형식승인서
TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

대한민국
REPUBLIC OF KOREA

이 증서는 국제해사기구(IMO) 결의서 MEPC.300(72)에 포함된 지침서의 상세요건에 따라서 아래의 선박 평형수처리설비가 검사/시험되었음을 증명합니다. 다만, 이 증서는 아래에 기재된 선박평형수처리설비에 대해서만 유효합니다.

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 Code for Approval of Ballast Water Management System (resolution MEPC.300(72)). This certificate is valid only for the ballast water management system referred to below.

선박평형수처리설비 명칭
Name of ballast water management system: EcoGuardian™
선박평형수처리설비의 제조자
Ballastwater management system manufactured by: HANLA IMS Co., Ltd.
형식 및 모델명
Under type and model designation(s) EG0250
and incorporating:
장비 및 조립도면번호
To equipment/assembly drawing No.: See the Supplement to the Certificate 날짜 2019. 06. 18
기타 장비의 제조자
Other equipment manufactured by:
장비 및 조립도면번호
To equipment/assembly drawing No.: N/A 날짜 N/A
정격처리용량
Treatment Rated Capacity (m³/h) 250

이 형식승인서의 사본은 선박검사를 위해 선박평형수처리설비를 설치한 선박에 항상 비치해야 합니다. 만일, 형식승인서가 타 주관청의 승인에 기초해서 발행되었다면 그 형식승인증서도 첨부해야 합니다. A copy of this Type Approval Certificate, shall be carried on board a ship fitted with this ballast water management system, for inspection on board the ship. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

운전제한조건은 이 증서에 기술되어 있습니다.
Limiting Operating Conditions imposed are described in this document.
(온도 해당사항 없음 / 염분 해당사항 없음)
(Temperature Not Applicable / Salinity Not Applicable)

기타 제한사항은 다음과 같습니다.
Other restrictions imposed include the following.
본장비는 다음의 조건에서 운전하도록 설계되었습니다.
This equipment has been designed for operation in the following conditions
증서 추록의 11.3 참조(Refer to Section 11.3 in the Supplement to the Certificate)

Official stamp



서명
Signed
주관청
Administration of
증서발급일
Issued
증서유효일
Valid until

최종욱

Ministry of Oceans and Fisheries

07th Sept. 2020

06th Sept. 2025

210mm × 297mm [보존용지(1종) 220g/m²]

선박평형수처리설비 형식승인서 추록
SUPPLEMENT TO THE TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

승인번호

Certificate No. 2020-98

선박평형수처리설비에 대한 시험결과와 환경시험 및 육상·선상시험의 세부사항은 국제해사기구(IMO) 결의서 MEPC.300(72)에 따라서 수행된 것입니다.

Test results and details of environmental testing, land-based testing and shipboard testing conducted on the ballast water management system in accordance with Code for Approval of Ballast Water Management System (resolution MEPC.300(72))

1. 선박평형수처리설비의 형식

Type of ballast water management system: Filtration + Electro-chlorination

정격처리용량

Treatment rated capacity: 250 m³/h

제조사

Manufactured by HANLA IMS Co., Ltd.

2. 처리물질의 종류

The Active Substance

Total Residual Oxidant (TRO)

2.1 처리물질의 최대 사용량(또는 UV 방식의 경우 최대 조사량)

Maximum dosage of the Active Substance*/Maximum radiation dosage*: 9 mg/L (as Cl₂)

2.2 처리물질의 최저 사용량(또는 UV 방식의 경우 최저 조사량)

Minimum dosage of the Active Substance*/Minimum radiation dosage*: 6 mg/L (as Cl₂)

3. 중화제의 종류

Substance for Neutralization of the Active Substance Sodium thiosulfate

4. 배출시 최대 TRO 농도(또는 UV 방식의 경우 배출시 조사량 허용범위)

Maximum Allowable Discharge Concentration of TRO*/Permitted range of radiation dosage* at discharge: < 0.1 mg/L (as Cl₂)

4.1 그 밖의 사용물질(해당시만)

Substances for any other use _____

5. 유입해수의 허용 온도 및 염분 범위

Permitted range of temperature and salinity of seawater inlet Not Applicable

6. 육상시험 결과 요약

Summary of the land-based test results

6.1 시험을 수행한 형식승인시험기관

Organization conducting the test Busan Techno Park (BTP)

6.2 시험된 선박평형수처리설비의 정격처리용량

Treatment rated capacity of Ballast Water Management System tested: 250 m³/h

6.3 시험시 온도 및 염분 범위

Range of temperature and salinity of test water 16.43 °C - 25.63 °C / 0.06 PSU - 33.83 PSU

6.4 시험결과 요약

Summary of the land-based test results

6.4.1 해수

Marine water: (33.25 ~ 33.83 PSU)

시험결과 Test results	주입수 Uptake Water			배출시 미처리수 Control Water at Discharge			배출시 처리수 Treated Water at Discharge		
	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.
50 µm 이상의 생물 Organisms ≥ 50 µm (individuals/m ³)	216,000	243,333	190,000	146,208	228,888	46,664	0.2	1	0
10 µm 이상 50 µm 미만인 생물 Organisms ≥ 10 and < 50 µm (individuals/mL)	1,329	1,483	1,067	964	1,497	323	N.D.	N.D.	N.D.
중속영양세균 Heterotrophic bacteria (cfu/mL)	154,067	200,111	94,889	175,112	249,568	106,778	500	852	288
대장균 <i>Escherichia coli</i> (cfu/100mL)	15	28	5	3	5	N.D.	N.D.	N.D.	N.D.
장구균 Enterococci (cfu/100mL)	2	5	N.D.	1	2	N.D.	N.D.	N.D.	N.D.
독성 비브리오 콜레라 (toxicogenic <i>Vibrio cholerae</i> 01, 0139) (cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

(제3쪽)

6.4.2 기수

Brackish water : (13.20 ~ 13.62 PSU)

시험결과 Test results	주입수 Uptake Water			배출시 미처리수 Control Water at Discharge			배출시 처리수 Treated Water at Discharge		
	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.
50 µm 이상인 생물 Organisms ≥ 50 µm (individuals/m ³)	315,333	373,333	273,333	234,199	359,964	66,660	0.3	1	0
10 µm 이상 50 µm 미만인 생물 Organisms ≥ 10 and < 50 µm (individuals/mL)	1,374	1,713	1,100	1,107	1,422	935	2	4	N.D.
종속영양세균 Heterotrophic bacteria (cfu/mL)	527,756	766,667	287,111	568,934	772,222	289,111	106,907	254,556	460
대장균 <i>Escherichia coli</i> (cfu/100mL)	128	192	60	104	181	75	N.D.	N.D.	N.D.
장구균 Enterococci (cfu/100mL)	52	135	6	37	65	15	N.D.	N.D.	N.D.
독성 비브리오 콜레라 (Toxicogenic <i>Vibrio cholerae</i> (01, 0139)) (cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

6.4.3 담수

Fresh water : (0.06 ~ 0.15 PSU)

시험결과 Test results	주입수 Uptake Water			배출시 미처리수 Control Water at Discharge			배출시 처리수 Treated Water at Discharge		
	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.
50 µm 이상인 생물 Organisms ≥ 50 µm (individuals/m ³)	290,667	376,667	236,667	230,644	364,408	73,326	0.1	0.3	0
10 µm 이상 50 µm 미만인 생물 Organisms ≥ 10 and < 50 µm (individuals/mL)	1,282	1,453	1,200	653	1,187	337	N.D.	N.D.	N.D.
종속영양세균 Heterotrophic bacteria (cfu/mL)	120,223	313,333	52,556	217,378	661,111	60,111	1,008	1,523	619
대장균 <i>Escherichia coli</i> (cfu/100mL)	193	345	92	163	321	88	N.D.	N.D.	N.D.
장구균 Enterococci (cfu/100mL)	N.D.	N.D.	N.D.	1	3	N.D.	N.D.	N.D.	N.D.
독성 비브리오 콜레라 (Toxicogenic <i>Vibrio cholerae</i> (01, 0139)) (cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

6.4.4 저염분 조건

Condition of Low Salinity : (0.06 ~ 0.15 PSU)

시험결과 Test results	주입수 Uptake Water			배출시 미처리수 Control Water at Discharge			배출시 처리수 Treated Water at Discharge		
	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.
50 µm 이상인 생물 Organisms ≥ 50 µm (individuals/m ³)	290,667	376,667	236,667	230,644	364,408	73,326	0.1	0.3	0
10 µm 이상 50 µm 미만인 생물 Organisms ≥ 10 and < 50 µm (individuals/mL)	1,282	1,453	1,200	653	1,187	337	N.D.	N.D.	N.D.
종속영양세균 Heterotrophic bacteria (cfu/mL)	120,223	313,333	52,556	217,378	661,111	60,111	1,008	1,523	619
대장균 <i>Escherichia coli</i> (cfu/100mL)	193	345	92	163	321	88	N.D.	N.D.	N.D.
장구균 Enterococci (cfu/100mL)	N.D.	N.D.	N.D.	1	3	N.D.	N.D.	N.D.	N.D.
독성 비브리오 콜레라 (Toxicogenic <i>Vibrio cholerae</i> (01, 0139)) (cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

7. 선상시험 결과 요약

Summary of the ship-based test results

7.1 시험을 수행한 형식승인시험기관

Organization conducting the test : Korea Marine Equipment Research Institute (KOMERI)

7.2 시험장소

Place of test : Haenam (Korea), Singapore, Antwerp (Belgium)

7.3 시험된 선박평형수처리설비의 정격처리용량

Treatment rated capacity of Ballast Water Management System tested : 2,000 m³/h

7.4 시험시 온도 및 염분 범위

Range of temperature and salinity of test water 8.89 °C ~ 29.90 °C / 7.25 PSU ~ 33.30 PSU

7.5 시험결과 요약

Summary of the Ship based test results

시험결과 Test results	주입수 Uptake Water			배출시 미처리수 Control Water at Discharge			배출시 처리수 Treated Water at Discharge		
	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.
50 µm 이상인 생물 Organisms ≥ 50 µm (individuals/m ³)	12,552	19,080	7,278	-	-	-	1.3	6.3	0
10 µm 이상 50 µm 미만인 생물 Organisms ≥ 10 and < 50 µm (individuals/mL)	237	380	106	-	-	-	N.D.	N.D.	N.D.
종속영양세균 Heterotrophic bacteria (cfu/mL)	-	-	-	-	-	-	-	-	-
대장균 <i>Escherichia coli</i> (cfu/100mL)	44	131	1	-	-	-	1	4	N.D.
장구균 Enterococci (cfu/100mL)	40	122	N.D.	-	-	-	N.D.	N.D.	N.D.
독성 비브리오 콜레라 (toxicogenic <i>Vibrio cholerae</i> (01, 0139)) (cfu/100mL)	N.D.	N.D.	N.D.	-	-	-	N.D.	N.D.	N.D.

7.6 물리화학 및 수질 조건

Physical and water quality conditions

변수 (Parameter)	주입수 Uptake Water			배출시 미처리수 Control Water at Discharge			배출시 처리수 Treated Water at Discharge		
	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.	평균 Mean	최대 Max.	최소 Min.
염분 Salinity (PSU)	22.80	33.30	7.25	-	-	-	23.10	33.30	7.62
온도 Water temp. (°C)	19.86	30.00	8.89	-	-	-	20.17	30.10	9.23
총부유물질량 Total Suspended Solids (TSS) (mg/L)	13.50	18.40	8.22	-	-	-	12.75	19.00	9.47
입자성 유기탄소량 Particulate Organic Carbon (POC) (mg/L)	1.45	1.65	1.34	-	-	-	1.09	1.28	0.85

8. 재성장평가결과

Evaluation result for regrowth

8.1 육상시험 시 선박평형수 처리 후 배출하기 위해 적용된 유지시간

Applied holding time during land-based testing to discharge ballast water after treatment:

해수 및 기수 : 해당없음 / 담수 : 2시간

Marine water & Brackish water : Not Applicable / Fresh water : 2 hours

(제5쪽)

8.2 재생장 시험결과(육상시험의 유지시간이 5일보다 짧은 경우)

Testing results for regrowth (in case of land-based testing being performed with a holding time of less than five days)

시험결과 Test results	육상시험 (Land-based testing)						선상시험 (Shipboard testing)		추가 실험실 규모 (Additional bench-scale testing)			
	해수 (marine)		기수 (brackish)		담수 (fresh)		1회 1st	2회 2nd	1회 1st	2회 2nd	3회 3rd	4회 4th
	1회 1st	2회 2nd	1회 1st	2회 2nd	1회 1st	2회 2nd						
50 µm 이상인 생물 Organisms ≥ 50 µm (individuals/m ³)	0	0	0	0	0	0	-	-	-	-	-	-
10 µm 이상 50 µm 미만인 생물 Organisms ≥ 10 µm and < 50 µm (individuals/mL)	N.D.	N.D.	4	4	N.D.	N.D.	-	-	-	-	-	-
종속영양세균 Heterotrophic bacteria (cfu/mL)	704	584	235,087	294,336	1,523	1,389	-	-	-	-	-	-
대장균 <i>Escherichia coli</i> (cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	-	-	-	-	-	-
장구균 Enterococci(cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	-	-	-	-	-	-
독성 비브리오 콜레라 (Toxicogenic) <i>Vibrio cholerae</i> (01, 0139)(cfu/100mL)	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	-	-	-	-	-	-

9. 승인된 선박평형수처리설비의 구성품 목록

Components list of BWMS approved

AFU(Auto Filter Unit), ECU(ElectroChlorination Unit), NEU(Neutralization Unit), TSU(TRO Sensor Unit), MCP(Main Control Panel), RCP(Remote Control Panel), MPP(Main Power Panel), SCU(Salt Control Unit)

10. 장비 및 조립 도면번호

Equipment/assembly drawing number of EGO250 (HLB-B-03 Rev.0)

10.1 제조자의 장비 및 조립 도면번호

Equipment/assembly drawing number of

- 1) AFU : 20250B0000, 20250B0100
- 2) ECU : 20250C0000, 20250C0100
- 3) NEU : 20250D0000, 20250D0100
- 4) TSU : 20250E0000, 20250E0100
- 5) MCP : 3XXXXM0100, 3XXXXM0200
- 6) RCP : 3XXXXR0100, 3XXXXR0200
- 7) MPP : 3XXXXN0100, 3XXXXN0200
- 8) SCU : 20250J0000, 20250J0100

10.2 그 밖의 장비 및 조립 도면번호

Equipment/assembly drawing number of: nil

11. 비고

11.1 동 증서는 발급일로부터 5년간 유효함

This certificate is valid for 5 years from the date of issuance (07 Sept. 2020)of this certificate.

11.2 BMW.2/Circ.33/Rev.1 제5항에 따라 성능을 승인받은 기본설비 및 동형처리설비의 조합은 병렬로 연결된 다중처리설비로 간주됨

According to paragraph 5 of BMW.2/Circ.33/Rev.1, combinations of base units and scaled units which have been approved their performance should be regarded as multiple models installed in parallel.

11.3 이 장비는 다음의 조건에서 운전하도록 설계되었음

This equipment has been designed for operation in the following conditions:

11.3.1 필터

- 메쉬 크기(Mesh size): 50 µm / 입구압력(Inlet pressure): >0.8 bar / 역세척 차압 (Differential pressure for backwash): ≥0.4 bar

11.3.2 전해조(Electrolysis unit)

- 유입수 염분(Feed salinity): >10 PSU / 유입수 온도(Feed temperature): >10 °C
- 활성물질(Active Substance): 2. 처리물질의 종류 참조(Refer to Section 2)

(제6쪽)

단, 발라스팅 시 최대 TRO 경보/차단 조건(alarm & shutdown upper limit during the ballasting operation): 10 mg/L (as Cl₂)

11.3.3 유지시간(Holding time): 8.1 참조 (Refer to Section 8.1)

11.3.4 최대허용압력(Maximum system operating pressure): 10 bar (Auto Filter Unit), 7 bar (ElectroChlorination Unit)

Official stamp



서명
Signed
주관청
Administration of
증서발급일
Issued
증서유효일
Valid until

최종욱

Ministry of Oceans and Fisheries

07th Sept, 2020

06th Sept, 2025