



ecoSepTM
Oil-water separator

ecoStopTM
Spill control system

Testing Summary

protect **TODAY** by
building for **TOMORROW**

The ecoSep™ oil water separator and ecoStop™ spill prevention system products have been thoroughly tested to provide proven performance for oil removal and spill control characteristics. This document provides a summary of this testing, copies of the actual test certificates are available upon request.

All testing was conducted at the LGA laboratories in Austria in accordance with standard DIN1999.

1. Testing of Closure Valve

Tests were conducted to determine the water tightness of the closure valve in the shut off position and check the volume of oil required to immerse the float. These tests were conducted on all three of the standard ecoStop™ spill prevention system valves.

FLOAT TEST:

The floats for each of the three standard ecoStop™ spill prevention system models were tested for the height of light liquid required to immerse the float and cause it to sink, closing the valve. For this test a light liquid (oil) with a specific gravity of 0.85 was used.



RESULTS OF FLOAT TESTING

Float Model Number	Light Liquid Density [g/cm ³]	Height of Liquid to Fully Immerse Float
DN100	0.85	230 mm
DN150	0.85	230 mm
DN200	0.85	230 mm

WATER TIGHTNESS TEST:

A pressure differential was placed across the inlet and outlet with the shut off valve in its closed position. This was then monitored for a period of 15 minutes for leakage through the valve. The maximum allowable leakage is determined from the standard DIN1999 and is related to the maximum allowable flow rate through the valve. The minimum measurable leakage in this test was 10ml.

RESULTS OF WATER TIGHTNESS TESTING			
Pressure Differential from Inlet to Outlet [m water column]	Valve model number	Maximum allowable leakage in 15 min. period	Actual leakage over 15 minute period
0.1m	DN100	300ml	<10ml
	DN150	600ml	<10ml
	DN200	1500ml	<10ml
5.0m	DN100	300ml	<10ml
	DN150	600ml	<10ml
	DN200	1500ml	<10ml

2. Testing of Oil Removal Rates

In these tests an oil and water mixture was run through the ecoSep™ oil-water separator to measure the effectiveness of the ecoSep™ oil-water separator at removing free oils from water. The testing was conducted in accordance with standard DIN1999 and conducted by LGA testing laboratories in Austria. Two models were tested, the first with a flow rate of 3 l/s, and the second with a flow rate of 10 l/s. For each test the ecoSep™ oil-water separator unit was tested using coalescing filter of thickness of 100mm (Type A) and 150mm (Type B).

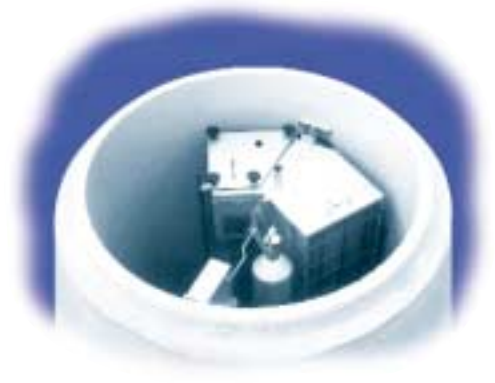
The test procedure and set up follows in the attachment. The oil used in the test had a specific gravity of 0.85.



RESULTS

TEST 1:

Nominal flow rate Q = 3 l/s
 Duration of test T = 22 minutes
 Water quantity for test V = 3960 liters
 Oil quantity for test V_{oil} = 19.8 liters (5000ppm)



RESULTS FOR TYPE A WITH 100MM THICK COALESCING MATERIAL

Influent Flow	Sample Number	Effluent Oil Concentrations
3 l/s	1	4.0 mg/l
	2	3.8 mg/l
	3	4.0 mg/l
	4	4.2 mg/l
	5	3.9 mg/l
	Mean Value	4.0 mg/l
	DIN 1999 Requirement	≤ 5 mg/l

RESULTS FOR TYPE B WITH 150MM THICK COALESCING MATERIAL

Influent Flow	Sample Number	Effluent Oil Concentrations
3 l/s	1	3.6 mg/l
	2	3.3 mg/l
	3	3.0 mg/l
	4	3.3 mg/l
	5	3.7 mg/l
	Mean Value	3.4 mg/l
	DIN 1999 Requirement	≤ 5 mg/l

RESULTS

TEST 2:

Nominal flow rate	Q = 10 l/s
Duration of test	T = 21 minutes
Water quantity for test	V = 12,600 liters
Oil quantity for test	V _{oil} = 63 liters (5000ppm)

RESULTS FOR TYPE A WITH 100MM THICK COALESCING MATERIAL		
Influent Flow	Sample Number	Effluent Oil Concentrations
10 l/s	1	4.0 mg/l
	2	4.4 mg/l
	3	4.8 mg/l
	4	4.8 mg/l
	5	4.6 mg/l
	Mean Value	4.5 mg/l
	DIN 1999 Requirement	≤ 5 mg/l

RESULTS FOR TYPE B WITH 150MM THICK COALESCING MATERIAL		
Influent Flow	Sample Number	Effluent Oil Concentrations
3 l/s	1	2.6 mg/l
	2	2.9 mg/l
	3	2.2 mg/l
	4	2.3 mg/l
	5	2.6 mg/l
	Mean Value	2.6 mg/l
	DIN 1999 Requirement	≤ 5 mg/l