Certificate no.:
TAP00002VX

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Sewage Treatment Plants

with type designation(s)
SUPER TRIDENT Sewage Treatment models: STC0-23, STC01-13, STC02-13, STC03-13, STC04-13, STC06-13, STC08-14, STC10-14, STC13-14, STC15-14, STC20-14, STC25-14, STC30-14, STC40-14, STC50-14, STC60-14, RTC20-14, RTC40-14, RTC60-14, RTC80-14

issued to
Wartsila Water Systems Ltd.
Poole, Dorset, United Kingdom

is found to comply with
IMO Resolution MEPC.227(64) "2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS" with the exception of Section 4.2

Application:

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

System design limitations / limiting operating conditions imposed are described in this document.

Issued at **Høvik** on **2024-06-06**
This Certificate is valid until **2029-06-05**.
DNV local unit: **UK & Ireland CMC & VMC**

for **DNV**

Approval Engineer: **Anna Piotrowska**

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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

The SUPER TRIDENT Series provide a biological and chemical disinfection to treat the wastewater produced by the ship. In principle, the incoming black water and grey water are led to the aeration compartment, where it is digested by aerobic bacteria and microorganisms which are promoted by the addition of atmospheric oxygen. The air is supplied to the aeration diffusers by the blowers.
The second stage of the treatment is a settling compartment, where the produced fluid gravitates to the next chamber, a chlorine contact compartment.
The effluent is discharged using the discharge pump. At the suction of the discharge pump, the de-chlorination chemical is dosed to remove residual chlorine content in the treated effluent prior to discharge overboard or to shore connections.

Application/Limitation

Application:

MBR Model	Design Hydraulic Capacity (m^3/day)	Design Organic Loading BOD_5 (kg/day)
STC0-23	1.03	0.66
STC01-13	1.74	1.11
STC02-13	3.12	2.0
STC03-13	4.66	3.0
STC04-13	6.01	3.82
STC06-13	9.36	6.0
STC08-14	11.84	7.59
STC10-14	15.81	10.13
STC13-14	20.83	13.35
STC15-14	25.704	15.887
STC20-14	33.974	20.998
STC25-14	40.778	25.203
STC30-14	47.422	29.309
STC40-14	64.145	39.645
STC50-14	80.182	49.557
STC60-14	100.80	62.3
RTC20-14	3.12	2.0
RTC40-14	6.01	3.82
RTC60-14	9.36	6.0
RTC80-14	11.84	7.59

STC – compact design sewage treatment plant
RTC – retrofit sewage treatment plant built up from three separate watertight tanks connected by external piping

Limitation:

Ambient temperature (°C)	0-55°C
Relative humidity	90%
Inclination range	0 - 22.5°
Power supply	380 – 480(690*) V and 50/60 Hz

*Optional with external transformer

The SUPER TRIDENT Series of Sewage Treatment Plant is for use by all type of ships or offshore units for the treatment of sewage in accordance with resolution MEPC.227(64), excluding for the use by passenger ships when operating in special areas as defined by the MARPOL Annex IV.

Chlorination and De-Chlorination shall be in accordance with the procedures described in the Installation, Commissioning, Operating and Maintenance Manual.

The equipment is not permitted to be installed in spaces subject to explosion hazards.

The location of hatches may be moved to facilitate safe access to the tank, provided the compartment to which access is being provided is maintained.

The location of interface flanges may be changed to allow the ship pipe work to align with the unit provided any alteration to black or grey water inlet flanges ensure the influent wastewater remains fully screened.

The mounting of access ladders and handrails are ship specific and may be added to suit customer requirements. It is not covered by this type approval.

Vacuum generation equipment (e.g. ejectors or vacuum pumps) may be fitted to a system where vacuum generation is required. It is not covered by this type approval.

Anti-condensation heaters may be fitted to suit customer requirements provided these are adequately documented within the operations manual. It is not covered by this type approval.

The ship should have on board at all times a copy of the Operation and Maintenance Manual listed in ‘Type Approval documentation’.

Type Approval documentation

Mechanical and Assembly Drawings:

Drawing Title	Drawing Number	Revision (date)

Piping and Instrumentation Drawings:

Drawing Title	Drawing Number	Revision (date)

Electrical and Instrumentation Drawings:

Drawing Title	Drawing Number	Revision (date)

Operation and Maintenance Manuals:

Drawing Title	Drawing Number	Revision (date)

Note: *The public copy of this certificate, visible in DNV Approval Finder on the DNV website, does not include information considered as proprietary details. All information is contained in the signed original certificate, owned by the manufacturer.*

Basis of acceptance

Performance testing was conducted on the ST2A model ashore in accordance with IMO Resolution MEPC.159(55). The sewage treatment plant upgrading in accordance with IMO Resolution MEPC.227(64) excluding section 4.2 is documented by the PDR0009 Rev.1 ‘‘STP Performance Testing Analysis’’ including a gap analysis.

The test reports with the results of all the testing on the SUPER TRIDENT model is listed in the “Tests carried out” section of this certificate and the results are given in the appendices.

Environmental testing was carried out in accordance with IMO Resolution MEPC.107(49) Annex Part 3 as required by IMO Resolution MEPC.227(64) and the test reports are listed in the “Tests carried out” section of this certificate.

Tests carried out

Performance Tests:

- Test Location: Wessex Water Sewage Treatment Works, Poole, Dorset, United Kingdom
  Test report: Hamworthy Sewage Treatment Plant Test Performance Report
  Date of testing: 2007-05-08 –2007-05-27
  Testing witnessed by Lloyd's Register

Environmental Tests:

- Test Location: MS Testing, located in Newton Aycliffe, Co. Durham, UK.
  Test Report: TL20094 Test Report Marine Type Approval Testing Wartsila Ltd Sewage Treatment Plant
  Test Report revision and date: Rev.1; 2020-10-08.
  Date of testing: 2020-09-25 – 2020-10-03

Marking of product

The marking shall give the following information:

- Manufacturer’s name or trademark
- Type designation
- Serial number
- Designed Hydraulic Load, and any other operational or installation limits considered necessary by the manufacturer or the Administration

A copy of this Certificate should be carried aboard a vessel fitted with this Sewage treatment plant at all times.

Periodical assessment

For retention of the Type Approval, a DNV surveyor shall perform periodical assessments (refer to Type Approval programme DNV-CP-0338). The main scope of the periodic assessment will normally include:

- Verification of the Type Approval applicant’s production and quality system with relation to ensuring continued consistent production of the type approved products at the applicant’s own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the documentation and checking that this is still used as basis for the production.
- Review of possible changes to the design, material and performance of the product.
- Verification of the product marking.

This certificate is valid for five years and periodical assessments will be required after 2 years (+/- 90 days) and 3.5 years (+/- 90 days).

Revision history

Revision	Date of issuance	Description
0	2024-06-06	Initial certificate

APPENDIX A – Summary of test results for ST2A-C

Test results and details of tests conducted on samples from the sewage treatment plant in accordance with IMO Resolution IMO Resolution MEPC.227(64) excluding section 4.2 for Passenger Ships in Special Areas:

Sewage treatment plant type: .....

Manufactured by: .....

Organization conducting the test: .....

Organization handling the samples: .....

Test Location: .....

Designed hydraulic loading: .....

Designed organic loading: .....

No. of effluent samples tested: .....

No. of influent samples tested: .....

Total suspended solids influent quality: .....

Total nitrogen influent quality:
- Geometric mean:
- Maximum
- Minimum .....

Total phosphorus influent quality:
- - Geometric Mean:
- - Maximum:
- - Minimum: .....

BOD_5 without nitrification influent quality: .....

Maximum hydraulic loading: .....

Minimum hydraulic loading: .....

Average hydraulic loading (Qi): .....

Effluent flow (Qe): .....

Dilution compensation factor (Qi/Qe): .....

Geometric mean of total suspended solids: .....

Geometric mean of the thermotolerant coliform count: .....

Geometric mean of BOD_5 without nitrification: .....

Geometric mean of COD: .....

Geometric mean of total nitrogen:
Percentage reduction of total nitrogen: .....

Geometric mean of total phosphorus:
Percentage reduction of total phosphorus: .....

Maximum pH: .....

Minimum pH: .....

Type of disinfectant used: .....

If Chlorine - residual Chlorine:

Maximum: .....

Minimum: .....

Geometric mean: .....

Was the sewage treatment plant tested with:

Fresh water flushing? .....

Salt water flushing? .....

Fresh and salt water flushing? .....

Grey water added? .....

Was the sewage treatment plant tested against the environmental conditions specified in section 5.9 of resolution MEPC.227(64):

Temperature: .....

Humidity: .....

Inclination: .....

Vibration: .....

Reliability of Electrical and Electronic Equipment: .....

Limitations and the conditions of operation are imposed:

Salinity: .....

Temperature: .....

Humidity: .....

Inclination: .....

Vibration: .....

Results of other parameters tested: .....