DNV·GL

Certificate No:
TAP00000ZS

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Ballast Water Management System

with type designation(s)
Ecochlor® Ballast Water Management System

Issued to
Ecochlor, Inc.
Maynard MA, United States

is found to comply with
Resolution MEPC.174(58)
Resolution MEPC.169(57)
DNV GL class programme DNVGL-CP-0209 – Type approval – Ballast water management systems
DNV GL rules for classification – Ships

Application :

This is to certify that the Ballast Water Management System listed above has been examined and tested in accordance with the requirements of the specifications contained in Guidelines contained in Resolution MEPC.174(58) and DNV GL Rules stated above. This Certificate is valid only for the Ballast Water Management System referred to above.

For the compliance with the resolution MEPC.174(58), the Certificate is issued on behalf of the Norwegian Maritime Authority.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL, unless otherwise instructed by relevant Maritime Administrations.

Operating media:

Issued at **Høvik** on **2017-10-24**

This Certificate is valid until **2022-10-23**.
DNV GL local station: **New York**

Approval Engineer: **Ingrid Sigvaldsen**

for **DNV GL**
Digitally Signed By:
Sæle-Nilsen, Dag
Location: DNV GL Høvik, Norway

Dag Sæle-Nilsen
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Job Id: **262.1-019159-1**
Certificate No: **TAP00000ZS**

Ballast Water Management System Supplier
Ecochlor Inc.

Type and model designation
Ecochlor® BWMS Series 75, Ecochlor® BWMS Series 100, Ecochlor® BWMS Series 150, Ecochlor® BWMS Series 200, Ecochlor® BWMS Series 250, Ecochlor® BWMS Series 300.

Place of production: ProFlow Inc. 303 State St., North Haven, CT 06473, USA and FluidTech Environmental & Equipment Technology Co., Ltd., 1st Floor, Block 2, Henglu Modern Industrial Park, 166 Min Dong Road, Pudong New Area, 201209 Shanghai, P. R. China.

Equipment assembly drawings
The Ballast Water Management System (BWMS) shall be installed in accordance with one of the piping and instrumentation diagram listed below.

Description	Title	Drawing no.	Rev.
Piping and instrumentation diagram	Treatment system P&ID	ES04075H01 ES04100H01 ES04150H01 ES04200H01 ES04250H01 ES04300H01	H G G H G H
Piping and instrumentation diagram	Main Filtration system P&ID Two Filter (Shared)	ES04075H02 to ES04300H02	J
Piping and instrumentation diagram	Main Filtratration system P&ID Two Filter (Each)	ES04075H12 to ES04300H12	A
Piping and instrumentation diagram	Main Filtration System P&ID Single Filter (Each)	ES04075H22 to ES04300H22	A
Piping and instrumentation diagram	Main Filtration System P&ID Single Filter	ES04075H32 to ES04300H32	A
Piping and instrumentation diagram	Zone 0 Main Filtration System P&ID Two Filter (Shared)	ET04075H42 to ET04300H42	A
Piping and instrumentation diagram	Motive Water Filter P&ID	ES04800H05	A
Wiring Diagram	Filtration System – Electrical Details	Package Revision ES05400H02-H22	C
Wiring diagram	Treatment system Electrical Details	Package Revision ES05400H32-H61	C
Wiring diagram	Aft Peak system Electrical Details	Package Revision ES05400H63-H77	A
Wiring diagram	Zone 0 Main Filtration System Electrical Details	Package Revision ET05400H01-H55	B

Product description
The Ecochlor Ballast Water Management System description is given in "Operation Maintenance & Safety Manual (OMSM), Ecochlor standard vessel (ES)" and "Operation Maintenance & Safety Manual (OMSM) Ecochlor tanker vessel (ET)" approved by DNV GL.

Treatment sequence:
• Ballast water uptake: Filtration and chemical disinfection

• Ballast water discharge: Manual verification of chlorine dioxide (ClO_2) levels in ballast water to be discharged. Discharge is allowed when the maximum concentration is ≤0.20 mg/L.

Application/Limitation

Model	TRC (m^3/h)	ClO_2 consentration (mg/L) during uptake
Ecochlor® BWMS Series 75	<500	4.25
Ecochlor® BWMS Series 100	<1300	4.25
Ecochlor® BWMS Series 150	<3500	4.25
Ecochlor® BWMS Series 200	<6900	4.25
Ecochlor® BWMS Series 250	<12200	4.25
Ecochlor® BWMS Series 300	<16200	4.25

Minimum capacity is 50 m^3/h for all models.
Temperature is not a limiting condition for this system.
The system is accepted for a salinity above 1 PSU.
Minimum holding time is 24 hours. Holding time is dependent on time to reach maximum allowable discharge concentration. Manual in-tank sampling regime is depending on the holding time times; 24-48 hrs; 48-72hrs or >72hrs.

Filter
The filter type BS-Series manufactured by Filtersafe is a screen filter with a 40µm wire mesh. Filter(s) shall be installed with a TRC that corresponds to the ballast flow capacity. The filter require a minimum inlet operational pressure of 1.6 bar. Backwash shall initiate when a differential pressure across the filter is 0.4 bar.

Model	TRC (m^3/h)
BS025	50
BS031	75
BS050	125
BS061	150
BS061-T	180
BS070	180
BS100	250
BS100-T	275
BS101	250
BS101-T	275
BS150	375
BS150-T	410
BS151	375
BS151-T	410

Model	TRC (m^3/h)
BS201-T	550
BS300	750
BS300-T	850
BS400	1000
BS400 -T	1200
BS603	1500
BS603-T	1650
BS804	2000
BS804-T	2250
BS1004	2500
BS1004-T	2750
BS1204	3000
BS1204-T	3300
BS1206	3000

BS200	500
BS200-T	550
BS201	500

BS1206-T	3300
BS1406	3420
BS1406-T	3762

Installation- and operational specifications for the different components

Flow Meter
The type approved system must be installed with a flow meter on filter outlet. If the flow meter is installed on filter inlet, an additional filter flush flow meter is installed.

Chemical storage and piping
For safety arrangement for chemical storage and piping DNV GL rules Pt. 6, Ch.7 applies. Further details are given in DNV GL report no 262.1-019159-J-83, rev. 0.

Control and monitoring equipment
Monitoring equipment to be installed; gas detectors inside ClO_2 generator installation space, flow meters for precursor chemicals, motive water and ClO_2 piping, pressure transmittors monitoring vacuum conditions for mixing chamber and leakage detectors in secondary containments and ClO_2 generator. Any indication of leakage shall trigger alarm and shutdown. The gas sensors are arranged with independent shutdown functionality.

The control and monitoring devices are to be energized and remain active while the system is switched OFF, in case of leakage during longer voyages.

The type approved system includes the following control units and sensors:

Name	**Manufacturer**	**Model**
Treatment system control panel	Ecochlor	CP-1 CP-1ExZ1
Main ballast filter control panel	Ecochlor	CP-2 CP-2EXZ1 CP-2ExZ0 CP-4
Remote HMI panel	Ecochlor	CP-3
Mixing chamber	Nalco	6052111
Metering pump	IWAKI	IX-C060TCF-TF01
ClO_2 Gas detector	Dräger	37
ClO_2 sensor	Optek	AF26
Handheld ClO_2 measuring instrument	Palintest	Photometer 7500
Handheld ClO_2 measuring instrument	Palintest	ChlordioXense
PLC program	Ecochlor	ES0400 V13_SP1 170401

All changes in software are to be recorded as long as the system is in use onboard. The records of all changes are to be forwarded to DNV GL for evaluation and approval. Major changes to the software are

to be approved before installed in the computer. Based on the modification, a Certification of Application Functions may be required for the particular vessel.

Information regarding the selected components shall be part of the documentation related to the specific installation, either by a reference to valid type approval certificate or technical documentation.

Explosion proof version

The Ecochlor chemical system is not designed for installation in a hazardous area. The Ecochlor filter EX model meets the requirements for use in hazardous area's zone 1 and zone 0 in accordance with DNV·GL rules Pt.4 Ch.8 Sec.11. Only the equipment listed in "Ecochlor BWTS – Zone 1 and Zone 0 Electrical Components List", Table 2 and marked as to be installed in "Zone 0 Hazardous" may be installed in this area.

Ex-certification is not covered by this certificate. Installation in hazardous area are to be approved in each case according to the Rules and Ex-certification/ Special Condition for Safe Use listed in valid Ex-certificate issued by a notified/recognized Certification Body

Documents approval

The following documentation is to be submitted for approval in each case.

Piping:

- Piping and Instrumentation Diagram (P&ID) of the ballast system including the treatment system installation

Control and instrumentation:

- Power supply arrangement
- Interface description specifying external signals including alarms for failure
- Description confirming the arrangement of alarms for bypass of the BWMS system (as part of Ballast Water Management Plan)
- List of EX equipment according to Pt. 4, Ch. 8, Sec. 11 if the system is to be installed in hazardous zone.

Type Approval documentation

- Test Quality Assurance Plan, Ecochlor BWTS Series 75, Model ES-400S-1.0, , 8 April 2015, Rev.0
- Final Land-based Ballast Water Management Report According to USCG Final Rule, Ecochlor BWTS Series 75, Model ES-400S-1.0, 17 March 2017, Rev.0.
- Final Shipboard Ballast Water Management Report According to USCG Final Rule, Ecochlor BWTS Series 75, Model ES-400S-1.0, 5 Oct. 2016, Rev.0.
- Operation Maintenance & Safety Manual (OMSM), Ecochlor standard vessel (ES), 21 Jun2017/Rev.B
- Operation Maintenance & Safety Manual (OMSM) Ecochlor tanker vessel (ET), 21 Jun2017/Rev.B
- OMSM ES Appendix Package
- OMSM ET Appendix Package
- ES Installation Specification, 26Mar2017/Rev. A
- ET Installation Specification, 26Mar2017/Rev. B
- Test Report for Ballast Water Treatment Systems (BWTS), report no. R-15756-1, October 17 2016
- Information for Approval of Scaled Treatment Systems, Series 100 to Series 300, 08Mar2017, Rev.4
- Ecochlor Commissioning, 22 June 2017, Rev.C

Tests carried out

• Land-based testing in accordance with Resolution MEPC.174 (58) witnessed by DNV GL
• Shipboard testing in accordance with Resolution MEPC.174 (58) witnessed by DNV GL
• Factory Acceptance Test of the control and automation system witnessed by DNV GL
• Environmental testing in accordance with Environmental test specification for instrumentation and automation equipment, DNV GL CG-0339 and Resolution MEPC.174 (58)

Marking of product

For traceability of this Type Approval, each treatment system is to be marked with:
• Manufacturer's name or trade mark
• Type designation
• Serial number

Periodical assessment

DNV GL's surveyor is to be given permission to perform Periodical Assessments at any time during the validity of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in DNV GL-CP-0338 Section 4.

The scope of periodical assessment includes:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Copy of type approval certificate

A copy of this type approval certificate should be carried onboard a vessel fitted with this ballast water management system at all times. An annex containing the summary reports of the test results of landbased and shipboard tests should be available for inspection onboard the vessel.