



Rev. 2.4



## Service, emission and alarm check report

<b>Plant information:</b> <b>Project Nr.:</b> 25110 <b>Company:</b> Atlantsolia <b>City:</b> Hafnarfjordur <b>Country:</b> Iceland  <b>Days of visit:</b> 3-4/9 <b>Year of visit:</b> 2015  <b>Purpose of visit:</b> Contractual Service - 1/1 Yearly		<b>Required action:</b>																									
<b>Engineer</b> Henrik Hansen <b>Phone:</b> +45 29 99 86 09 <b>E-mail:</b> henrik.hansen@coolsorption.com  <b>Webpage:</b> <a href="#">Cool Sorption</a> <b>Service E-mail:</b> <a href="mailto:servicedept@coolsorption.com">servicedept@coolsorption.com</a>		<table border="1"> <thead> <tr> <th></th> <th>OK</th> <th>Not OK</th> </tr> </thead> <tbody> <tr> <td>1) Process and Vacuum Pumps</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>2) Valves and Instrumentation</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>3) Absorption System</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>4) Adsorption System</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>5) Control System</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>6) Electrical System</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>7) Emission from unit</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		OK	Not OK	1) Process and Vacuum Pumps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2) Valves and Instrumentation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3) Absorption System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4) Adsorption System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5) Control System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	6) Electrical System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	7) Emission from unit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
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<b>Recommendations and predictions</b>  <b>4</b> Years to carbon change <b>1</b> Years to pump/motor change/overhaul <b>N/A</b> Years to Glycol/Oil change/refilling <b>2</b> Years to SCADA/PLC system revamp  <b>N/A = Not Applicable</b>		<b>Summary of required actions:</b> 1) 2) 3) 4) 5) 6) 7)																									
<b>Recommendation for additional services</b> <input type="checkbox"/> Training <input type="checkbox"/> Additional service visit <input type="checkbox"/> Manuals <input type="checkbox"/> Hotline <input type="checkbox"/> Onsite Survey <input type="checkbox"/> Quotation for recommended spares		<b>Estimated maintenance cost for the next 12 month</b> <table border="1"> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td>0 - 15.000</td> <td>EUR</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>15.000 - 30.000</td> <td>EUR</td> </tr> <tr> <td><input type="checkbox"/></td> <td>30.000 - 60.000</td> <td>EUR</td> </tr> <tr> <td><input type="checkbox"/></td> <td>60.000+</td> <td>EUR</td> </tr> </tbody> </table>		<input checked="" type="checkbox"/>	0 - 15.000	EUR	<input checked="" type="checkbox"/>	15.000 - 30.000	EUR	<input type="checkbox"/>	30.000 - 60.000	EUR	<input type="checkbox"/>	60.000+	EUR												
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<b>Cool Sorption - Life Cycle Services</b>		<b>Date:</b> 3-4/9 2015	<b>Name:</b> Henrik Hansen
<b>Project</b>	25110 Contractual Service - 1/1 Yearly		

<b>Terminal</b>	<b>Service inspection sheet Vapour Recovery Unit</b>
Rev. 2.4	

<b>0</b> N/A	<b>1</b> OK	<b>2</b> Replaced / Fixed	<b>3</b> Up for replacement at next visit	<b>4</b> Must be repaired / cleaned
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### Inspection Of Operation

	<u>V110</u>	<u>V130</u>	
Filter no.	_____	_____	_____
Opening of purge air	_____ 130 mbar(a)	_____ 130 mbar(a)	_____
Time of air equalization(850mbar)	_____ 25 sec.	_____ 25 sec.	_____
Balancing Step (only valid for 3 bed)	_____ NA mbar(a)	_____ NA mbar(a)	_____
Purge air flow	_____ *6,5 m <sup>3</sup> /h	_____ *6,5 m <sup>3</sup> /h	_____
Filter temperatures (bottom/middle/top) (Obtained at end of adsorption period)	_____ 8/11 °C	_____ 11/11 °C	_____
Lowest final pressure	_____ 43 mbar(a)	_____ 44 mbar(a)	_____
Pressure increase after 10 min.	_____ 3 mbar(a)	_____ 3 mbar(a)	_____
Drain	_____ 0 liter	_____ 0 liter	_____

**Remarks:**  
 \* Purge air valve was filled with dirt and stuck closed, therefore no purge air present - set for 6,5 Nm<sup>3</sup>/h, it is recommended to replace the hand valve and flow meter for this.

### Valves

Inspection of modulating valves	<input checked="" type="checkbox"/>	By-pass valves (vacuum pump)	<input checked="" type="checkbox"/>
Inspection of on / off valves	* <input checked="" type="checkbox"/>	Drain evacuation fan	<input type="checkbox"/>
Non return valves	<input checked="" type="checkbox"/>	Automatic drip tee, drain valve	<input type="checkbox"/>
Visual inspection of safety valves	<input checked="" type="checkbox"/>	Manual drip tee, drain valve	<input checked="" type="checkbox"/>
Safety valve replaced	<input type="checkbox"/>		

Safety valve must be replaced no later then: \_\_\_\_\_

Safety valve to be overhauled / calibrated by Cool Sorption?      **Yes**      **No**  
     

**Remarks:**  
 \* Consider to have the valves replaced any time soon, some has been replaced and the rest is in need of replacement.  
 It was found that the by-pass valve has a missing orrifice, this should be fixed in order to secure fast pre-heat of vacuum pump. a ø7 mm plate has been tested on the unit and found the right size for this orrifice.  
 Installed ø7,5 mm, found OK!  
 The SV311 is in need of check up or replacement.

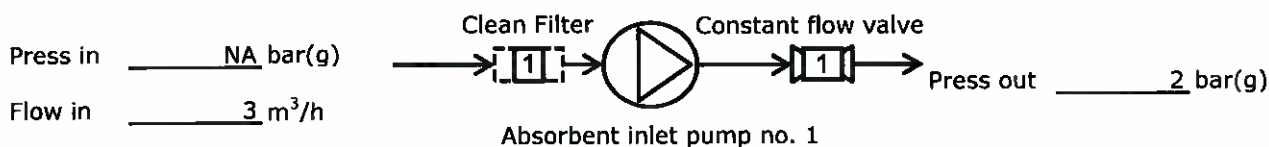


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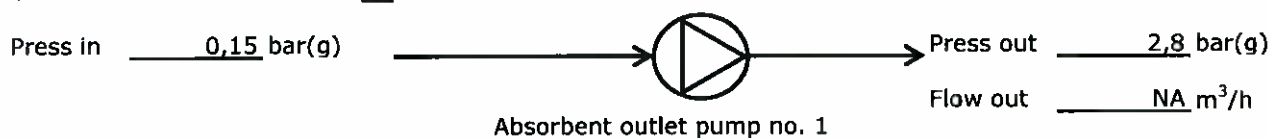
<b>Terminal</b>	<b>Service inspection sheet Vapour Recovery Unit</b>
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<b>0</b> N/A	<b>1</b> OK	<b>2</b> Replaced / Fixed	<b>3</b> Up for replacement at next visit	<b>4</b> Must be repaired / cleaned
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### Absorbent Line



Coupling if direct driven  1  
 Magnetic Coupling  0  
 Oil level  4



Coupling if direct driven  1  
 Magnetic Coupling  0  
 Oil level  1

**Remarks:**

Oil is leaking from both pumps.  
 P301 needs to be refilled with oil ASAP.

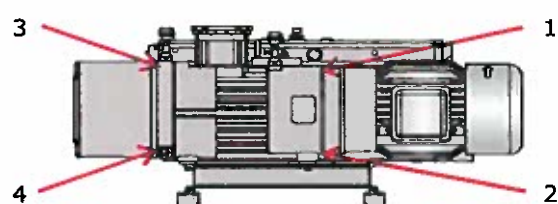
### Quality of Absorbent

Absorbent volumen            m<sup>3</sup>      Last import of absorbent            date  
 Due time to absorbent change            date

Expected optimal operating time with the current absorbent level amount: 0 Days

**Remarks:**

often replacement - OK.

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<b>Rotary Vane Vacuum Pump no. 1</b>				
Oil quality (smell, colour)	1	Air filter	1	
Oil filter	2	Exhaust filter	2	
Oil level	2	Vent. valves (closed)	0	
Rupture disc	1	Drained knock out pot	1	
Heat element disconnected	1			
<b>Operational observations:</b>				
Suction pressure when preheating	_____	*132 mbar(a)	Type of oil	_____ VE-101
End pressure at closed valve	_____	13 mbar(a)	Temperature of oil	_____ 75 °C
Suction filter size	_____	149x83x221 mm	Operation time	_____ 14216 h
Air filter last changed	_____	22.07.2014 date	Operation time /day	_____ 8,6 h
Measured data at:	_____	50 Hz	→ 8,85 A →	_____ 244 mbar(a) SP250
<b>Vibrations measurement:</b>				
Measuring point no. 1 DE	_____	mm/s		
Measuring point no. 2 DE	_____	mm/s		
Measuring point no. 3 NDE	_____	mm/s		
Measuring point no. 4 NDE	_____	mm/s		
<b>Remarks:</b>				
Refilled 6 liters of oil instead of 5, up to upper level in level glas, this due to several low level alarms on the oil vacuum pump. If this alarm continues to come a new level switch is recommended.				
*pre heat pressure changed from 800 mbara to 132 mbara - installed orifice ø7,5 mm.				





<b>Cool Sorption - Life Cycle Services</b>		<b>Date:</b>	<b>Name:</b>
Rev. 2.4		3-4/9	Henrik Hansen
<b>Project</b>	<b>25110</b>	<b>Contractual Service - 1/1 Yearly</b>	<b>2015</b>

## Findings

### During the visit the following has been done / observed:

Purge air system was clocked up, it is highly recommended to replace the hand valve and flow meter for this system in order for it to work properly again and ease adjustment if needed. This should be part of customers maintenance plan to check this flow frequently.

Some of the valves that hasn't been replaced yet is in need of replacement soon, especially LS315 absorbent inlet valve that is not working properly. This could in worst case lead to flooding of the VRU from the tanks.

SV311 safety valve is in need of check up / replacement. It is highly recommended to buy a spare valve for easy replacement at agreed upon certain intervals. At least have this valve tested 1 time pr. year.

Both absorbent pumps are in need of an overhaul, especially P301 inlet pump. These are leaking oil from seals.  
P301 will need refilling of oil ASAP.

Filled the vacuum pump with 1 extra liter of oil to reach high level in oil glass, this in order to check if the VRU still gets low level oil alarms - if it does it is highly recommended to replace the level switch in the pump.  
It is recommended to change all gaskets and bolts at next service to fix the small oil leaks from the pump. If you buy 10 liters of oil for the pump, you will have spares for the next 2 services on site.

Installed orifice before AV291 by-pass valve, in order to lower the vacuum for pre-heating of the vacuum pump. This could have been the problem for keeping temperature up in vacuum pump during the winter.  
**Please give as much feedback as possible on this - if some problems still occurs we will need to prepare for heat tracing and insulation for the pump, if not before, then no later than next service.**

PI301 0-6 barg is in need of replacement.

FIS305 needs to be replaced, bearing is not OK inside and needle hangs from time to time - tried to lubricate, but problems remains from time to time.  
Please replace silicagel bag inside to prevent for more moist inside the flow switch.

Air silencers in pneumatic panel was clocked up, will need to be replaced ASAP. These has been removed for now in order to prevent problems with valves not opening or closing as they should.

**Have in mind the the IO modules has been replaced with newer models that will still fit the system, but if CPM brakes down, the whole system will need to be replaced.**

Checked up and adjusted pre-heat system online - this should also help to avoid further problems in the winter.

### The issues below needs attention / action from the customer:

- Order parts for purge air system.
- Order valves needed and new safety valve.
- Order parts for absorbent pumps.
- Order parts needed for vacuum pump at next service.
- Order pressure gage (0-6 barg - PI305)
- Order new FIS305 and have silicagel bags on site for replacement at service (and in between if needed).
- Order air silencers for pneumatic panel.

### The issues below needs attention / action from ACS:

Quote above needed parts upon request from customer.





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### Engineer's Timesheet

Day	Date	Leave Base	Arrive Site	Depart Site	Arrive Base	Travel Time	Hours Worked	Over Time	Milage
Mon						00:00	00:00	0	
Tues						00:00	00:00	0	
Wed						00:00	00:00	0	
Thur	3/9	07:30	07:45	17:00	17:15	00:30	09:15	2,25	
Fri	4/9	07:30	07:45	14:30	14:45	00:30	06:45	0	
Sat						00:00	00:00	0	
Sun						00:00	00:00	0	

**Remarks:**

### Consumed spare parts / material

Qty	Material Description / Type	Price pr. pcs:	Total in EUR
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
<b>All lines in total [EUR]</b>			<b>0</b>

**Remarks:**



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## Emission test report

### Purpose and background:

The purpose with the service visit was to control the VRU-plants emission and monitor VRU operation for any functional problems

### Measuring instruments:

For measuring VRU-plants emission, we use:

One Dräger Polytron IR Ex gas analyser, ranged and calibrated for 0-1.70 vol % (0-41g/Nm<sup>3</sup>)  
Pressure transmitter PT211, installed in the suction line of the vacuum pump

### Calibration:

Before initializing the measurement period, an engineer from Cool Sorption Denmark has calibrated the gas analyser with a certificated calibrating gas, containing 0.90% butane (21.7g.HC/Hm<sup>3</sup>)

### Explanation of the measurement:

The red curve shows the emission from the VRU in g.HC/Nm<sup>3</sup>. the scale is shown on the left side of the paper

The blue curve shows the suction pressure from the vacuum pump in mbar(a)

### Results (ACS)

The following HC emission value represents the mean value for the one "worst case scenario" that has been hand picked from the entire measuring period.

1 Hour Period	Average outlet concentration [g.HC/Nm <sup>3</sup> ]
03.09.15 at 18:25 - 19:25	0.95

Emission result shows that the VRU is well below the required legal / design limit of:

**35g.HC/Nm<sup>3</sup>**

The following HC emission value represents the mean value for the entire measuring period.

24 Hour Period	Average outlet concentration [g.HC/Nm <sup>3</sup> ]
03.09.15 at 12:00 - 12:00	0.12

Emission result shows that the VRU is well below the required legal / design limit of:

**35g.HC/Nm<sup>3</sup>**

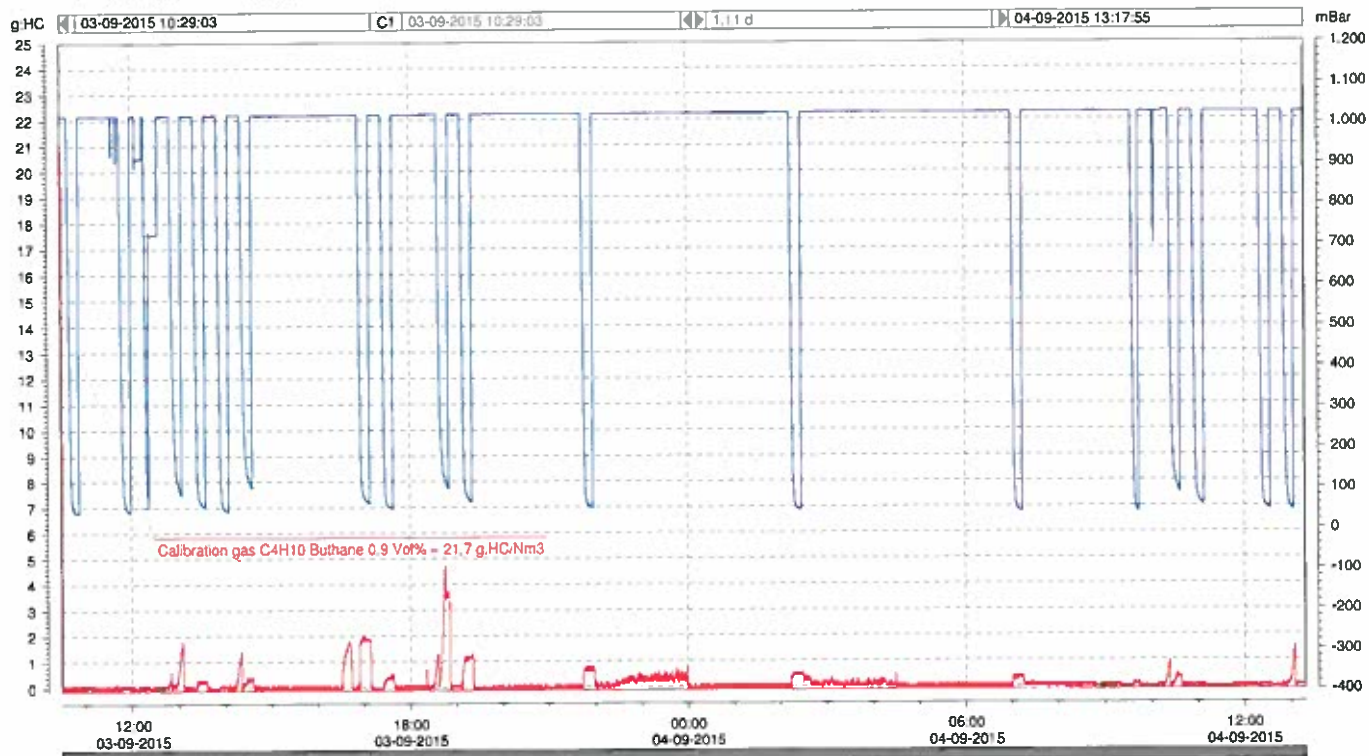
### Remarks:

Nice and low emissions - still a tendency of higher emissions from filter V130!  
Otherwise the VRU is running good.



25110 Atlantsoia - The 3rd to the 4th of September 2015

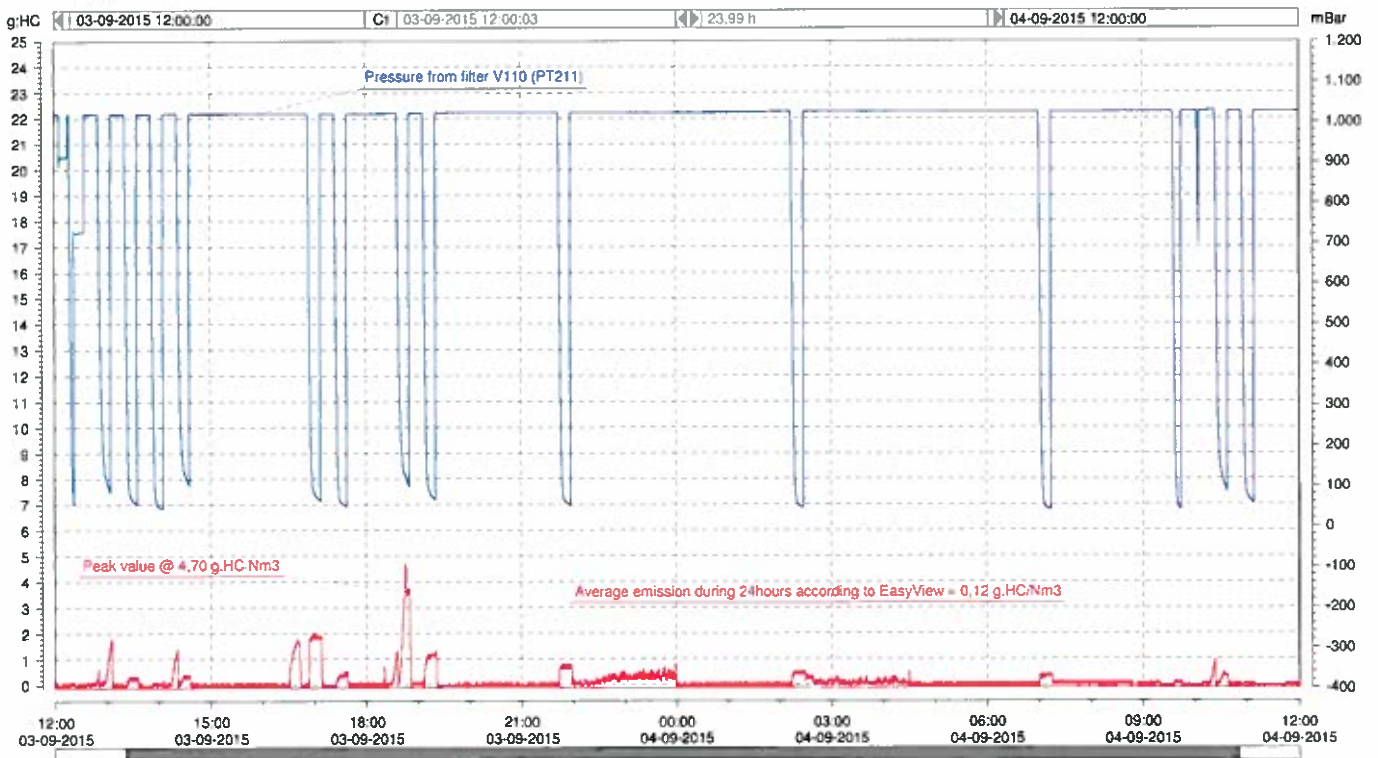
Cool Sorption A/S part of Fjords Processing



	Color	Label	Ave
001	Red	g HC Nm3	0.13
002	Blue	mBar(a)	890.45

25110 Atlantisola - The 3rd to the 4th of September 2015

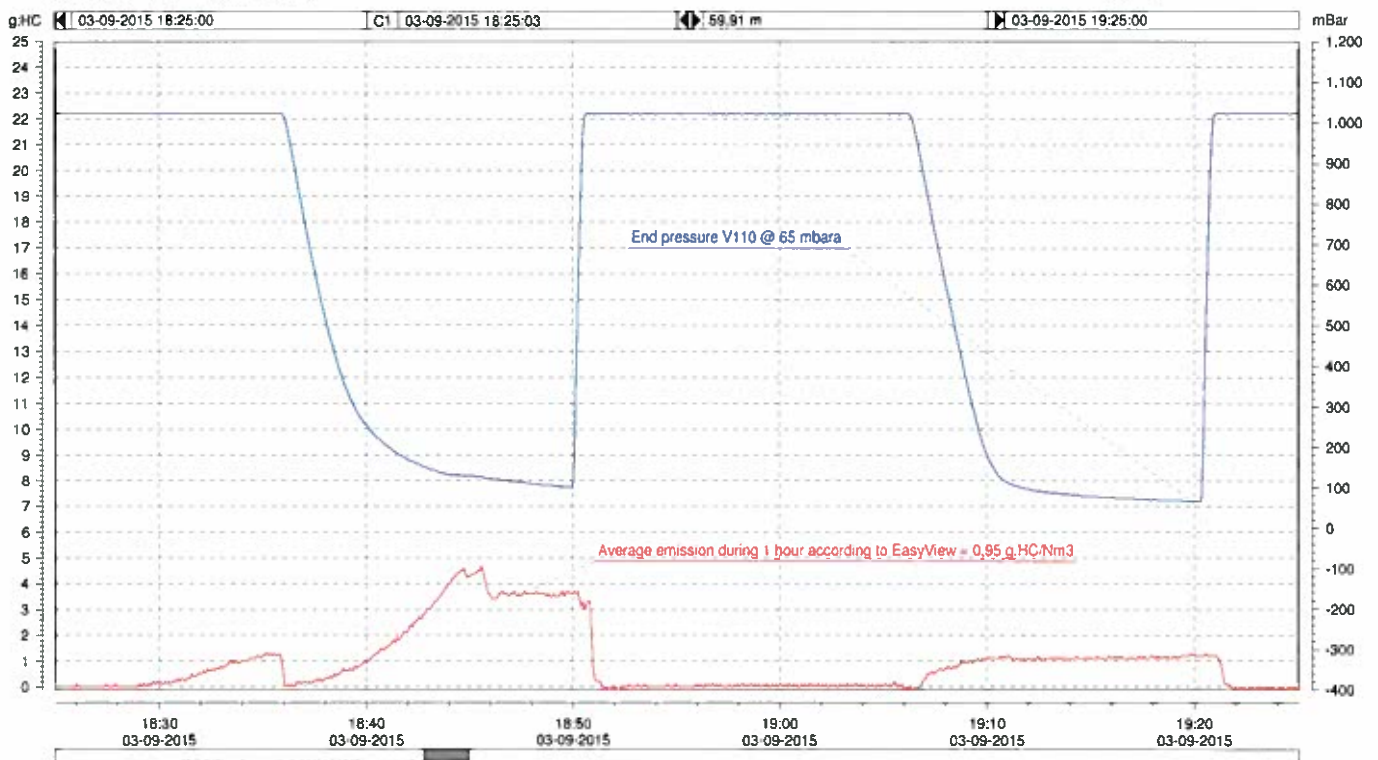
Cool Sorption A/S part of Fjords Processing



	Color	Label	Ave	Max
001	Red	g HC Nm3	0.12	4.70
002	Blue	mBar(a)	907.79	1.027.50

25110 Atlantisola - The 3rd to the 4th of September 2015

Cool Sorption A/S part of Fjords Processing



	Color	Label	Ave	Max
001	Red	g HC/Nm3	0,95	4,70
002	Blue	mBar(a)	648,38	1.022,50

