Oil mist separator module

Open design
# TABLE OF CONTENTS

1. MODULE DESCRIPTION ............ 3  
   Application ..................................................... 3  
   Design ..................................................................... 3  
   Functional description .................................. 3  
   Technical data ................................................ 4  
   Performance .................................................... 4  
   Dimensions and weights ........................... 4  
   Drawings and documents Error! Bookmark not defined. 
   Standards and protection classes ............ 4  
   Emissions ........................................................ 4  
   Site requirements ........................................... 4  
   Ambient conditions (operation) ............. 4  
   Storage conditions ........................................... 4  
   Electrical system .............................................. 4  
   Separator .......................................................... 4  

2. INSTALLATION ......................... 5  
   Safety instructions ........................................ 5  
   Product handling ........................................... 5  
   Scope of supply .............................................. 5  
   Storing the unit before installation .......... 5  
   Unpacking and checking delivery .......... 5  
   Preparing installation environment ....... 5  
   Assembling the module ............................... 5  
   Mounting the module ..................................... 5  
   Lifting the module ........................................... 5  
   Positioning and fastening the module ...... 6  
   Installing pipe connections .................... 6  

3. COMMISSIONING ..................... 8  
   Adjusting throttle valve ............................. 8  

4. OPERATION .............................. 9  
   Start and stop ................................................. 9  
   Starting and stopping separator ............... 9  
   Emergency stop .............................................. 9  
   Supervision ...................................................... 9  
   General ............................................................ 9  
   At clogged drain outlet pipe ................. 9  
   At abnormal vibration ............................. 9  
   Alarm handling .............................................. 9  

5. MAINTENANCE ....................... 11  
   Safety instructions ..................................... 11  
   Every 4000 running hours .................... 11  
   After 16000 running hours ................. 11  
   After major engine overhaul .............. 11
1. **MODULE DESCRIPTION**

**Application**

The oil mist separator module is used for removing oil particles from the crankcase ventilation gas.

The oil mist separator module is based on the Pure-vent separator from Alfa-Laval, which typically removes 98% of the oil particles. The module is available in two different designs:

- Open design, which means that the purified gas is let out into open air. The open design is suitable for diesel driven engines.
- Closed design, which means that the purified air is taken to the turbocharger, and no gases are released to the atmosphere. Closed design is suitable for gas driven engines.

This manual deals with the open design mode.

**Design**

The central component of the module is the electrically driven separator which is mounted on a steel frame along with the inlet and outlet pipes and a drain container. As the processed gas may be explosive, all components inside the separator are made of spark-proof material.

To improve the separation efficiency, a frequency converter is used for boosting up the speed of the electrical motor. The gas flow is adjusted to the engine size with a throttle valve in the inlet pipe.

The electrical equipment is installed in an electrical cabinet, which due to the heat sensitivity of the equipment cannot be mounted near the module. For emergency and maintenance stop there is a safety switch on the frame.

Balancing air to the separator is taken from the outlet air pipe. In case of a separator fault or overflow, the balancing air pipe will serve as a by-pass line.

**Functional description**

The crankcase ventilation gas is carried to the separator, where the heavier oil particles are centrifuged and collected into a drain pipe that empties into a small container. From the container the oil is carried back to the inlet pipe, where it flows back to the oil sump via the crankcase.
Technical data

Performance
Capacity: Up to 400 Nm³/h
Inlet gas temperature: 20 – 80 °C
Cleaning efficiency: 98 % at a flow rate of 150 Nm³/h. The efficiency is reduced at higher flow rates, and improved at lower flow rates.

Dimensions and weights
Dimensions: See the dimensional drawing.
Weight, DN100: About 155 kg, packed about 200 kg
Weight, DN150: About 185 kg, packed about 230 kg

Standards and protection classes
Safety standard: EN 292, Safety of machinery
Piping standard: EN 13480
Enclosure class: IP54 + drip water safe

Emissions
Heat dissipation: About 2 kW
Noise: Max. 80 dB(A)
Vibration: Less than 28 mm/s (RMS)

Site requirements
Space requirements: The dimensions + service space at least the same height as the separator above the top of the module.

Flatness tolerance: 10 mm
Vibration resistance: Max. 20 mm/s

Ambient conditions (operation)
Temperature: Separator: 0°C - 65°C
Humidity: Must not be exposed to water
Electrical cabinet: 0°C - 30°C
Recom. humidity: < 60%

Storage conditions
Stable conditions. Dry, vibration free, and dust free.
Temperature: 0°C - 30°C
Recom. humidity: < 60%

Electrical system
Operating voltage: Three phase 380 - 480 VAC
Frequency: 50 or 60 Hz
Power consumption: Max. 1.5 kW
Frequency converter: ABB ACS 140 2.2 kW
Cabling: 4 wires, L1, L2, L3, PE
Min. cable size: 2.5 mm²

Separator
Type: Purevent
Supplier: Alfa-Laval
Power: 1.5 kW with heavy duty bearing and bearing housing
Speed: 7200 rpm
Number of discs: 185
Housing: Aluminum casting
2. INSTALLATION

Safety instructions

Do not go under the module while it is lifted.
The installation of the electrical system must be done by a certified electrician.

Product handling

Scope of supply
The module is delivered in three pieces included in the same package:

- The separator housing and the pipe systems fastened within the frame
- The separator disc stack and the electrical motor including 1m cable and a quick coupling, due to their fragility packed separately in an expanded polystyrene box
- The control cabinet including frequency converter, RFI filter (grounded networks), cooling fan and front panel.

Storing the unit before installation
Store the unit inside in stable, dry, vibration free and dust free conditions. If the unit must be stored outdoors, keep the container unopened, or cover it thoroughly.

Unpacking and checking delivery
Check that the delivery is in accordance with the packing list.

Remove the counter flanges from one or more pipes and check that the pipes are clean. Replace the counter flanges and protection plates.

Preparing installation environment

The module must be placed so that it is accessible for supervision and service.

Note! To enable the disk stack to be removed, a service space at least the same height as the separator (614 mm) is required above the top of the module.

Assembling the module

Note! The disk stack is fragile. It is recommended to assemble the separator after the module has been mounted in its place.

Assemble the separator in accordance with the assembly instructions provided by Alfa-Laval.

Mounting the module

Lifting the module
Lift the module in the lifting lug using an appropriate lifting device. The weight of the module is 150 kg (with DN100 pipes) or 175kg (with DN150 pipes).

Warning! Do not go under the unit while it is lifted.
Positioning and fastening the module
Fasten the module with four fixing bolts (φ14) at the bottom frame. Tighten the bolts.

Installing pipe connections

General
Refer to the dimensional drawing and the flow diagram.
The module is delivered including counter flanges and gaskets.

Note! Remove the protective plates and adjust the pipes in correct positions before welding the flanges.

Installing inlet pipe (1)
Connect the pipe to the engine crankcase outlet.

Installing outlet pipe (2)
Lead the pipe out through the roof.

Installing drain pipe (3)
Connect the drain pipe to the straight part of the crankcase ventilation pipe close to the engine.

Installing power supply system

Connecting power supply to cabinet
The power supply to the electrical cabinet may be factory installed in some models. Otherwise, connect the power supply cable to the safety switch and to the PE grounding in the electrical cabinet according to the wiring diagram.
Connecting power supply to separator

Connect the power supply cable from the frequency converter outlet to the safety switch on the module. Connect the separator motor to the safety switch.

Note! Use a power cable with a concentric protective conductor or shield (for instance, EKKJ, FKKJ, RKFK, MCMK, Ölflex Classic 100CY or similar).

Installing control system

General

When installing the oil mist separator in an existing plant, some modifications are required in the plant control system:

- Configuration of input channels
- Alarm activation and indication

The control system installation is completed by connecting the signal wires.

Configuring input channels

The following input channels must be configured in the plant control system:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separator running signal</td>
<td>DI</td>
</tr>
<tr>
<td>Separator common alarm signal</td>
<td>DI</td>
</tr>
</tbody>
</table>

Alarm activation and indication

In auto mode, the oil mist separator should start when the engine has started (engine running signal activated) and stop when the engine is stopped (engine running signal de-activated). The plant control system should activate an alarm if the separator is not started or stopped correctly. Refer to Alarm handling on page 9 for an overview of the alarms.

Oil mist separator not running alarm should be activated if separator running signal is not received within 2 minutes after the engine running signal. The time delay is needed to prevent false alarm due to the acceleration curve of the separator.

Oil mist separator running alarm should be activated if the oil mist separator does not stop when the engine has stopped. This is not very crucial and there can be a 10 minutes time delay before the alarm is activated.

Common alarm should be indicated in the plant control system at an alarm signal from the separator control system.

Connecting signal wires

Connect the “Separator running” signal and the “Separator common alarm” signal from the separator cabinet to the plant control system (see above).

Connect the “Engine running” signal from the plant control system to the separator cabinet. Engine running signal is available as a potential free contact (either from auxiliary relay or PLC output)

Refer to the wiring diagram.
3. COMMISSIONING

Adjusting throttle valve

1. Start the separator and wait until it reaches full speed.
2. The diesel/gas engine must be running on 100% output.
3. Remove the lower pipe clamp on the flexible balancing air pipe (1). Cover the opening of the flexible pipe to prevent gases after the separator to come out from the balancing pipe while adjusting the throttle valve.
4. Close the throttle valve (2) in small steps until visible smoke starts to emerge through the lower opening (3).
5. From the position when smoke is starting to escape, open the throttle valve 2.5 degrees. Check that no visible gas is coming out from the lower opening.
6. Fasten the pipe clamp on the balancing air pipe.
7. Lock the throttle valve locking screw and remove the valve handle to prevent accidental adjustment.
4. OPERATION

Start and stop

Starting and stopping separator
The separator is switched on and off with the switch on the control panel.

During operation the separator control switch should be in AUTO position, which means that the separator is started when the engine starts, and stopped when the engine stops. The possibility to run the separator manually is intended for test and maintenance purposes.

Emergency stop
The safety switch on the module can be used as local emergency stop.

Supervision

General
The following events in the oil separator module require operator interventions:

- Clogged drain outlet pipe. If the oil level in the drain container rises and flows over, the drain outlet pipe is clogged.
- Abnormal vibration. The vibration can be supervised by putting a hand on the separator.

In both cases can the engine be kept running. The ventilation air will flow out un-cleaned.

At clogged drain outlet pipe
1. Stop the separator and close the throttle valve.
2. Clean the drain pipe.
3. Open the throttle valve in about the same position as before the stop and restart the separator.
4. Adjust the throttle valve as described on page 8.

At abnormal vibration
1. Stop the separator and close the throttle valve.
2. Have the separator overhauled. See the Alfa-Laval documentation.
3. Open the throttle valve in about the same position as before the stop and restart the separator.
4. Adjust the throttle valve as described on page 8.

Alarm handling

Oil mist separator not running alarm
“Oil mist separator not running” alarm is activated in the plant control system if the separator is not running when the engine is running.

1. Ensure that the separator control switch is in AUTO position.
2. Check that the safety switches on the control panel and on the module are in ON position.
3. If the separator has stopped due to a fault, close the throttle valve.

Adjust the throttle valve as described on page 8 when restarting the separator.

For separator trouble shooting, refer to the Alfa-Laval documentation.
**Oil mist separator running alarm**

This alarm is activated if the oil mist separator is running though the engine is stopped.

Check that the separator control switch is in AUTO position.

**Separator common alarm**

The common alarm is activated in the oil mist separator panel. The reason may be separator motor or frequency converter failure.
5. MAINTENANCE

Safety instructions

Set the safety switch on the module in 0 position before opening the separator.

Every 4000 running hours

Open the separator and check that there are no deposits. Clean if needed. Check the drain outlet. Close the separator. See the separator manual.

After 16000 running hours

Replace the disc stack and motor. Refer to documentation provided by Alfa-Laval.

After major engine overhaul

Adjust the throttle valve as described on page 8.