Classification: None

Use of on-line monitoring for oil discharge reporting

Experiences from BRAGE Platform

Arne Henriksen, Principal Engineer StatoilHydro

StatoilHydro

Project History

- **Project 2005 --> 2007 (HYDRO projects)**
  - **Qualify on-line Oil in Water Analyser**
  - **Establish "the Best Practise" for process control (trend measurements) and discharge to sea (reporting to SFT)**
  - **Co-ordinate ongoing activities for on-line oil in water measurements in Hydro**
  - **Project owner : Gunnar Breivik, HMS**
  - **Steering group (Bergen) : Jostein Toft, (Toril Utvik), Ståle Teigen, Geir Engvoldsen**
  - **Project group (RCP) : Arne Henriksen, Jørn Paus, + +**
  - **Brage platform : Yngve Tvedt, Hans Kåre Borge, Laboratory, ++**

2005

From 13 analysers 3 were selected for testing in test rig in Porsgrunn

Turner Design, Teledyne Analytical Instruments and Advanced Sensors

2006 --> 2007

- **Joint Venture Project**

  Research Centre Porsgrunn, Advanced Sensors Ltd. and Brage platform
- **Develop and qualify the on-line OIW-EX100 analyser for reporting oil discharge to sea**

On-line Analysis for oil concentration in produced water

Conclusion remarks given at last year conference

On-Line Analyser at Offshore Platform will be Qualified and Approved in 2007 by the Authority for reporting oil discharge to sea

Qualification of OIW-EX1000 analyser at BRAGE

Manual sampling

On-line Analysis

OIW-EX1000 Analyser at BRAGE

UV Fluorescence Analyser measures oil concentration in produced water

On-line Analyser installed after the Degassing Tank

Qualification program is in progress for SFT reporting oil discharges to sea

Intranet connection to the monitor from Research Centre in Porsgrunn

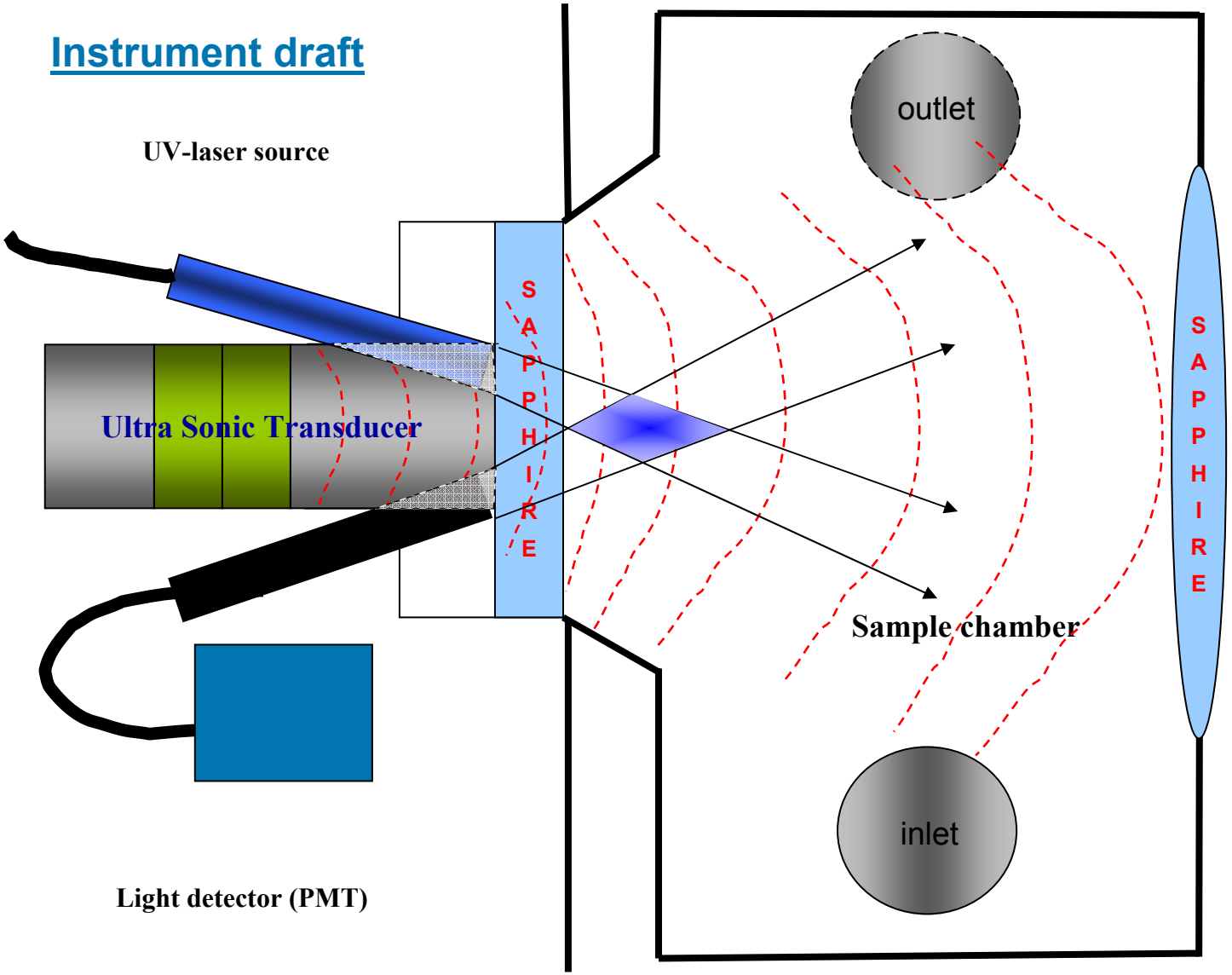
BRAGE monitor

On-line oil in water measurements for real time process control

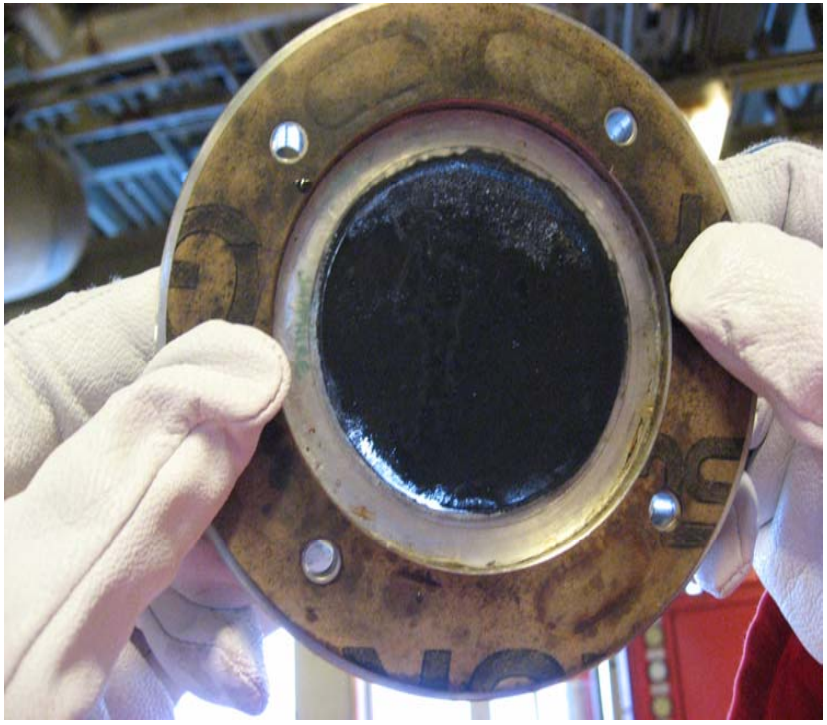
Light from the UV laser in the sample chamber

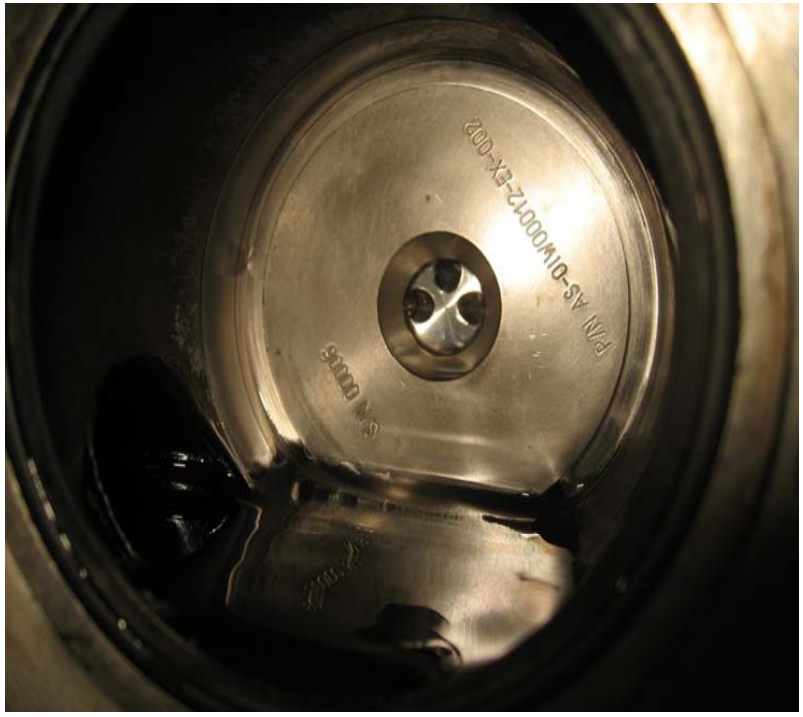
Advanced Sensors OIW-EX1000 monitor at Brage

Instrument draft



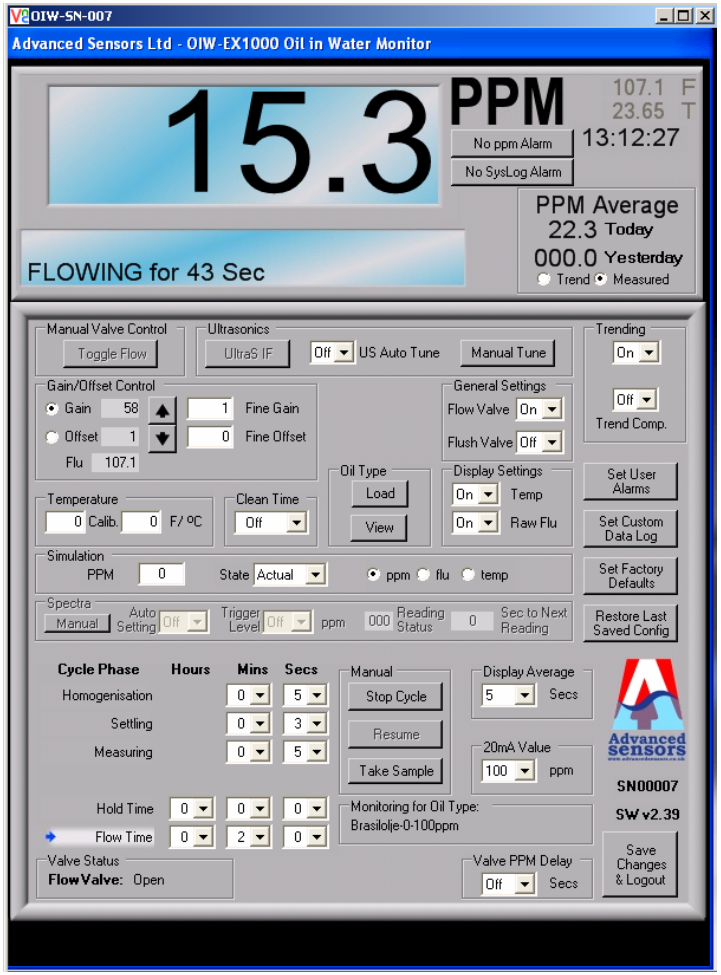
Automatic Cleaning System in OIW-EX1000 Analyser

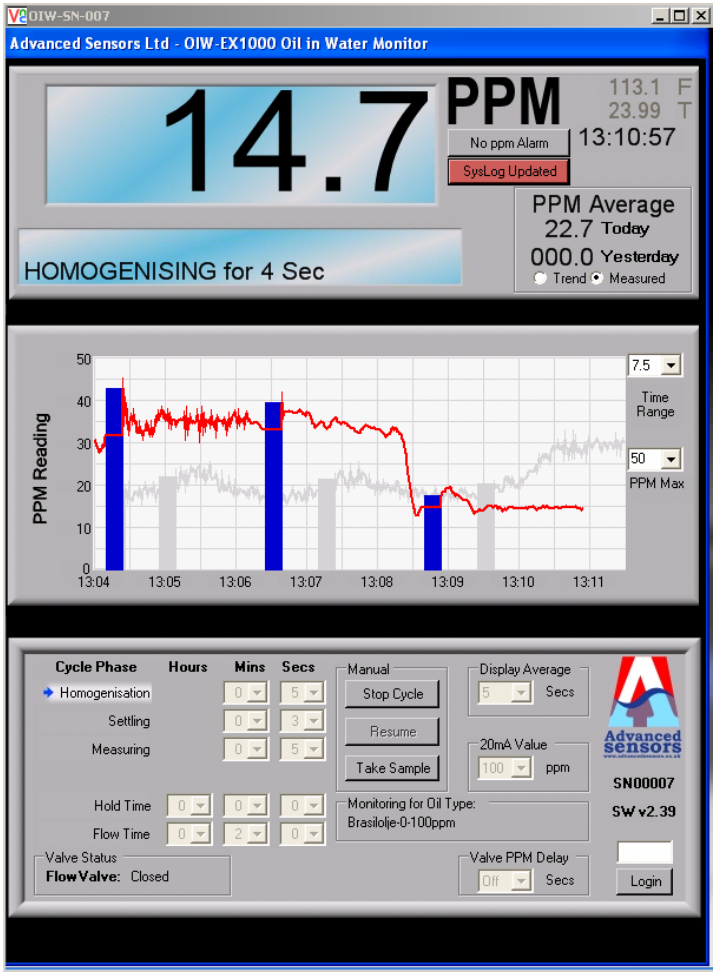




Automatic cleaning system of the sapphire glass in front of the light probes based on ultrasonic wave generated by the transducer. Result after 30 days continuing measurements.

On-line oil in water measurements for real time process control





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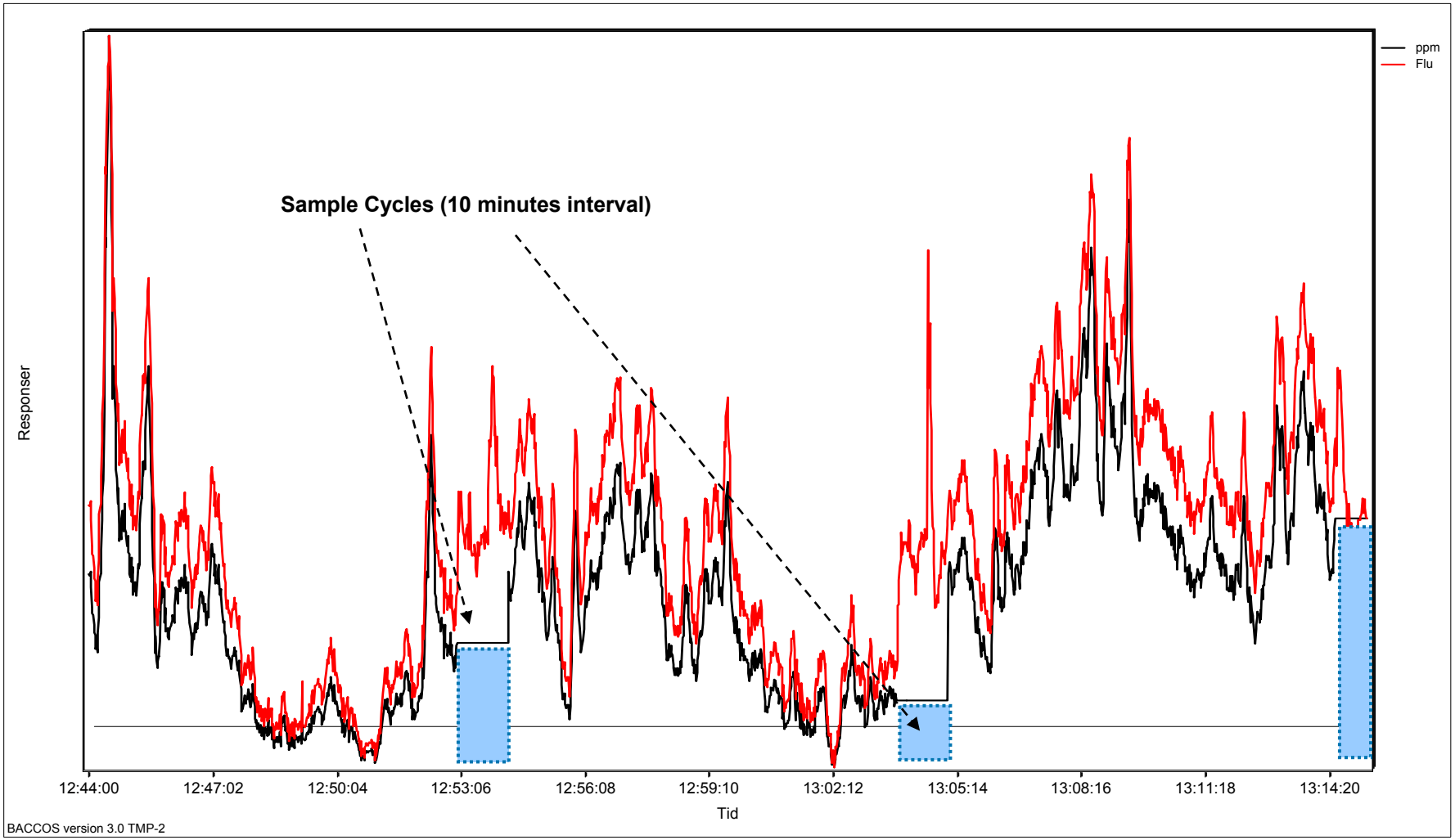
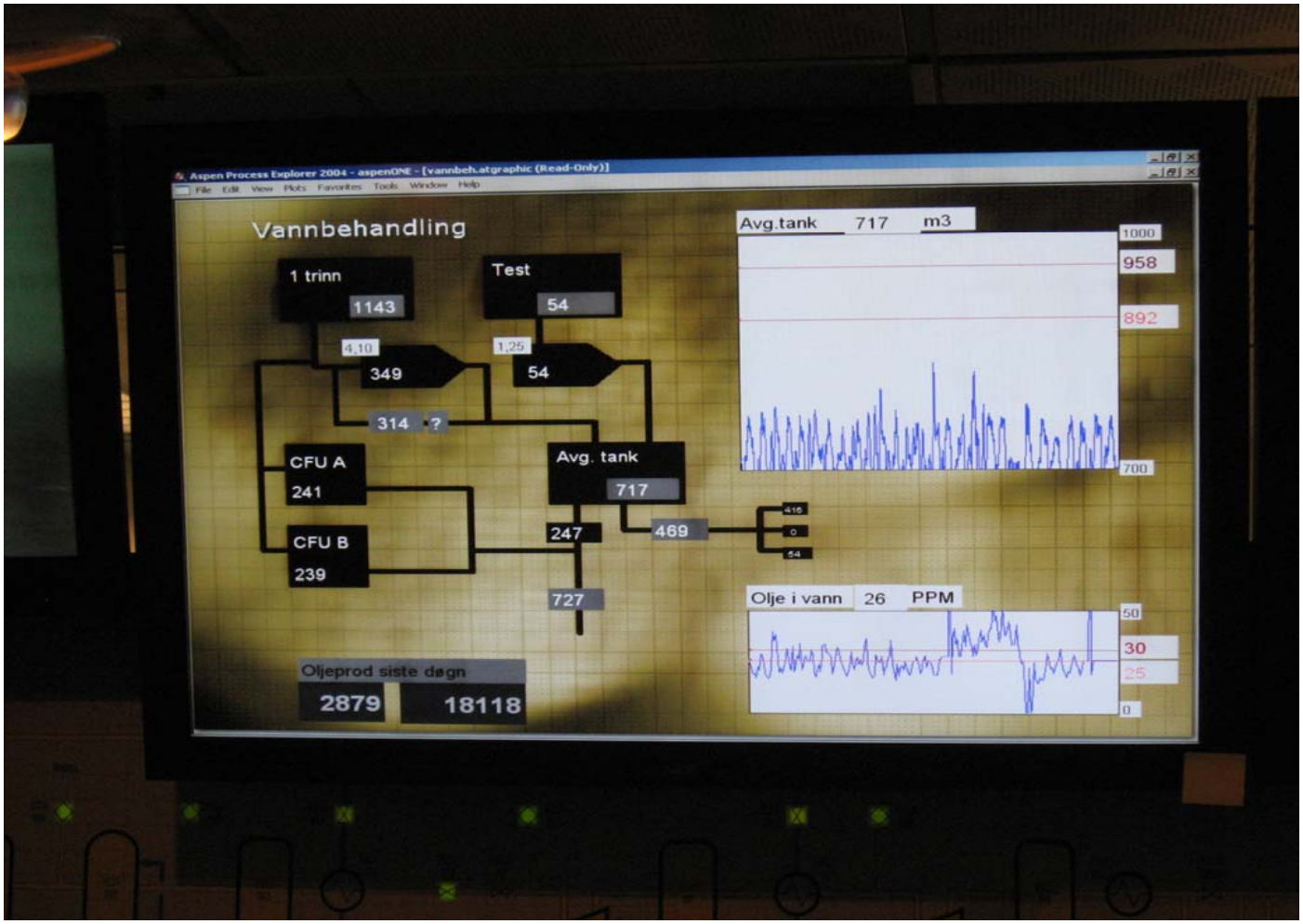
Data: oil fluorescence and predicted oil ppm [OIW-EX1000 Monitor at BRAGE]



On-line oil in water measurements for real time process control



Monitor Screen at BRAGE Control Room

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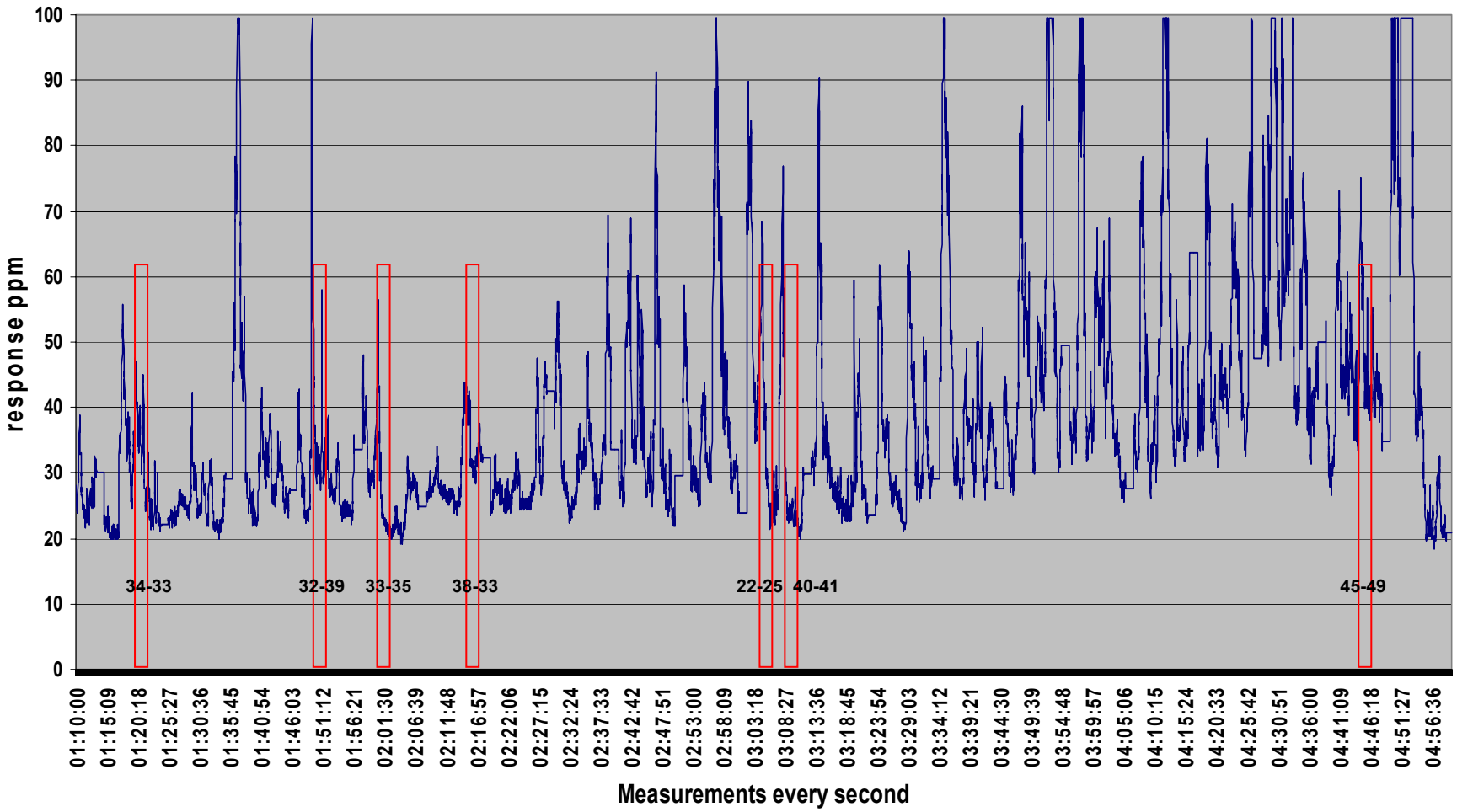
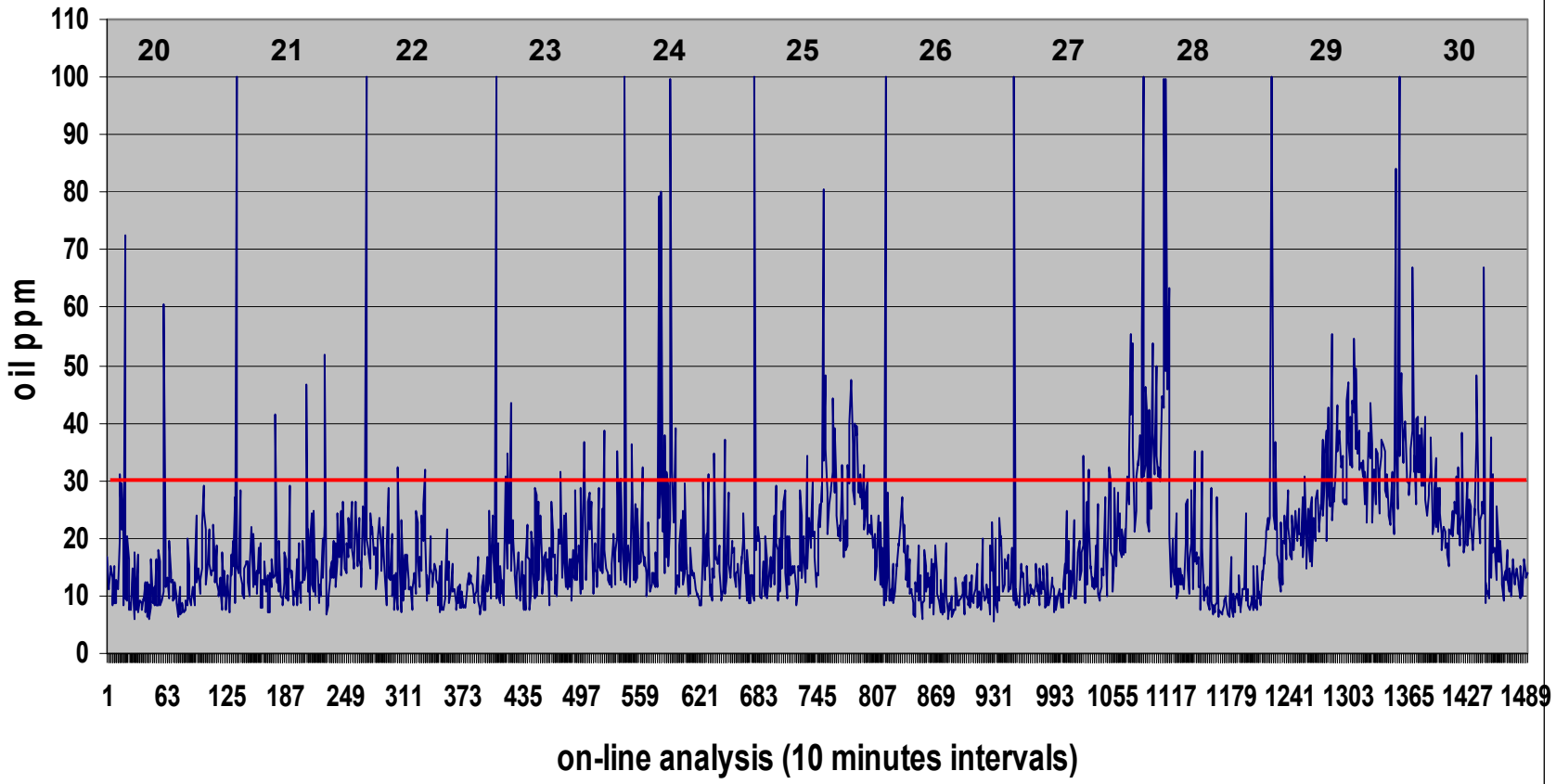
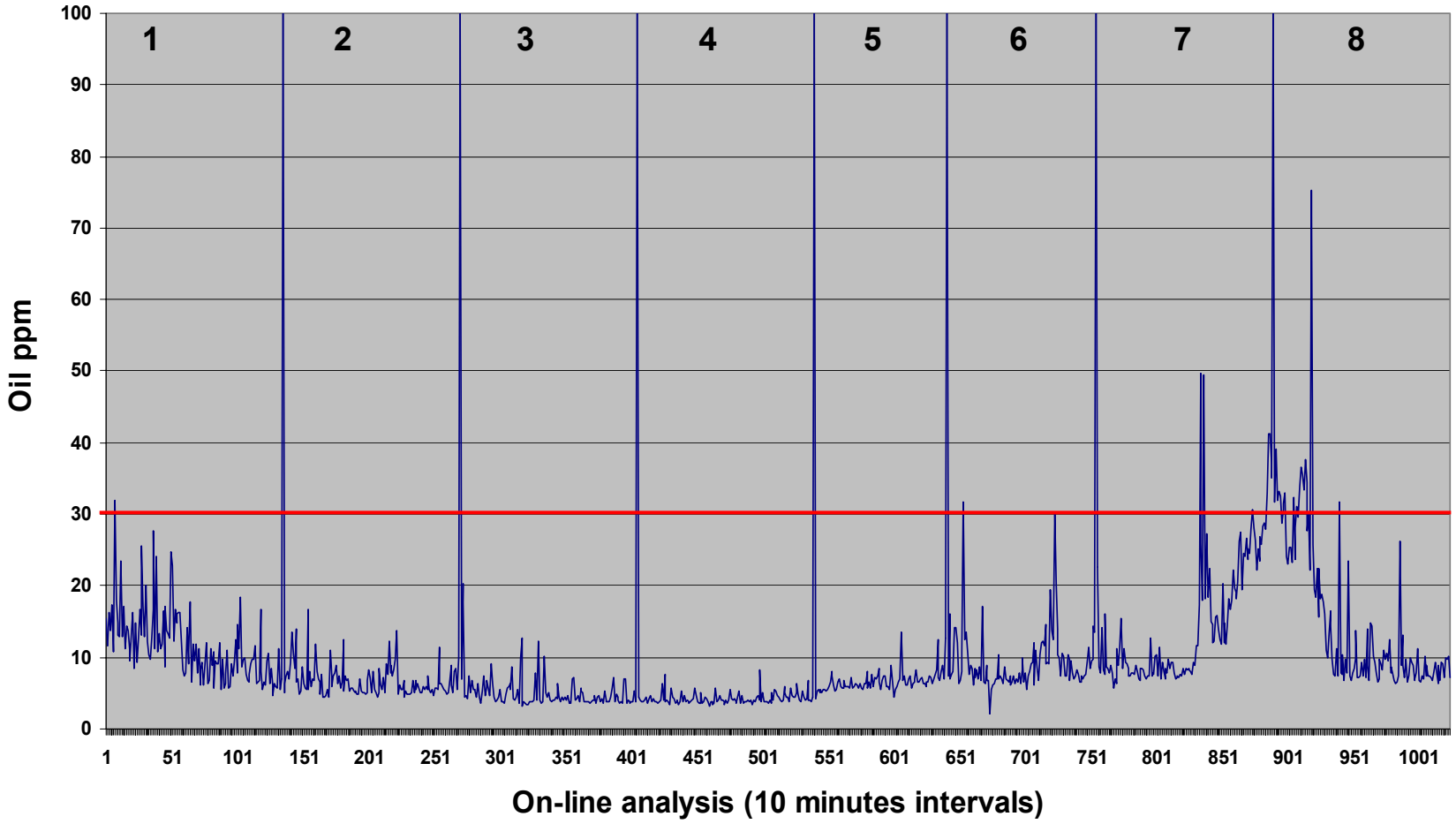

28. April, time 01:30 to 05:00
response ppm
100
90
80
70
60
50
40
30
20
10
0
34-33
32-39
33-35
38-33
22-25
40-41
45-49
01:10:00
01:15:09
01:20:18
01:25:27
01:30:36
01:35:45
01:40:54
01:46:03
01:51:12
01:56:21
02:01:30
02:06:39
02:11:48
02:16:57
02:22:06
02:27:15
02:32:24
02:37:33
02:42:42
02:47:51
02:53:00
02:58:09
03:03:18
03:08:27
03:13:36
03:18:45
03:23:54
03:29:03
03:34:12
03:39:21
03:44:30
03:49:39
03:54:48
03:59:57
04:05:06
04:10:15
04:15:24
04:20:33
04:25:42
04:30:51
04:36:00
04:41:09
04:46:18
04:51:27
04:56:36
Measurements every second

Results 20-30 April

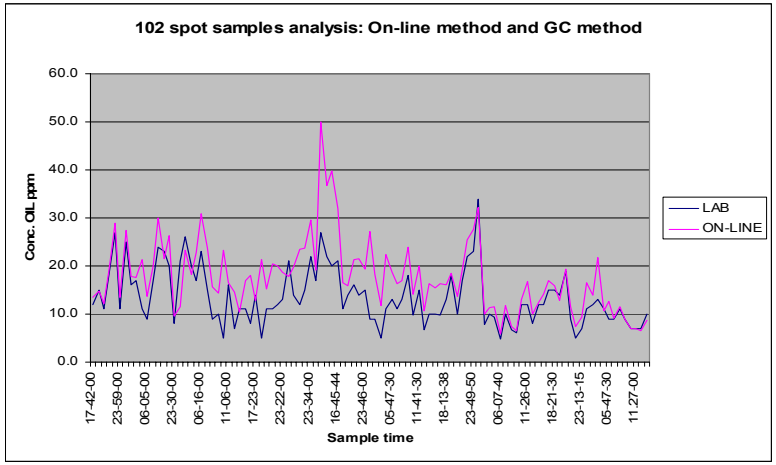


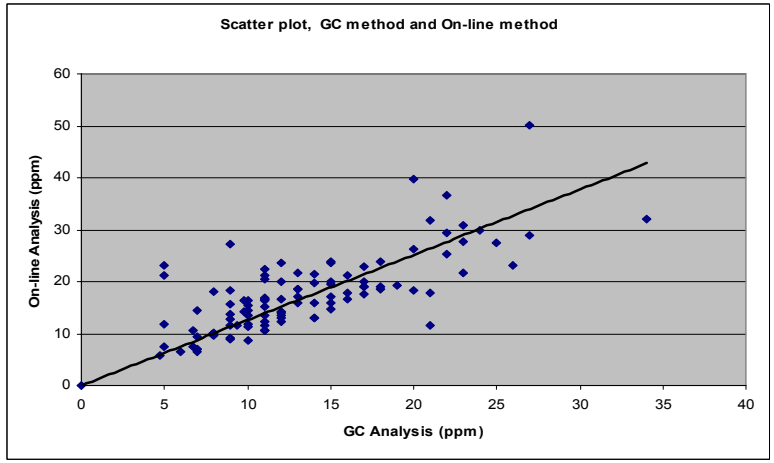

Results 1-8 May
Oil ppm
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
1
51
101
151
201
251
301
351
401
451
501
551
601
651
701
751
801
851
901
951
1001
On-line analysis (10 minutes intervals)

Results from Brage

- Test period 12. March to 15. April
  - Mean deviation between GC method and on-line method: - 4.2 mg/l (std dev. 5.0 mg/l) for 102 spot samples
- ” Monthly reporting” 12. March – 15. April
  - Spot samples and same time period on-line
  - GC method (average of 4 spot samples): 13.5 mg/l
  - On-line analysis (spot sampling time): 17.7 mg/l
  - On-line analysis (mean over 24 hours): 17.8 mg/l

Spot samples





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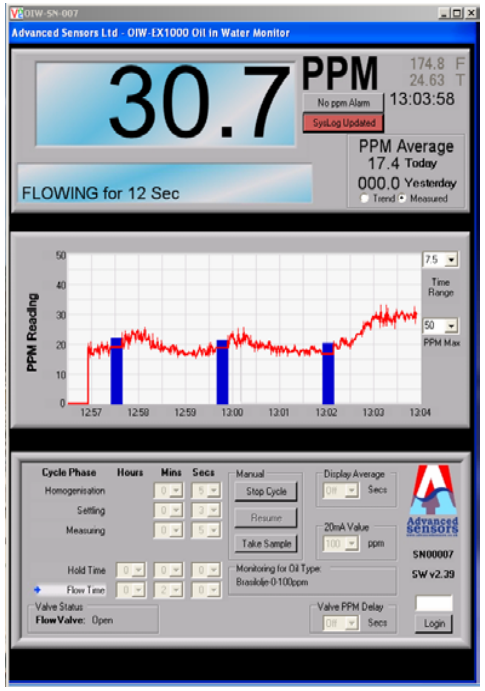
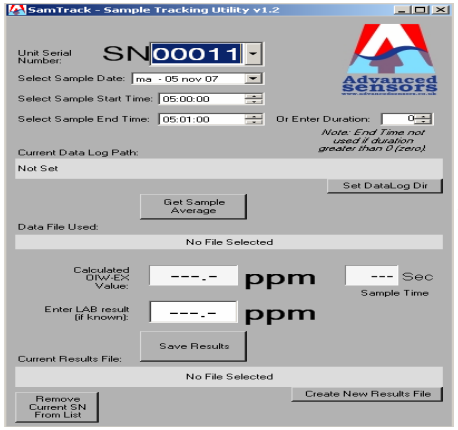




24 hours report from BRAGE OIW-EX1000 Degassing Tank

Daily online Oil-in-Water Monitor Report **Date: 2007-09-19.**

RESULT for *DEGASSING TANK and OIW-EX1000 Monitor (SN0011)*

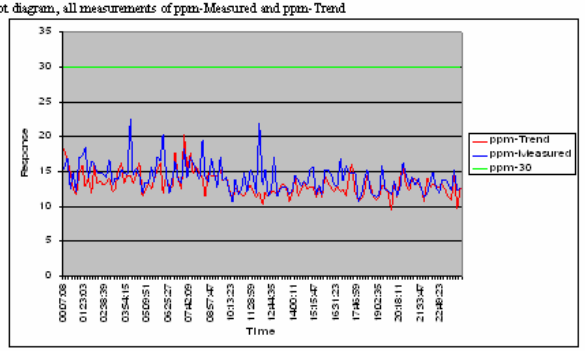
All data are collected from Data file: [*SN0011-19_Sep_07-00_00_00_Wed_OIW_Data.csv*]

Oil concentration for reporting: 14 ppm

Statistical data

Parameter	ppm-Measured	ppm-Trend	Difference [M – T]	ppm-All (sec)	Difference [M – All]	Water-Temp. °C (sec)
Average	14.2	13.2	1.0	13.4	1.2	73.2
Standard Deviation	2.1	1.7	0.4	2.8	-0.7	1.2
Measurements	133	133	0	84341	-	84341
Maximum	22.5	20.2	2.3	28.5	-4.0	74.4
Minimum	10.4	9.5	1.1	7.8	2.8	70.3
% > 30 ppm	0	0	0	0	-	-
% > 75 ppm	0	0	0	0	-	-

Plot diagram, all measurements of ppm-Measured and ppm-Trend



Spot samples analysed

Time sampling	Monitor result in ppm	Ref. Method result in ppm	Diff (Monitor – Ref-method)
20:20:30 – 20:21:20	12	9.5	2.5
22:51:30 – 22:52:20	12	11	1

COMMENTS:

APPROVED: (Yes/No): ____

Date/Name: _____

Date/Name: _____

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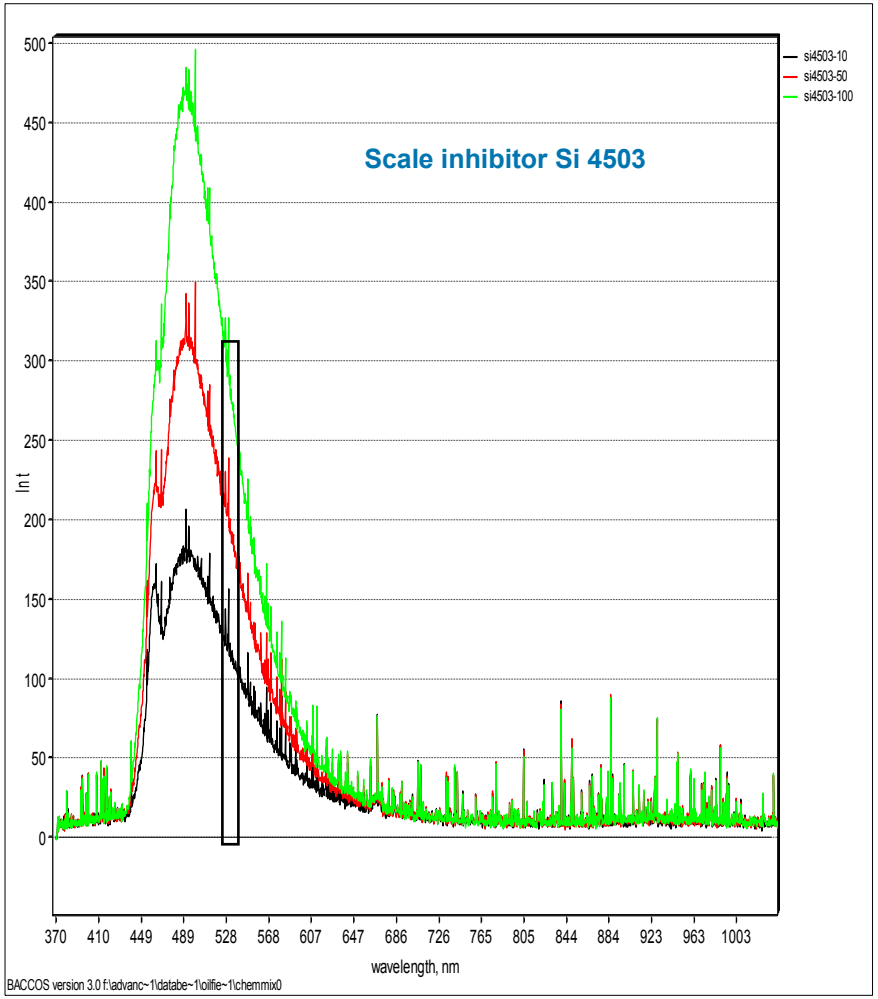
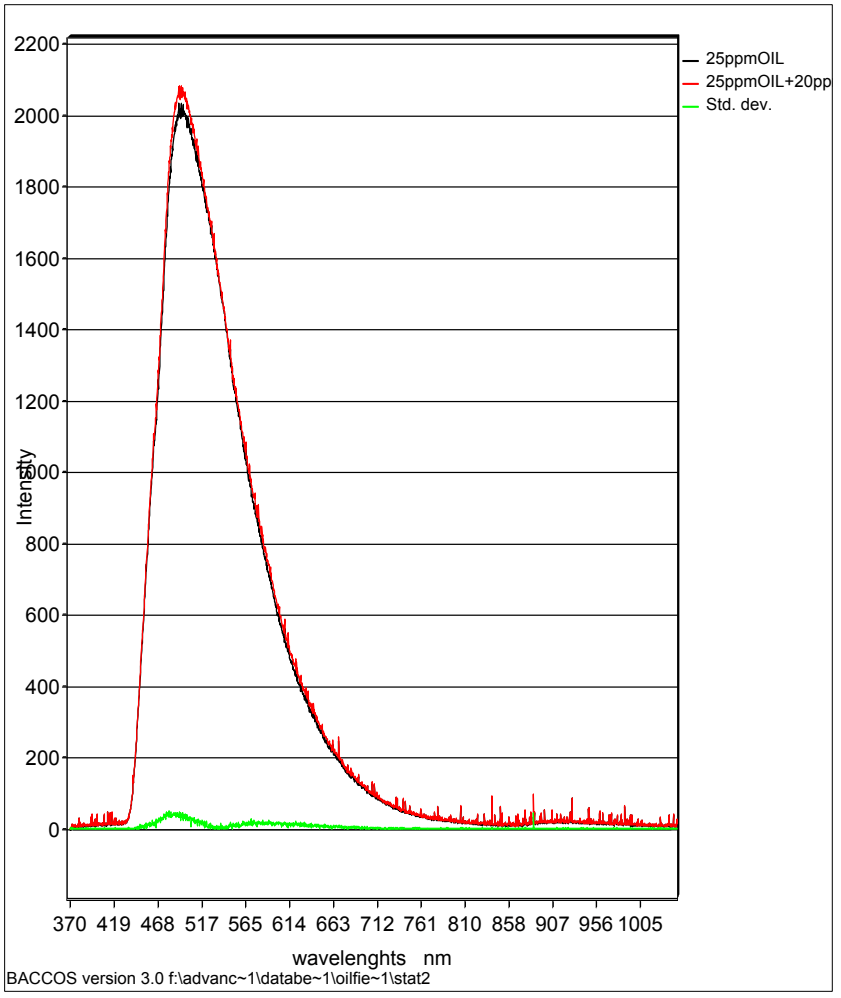
Analysis of oil field chemicals in produced water (Full Scan Spectrometer)





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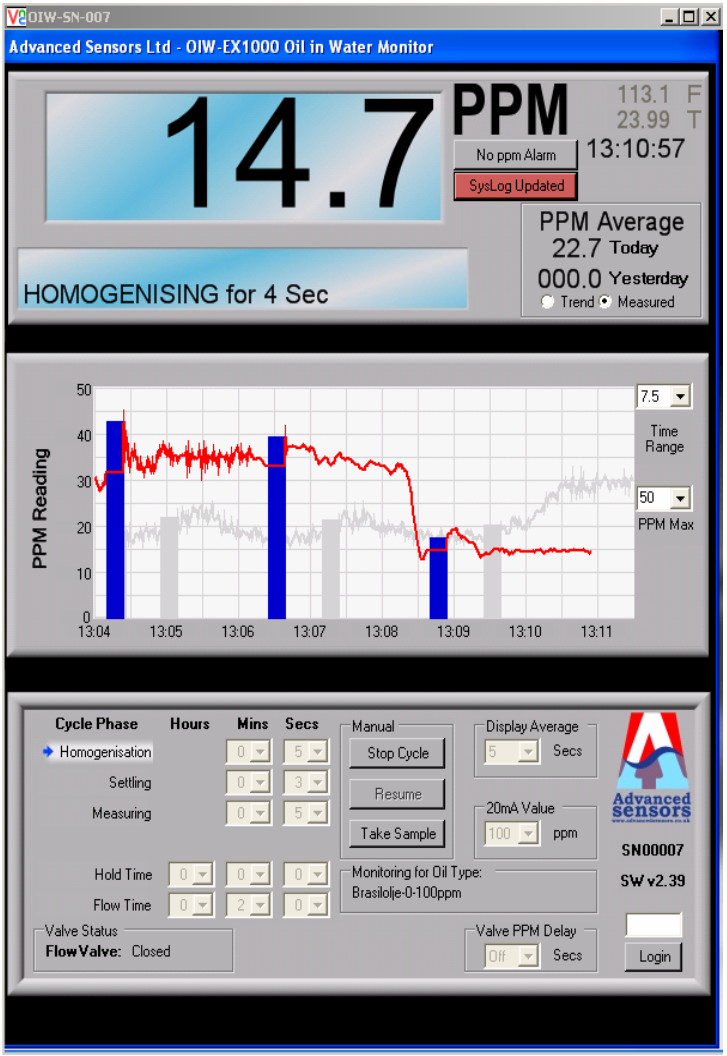
Advantages on-line Analyser

Environment

- Oil discharge analysis for all 24 hours
- Operator can handle quickly to process disturbance and minimise oil to sea discharge
- Platform can use the analysis for SFT reporting
- Reduction in Lab work at the platform



Advantages on-line Analyser

PRODUCTION

Real-time analysis can give

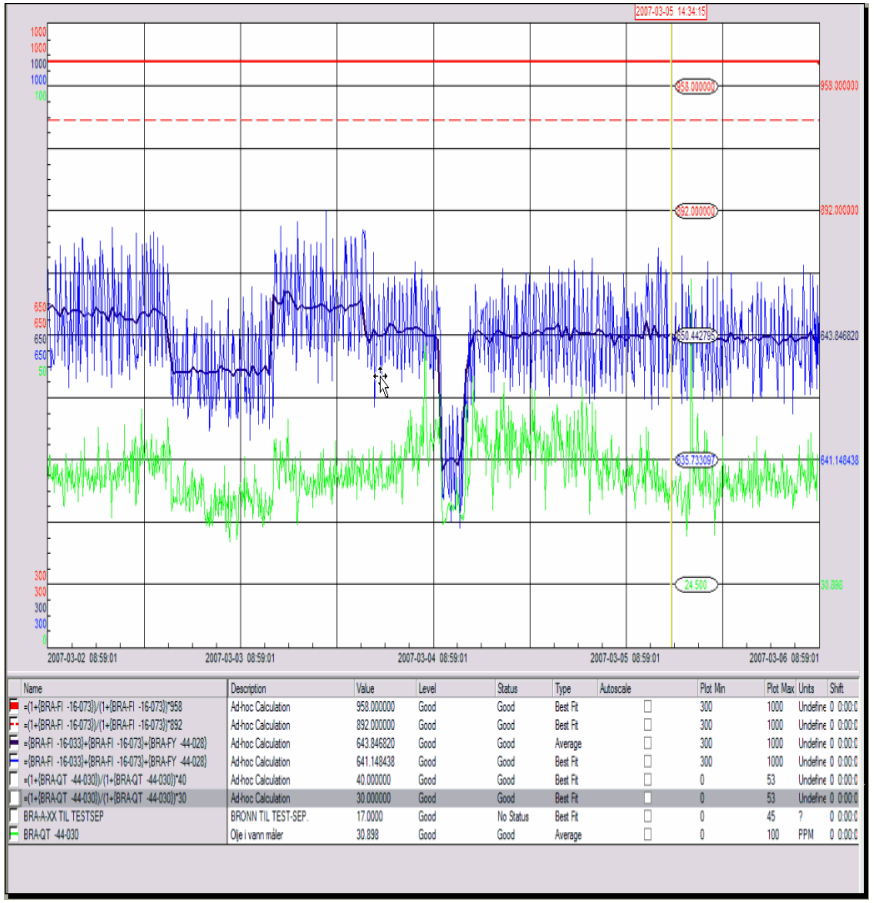
- **better process control**
- **process optimization**

for achieving

- **higher oil production**
- **without increased oil discharges**

Potential for analysis of

- **higher oil concentration**
- **oil field chemicals**



Name	Description	Value	Level	Status	Type	Autoscale	Plot Min	Plot Max	Units	Shift
=(1+[BRA-FI -16-073])/(1+[BRA-FI -16-073])*958	Ad-hoc Calculation	958.000000	Good	Good	Best Fit		300	1000	Undefine	0 0.00.0
=(1+[BRA-FI -16-073])/(1+[BRA-FI -16-073])*892	Ad-hoc Calculation	892.000000	Good	Good	Best Fit		300	1000	Undefine	0 0.00.0
=[BRA-FI -16-033]+[BRA-FI -16-073]+[BRA-FY -44-028]	Ad-hoc Calculation	643.846820	Good	Good	Average		300	1000	Undefine	0 0.00.0
=[BRA-FI -16-033]+[BRA-FI -16-073]+[BRA-FY -44-028]	Ad-hoc Calculation	641.148438	Good	Good	Best Fit		300	1000	Undefine	0 0.00.0
=(1+[BRA-QT -44-030])/(1+[BRA-QT -44-030])*40	Ad-hoc Calculation	40.000000	Good	Good	Best Fit		0	53	Undefine	0 0.00.0
=(1+[BRA-QT -44-030])/(1+[BRA-QT -44-030])*30	Ad-hoc Calculation	30.000000	Good	Good	Best Fit		0	53	Undefine	0 0.00.0
BRA-A-XX TIL TESTSEP	BRONN TIL TEST-SEP.	17.0000	Good	No Status	Best Fit		0	45	?	0 0.00.0
BRA-QT -44-030	Olje i vann måler	30.898	Good	Good	Average		0	100	PPM	0 0.00.0

Control Plot from OPIS [BRAGE]

read at the platform or onshore

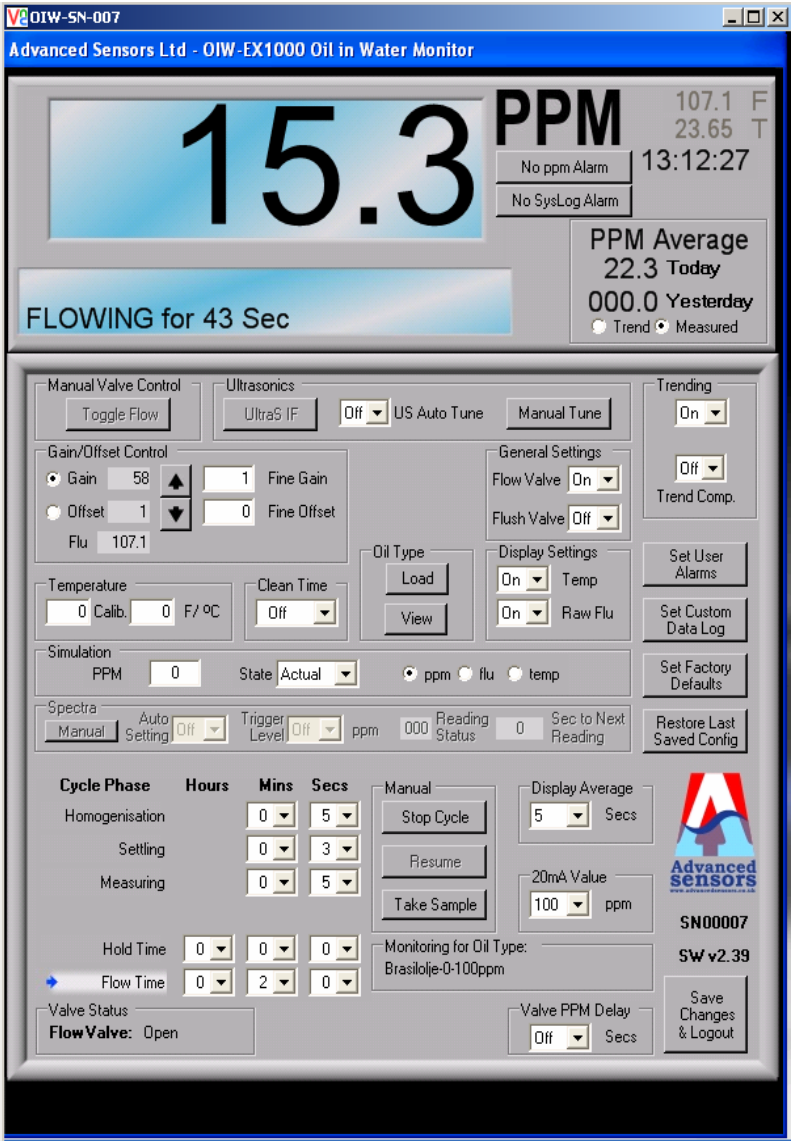
Goal for the future

<u>On-line analysis approved by SFT for reporting of oil discharges to sea</u>

Full time monitoring of oil discharges to sea

Real-time on-line analysis of oil components in separation processes for

- better process control
- reduction of oil field chemicals
- higher oil production
- lower oil discharges
- sub sea installation



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