

Summary of measured values

017/12 A	Process water
017/12 A	Distillate
017/12 A	Concentrate

Company: Eks Poznań
Contact: Mir Krzysztof Madajczak
Application: Degreasing
Project-No.: 93100384 / 1000 ClearCat®
Lab test: MVC (600 mbar/ 86 °C)
Date: 30.01.2012 / bp

[illegible]

1) Separation funnel	5) Dr. Lange	9) without settle able parts	13) calcinated
2) Imhoff funnel	6) Merck Quiktest	10) Hydrocarbon total DEV H18/ H17	14) stabilised with KCL due to low conductivity
3) Satorius MA 30 (65°C)	7) filtrated	11) Hydrocarbon non polar DEV H18	n.d. not determinable due to complex matrix
4) WTW Multiline	8) without free oil	12) mean value	< less than
			> greater than

The values above refer to a failure-free operation of the VACUDEST®. Base is a process water composition according the analyzed sample.

Aim of the lab test

- Determination of the concentration
- Quality of distillate

Chemicals

- none (material safety data sheets missing)

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SWIFT (BIC): HYVDEMM357
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SWIFT (BIC): SOLADES10E

Ekos Poznan Sp.z.o.o
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process water engineering
VACUDEST® Technology



Lab report 017/12 VACUDEST® 1000 ClearCat® Project 93100384

for the treatment of process water from
cooling lubricant

Smart ideas for clean water

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Summary of measured values

017/12 B	Process water	After UF
017/12 B	Distillate	
017/12 B	Concentrate	

Company: Ekos Poznan
Contact: Mr Krzysztof Madajczak
Application: Cooling lubricant
Project-Nº: 93100384 / 1000 ClearCar®
Lab test: MVC (600 mbar/ 86 °C)
Date: 30.01.2012 / b5

[illegible]

1) Separation funnel	9) Hydrocarbon to tal DEV H18/H17	12) mean value	< less than	> greater than	~ about
2) Imhoff funnel	10) Hydrocarbon to tal DEV H18/H17				
3) Sartorius MA 30 (65°C)	11) Hydrocarbon non polar DEV H18				
4) WTW Multiline	13) calculted				
	14) stabilised with KCl due to low conductivity				
	n.d. not determinable due to complex matrix				
	7) filtrated				
	8) without free oil				
	5) Dr. Lange				
	6) Merck Quicktest				

The values above refer to a failure-free operation of the VACUDEST®. Base is a process water composition according the analyzed sample.

Aim of the lab test

- Determination of the concentration
- Quality of distillate

Chemicals

none (material safety data missing)

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Lab Report 017/12



Characterisation of the process water

The process water 017/12 A contains 0,4 percent of high boiling substances (total evaporation residue). There could be detected less than 10 ppm ammonia, 57 ppm chloride, 810 ppm organic acids and 4,3 mmol/l water hardness in the sample.

To avoid off odour due to anaerobic rottenness and to improve distillate quality we recommend to equip all feed tanks with our JetFlex ventilation system.

Distillation test

Because of the organic acids it is necessary to correct the pH-factor from pH-factor 6,2 to pH-factor 9,5 with caustic potash (0,2 ml KOH 50% / litre).

During the lab test with MVC – conditions (mechanical vapour compression evaporator) 200 grams of the sample have been distilled at 600 mbar with the rotary evaporator. The sample could be concentrated to a rest of 3,5 percent.

During the test we could not recognize foaming. The addition of defoamer was not necessary. For safety reasons we recommend equipping the VACUDEST® with an automatic defoamer dosage device.

Assessment of distillate and concentrate

The distillate is colourless clear. It has no floating oils. If the distillate need to be absolute free of oil, we recommend the use of our ClearCat® technology for total oil elimination.

The conductivity can be reduced of 97,6 percent to 27 µS/cm. The chemical oxygen demand (COD) can be reduced of 97,3 percent to 213 ppm. The pH-factor of the distillate is 8,6.

The concentrate is liquid, grey brown with settle able parts and a pH-factor of 8,8.

Assessment of cleaning

After the distillation was a little oily layer on the distilling flask. The layer could be removed by rinsing with our cleaning agent CL 1-1 and APC balls. Therefore we recommend equipping the VACUDEST® with an automatic rinsing device and the self cleaning fluidised bed heat exchanger ActivePowerClean® (APC).

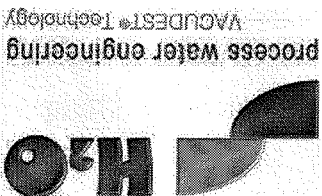
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Lab Report 017/12



Summary of measured values

017/12 C	Process water	Volkswagen
017/12 C	Distillate	
017/12 C	Concentrate	

Company: Ekos Poznan
 Contact: Mr Krzysztof Madajczak
 Application: Cooling lubricant
 Project-Nº: 93100384 / 1000 ClearCat®
 Lab test: MVC (600 mbar/ 86 °C)
 Date: 30.01.2012 / bb

Appearance		
Smell		
Total evaporation residue ³⁾	TR	%
Amount	g	
Evaporation rate	ER	%
Concentration	factor	1:
pH – factor (20 °C) ⁴⁾	pH	
conductivity (25 °C) ⁴⁾	LF	µS/cm
reduction of conductivity		%
Chemical Oxygen Demand ⁵⁾	COD	ppm
reduction of COD		%
Ammonia nitrate ⁶⁾	NH4-N	ppm
Chloride ⁶⁾	Cl-	ppm
Water hardness ⁶⁾		mmol/l

1) Separation funnel
 2) Imhoff funnel
 3) Sartorius MA 30 (65°C)
 4) WTW Multiline
 5) Dr. Lange
 6) Merck Quicktest
 7) filtered
 8) without free oil
 9) without settle able parts
 10) Hydrocarbon total DEV H18/ H17
 11) Hydrocarbon non polar DEV H18
 12) mean value
 13) calculated
 14) stabilised with KCL due to low conductivity
 n.d. not determinable due to complex matrix
 < lesser than
 > greater than
 ~ about

The values above refer to a failure-free operation of the VACUDEST®. Base is a process water composition according to the analyzed sample.

Aim of the lab test

- Determination of the concentration
- Quality of distillate

Chemicals

- none (material safety data sheets missing)

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Lab Report 017/12



Characterisation of the process water

The process water 017/12 B contains 5,2 percent of high boiling substances (total evaporation residue). There could be detected less than 10 ppm ammonia, 95 ppm chloride and less than 0,9 mmol/l water hardness in the sample.

Distillation test

During the lab test with MVC – conditions (mechanical vapour compression evaporator) 400 grams of the sample have been distilled at 600 mbar with the rotary evaporator. The sample could be concentrated to a rest of 16 percent.

During the test we could recognize any foaming. The addition of defoamer was not necessary. For safety reasons we recommend equipping the VACUDEST® with an automatic defoamer dosage device.

Assessment of distillate and concentrate

The distillate is colourless clear. It has no floating oils. If the distillate need to be absolute free of oil, we recommend the use of our ClearCar® technology for total oil elimination.

The conductivity can be reduced of 74,1 percent to 482 µS/cm. The chemical oxygen demand (COD) can be reduced of 97,0 percent to 5,712 ppm.

The pH-factor of the distillate is 9,5.

The concentrate is pasty, beige brown with settle able parts and a pH-factor of 7,9.

Assessment of cleaning

After the distillation was a little oily layer on the distilling flask. The layer could be removed by rinsing with our cleaning agent CL 1-1 and APC balls (hot). Therefore we recommend equipping the VACUDEST® with an automatic rinsing device and the self cleaning fluidised bed heat exchanger ActivePowerClean® (APC).

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Lab Report 017/12

process water engineering
VACUDEST® Technology

Summary of measured values

017/12 D Process water	017/12 D Distillate	017/12 D Concentrate
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Company: Ekos Poznan
Contact: Mr Krzysztof Madajczak
Application: Cooling lubricant
Project-Nº: 93100384 / 1000 ClearCat®
Lab test: MVC (600 mbar/ 86 °C)
Date: 30.01.2012 / bb

Appearance		
Smell		
Total evaporation residue ³⁾	TR	%
Amount	g	
Evaporation rate	ER	%
Concentration	factor	1:
pH – factor (20 °C) ⁴⁾	pH	
conductivity (25 °C) ⁴⁾	LF	µS/cm
reduction of conductivity		%
Chemical Oxygen Demand ⁵⁾	COD	ppm
reduction of COD		%
Ammonia nitrate ⁶⁾	NH ₄ -N	ppm
Chloride ⁵⁾	Cl-	ppm
Organic acids ⁵⁾	CH ₃ COOH	ppm
Water hardness ⁶⁾		mmol/l

Orange beige strong trouble	Colourless clear	Dark brown Oily
Clearly solvent	Neutral	
1,6	0,0	30,7 ¹³⁾
500	474	26
-	94,8	5,2
-	-	19,2
6,5	9,8	8,9 (38°C)
4,210	677	-
-	83,9	-
47,580	5,024	-
-	89,4	-
~ 100	~ 80	-
243	-	~ 4,666 ¹³⁾
3,330	-	-
~ 2,3	-	~ 44 ¹³⁾

- 1) Separation funnel
2) Imhoff funnel
3) Sartorius MA 30 (65°C)
4) VTM Multiline
5) Dr. Lange
6) Merck Quicktest
7) filtrated
8) without free oil
9) without settle able parts
10) Hydrocarbon total DEV H18/ H17
11) Hydrocarbon non polar DEV H18
12) mean value
13) calculated
14) stabilised with KCL due to low conductivity
n.d. not determinable due to complex matrix
< lesser than
> greater than
- about

The values above refer to a failure-free operation of the VACUDEST®. Base is a process water composition according the analyzed sample.

Aim of the lab test

- Determination of the concentration
- Quality of distillate

Chemicals

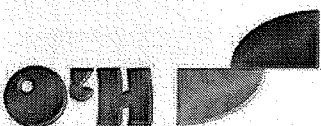
- none (material safety data sheets missing)

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Lab Report 017/12



Characterisation of the process water

The process water 017/12 C contains 1,4 percent of high boiling substances (total evaporation residue). There could be detected 60 ppm ammonia, 95 ppm chloride and 2,1 mmol/l water hardness in the sample.

Distillation test

During the lab test with MVC – conditions (mechanical vapour compression evaporator) 500 grams of the sample have been distilled at 600 mbar with the rotary evaporator. The sample could be concentrated to a rest of 3,0 percent.

During the test we could not recognize foaming. The addition of defoamer was not necessary. For safety reasons we recommend equipping the VACUDEST® with an automatic defoamer dosage device.

Assessment of distillate and concentrate

The distillate is colourless clear. It has no floating oils. If the distillate need to be absolute free of oil, we recommend the use of our ClearCat® technology for total oil elimination.

The conductivity can be reduced of 77,0 percent to 627 µS/cm. The chemical oxygen demand (COD) can be reduced of 96,9 percent to 1.043 ppm.

The pH-factor of the distillate is 9,3.

The concentrate is pasty, dark brown with settle able parts and a pH-factor of 9,6.

Assessment of cleaning

After the distillation was a clearly oily layer on the distilling flask. The layer could be removed by rinsing with our cleaning agent CL 1-1 and APC balls. Therefore we recommend equipping the VACUDEST® with an automatic rinsing device and the self cleaning fluidised bed heat exchanger ActivePowerClean® (APC).

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Summary of measured values

017/12 E	Process water	From car washing
017/12 E	Distillate	
017/12 E	Concentrate	

Company: Ekas Poznan
Contact: Mr Krzysztof Madajczak
Application: Car washing
Project-Nº: 93100384 / 1000 ClearCat®
Lab test: MVC (600 mbar/ 86 °C)
Date: 30.01.2012 / bb

Appearance	Smell	Total evaporation residue ³⁾	TR	%	Amount	g	Evaporation rate	ER	%	Concentration	pH – factor (20 °C) ⁴⁾	pH	LF	conductivity (25 °C) ⁴⁾	<i>reduction of conductivity</i>	Chemical Oxygen Demand ⁵⁾	COD	ppm	<i>reduction of COD</i>	Ammonia nitrate ⁶⁾	NH4-N	ppm	Cl- ppm	mmol/l
								factor	1:															

(7) Separation funnel
(8) without free oil
(9) without settleable parts
(10) Hydrocarbon total DEV H18/H17
(11) Hydrocarbon non polar DEV H18
(12) mean value
< lesser than
> greater than
n.d. not determinable due to complex matrix
{3} calculated
{4} stabilised with KCl due to low conductivity

The values above refer to a failure-free operation of the VACUDEST®. Base is a process water composition according to the analyzed sample.

Aim of the lab test

- Determination of the concentration
- Quality of distillate

Chemicals

- none (material safety data sheets missing)

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Lab Report 017/12



Characterisation of the process water

The process water 017/12 E contains 0,9 percent of high boiling substances (total evaporation residue). There could be detected 60 ppm ammonia, 439 ppm chloride and 30,3 mmol/l water hardness in the sample.

To avoid off odour due to anaerobic rottenness and to improve distillate quality we recommend to equip all feed tanks with our JetFlex ventilation system.

Distillation test

During the lab test with MVC – conditions (mechanical vapour compression evaporator) 450 grams of the sample have been distilled at 600 mbar with the rotary evaporator. The sample could be concentrated to a rest of 17,5 percent.

During the test we could not recognize foaming. The addition of defoamer was not necessary. For safety reasons we recommend equipping the VACUDEST® with an automatic defoamer dosage device.

Assessment of distillate and concentrate

The distillate is colourless clear. It has no floating oils. If the distillate need to be absolute free of oil, we recommend the use of our ClearCat® technology for total oil elimination. The conductivity can be reduced of 98,6 percent to 125 µS/cm. The chemical oxygen demand (COD) can be reduced of 86,8 percent to 1.530 ppm. The pH-factor of the distillate is 10,4.

The concentrate is liquid, yellow with settle able parts and a pH-factor of 12,4.

Assessment of cleaning

After the distillation was a strong oily and crystalline layer on the distilling flask. The layer could be removed by rinsing with our cleaning agent DC 3-1 and APC balls. Therefore we recommend equipping the VACUDEST® with an automatic rinsing device and the self cleaning fluidised bed heat exchanger ActivePowerClean® (APC).

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Company: Ekos Poznań
Contact: Mr Krzysztof Madajczak
Application: Flexo Printing
Project-N°: 93100348 / 1000 ClearCat®
Lab test: MVC (600 mbar/ 86 °C)
Date: 30.01.2012 / bb

017/12 G	Process water	From flexo printing
017/12 G	Distillate	
017/12 G	Concentrate	

Appearance		
Smell		
Total evaporation residue ³⁾	TR	%
Amount		g
Evaporation rate	ER	%
Concentration	factor	1:
pH – factor (20 °C) ⁴⁾	pH	
conductivity (25 °C) ⁴⁾	LF	$\mu S/cm$
reduction of conductivity		%
Chemical Oxygen Demand ⁵⁾	COD	ppm
reduction of COD		%
Ammonia nitrate ⁶⁾	NH4-N	ppm
Chloride ⁶⁾	Cl-	ppm
Organic acids ⁵⁾	CH ₃ COOH	ppm
Water hardness ⁶⁾		$mmol/l$

(1) Separation funnel	(5) Dm. Large	(9) Without settle able parts	(13) calcuated
(2) Imhoff funnel	(6) Merck Quicktest	(10) Hydrocarbon total DEV H18/H17	(14) stabilised with KCL due to low conductivity
(3) Sartorius MA 30 (65°C)	(7) filtered	(11) Hydrocarbon non polar DEV H18	n.d. not determinable due to complex matrix
(4) WTW Multiline	(8) without free oil	(12) mean value	< lesser than
			> greater than

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- Determination of the concentration
- Quality of distillate

none (material safety data sheets missing)

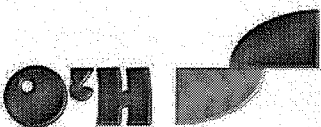
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Lab Report 017/12

process water engineering
VACUDEST® Technology



Characterisation of the process water

The process water 017/12 F contains 0,6 percent of high boiling substances (total evaporation residue). There could be detected 60 ppm ammonia, 384 ppm chloride, 3.100 ppm organic acids and 21,4 mmol/l water hardness in the sample.

Distillation test

Because of the organic acids it is necessary to correct the pH-factor from pH-factor 5,5 to pH-factor 9,5 with caustic potash (3,3 ml KOH 50% / litre).

During the lab test with MVC – conditions (mechanical vapour compression evaporator) 500 grams of the sample have been distilled at 600 mbar with the rotary evaporator. The sample could be concentrated to a rest of 3,6 percent.

During the test we could recognize any foaming. The addition of defoamer was not necessary. For safety reasons we recommend equipping the VACUDEST® with an automatic defoamer dosage device.

Assessment of distillate and concentrate

The distillate is colourless clear. It has no floating oils. If the distillate need to be absolute free of oil, we recommend the use of our ClearCat® technology for total oil elimination. The conductivity can be reduced of 91,1 percent to 408 µS/cm. The chemical oxygen demand (COD) can be reduced of 87,1 percent to 1.288 ppm. The pH-factor of the distillate is 9,5.

The concentrate is liquid, brown beige with settle able parts and a pH-factor of 9,2.

Assessment of cleaning

After the distillation was a strong greasy layer on the distilling flask. The layer could be removed by rinsing with our cleaning agent CL 1-1, DC 3-1 and APC balls. Therefore we recommend equipping the VACUDEST® with an automatic rinsing device and the self cleaning fluidised bed heat exchanger ActivePowerClean® (APC).

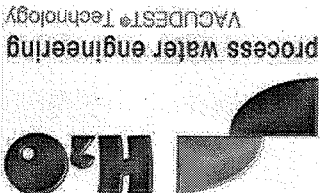
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Lab Report 017/12



Our advice

We do not recommend to treat the water "G" – Flexo Printing.

For the treatment of your process water A to F we recommend the following technique:

Pre Treatment

- Ventilation of the process water tanks to avoid off odours with Jet/Flex (optional)
- Correcting the pH-factor with a automatic neutralisation unit

VACUDEST® evaporator with mechanical vapour compression (MVC)

- Process water contacted parts in special material 1.4539 – step II
- VACUDEST® automatic defoamer dosage device
- VACUDEST® self cleaning fluidised bed heat exchanger ActivePowerClean® (APC)
- Alkali resistant APC balls due to the high pH-factor of concentrate
- VACUDEST® dual automatic rinsing device with rinsing pump and heating
- Spray-Nozzles in the separator because of settle able parts (optional)
- Refilling step with tap water to avoid foaming (optional)
- Forced discharge of the evaporator chamber in case of evaporator hold up

Distillate polishing

- ClearCat® technology for total oil elimination (optional)

Accessories

- SmellCat odour filter for process water tanks (optional)

Best Regards

H2O GmbH

process water engineering

Peter Demarez
Sales & Team Manager Lab.

Jochen Freund
Leiter Produkt- und Absatzentwicklung

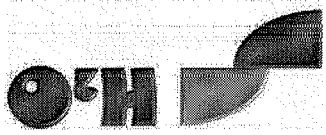
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Lab Report 017/12



Characterisation of the process water

The process water 017/12 G contains 0,7 percent of high boiling substances (total evaporation residue). There could be detected 80 ppm ammonia, 66 ppm chloride, 183 ppm organic acids and more than 4,5 mmol/l water hardness in the sample.

Distillation test

During the lab test with MVC – conditions (mechanical vapour compression evaporator) 530 grams of the sample have been distilled at 600 mbar with the rotary evaporator. The sample could be concentrated to a rest of 5,1 percent.

During the test we could recognize some foaming. The addition of defoamer E 2 was necessary. Therefore we recommend equipping the VACUDEST® with an automatic defoamer dosage device.

Assessment of distillate and concentrate

The distillate is colourless clear. It has no floating oils. If the distillate need to be absolute free of oil, we recommend the use of our ClearCar® technology for total oil elimination.

The conductivity can be reduced of 42,9 percent to 622 µS/cm. The chemical oxygen demand (COD) can be reduced of 96,3 percent to 686 ppm.

The pH-factor of the distillate is 7,8.

The concentrate is liquid, black with settle able parts and a pH-factor of 9,0.

Assessment of cleaning

After the distillation was a strong hard layer on the distilling flask. An automatic cleaning (cleaning agent / ActivePowerClean®) was not possible.

Defoamer test

Defoamer	E2
Effect	very good

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