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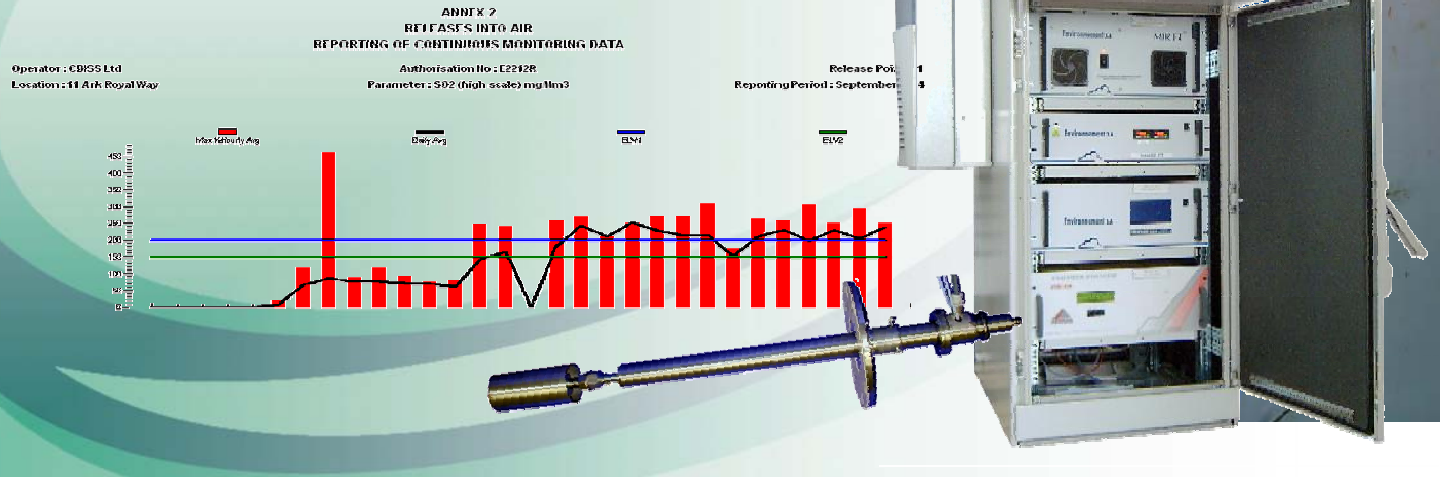
How To Achieve Compliance WID/EN14181



monitoring & control for your environment

Who are CBISS?

- We are an ISO 9001 accredited engineering company based in the North West of England.
- We specialise in Emissions monitoring and gas analysis
- We employ over 50 people and have offices across the UK

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Why do we have CEMS ?

- Environmental - Green and clean !
- Process optimisation !
- **IN THE MAJORITY OF CASES ITS DUE TO LEGISLATION**
- Waste Incineration Directive (WID)
- Large Combustion Plant Directive (LCPD)
- IPPC/IPC

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MCERTs

Working under either WID or LCPD your permit/licence will ask for MCERTs or TUV approval

The certified range must be a minimum of 1.5 Times the ELV for WID or 2.5 Times for LCPD

E.g.: HCL 0 – 15mg/m³ on an daily ELV of 10mg/m³

sira MCERTS ENVIRONMENT AGENCY

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

MIR9000 Multi-gas Analyser
Type 2 SEC Probe
Type 2 TIG Calibration/blow back module

manufactured by:

Environnement SA
111 Boulevard Robespierre
78304 Poissy Cedex
France

has been assessed by Sira Certification Service and found to comply with:

MCERTS Performance Standards for Continuous Emission Monitoring Systems (November 1998)

Certification Ranges :

SO_2	0 - 75 mg/m³ (0 to 25 ppm),	0 - 200 mg/m³ (0 to 70 ppm)
CO	0 - 75 mg/m³ (0 to 60 ppm),	0 - 250 mg/m³ (0 to 200 ppm)
NO	0 - 80 mg/m³ (0 to 60 ppm),	0 - 335 mg/m³ (0 to 250 ppm)
HCl	0 - 15 mg/m³ (0 to 10 ppm),	0 - 100 mg/m³ (0 to 60 ppm)

Certification is awarded in respect of the conditions stated in this certificate

Project No:	474/01/04
Certificate No:	Sira MC 020010/01
Initial Certification:	10 January 2002
This Certificate issued	21 February 2006
Renewal Date:	09 January 2007

Chief Executive

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service
South Hill, Chislehurst, Kent, BR7 5EH, England
Tel: 020-8467-2636 Fax: 020-8468 1841

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Heated FID – EN12619

- For WID applications the VOC measurement must utilise a Heated FID instrument.
- This again must be MCERT/TUV approved and the relevant certification range for 1.5 times ELV
- Most permits/licenses will ask for compliance with EN12619 which requires the measurement to be hot/wet
- Currently only heated FID's have met this standard
- Burners placed in a heated furnace, up to 190°C allowing measurement of high concentrations of heavy hydrocarbons

MCERTS

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Duplex Systems

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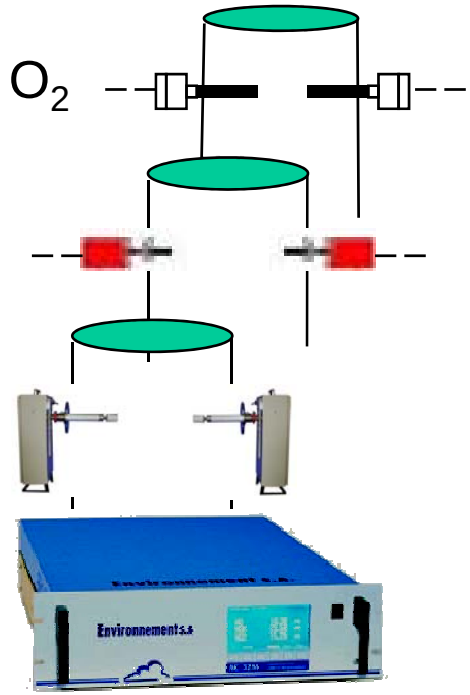
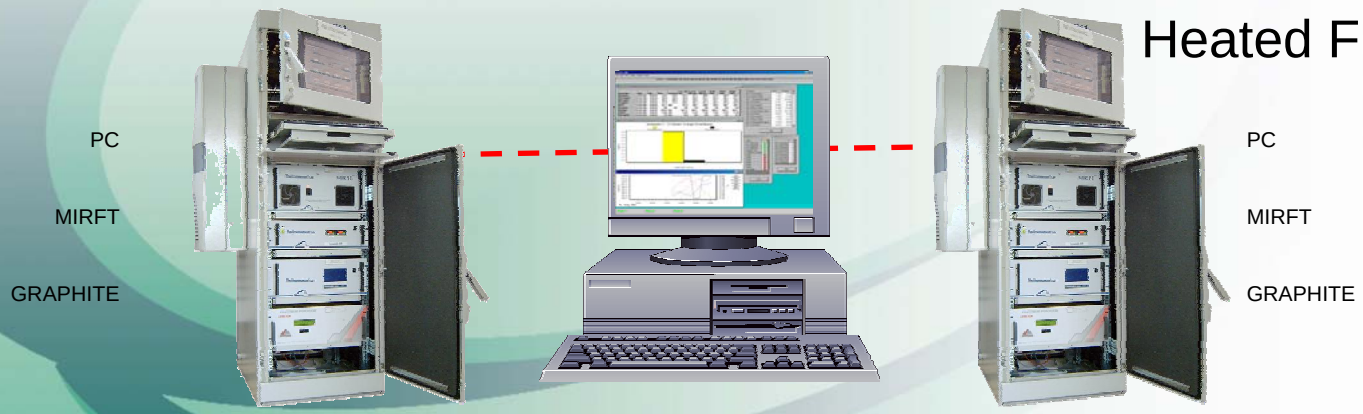
Duplex Systems

- External O_2 to offer full redundancy without the requirement to switch the whole system
- Particulate compliant with EN13284
- Sample extraction probe/conditioning unit
- Integrated Temperature, Pressure & Flow
- Heated FID for VOC's
- Live data comparison between duty & standby system on C-DAS





Live Duty
&
Standby Data

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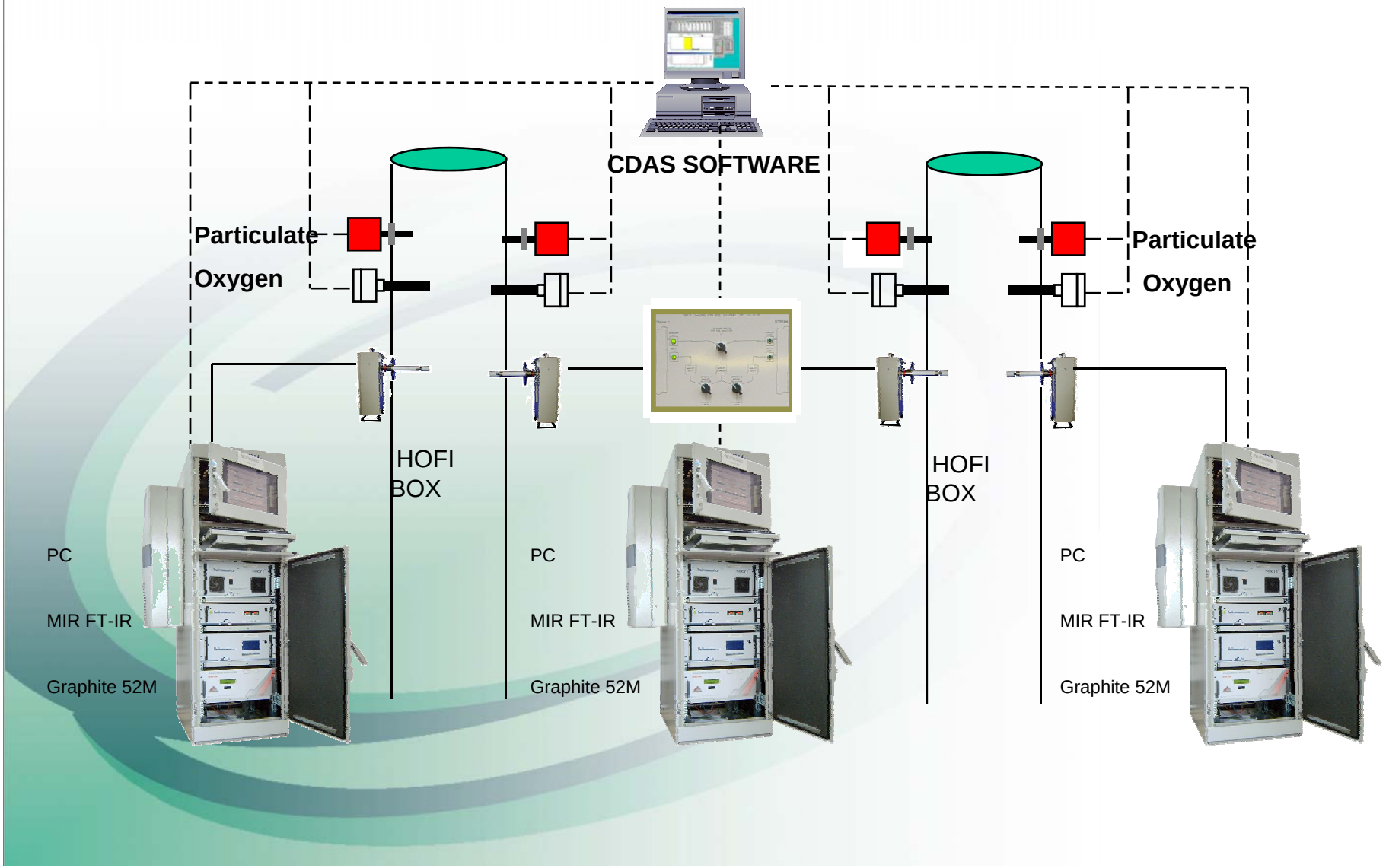
MIR-FT Example Duplex System



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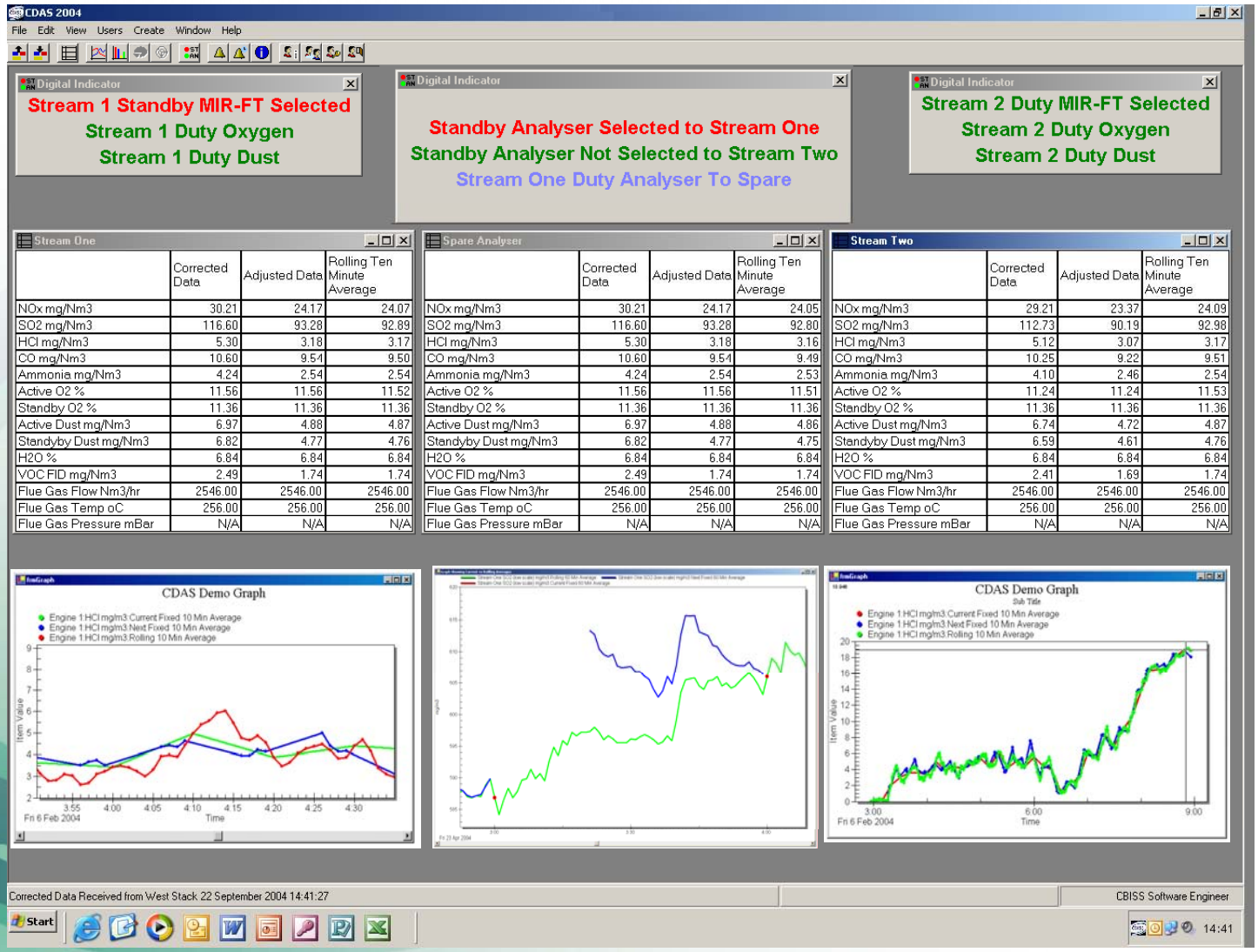
Duplex Screen Shot



Stream One	Corrected Data	Adjusted Data	Rolling Ten Minute Average
NOx mg/Nm3	30.21	24.17	24.07
SO2 mg/Nm3	116.60	93.28	92.89
HCl mg/Nm3	5.30	3.18	3.17
CO mg/Nm3	10.60	9.54	9.50
Ammonia mg/Nm3	4.24	2.54	2.54
Active O2 %	11.56	11.56	11.52
Standby O2 %	11.36	11.36	11.36
Active Dust mg/Nm3	6.97	4.88	4.87
Standyby Dust mg/Nm3	6.82	4.77	4.76
H2O %	6.84	6.84	6.84
VOC FID mg/Nm3	2.49	1.74	1.74
Flue Gas Flow Nm3/hr	2546.00	2546.00	2546.00
Flue Gas Temp oC	256.00	256.00	256.00
Flue Gas Pressure mBar	N/A	N/A	N/A

Spare Analyser	Corrected Data	Adjusted Data	Rolling Ten Minute Average
NOx mg/Nm3	30.21	24.17	24.05
SO2 mg/Nm3	116.60	93.28	92.80
HCl mg/Nm3	5.30	3.18	3.16
CO mg/Nm3	10.60	9.54	9.49
Ammonia mg/Nm3	4.24	2.54	2.53
Active O2 %	11.56	11.56	11.51
Standby O2 %	11.36	11.36	11.36
Active Dust mg/Nm3	6.97	4.88	4.86
Standyby Dust mg/Nm3	6.82	4.77	4.75
H2O %	6.84	6.84	6.84
VOC FID mg/Nm3	2.49	1.74	1.74
Flue Gas Flow Nm3/hr	2546.00	2546.00	2546.00
Flue Gas Temp oC	256.00	256.00	256.00
Flue Gas Pressure mBar	N/A	N/A	N/A

Stream Two	Corrected Data	Adjusted Data	Rolling Ten Minute Average
NOx mg/Nm3	29.21	23.37	24.09
SO2 mg/Nm3	112.73	90.19	92.98
HCl mg/Nm3	5.12	3.07	3.17
CO mg/Nm3	10.25	9.22	9.51
Ammonia mg/Nm3	4.10	2.46	2.54
Active O2 %	11.24	11.24	11.53
Standby O2 %	11.36	11.36	11.36
Active Dust mg/Nm3	6.74	4.72	4.87
Standyby Dust mg/Nm3	6.59	4.61	4.76
H2O %	6.84	6.84	6.84
VOC FID mg/Nm3	2.41	1.69	1.74
Flue Gas Flow Nm3/hr	2546.00	2546.00	2546.00
Flue Gas Temp oC	256.00	256.00	256.00
Flue Gas Pressure mBar	N/A	N/A	N/A

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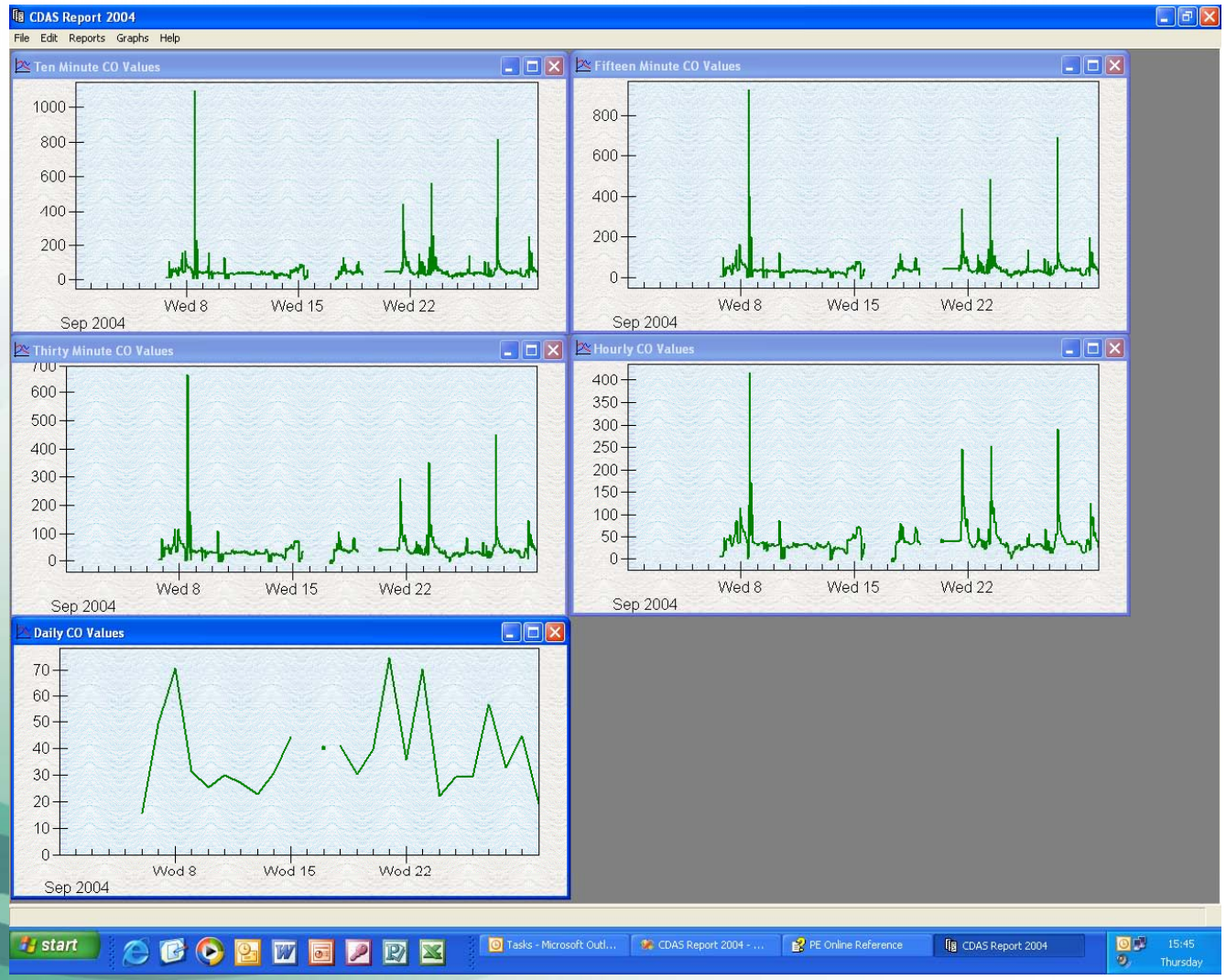
Data Acquisition & Reporting



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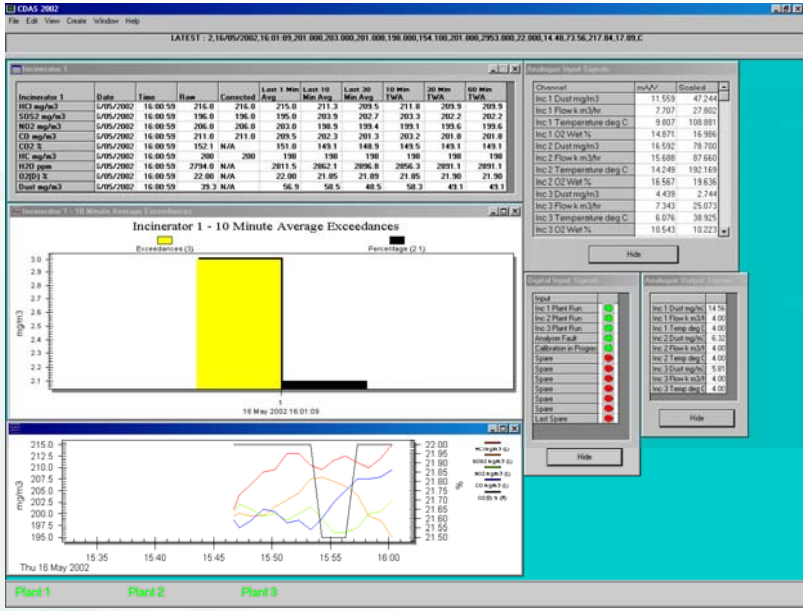
C-DAS Data Acquisition Software

- Corrects values for flow, pressure, temperature
- Reports mass emissions
- Allows for plant run time
- Generates alarms
- 8 years 100+licenses



- Combustion, boilers, incineration, chemical, Cement, etc

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Information Grids (configurable)

Channel 1	Date	Time	Raw	Corrected	Daily Average	Max 10 Min TWA	Max 30 Min TWA	Daily Average Hi Limit	Exceeeds of Daily Average Hi Limit
O2 %	23/08/2002	10:10:57	12.1	N/A	12.0	12.2	12.2	18.0	0
CO mg/m3	23/08/2002	10:10:57	249.80	281.03	305.83	410.71	410.71	400.00	0
HCl mg/m3	23/08/2002	10:10:57	721.9	812.1	452.3	647.2	647.2	100.0	3
TOC mg/m3	23/08/2002	10:10:57	203	229	241	291	252	500	0
NO mg/m3	23/08/2002	10:10:57	11.10	12.49	13.33	19.33	19.33	20.00	0
NH3 mg/m3	23/08/2002	10:10:57	24.9	28.0	22.4	29.9	22.4	30.0	0
SO2 mg/m3	23/08/2002	10:10:57	19.8	22.3	15.2	20.2	20.2	100.0	0
NO2 mg/m3	23/08/2002	10:10:57	47.30	53.21	54.94	89.33	89.33	120.00	0
HF mg/m3	23/08/2002	10:10:57	42.0	47.3	51.2	64.1	64.1	120.0	0
Temperature C	23/08/2002	10:10:57	607	N/A	696	777	777	1000	0
Flow Rate m3/h	23/08/2002	10:10:57	25055.60	N/A	24264.85	26065.05	26065.05	40000.00	0

CDAS 2002

File Edit View Create Window Help

LATEST : 2,16/05/2002,16:01:09,201.000,203.000,201.000,198.000,154.100,201.000,2953.000,22

Incinerator 1

Incinerator 1	Date	Time	Raw	Corrected	Last 1 Min Avg	Last 10 Min Avg	Last 30 Min Avg	10 Min TWA	30 Min TWA	60 Min TWA
HCl mg/m3	6/05/2002	16:00:59	216.0	216.0	215.0	211.3	209.5	211.8	209.9	209.9
SOS2 mg/m3	6/05/2002	16:00:59	196.0	196.0	195.0	203.9	202.7	203.3	202.2	202.2
NO2 mg/m3	6/05/2002	16:00:59	206.0	206.0	203.0	198.9	199.4	199.1	199.6	199.6
CO mg/m3	6/05/2002	16:00:59	211.0	211.0	209.5	202.3	201.3	203.2	201.8	201.8
CO2 %	6/05/2002	16:00:59	152.1	N/A	151.0	149.1	148.9	149.5	149.1	149.1
HC mg/m3	6/05/2002	16:00:59	200	200	190	190	190	190	190	190
H2O ppm	6/05/2002	16:00:59	2794.0	N/A	2811.5	2862.1	2896.8	2856.3	2891.1	2891.1
O2(D) %	6/05/2002	16:00:59	22.00	N/A	22.00	21.85	21.89	21.85	21.90	21.90
Dust mg/m3	6/05/2002	16:00:59	39.3	N/A	56.9	58.5	48.5	58.3	49.1	49.1

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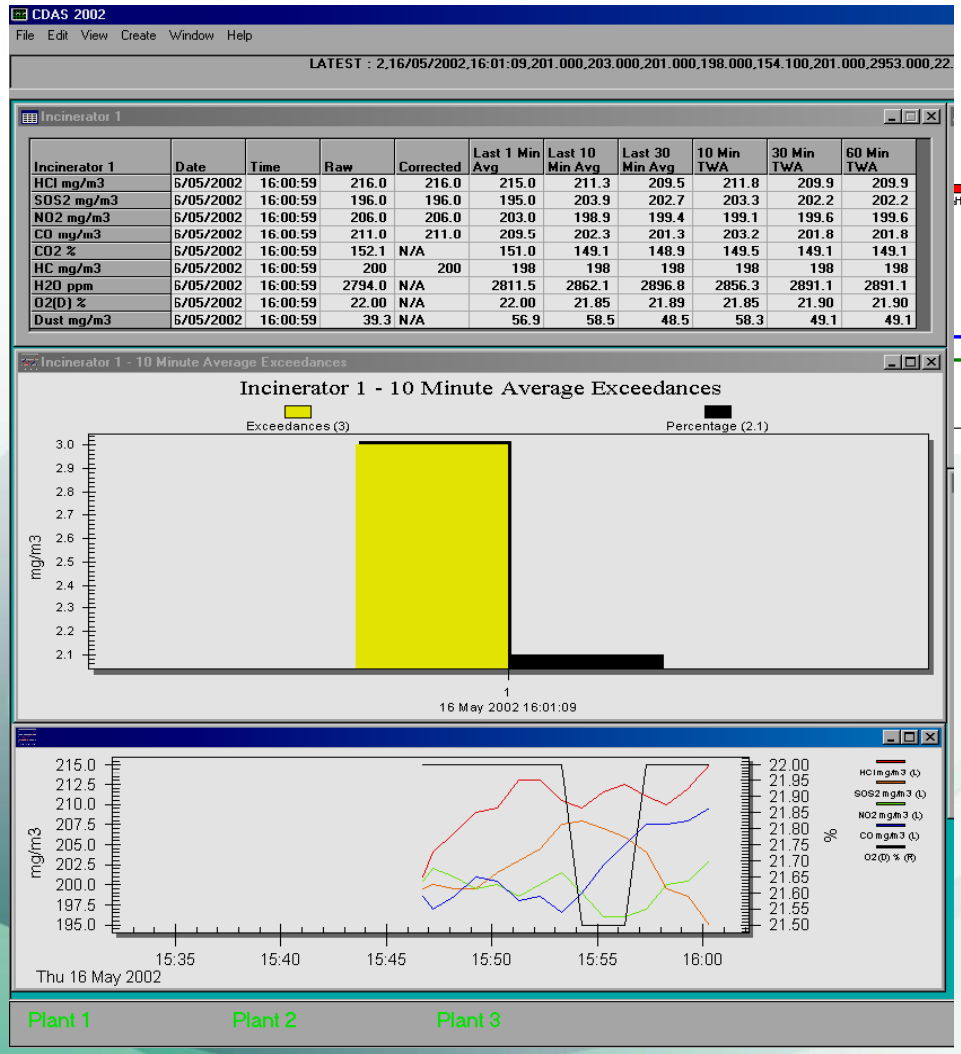
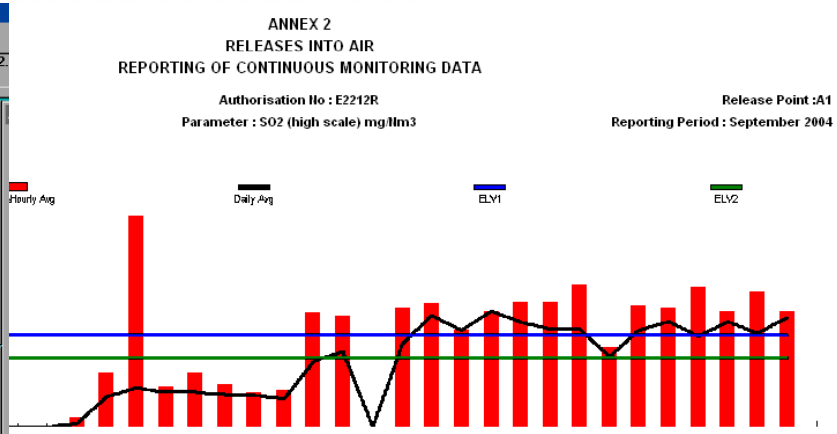
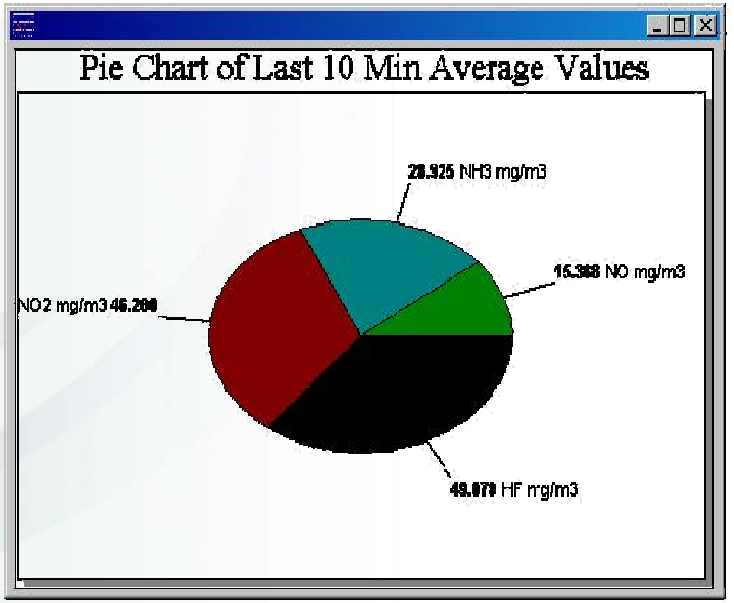
On-Line Trends



Incinerator 1	Date	Time	Raw	Corrected	Last 1 Min Avg	Last 10 Min Avg	Last 30 Min Avg	10 Min TWA	30 Min TWA	60 Min TWA
HCl mg/m3	6/05/2002	16:00:59	216.0	216.0	215.0	211.3	209.5	211.8	209.9	209.9
SOS2 mg/m3	6/05/2002	16:00:59	196.0	196.0	195.0	203.9	202.7	203.3	202.2	202.2
NO2 mg/m3	6/05/2002	16:00:59	206.0	206.0	203.0	198.9	199.4	199.1	199.6	199.6
CO mg/m3	6/05/2002	16:00:59	211.0	211.0	209.5	202.3	201.3	203.2	201.8	201.8
CO2 %	6/05/2002	16:00:59	152.1	N/A	151.0	149.1	148.9	149.5	149.1	149.1
HC mg/m3	6/05/2002	16:00:59	200	200	198	198	198	198	198	198
H2O ppm	6/05/2002	16:00:59	2794.0	N/A	2811.5	2862.1	2896.8	2856.3	2891.1	2891.1
O2(D) %	6/05/2002	16:00:59	22.00	N/A	22.00	21.85	21.89	21.85	21.90	21.90
Dust mg/m3	6/05/2002	16:00:59	39.3	N/A	56.9	58.5	48.5	58.3	49.1	49.1





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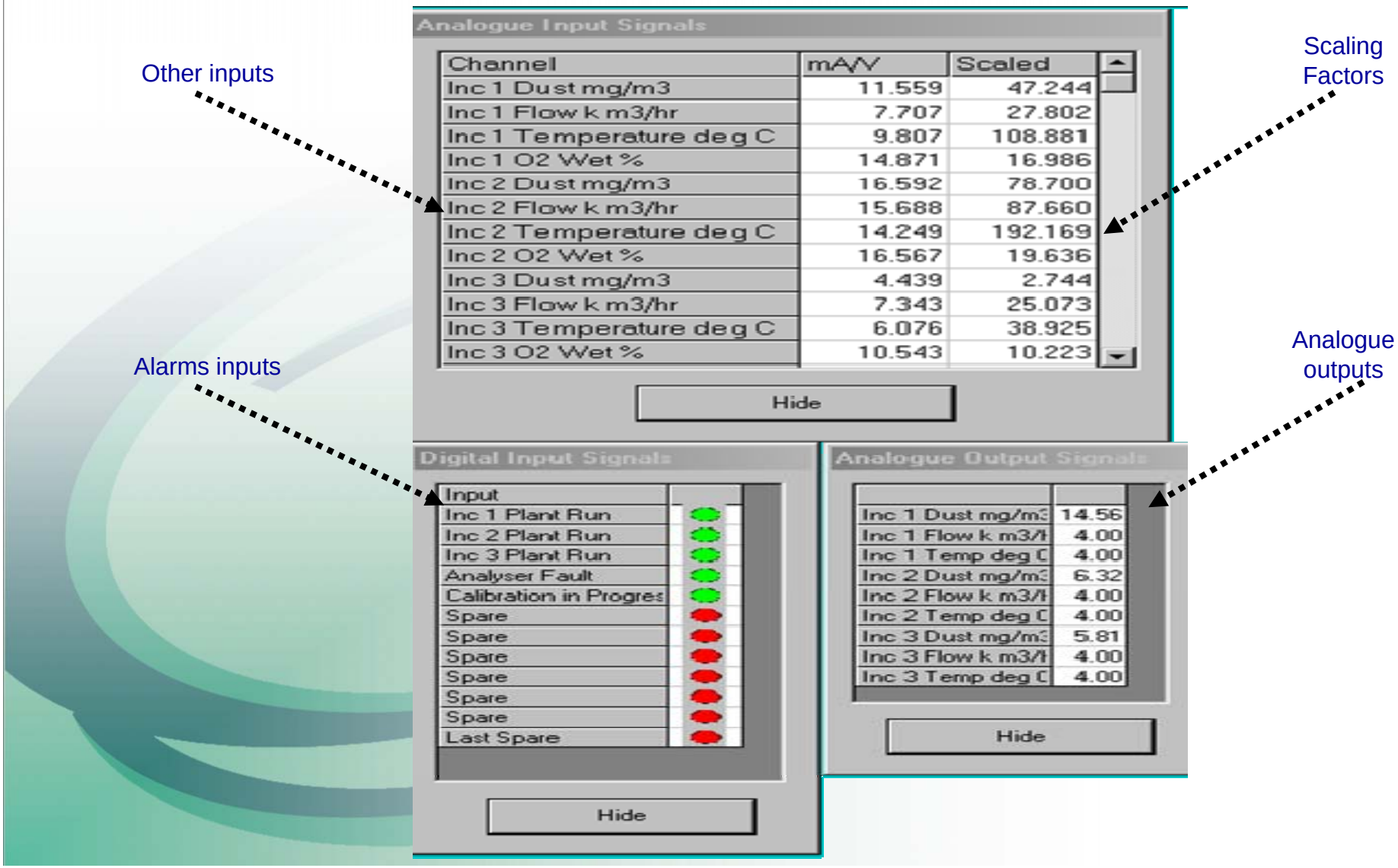
Corrections and Re-transmissions



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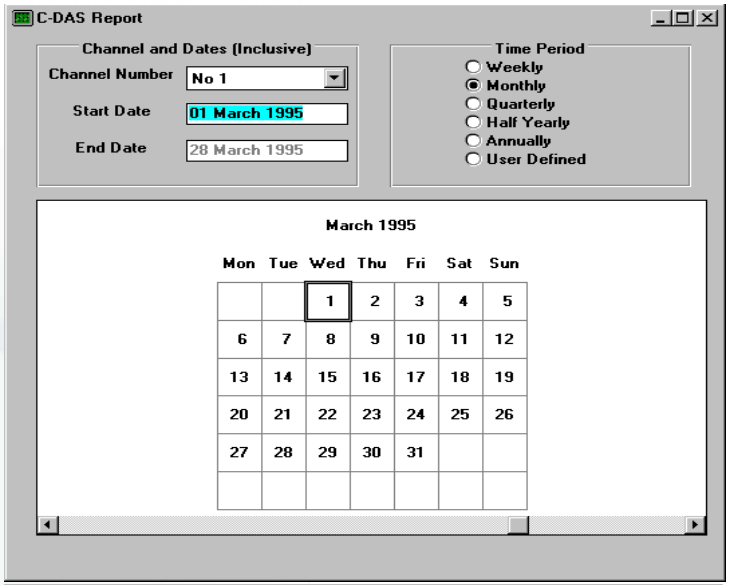
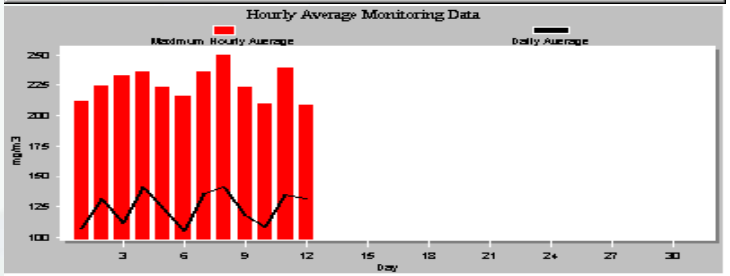
Reporting Software

- Off-line Reporting Software
- Uses daily log files
- Produces monthly, quarterly etc. reports
- Easy to use calendar
- Haz waste variation displays
- Customised reports available
- Supported in the UK & Ireland





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Daily Software Reports

- Shift Reports
- Daily Log of Raw data
- User defined text “incinerator 1”
- Daily Report
- On demand Report / Printout
- Print on Alarm
- IPPC Annexes

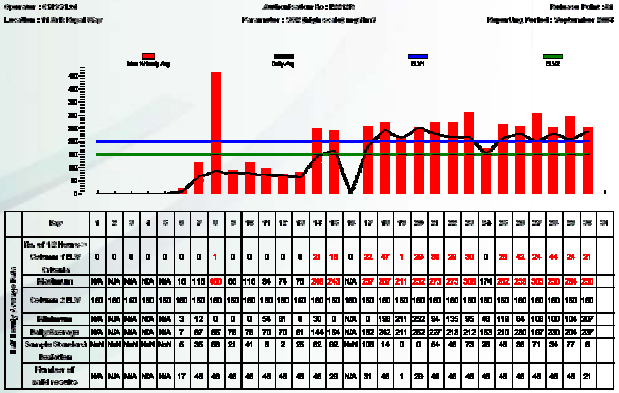
CBISS DEMO SYSTEM Emission Report
From 15 May 2002 00:00 to 15 May 2002 23:59
Report printed on 15/05/2002 at 15:33:43

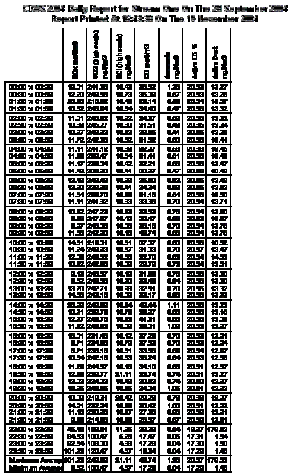
Incinerator 1	Corrected HCl mg/m3	Corrected NOx mg/m3	Corrected SO2 Dry mg/m3	Corrected HCl mg/m3	Corrected CO mg/m3
Maximum Value	345.7	346.2	278.2	209.6	315.9
Average Value	312.2	314.5	250.6	188.6	282.9
No. Alarms	0	0	0	0	0
Minimum Value	171.3	170.4	137.7	103.3	163.4
Maximum Hourly Avg	312.2	314.5	250.6	188.6	282.9

Incinerator 1	Corrected HF mg/m3	Raw O2 %	Corrected TOC mg/m3
Maximum Value	344.3	15.23	240.9
Average Value	311.4	13.56	218.1
No. Alarms	0	0	0
Minimum Value	173.0	7.66	119.9
Maximum Hourly Avg	311.4	13.56	218.1

Incinerator 2	Corrected HCl mg/m3	Corrected NOx mg/m3	Corrected SO2 Dry mg/m3	Corrected HCl mg/m3	Corrected CO mg/m3
Maximum Value	338.6	337.5	268.1	201.2	307.0
Average Value	332.7	329.7	259.9	195.8	297.3
No. Alarms	0	0	0	0	0
Minimum Value	327.8	319.4	250.9	187.2	282.9
Maximum Hourly Avg	332.7	329.7	259.9	195.8	297.3

Incinerator 2	Corrected HF mg/m3	Raw O2 %	Corrected TOC mg/m3
Maximum Value	338.8	15.01	237.6
Average Value	326.3	14.53	230.9
No. Alarms	0	0	0
Minimum Value	319.8	14.56	224.0
[illegible]	326.3	14.53	230.9





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Service & Support

Paul Burgess
(Service Manager)

Adam Dabrowski
(Regional Service Manager - North)

Paul Morgan
(Regional Service Manager - South)

John Dakers
(Senior Service Engineer – Scotland)

Lee Spencer
(Senior Service Engineer - South)

Dee Lound
(Service Coordinator & Supervisor)

Iain McGlinchey
(Service Engineer-Scotland)

Daryl Wilson
(Service Engineer - North)

Stuart Barrowcliff
(Service Engineer - North)

John Hall
(Service Engineer - North)

Paul Reeve
(Service Engineer - South)

Andy Dowling
(Service Engineer - South)

Marc Roach
(Bench Service Engineer)

Angela Evans
(Service Admin)

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Service & Support

24 hour 7 days per week cover

Direct engineer contact day or night

14 person service team

11 Factory trained dedicated engineers

Remote system diagnostics through modem

Software & IT support for supplied equipment

Commissioning to relevant performance standards

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Commissioning

Full function check of complete system including standard zero and span calibration of the analyser.

Verification of compliance to relevant performance standards.

NOX - ISO10849

CO,CO2 and O2 - ISO12039

SO2 - BS6069

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EN 14181 – The QAL's

Quality Assurance of Automated Measuring Systems

"***(QAL 1)*** *to demonstrate that the AMS is suitable for the intended purpose before installation, by meeting required performance standards and the uncertainty budgets specified in the EU directives;"*

"***(QAL 2)*** *to calibrate the AMS and determine the variability of the measured values obtained by it; so as to demonstrate the suitability of the AMS for its application, following installation;"*

"***(QAL 3)*** *to maintain and demonstrate the required quality of the measurement results during the normal operation of the AMS, by checking that the zero and span characteristics are consistent with those determined during QAL 1;*"

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EN 14181 – QAL 1

Quality Assurance of Automated Measuring Systems

"***(QAL 1)*** *to demonstrate that the AMS is suitable for the intended purpose before installation, by meeting required performance standards and the uncertainty budgets specified in the EU directives;"*

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EN 14181 – QAL 1

SUMMARY REPORT - Waste Incineration

Expanded Uncertainties of ENVIRONNEMENT SA's AMS : MIR 9000, MIR FT and GRAPHITE 52M

Environnement s.a

AMS	Gas	Expanded uncertainty at 95% (in mg/m3 dry without O2 correction)	Expanded uncertainty at 95% (in mg/m3 dry corrected @11%O2)	Expanded uncertainty at 95% (in % of ELV dry corrected @11%O2)	Maximum Authorized Expanded Uncertainty according to Directive 2000/76/CE	AMS acceptable (Yes/No)
MIR 9000	HCl	3,38	3,40	34,0%	40,0%	Yes
MIR 9000	SO2	6,73	6,07	13,5%	20,0%	Yes
MIR 9000	NO	7,49	10,48	3,7%	20,0%	Yes
MIR 9000	NOx	7,89	11,03	3,9%	20,0%	Yes
MIR 9000	CO	2,83	3,37	5,7%	10,0%	Yes
MIR 9000	TOC	under evaluation	under evaluation	under evaluation	30,0%	-
GRAPHITE 52M (used with MIR 9000)	TOC	0,83	0,91	9,1%	30,0%	Yes
MIR FT	HCl	0,74	0,84	8,4%	40,0%	Yes
MIR FT	SO2	2,79	3,40	6,8%	20,0%	Yes
MIR FT	NO	11,82	16,74	5,6%	20,0%	Yes
MIR FT	NOx	12,44	17,62	5,8%	20,0%	Yes
MIR FT	CO	2,51	3,17	6,3%	10,0%	Yes
MIR FT	TOC	0,83	1,00	10,0%	30,0%	Yes
GRAPHITE 52M (used with MIR FT)	TOC	0,86	0,94	9,4%	30,0%	Yes

Nota :
1) NO & NOx expressed as mg/m3 eq NO2. TOC expressed as mgC/m3
2) Data from TÜV reports for MIR FT and GRAPHITE 52M are on a dry basis
3) Data from MCERT report MIR 9000 and MIR 9000 O2 sensor are on dry basis
4) Data for MIR FT O2 sensor are on wet basis

Calculations according to EN ISO 14956 Standard - Summary - v8, December 8th, 2004 - DM/SA

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EN 14181 – QAL 1

Expanded Uncertainty of MIR 9000 AMS for use in Waste Incineration in the EU
Gas : HCl

MIR 9000

Environnement S.A

Certification Range (CR) : 98,4 mg/m3 (MCERT / 60 ppm)
Test concentration (TC) : 82,0 mg/m3 (MCERT / 50 ppm)
Emission limit value (ELV) : 10,0 mg/m3 corrected to dry @11%vO2 (daily)

Partial uncertainty	Result of MCERT test			u (HCl) (mg/m3)	u^2 (HCl)	Remarks
Refer to "Formula" sheet. Equation n° x	% of CR or TC	mg/m3 referred to CR or TC	mg/m3 referred to ELV			
n°1 - Uncertainty due to linearity (lack of fit) : u_{lin}	0,710%	0,699	-	0,403	0,1627	MCERT Laboratory Evaluation Report page 18-Table 6a
n°2 - Uncertainty due to zero drift : u_{inst}(zero drift)	-	-	-	-	-	Zero drift < Span drift : not considered
n°3 - Uncertainty due to span drift : u_{inst}(span drift)	1,700%	1,394	0,170	0,098	0,0096	MCERT Field Evaluation Report - Page 27 (% TC / week)
n°4 - Uncertainty relating from variations in ambient pressure expressed as standard deviation : u_{press}	N.A.	N.A.	N.A.	0,000	0,0000	N.A. , no sensitivity to atmospheric pressure variations (compensation)
n°5 - Uncertainty relating from variations in ambient temperature expressed as standard deviation : u_{temp}	2,388%	2,331	-	1,348	1,8105	MCERT Laboratory Evaluation Report page 30-Table 10a (interpolation at 20°C +/-5°C)
n°6 - Uncertainty due to cross interferences : u_{inst}(int)	-	-1,582	-	-0,913	0,8343	MCERT Laboratory Evaluation Report page 22-Table 7a. Max (Σ interferences +,Σ interferences -)
n°7 - Standard deviation of repeatability at zero : Sr,o	0,045%	0,045	-	0,026	0,0007	MCERT Laboratory Evaluation Report page 26-Table 8a. Sr,o < Sr,s : not considered
n°8 - Standard deviation of repeatability at test concentration : $S_{r,s}$	0,177%	0,175	-	0,175	0,0305	p 27 tab 9a repeatability divided by t student (2,65)
n°9 - Uncertainty due to span gas unaccuracy : u_{sg}	-	2,000%	0,20	0,115	0,0133	span gas relative accuracy : 2%
n°10 - Uncertainty relating from correction to dry : u_{condry}	N.A.	N.A.	N.A.	N.A.	N.A.	Measurements are made on a dry sample thanks to SEC sampling device (permeation-based)
					2,8610	Sum of u^2 (HCl), without O2 correction
n°11 - Uncertainty relating from influence of correction to O2 : u_{inO2}					0,0335	Refer to "O2" uncertainty calculation sheet
					2,8945	Sum of u^2 (HCl), with O2 correction

Combined uncertainty u_c (HCl) :	1,691 mg/m3 (dry without O2 correction)	$\sqrt{\sum u^2(HCl)}$
Combined uncertainty u_c (HCl) :	1,701 mg/m3 (dry with O2 correction)	
Expanded uncertainty U (HCl) at 95% confidence interval (K=2) :	**3,38 mg /m3 (dry without O2 correction)**	
Expanded uncertainty U (HCl) at 95% confidence interval (K=2) :	**3,40 mg /m3 (dry at 11%O2)**	
Expanded uncertainty U (HCl) at 95% confidence interval (K=2) :	**34,0% of ELV (dry @11%O2)**	
Required U_{req}(HCl) according to 2000/76/CE Directive :	**40,0% of ELV (dry @11%O2)**	
U (HCl) <U_{req}(HCl) - MIR 9000 for HCl complies with Waste Incineration Directive 2000/76/CE		

Calculations made according to EN ISO 14956 Standard - MIR HCl data - v8, December 9th, 2004 – DM/SA

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EN 14181 – QAL 2

Quality Assurance of Automated Measuring Systems

"***(QAL 2)*** *to calibrate the AMS and determine the variability of the measured values obtained by it; so as to demonstrate the suitability of the AMS for its application, following installation;*"

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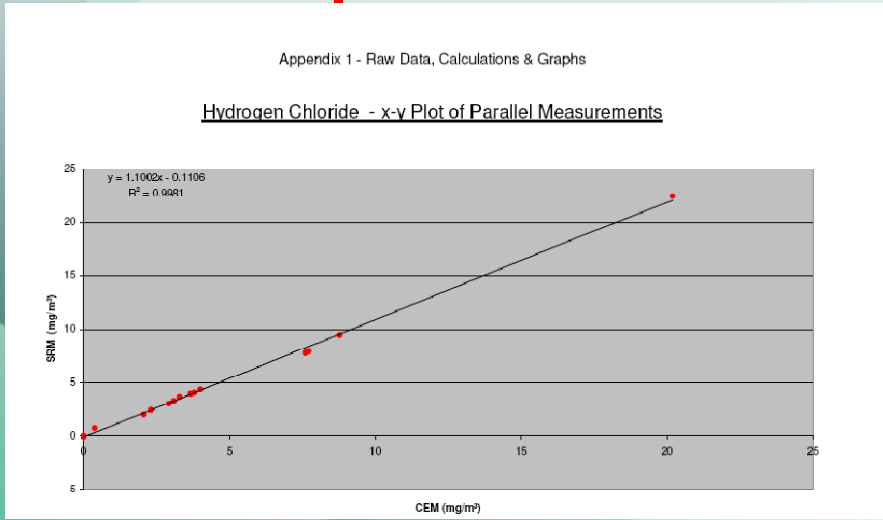
EN 14181 – QAL 2



- Instrument Compared to Standard Reference Method (SRM) in a Parallel Test.
- Results From Two Instruments Compared and Linear Calibration Function Generated
- All Data from the AMS is now Calibrated in Software Against This Function.
- Range of Data used to Generate Function Provides Valid Instrument Range. Emissions Should Remain Within This Range or New QAL 2 Performed.

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Traditionally

- End users would usually have existing relationships with stack testing houses
- The same companies who carry out periodic testing would be approached for the QAL 2 test
- Site specific experience, existing account info, trusted engineers & fully inducted etc
- As long as the company has the correct certification of personnel, equipment and procedure then, this option is not always a bad one.

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The Danger Of Separation

It may seen sensible for an operator to Order a AMS systems from a AMS supplier, and order a Stack test from a Stack tester.

This can and has caused problems in the past eg

- Results From Stack test compared to wrong data
- Results from stack tests not corrected in the same way as CEMS , (moisture O2 etc)
- Analyser (s) offline/in fault for part of tests
- Analyser Calibration / zero ref not adjusted
- Test carried out when analyser is due for calibration / service
- Usually results in tests having to be repeated at a cost and contractual disputes

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AMS Provider Involved In QAL 2

Due to our previous experience with stack testing we recommend to our customers that we are **involved** in all QAL 2 testing.

The majority of systems we are installing today include the QAL 2 test as our scope of supply. As an example CBISS hired an qualified Test House to do this work with our assistance.

On reviewing the Standard we found that it was essential that the Stack tester and CBISS understood the standard, and the AMS equipment.

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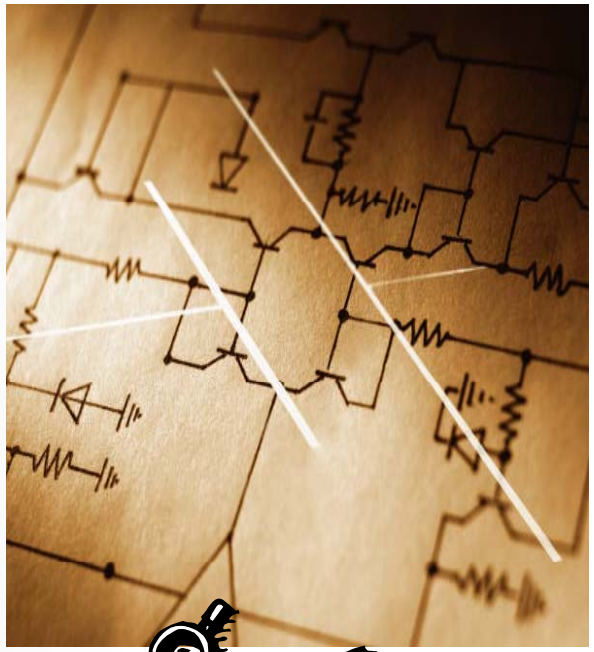
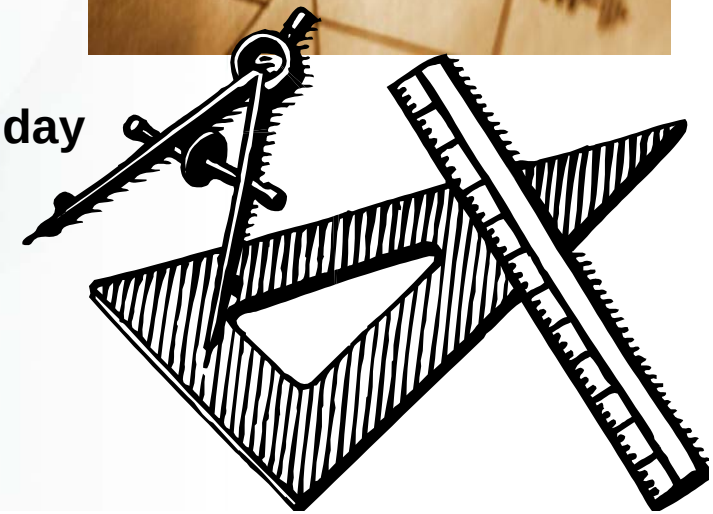
Working Relationship

- Initial meeting to discuss Standard and equipment tests
- Produce test document specific to equipment and site
- Stack tester is trained to be able to view analyser error messages make simple analyser checks and be able to take data from AMS reporting software
- CBISS perform service & calibration visit on site prior to Stack tests
- CBISS engineer & Stack tester visit site for first day of testing
- Report completed and passed to customer.

Usually results in tests <u>not</u> repeated.





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QAL 2 Report

- Once the tests have taken place and the successful report has been issued, the data is utilised by the software package
- The AMS must be calibrated to the SRM results
- Various software packages are available with an additional upgrade specifically for the EN14181 standard

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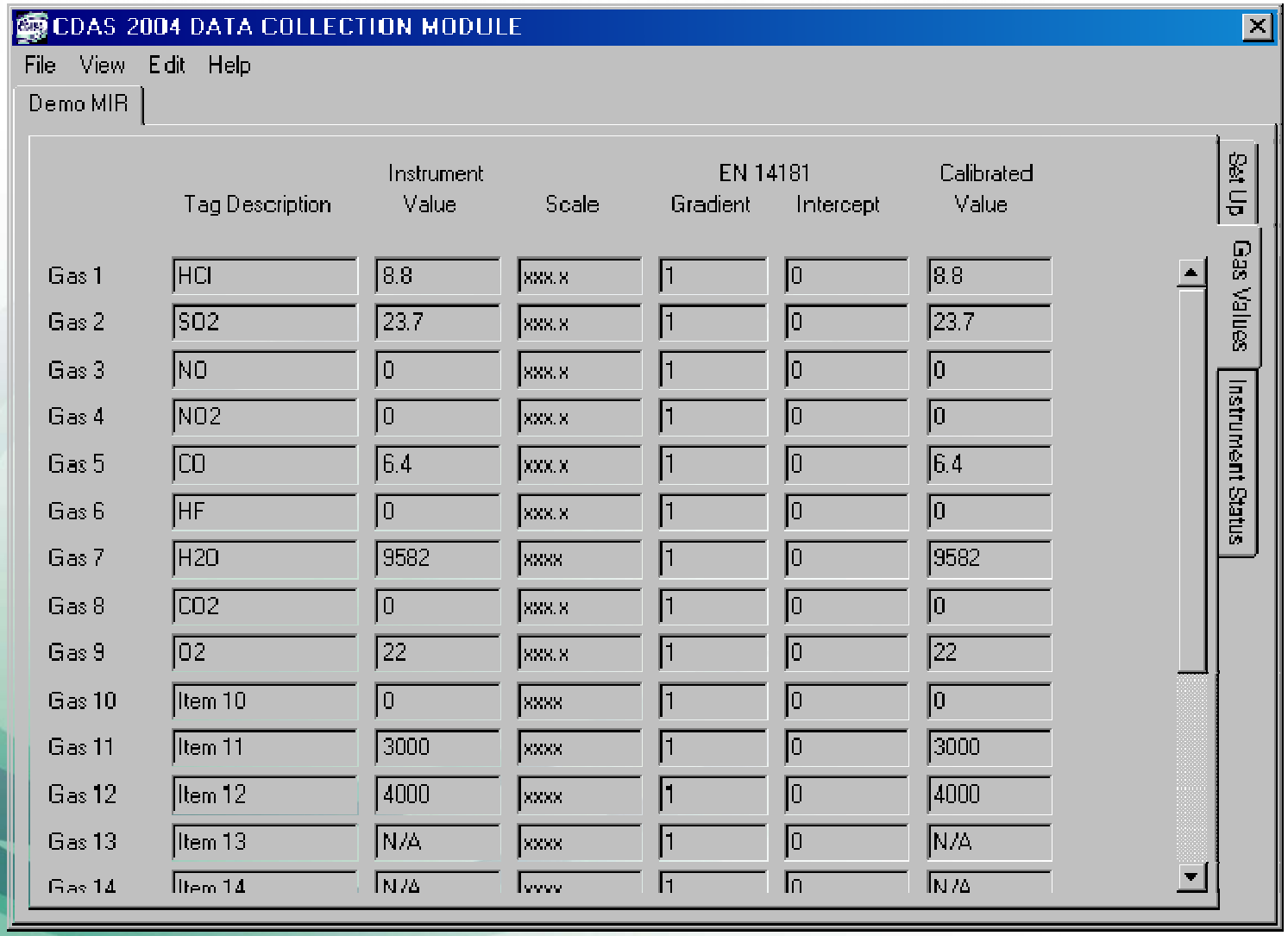
Example QAL 2 software



	Tag Description	Instrument Value	Scale	EN 14181 Gradient	EN 14181 Intercept	Calibrated Value
Gas 1	HCl	8.8	xxx.x	1	0	8.8
Gas 2	SO2	23.7	xxx.x	1	0	23.7
Gas 3	NO	0	xxx.x	1	0	0
Gas 4	NO2	0	xxx.x	1	0	0
Gas 5	CO	6.4	xxx.x	1	0	6.4
Gas 6	HF	0	xxx.x	1	0	0
Gas 7	H2O	9582	xxxx	1	0	9582
Gas 8	CO2	0	xxx.x	1	0	0
Gas 9	O2	22	xxx.x	1	0	22
Gas 10	Item 10	0	xxxx	1	0	0
Gas 11	Item 11	3000	xxxx	1	0	3000
Gas 12	Item 12	4000	xxxx	1	0	4000
Gas 13	Item 13	N/A	xxxx	1	0	N/A
Gas 14	Item 14	N/A	xxxx	1	0	N/A

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EN 14181 – QAL 3

Quality Assurance of Automated Measuring Systems

"***(QAL 3)*** *to maintain and demonstrate the required quality of the measurement results during the normal operation of the AMS, by checking that the zero and span characteristics are consistent with those determined during QAL 1;*"

This is the end users responsibility to carry these tests out

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EN 14181 – QAL 3

- Regular zero and span check to ensure equipment continues to meet the uncertainty specification.
- Results of these measurements need to be recorded.
- Analysis of the all recent recorded results must be performed.
- If necessary actions must be taken if results of analysis show problems with performance of the monitoring system.

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EN14181 - Analysis of Results

- EN 14181 QAL 3 allows for two methods of analysing results.
    - Shewhart Chart
    - CUSUM
- A report will be generated upon completion of the QAL 3 calibration and any problems arising should be clearly noted on the report.
- Possible to recreate old reports as well as viewing results of the calibration.

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EN 14181 – QAL 3

Manual QAL 3 procedure would consist of:

- **Injecting each calibration gas either to the probe or analyser**
- **Logging of the data either manually or from the software package**
- **Comparing of the data against the relevant calibration gas values**
- **Calculate Shewhart/CUSUM control charts**
- **QAL 3 report**

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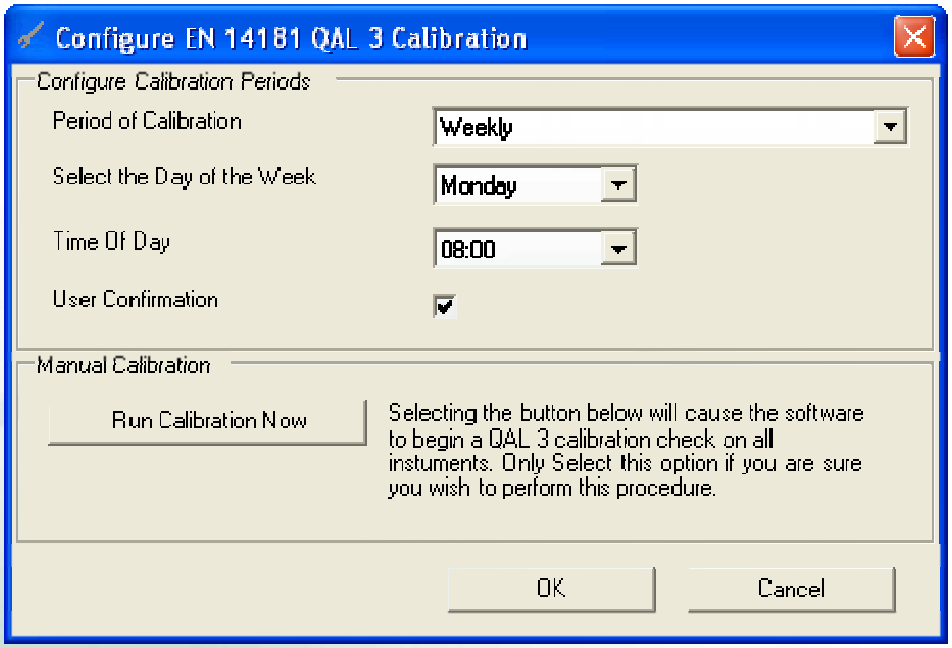
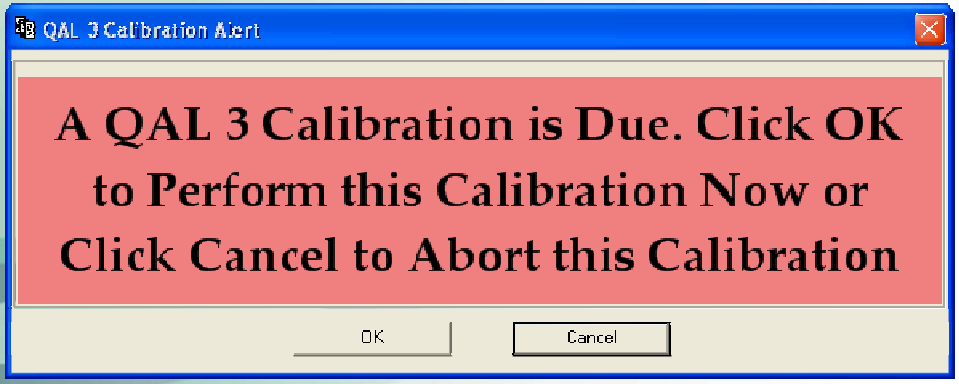
QAL 3 Calibration checks





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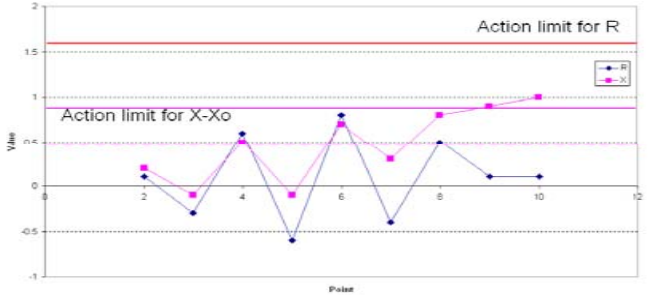
Example of a CUSUM Report

Keep it simple

Keep the level of input from the operators to a minimum

The easiest way to control and comply with EN14181 is through software

Weekly QAL 3 Report
Gosford Incinerator
CUSUM Chart for CO : Analyser MIR9000
Report Generated 10th January 2005
Report for Data from 2/9/04 to 5/1/05



Summary of Analysis

S_{ams} = 0.789

Drift

S_t > 2.850 S_{ams} : 2.850 > 2.249 **OK**
S_t > 0.501 S_{ams} : 0.254 > 0.395 **OK**

Precision

S_t > 6.900 S_{ams} : 3.900 > 5.444 **OK**
S_t > 1.850 S_{ams} : 1.150 > 1.460 **OK**

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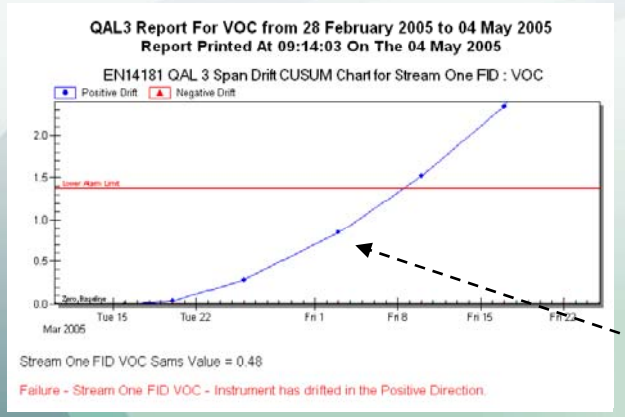
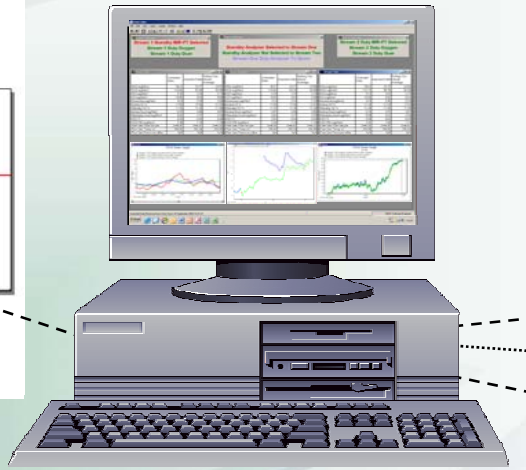
EN 14181 – QAL 3

- When a QAL 2 is completed the AMS should be QAL 3 “ready”.
- Analysers need to carry out calibration checks against span gas and zero readings at regular intervals.
- Results of these measurements need to be recorded.
- Analysis of all recently recorded results must be performed.



QAL 3 REPORTS
Cusum or Shewhart



Data logging & Control of Gas injection

IR analyser

Cal Gas BOX

FID Analyser

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EN 14181 – AST

- **AST - Annual Surveillance Test** used to ensure QAL 2 calibration function is maintained. Consists of alignment/cleaning of sampling system, leak test, zero/span, linearity, response time, interference check **plus 5 parallel measurements** spread evenly over one day, checking documentation and records followed by issuing of a report

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Summary

- Find out all of your stack conditions - temp, moisture, flow, particulate….
- Select the best technique for your environment – In-situ, Extractive….
- Compliant with relevant standards – WID, LCPD, MCERTS…
- Select a company who have the backup for all integrated products
- Select a software package which is flexible
- Turnkey contract from design to commissioning
- Remote diagnostics if possible
- Duplex systems - Justifiable?