

Exhaust Treatment
Technical Services

WV92Q328
Issue 1, 03 September 2020

Exhaust Gas Cleaning system lay-up procedure

**Distribution to operators and owners of installations
concerned**

For your information

Products concerned
WÄRTSILÄ® SOx scrubbers.

Introduction
This document has been compiled to provide guidance to the operators regarding the maintenance activities for preservation of the Exhaust Gas Cleaning (EGC) system during long term stand still.

Validity
Until further notice.

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Document history

Issue	Date	Description	SBWT ID
1	03-09-2020	Initial release	003528

Introduction

The document found in the enclosure has been compiled to provide guidance to the operators regarding the maintenance activities for preservation of the Exhaust Gas Cleaning (EGC) system during long term stand still.

Enclosures

EGCS Lay-Up Procedure, 11 pages.

Contact

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Doc Name	EGCS Lay-Up Procedure		
Doc ID	DMTA00027598	Revision	-
Doc Type	Procedure	State	Finalized
Author		Modified	5/18/2020

EGCS Lay-Up Procedure

Preservation of EGC systems during an extended shutdown period

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1 Introduction

1.1 Purpose of Document

This document has been compiled to provide guidance to the operator regarding maintenance activities for preservation of the EGC system during long term stand still. The document is applicable for equipment supplied by Wärtsilä Moss AS.

Where relevant, reference is made to specific documentation supplied by third party equipment suppliers for equipment provided to Wärtsilä Moss AS for use in the EGC System. It is recommended that all equipment supplier specified requirements and advices are followed when performing maintenance tasks.

When system is to be re-started after a long period of stand still, all equipment to be thoroughly inspected and checked.

1.2 Application of Document

This document is provided for guidance only, and reference should be made to the P&ID drawing provided with system documentation for identification of the system components.

It is important to note that **all** maintenance functions are to be recorded in the EGC Record Book. The EGC Record Book is an approved document and will be subject to inspection on request by Flag/Port State and Classification Society surveyors.

1.3 System start-up

After a longer period in lay-up, it is recommended to perform a functionality test, similar to the test done during commissioning, to ensure correct operation and function of the EGC system. The functionality test should consist of the following activities:

- Operation of the scrubber in manual mode
- Operation of the scrubber system with automatic control
- Ensure that control settings and operating parameters are correct

2 Abbreviations

BOTU	Bleed-Off Treatment Unit
BOTU-M	Bleed-Off Treatment Unit - Membrane
BOTU-DAF	Bleed-Off Treatment Unit – Dissolved Air Flotation
CEMS	Continuous Emission Monitoring System
EGC	Exhaust Gas Cleaning
HEX	Heat Exchanger
HV	Hand Valve
MgOH ₂	Magnesium Hydroxide
NaOH	Sodium Hydroxide
SV	Solenoid Valve

3 EGC Unit(s)

3.1 Scrubber Unit(s) (15N01)

Scrubber internals to be visually inspected at time of shutdown and prior to restart of the system. For extended lay-up time it is also recommended to follow instructions for stainless steel maintenance; Visual inspections to be performed every **3 months** and scrubber cleaning to be performed **yearly**.

3.2 Venturi / Quench Unit(s) (15N10 /15N19)

Venturi(s) or Quench internals to be visually inspected at time of shutdown and prior to restart of the system. For extended lay-up, see 3.1.

3.3 Deplume System (15N15)

- Deplume air fans to be rotated manually or operated for a few minutes every **2 weeks**.
- While rotating the fan and motor, apply grease to replenish the bearing surfaces to maintain full bearing cavity every **4 weeks**.
- Manual soot cleaning of impeller and of fan casing with high pressure wash to be performed **when shutting down** the system for a longer time, water to be removed by dry-running the fan.
- **Regularly** clean dust and dirt off the motor using a low-pressure airstream.

4 Bypass System

4.1 Bypass Damper(s) (15V06)

- Dampers and their accessories should be visually inspected regularly during a long-term lay-up. This includes the sealing surfaces inside the duct, and they should be cleaned if necessary
- Regular maintenance inspections as described in system operating and system manual to be performed
- If it is necessary to start a connected combustion unit during lay-up, sealing air fans must also be initialized to avoid leakage of hot exhaust gas into the scrubber when it is not running.
- If extra soot cleaning of the damper is necessary during lay-up, this can be done by using manual override button on solenoid valve for soot cleaning in damper control cabinet.

4.2 Sealing Air Fan(s) (15N21)

- Sealing air fans to be rotated manually or operated for a few minutes every **2 weeks**.
- While rotating the fan and motor, apply grease to replenish the bearing surfaces to maintain full bearing cavity every **4 weeks**.
- Manual soot cleaning of impeller and of fan casing with high pressure wash to be performed **when shutting down** the system for a longer time, water to be removed by dry-running the fan.
- **Regularly** clean dust and dirt off the motor using a low-pressure airstream.

4.3 Boiler Booster Fan(s) (15N18)

- Boiler booster fan to be rotated manually or operated for a few minutes every **2 weeks**.
- While rotating the fan and motor, apply grease to replenish the bearing surfaces to maintain full bearing cavity every **4 weeks**.
- Manual soot cleaning of impeller and of fan casing with high pressure wash to be performed **when shutting down** the system for a longer time, water to be removed by dry running the fan.
- **Regularly** clean dust and dirt off the motor using a low-pressure airstream.

5 Valves

5.1 System Valves

5.1.1 Automated Valves SV-

All automated valves (SV-XX) to be operated every **4 weeks**. This can be done by using manual override button on the actuator. Valve to be operated AND returned to normal/fail position.

Normal/fail position positions are as per P&ID; NC=Normally closed, NO=Normally open, FC= Fail Close, FO=Fail Close

5.1.2 Manual Valves HV-

All manual valves (HV-XX) to be operated every **4 weeks**. Butterfly valves to be set in almost closed position (10 degrees open), as illustrated in XX.



Figure 5-1: Manual butterfly valve position during system idle time

6 Water Supply

6.1 Scrubbing Water Pump(s) (15P01)

- When pump(s) are not running the shaft shall be rotated at least every **2 weeks**. This to avoid standstill damage to shaft seal and bearings. If the pump is filled with liquid it can alternatively be started up shortly.
- If Scrubbing Water Pumps are also functioning as Closed Loop Pumps, low pH water is to be flushed out to avoid corrosion.
- If possible, while rotating the pump and motor, apply grease to replenish the bearing surfaces to maintain full bearing cavity every **4 weeks**.

6.2 Closed Loop Water Pumps (15P01)

Low pH water to be flushed out to avoid corrosion, otherwise see 6.1.

6.3 Cooling Water Pump(s) (15P02)

See 6.1.

6.4 Make-Up Water Pump (15P15)

See 6.1.

6.5 Reaction Water Pump (15P16)

See 6.1.

6.6 HEX – Heat Exchanger (15E01)

For long term shut-down, the heat exchanger is to be shut off, drained and flushed. For details on long term shut-down / storage procedure, please refer to product operating and maintenance manual.

7 Water Monitoring (15N06)

- When the system is to be shut down for longer than 30 days, the Water Monitoring systems is to be put in hibernation mode as described in operation manual.
- If system is completely drained, pH electrode is to be removed and kept moist.
- Prior to restart of the system, **6 months and 1 year maintenance** activities to be carried out as per system operating and maintenance manual.
- **If installed:** On 15N06/2, pump impeller to be removed from pump after flushing, dried, put in a plastic bag and put inside cabinet.
- **If installed:** During initial start-up, it is recommended to keep the end cover of the pump on 15N06/2 loosened to verify that the impeller is rotating.
- It is recommended to keep an impeller, end cover, shaft seal and pH electrode in stock as spare parts since these might need to be replaced when restarting the system from hibernation mode.

8 Pneumatic Panel (15F08)

No action needed.

9 Electrical and Automation Panels

- All electrical and automation panels are to be powered OFF.
- Power to be turned **ON** once per quarter (**every 3 months**) to verify that system is powering up as intended and identifying any communication issues. Findings to be recorded and rectified in due course before system is to be taken into use.

10 Instruments

10.1 General

All instruments, both transmitters, switches and gauges to be visually inspected every **6 months**. When system is powered up every **3 months** (ref section 9), reading of **all** transmitters to be checked.

Prior to restart of the system, all hardwired shutdown instruments to be tested:

- N01/1-LS-02
- N10/x-PS-01 (V-SOx)
- N19/x-PS-01 (Q-SOx)
- N01/1-TS-01
- T01/1-LS-01 (If process tank is installed)
- T08/1-LS-01 (If residence tank is installed)
- Emergency Stop Button(s)

In addition, N01/1-LS-01 to be tested.

10.2 Exhaust Gas Monitoring - CEMS (15N07)

- CEMS system to be decommissioned for long-term storage according to SICK instructions and stored in a dry, well-ventilated room whenever possible.
- Re-commissioning to be done according to SICK Technical Information manual
- Prior to restart of the system, 1-year maintenance activities to be carried out as per system operating and maintenance manual.

It is recommended that CEMS is re-commissioned by Wärtsilä/supplier when system is restarted.

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11 Tanks

11.1 Process Tank (15T01)

Process tank to be drained, cleaned and visually inspected at system shutdown. Prior to system start up tank is to be visually inspected again and refilled to necessary level using make-up water pump.

Process tank fan to be rotated manually or operated for a few minutes every **2 weeks**. While rotating the fan and motor, apply grease to replenish the bearing surfaces to maintain full bearing cavity every **4 weeks**. **Regularly** clean dust and dirt off the motor using a low-pressure airstream.

11.2 Residence Tank (15T08)

Residence tank to be drained, cleaned and visually inspected at system shutdown. Perform visual inspection again prior to system start up.

Residence tank fan to be rotated manually or operated for a few minutes every **2 weeks**. While rotating the fan and motor, apply grease to replenish the bearing surfaces to maintain full bearing cavity every **4 weeks**. **Regularly** clean dust and dirt off the motor using a low-pressure airstream.

11.3 Alkali Tank (15T04)

11.3.1 NaOH – System

Alkali tank is to be drained, cleaned and visually inspected at system shutdown. If drained, perform visual inspection again prior to system start up.

11.3.2 MgOH₂ – System

Alkali tank is to be drained, cleaned, visually inspected and system (including pipes) should be flushed. MgOH₂-slurry at a standstill will crystallize and will cause issues if stored without circulation.

11.4 Sludge Tank (15T07)

Sludge tank to be emptied and cleaned at system shutdown.

11.5 Holding Tank (15T03)

Maintenance and inspections according to vessel procedures.

12 Piping

12.1 Scrubbing Water Piping (SW Inlet → Scrubber)

If the system is stopped for a long time, please ensure the following:

- For an Open Loop system, it is preferable to drain the scrubbing water piping.
- For a Closed Loop system, the scrubbing water piping should be flushed and preferably drained to avoid deposition in the pipelines.

12.2 Wash Water Piping (Scrubber → Overboard)

If the system is stopped for a long time, all piping containing wash water should be flushed and preferably drained to avoid deposition in the pipelines.

12.3 Alkali Piping (NaOH or MgOH₂)

If the system is stopped for a long time, all piping connected to the alkali system should be flushed and drained to avoid deposition in the pipelines.

12.4 Sludge Piping

If the system is stopped for a long time, all piping connected to the sludge system should be flushed and drained to avoid deposition in the pipelines.

13 Water Treatment

13.1 BOTU-DAF (15N05)

When the system is shut down for an extended time, the BOTU-DAF separator should be prepared by removing the solids layer in the flotation tank and cleaning the tank. Next, the BOTU should be put in STOP mode. Details will be found in operation and maintenance manual.

General maintenance to be carried out as described in the operation and maintenance manual.

13.2 BOTU-M (15N05)

When the system is shut down for an extended time, the PRESERVATION program on the BOTU-M should be activated. This will pump the circulating content to the sludge and fill the circulation with technical water to preserve the membranes. Details will be found in the BOTU operating instruction.

General maintenance to be carried out as described in the maintenance manual.

13.3 Hydrocyclone (15N14)

Hydrocyclone to be flushed to ensure that no particles are left when shutting down system for an extended period. Prior to restart, **6 months** maintenance to be performed according to maintenance manual.

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13.4 Wash Water Pump (15N14)

See 6.2.

13.5 Sludge Dewatering Skid (15N16)

When the system is shut down, the filter bag is to be replaced and O-ring inspected (replace if necessary). During lay-up perform regular visual inspections for any wear or damage and keep the outer surface clean and free from dirt. Assess maintenance need for membrane pump and perform maintenance according to pump manufacturing manual if needed.