DNV·GL

CERTIFICATE OF CONFORMITY – EC (MODULE G)

Certificate No:
MEDG000001A

Application of: Council Directive 96/98/EC of 20 December 1996 on Marine Equipment as amended by directive 2014/93/EU, issued as "Forskrift om Skipsutstyr" by the Norwegian Maritime Directorate. This Certificate is issued by DNV GL AS under the authority of the Government of the Kingdom of Norway.

This is to certify:

That the On board exhaust gas cleaning systems

with type designation and serial number
ECO-DeSOx+MK3B15 - 14-046-APC installed onboard FINNSTAR (IMO 9319442)

Issued to
Ecospray Technologies S.r.l.
Alzano Scrivia - AL, Italy

is, by design assessment and product verification, found to comply with
Annex A.1, item No. A.1/2.10 and Annex B, Module G in the Directive. Marpol 73/78 as amended, Annex VI Regulation 4 and IMO Res. MEPC.259(68)

USCG Approval No: **N/A**

Further details of the equipment and conditions for certification are given overleaf.

Issued at **Høvik** on **2016-02-29**

DNV GL local station:
Høvik

Approval Engineer:
Tin Nguyen

Notified Body
No.: **0575**

for **DNV GL AS**

Vidar Dolonen
Head of Notified Body

Product description

The Ecospray EGC System onboard FINNSTAR is a Wet Open-loop scrubber system consisting of:

- one DOC (Diesel Oxydation Catalyst) filter installed after each main diesel engine (DE#1, DE#2, DE#3, DE#4)
- one ECO-DeSOx Tower for each main diesel engine (DE#1, DE#2, DE#3, DE#4)
- two gas analyzers (one for both DE#1 and DE#2; one for both DE#3 and DE#4)
- one SW (Sea Water) Inlet analyzer
- two Discharge Water analyzers (one for both DE#1 and DE#2; one for both DE#3 and DE#4)

The following working description is applicable to each of the four ECO-DeSOx Towers installed onboard the vessel and the connected diesel engines.

The exhaust gas produced by the engine is first treated in Ecospray DOC filter MK3B15 which improves the removal of particle matters and hydrocarbons, as well as CO, before the gas is treated in the ECO-DeSOx Tower.

After the DOC filter, the exhaust gas enters the Economizer and thereafter the ECO-DeSOx Tower. The process that takes place inside the ECO-DeSOx Tower is a natural absorption process to capture SO2 in the exhaust gas by using sea water.

At the outlet of each couple of ECO-DeSOx Towers, the cleaned exhaust gas freely exits in the atmosphere: No valves are fitted which can stop the exit of the gas.

Seawater is continuously supplied to the ECO-DeSOx Towers by SW pumps, and the required seawater flow rate is controlled based on parameters like engine load, % sulphur content in the exhaust gas, etc. Downstream the SW Pumps fully Automated Seawater Filters are installed to:

- Ensure a good SOx absorption process due to clean seawater
- Reduce heavy particles and biota that affect the spray pattern in the event of build-up on the nozzles, which are made of metal.
- Reduce abrasion of nozzles causing a change in the geometry, thus spray pattern.
- Reduce biota at the inlet of the process, ensuring a reduced/minimized O2 depletion during the SO2 absorption process.

The ECO-DeSOx Tower is fitted with three nozzle banks and one high efficiency contact tray.
A Static Demister is fitted at the top of the ECO-DeSOx Tower to remove water droplets and mist to avoid carry over. The water removed by the Demister is drained by gravity to the contact tray.
Absorbed seawater percolates through the contact tray to the base of the ECO-DeSOx Tower from where it is gravity-drained to the discharge line.

After being used in the ECO-DeSOx Tower, the Discharge Water (or Wash Water) passes through the Ecospray Filter prior to overboard discharge, in order to capture solid particles contained in the Discharge Water. The Ecospray Filter has an absolute degree of filtration of 10 microns. The Filter goes into a back-washing mode periodically where the Wash Water is pumped in a tank and subsequently in a bag filter, in order to allow collecting of solid particles that must be discharged ashore.

Application/Limitation

Exhaust Gas Cleaning (EGC) Systems are intended for reducing the SOx emissions to a level below the current and upcoming requirements in worldwide and ECA areas. In scheme B, compliance with emission requirements are demonstrated by continuous exhaust gas and washwater discharge monitoring. The monitoring system is to be approved by the Administration.

The monitoring equipment is to have yearly surveys according to MEPC.259(68)

Type Examination documentation

2014-46-0091 Rev 4:	ETM-B - EGC Technical Manual for Scheme B
2014-46-0092 Rev 6:	OMM - EGC Onboard Monitoring Manual
2014-46-0091 Rev 4:	EGC Record Book
2014-46-0093 Rev 3:	SECP - EGC SOx Emissions Compliance Plan
25496-19563508/DNV:	Washwater Analysis Reports

Tests carried out

25496-19563508/DNV:	DNV GL MARPOL survey checklist EGCS

Marking of product

The product is to be indelibly marked with name of manufacturer, type designation, dimensions and date of manufacture, according to LSA code item 4.4.1.2 and the mark of conformity. In addition, the manufacturer shall affix the Mark of Conformity followed by DNV Notified Body No. and the two last digits of the production year.

END OF CERTIFICATE