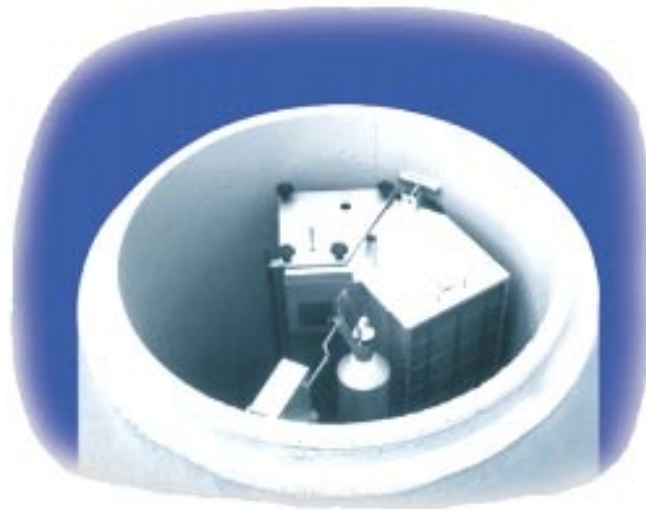


Test Procedure for coalescing oil water separators



According to DIN 1999 and pr-EN 858

1 Testing apparatus

The testing equipment for determining the performance response for nominal size shall comply with to Figure 1, Figure 2 and Figure 3.

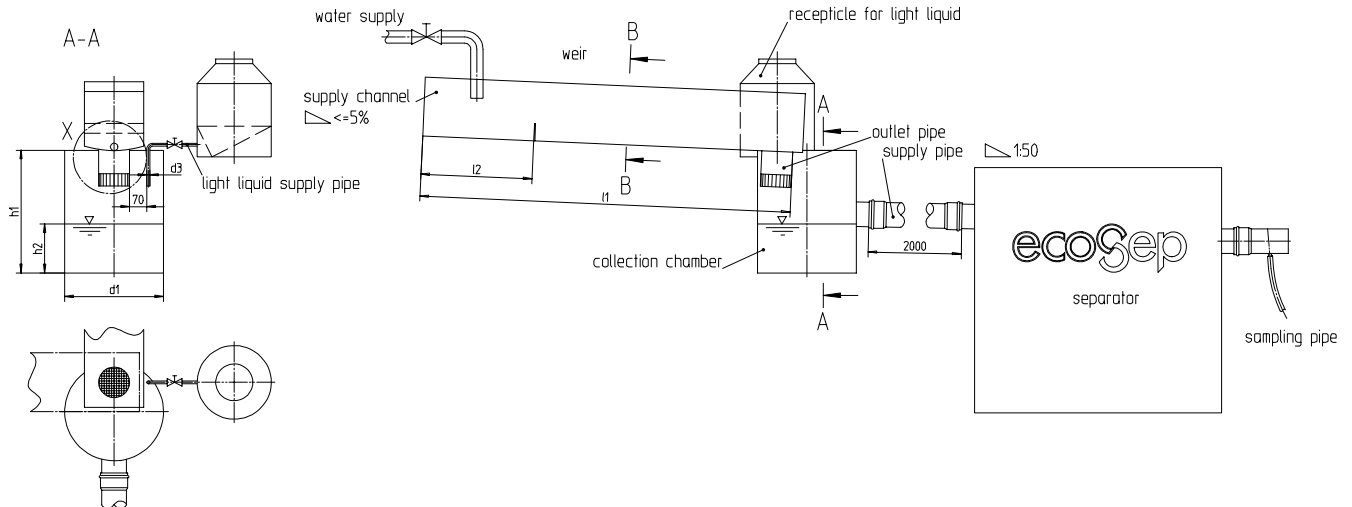


Figure 1: Testing apparatus

The supply pipe between the collecting chamber and the separator shall have the nominal diameter of the inlet pipe of the separator. For separators having two inlet pipes, the supply pipe close to the collecting chamber, shall be divided into two appropriate branch pipes, each having a length of 2 m. The cross section of the supply pipe close to the collecting chamber but before the branching shall be equivalent to the total cross section of the two branch pipes.

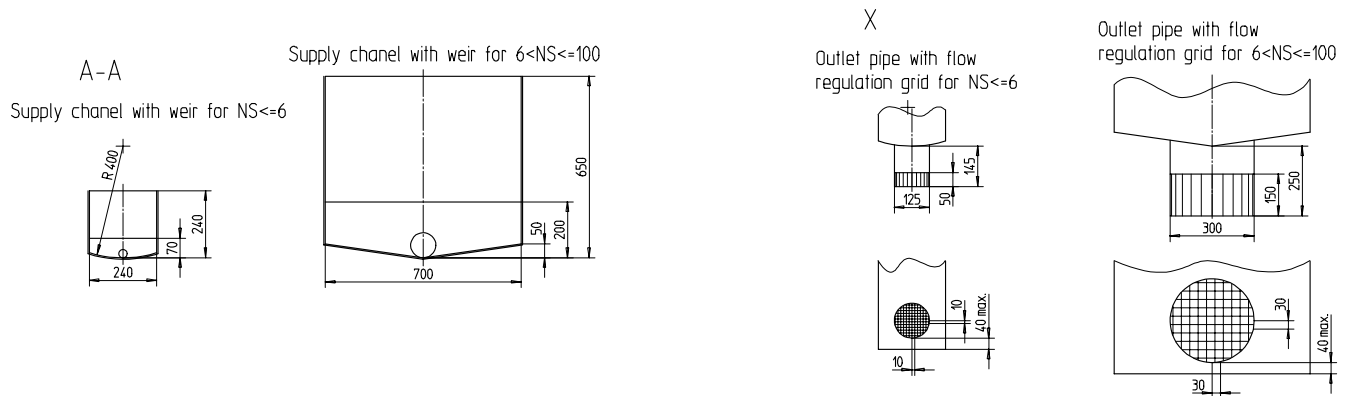


Figure 2: Supply channel

The test fluids shall be supplied by means of dosing pumps allowing appropriate flow control or by gravity. The flow rates shall be constant during testing. The outlet pipe(s) of the supply channel shall receive a stream regulating grid, it must be ensured that the cross section of the outlet pipe(s) is even and uniformly charged. The end(s) of the outlet pipe(s) and light liquid supply pipe shall be on the level.

2 Test fluids

2.1 Water

The water used shall be drinking water or river water that has been purified by mechanical means. The temperature shall be between 4°C and 20°C and the pH-value 7 ± 1 .

2.2 Light liquid

Extra light heating oil (see Section 5). The mixing with other types of oil in order to adjust the density is not permissible.

3 Test procedure

Fill the separator with water. The volume of water (V_k) and the resulting water level determined without flow through the separator.

The water level at maximum allowable flow rate Q_w and the fluid level after reaching the storage capacity of light liquid shall be measured (in the latter case, determining by way of calculation shall be accepted for separators > NS 6).

The essential test for the determination and/or verification of the nominal size and of the performance of the separator shall have a total duration (T) comprising of a running in period T_E and the proper test period T_p .

The running in period (T_E) shall be equivalent to the length of time needed to exchange four times the volume (V_k) this should be for a minimum of 15 min.

$$T_E = (4 \cdot V_k) / (Q_w \cdot 60)$$

Where

T_E ... running in period in min.

V_k ... water volume of separator in l

Q_w ... maximal allowable of water in l

The specific test period (T_p) shall be 5 min.

The maximum allowable flow rate Q_w shall be maintained and the heating oil to be added at a constant flow rate of 5ml/l during the duration of the test (T).

The content of residual oil in the effluent of the separator shall be $\leq 5,0$ mg/l response.

4 Sampling and analysis

Sampling shall be made in every outlet of the separator. To this end a sampling pipe according to Figure 1, Figure 2 and Figure 3 shall be used which is connected to an outlet hose, test fluid being discharged during the whole of the test period(T).

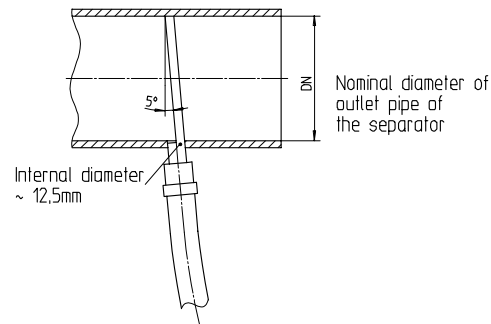


Figure 3: Sampling pipe

After the running in period (TE) response from the beginning of the specific test period (Tp), five samples shall be taken at 1 min. intervals.

The samples shall be analyzed according to Section 6. The content of oil in the samples being determined by infrared absorption. Extra light heating oil according to Section 5 shall be used as a reference fluid.

The content of oil shall be calculated as the mathematical mean value resulting from the five samples.

5 Standard requirements for extra light heating oil

The extra light heating oil used as a test fluid and reference fluid shall comply with the following requirements:

	Requirement	Test method
Density at 12°C	0.85 (+0/-0.015) g/cm ³	ISO 3675
Flash point	above 55 °C	ISO 2719
Viscosity at 20°C	min. 2.8 cSt max. 6.0 cSt	ISO 3104 and ISO 3105
Cold filter plugging point (CFPP)	max. -8 °C	EN 116
Distillation characteristics up to 350 °C:	min. 90% (Vol.)	ISO 3405
Total sulfur content	max. 0.10% (mass)	EN 41
Copper strip test	max. 1b	ISO 2160
Conradson carbon residue of the 10%(Vol.) distillation residue	max. 0.15% (mass)	ISO 6615
Ash content	max. 0.01% (mass)	EN 7

The heating oil shall be free of deposited water and solid foreign substances and shall be colored according to the local regulations.

6 Standard requirements for analysis of effluent samples

Samples shall be analyzed for their hydrocarbon content using infrared spectroscopy. It is necessary to consult experts and/or specialist institutions for examinations based on these specification and, if necessary to refer to the requirements of the appropriate standards (e.g., DIN 38 409 Part 18).

6.1 Extraction and preparation of the extract

Approximately 500 ml of water, taken through the sampling pipe is weighed into a separating funnel, rated volume 1000 ml, and directly extracted. The mixture shall be set to a pH value of between 1 and 2 using sulfuric acid and 25 ml of 1.1.2-trichloro-1.2.2-trifluoroethane must be added. It is then immediately agitated, with a frequency of 3 to 4 Hz, for 10 min and the phases are then allowed to settle for 30 min. After phase separation the aqueous fraction is run off leaving the organic fraction in the bottom of the flask which is immediately filtered through approximately 10 g of anhydrous sodium-sulfate contained in a 50 ml flask. The extract obtained is then passed through a chromatography column containing 8 g of activated alumina, neutral grade.

6.2 Evaluation

The purified extract shall contain 0.1 to 8 ml of hydrocarbons in 25 ml of extracting agent. Measurement is made against a reference of the pure solvent of same layer thickness using matched cuvettes of equal length. Before measurement, a transmission value of exactly 100% is set with the cuvettes inserted at 3.2 μm . Those absorption bands showing 3.38 and 3.42 μm are recorded.

The mass concentration of hydrocarbons in the water sample is obtained from:

$$G = [1.4 \cdot V_{TE} \cdot (E_1/C_1 + E_2/C_2)] / V_p \cdot d$$

wherein:

- G ... mass concentration of hydrocarbons in mg/l in the water sample
- V_{TE} ... Volume of the extracting agent used for extraction, in ml
- E_1 ... spectral absorption magnitude of CH3 band at 3.38 μm
- C_1 ... molecular extinction coefficient of the CH2 band, in ml/(mg*cm)
- E_2 ... spectral absorption magnitude of CH2 at 3.42 μm
- C_2 ... molecular extinction coefficient of the CH2 band, in ml/(mg*cm)
- V_p ... volume of water sample used, in l
- d ... layer thickness of absorbent solution, in cm

The result is indicated as a rounded value to an accuracy of:

- 0.1 mg/l for < 10 mg/l; and
- 1 mg/l for \geq 10 mg/l.

Heating extra light oil according to Appendix B shall be used as a reference substance for calibration, i.e., to determine the group absorbance coefficients.

6.3 Comment

Similarly, when hydrocarbon concentrations > 5.0 mg/l, it is possible to use non-dispersive infrared devices. With this method, the hydrocarbon concentration is evaluated solely using the CH2 absorption band at 3.42 μm . Also in this case extra light heating oil shall be used for calibration.

Extraction and preparation of the extract shall be conducted as described under Section 6.1.