

Data acquisition and report generation for CEM systems Principles & Practice

Environmental reporting made
easy with **CEMData**

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Product Development & Process Support

Increasingly, clients require a DAHS that is:

- Universal
 - Stand-alone, i.e. analyser-independent
 - Communicates with other equipment and systems, e.g. DCS/SCADA
- User-friendly
- Able to facilitate compliant ***operation***
- Easy to install and configure
- Expandable/upgradable with changes to plant/legislation
- WID, LCPD, EN14181-compliant
- Fully Automatic - including EN14181 data input
- Feature-rich

Features of a good DAHS

Universal

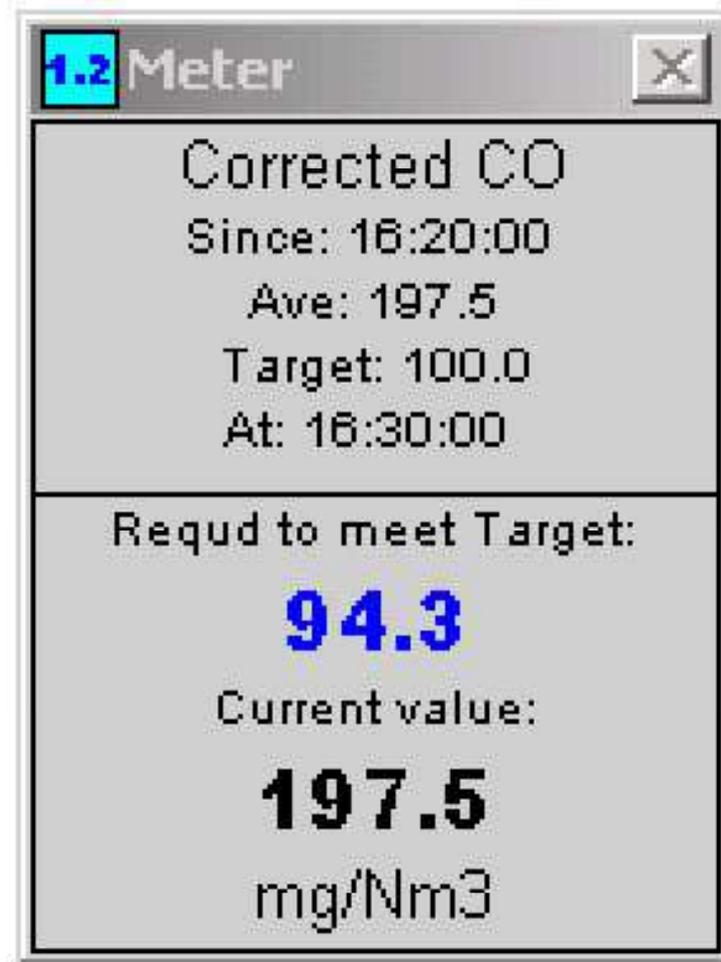
- Interfaces intelligently with equipment from any vendor, from simple field instruments to sophisticated analysers.
- Accepts a wide range of input types
 - e.g 0/4-20/21mA, 0-5V, 0-10V, VFC, RS232, RS485, RS422, Ethernet
- Supports industry-standard protocols
 - e.g. Modbus RTU, Modbus TCP
 - Expect to find some vendor-specific interfaces for added functionality but no vendor-fixed limitations
- Supports networking
- Provides real-time outputs (analogue and digital) in all these formats for calculated values and alarms.

Universal - Data input



- ⌘ We continue to supply hard-wired data acquisition systems where necessary.
- ⌘ However, such systems are increasingly seen as costly (especially in cabling/marshalling), cumbersome, and non-future-proof.
- ⌘ There is an increasing demand for networked, multi-PC-based systems and installations with distributed data sources.
- ⌘ Serial-based and more importantly, networked solutions are more cost-effective, more powerful, more adaptable and more maintainable.
- ⌘ Active-X technology can provide powerful interactive front-end solutions for direct low-level communication with devices such as PLCs and certain analysers.

Operating Target meter:



QAL2

QAL2 Calibration...

Raw NDx

Ref	Date	Time	SRM	CEM
1	16/04/2000	09:00:00	277	297
2	16/04/2000	11:00:00	270	307
3	16/04/2000	14:00:00	227	271
4	16/04/2000	16:00:00	248	296
5	17/04/2000	10:00:00	298	271
6	17/04/2000	12:00:00	388	287
7	17/04/2000	14:00:00	347	286
8	17/04/2000	16:00:00	243	252
9	18/04/2000	09:00:00	305	256
10	18/04/2000	11:00:00	345	285
11	18/04/2000	13:00:00	209	228
12	18/04/2000	15:00:00	38	66
13	18/04/2000	17:00:00	7	13
14	19/04/2000	09:00:00	14	4
15	19/04/2000	11:00:00	10	2

Method(a) Slope: 1.04858, Intercept: -3.1089
R-squared: 0.890354 Valid calibrated range: Min: 0, Max: 350.789
Kv=0.9761, Variability SD=43.8205 mg/Nm3

16/04/2000 09:00:00 277 297 Calculate CF

Edit From archive

Add Remove Edit **Check DataSet...**

Display time as:
 Local UTC (=GMT) LST

Load... Save... Calibrate

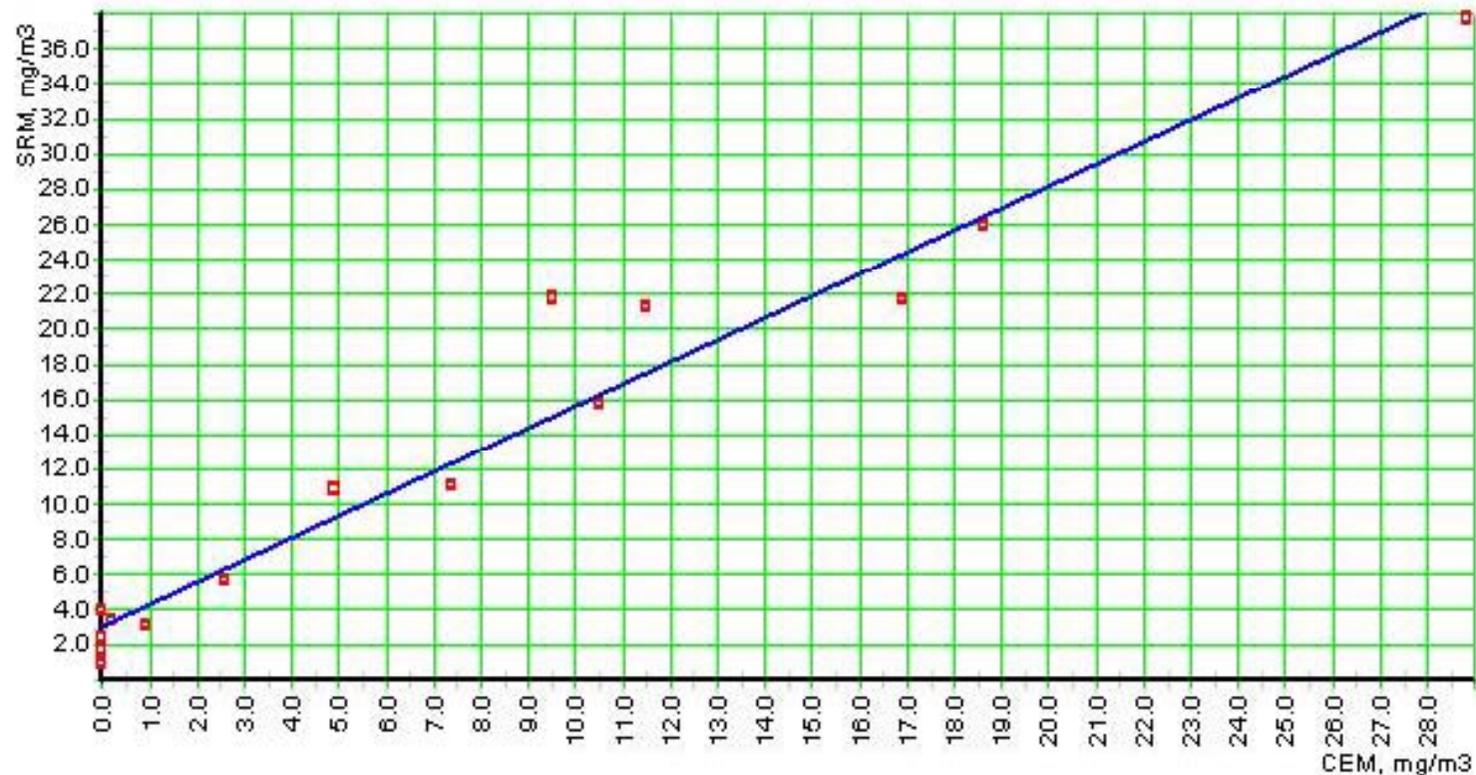
X-origin: Auto Zero
Y-origin: Auto Zero

ELV: 450 mg/Nm3 Document...
CEM units: mg/Nm3
SRM units: mg/Nm3
CEM Zero offset: 0 mg/Nm3
Requd. max. uncertainty: 20 % ELV abs. SD
 Analyser is a dust monitor

Close

BS EN14181 - Calibration

Calibration function for CO



Method(a) Slope: 1.25245, Intercept: 3.08509
Rsquared: 0.951679 Valid calibrated range: Min: 0, Max: 42.7626
Kv=0.9761, Variability SD=2.44039

QAL2 history at-a-glance

Calibration Function to EN14181

Measurement	Calibrated	Slope	Intercept	Methd.	Rsquared	Min. Valid Cal	Max. Valid Cal
O2	01/09/2005 10:01:44	1.0	0.0	(a)	1.0	0.0	44.
CO	23/09/2005 11:52:16	1.04858	-3.1089	(a)	0.890354	0.0	350.789
NOx		0.0	0.0	(a)	0.0	0.0	0.0

Edit calibration data manually Apply 1.04858 -3.1089 B 0.890354 0.0 350.789

History... Calibrate... Close

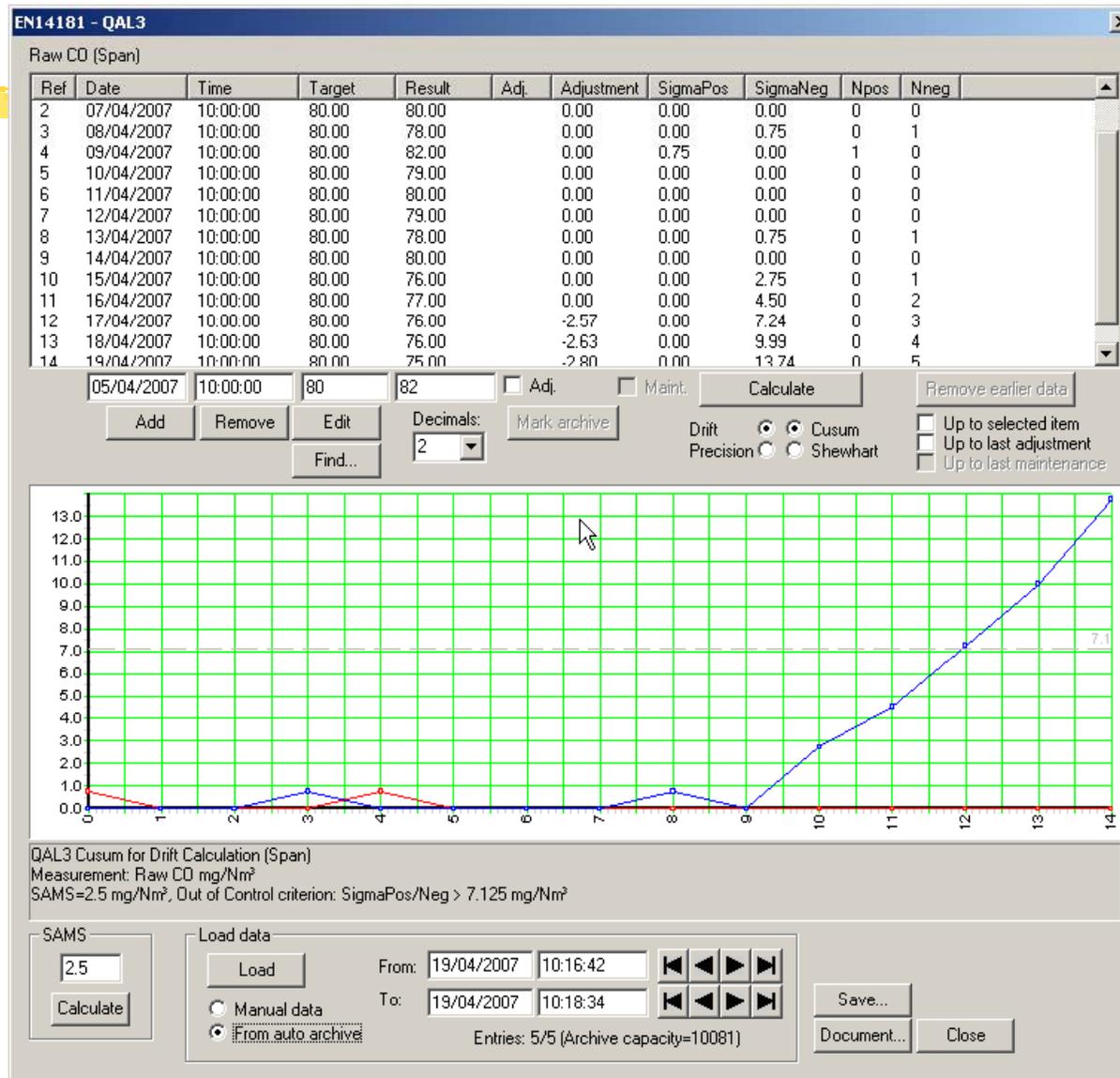
Calibration history

CO

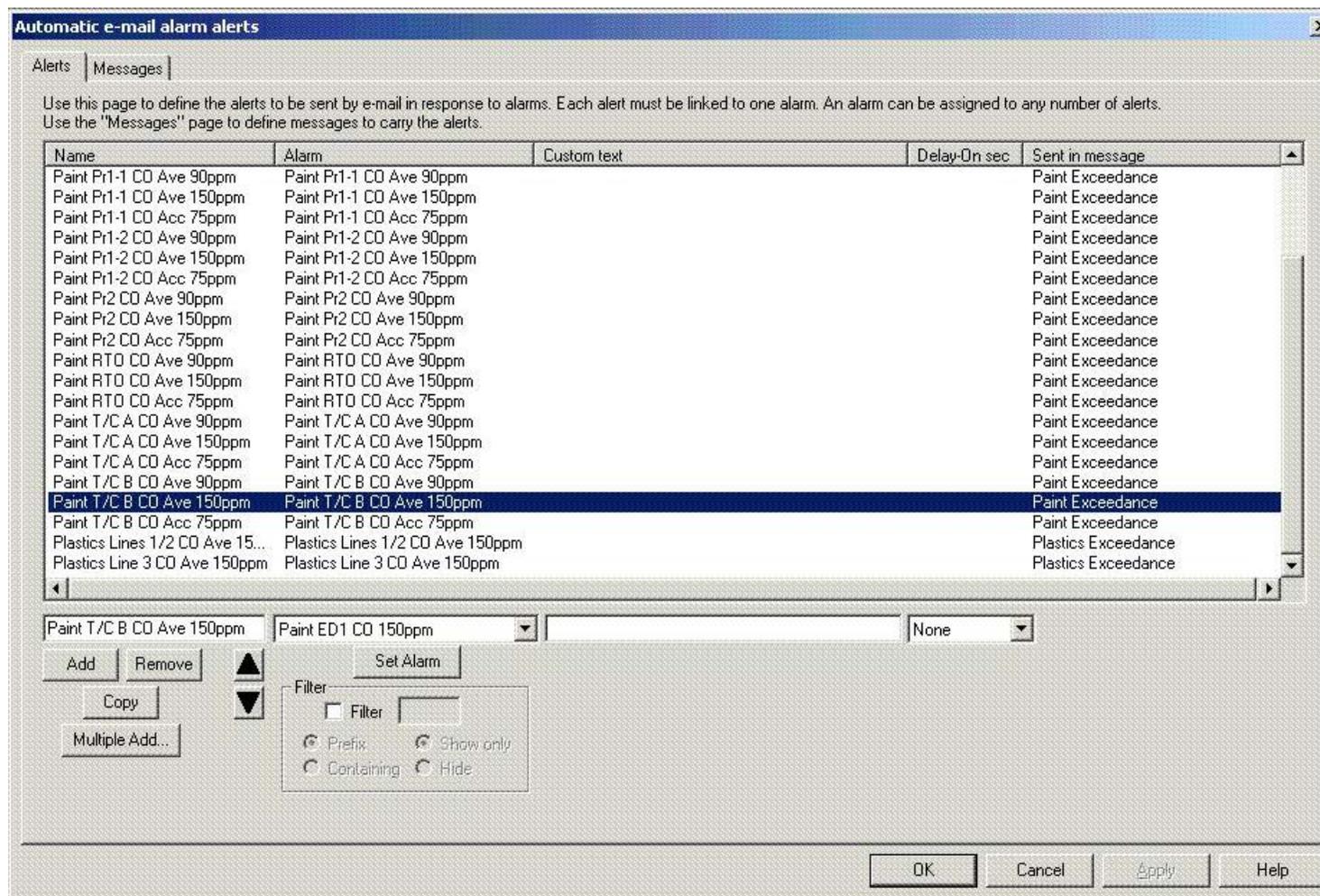
Calibrated	Slope	Intercept	Mthd.	RSquared	MinValidCal	MaxValidCal	Kv	SD
23/09/2005 11:52:16	1.04858	-3.1089	(a)	0.890354	0	350.789	0.9761	43.8205
01/09/2005 10:45:44	1.25245	3.08509	(a)	0.951679	0	42.7626	0.9761	2.44039
01/09/2005 10:35:41	1.04858	-3.1089	(a)	0.890354	0	350.789	0	0
01/09/2005 10:35:31	1.04858	-3.1089	(a)	0.890354	0	350.789	0.9761	43.8205
01/09/2005 10:35:11	1.04858	-3.1089	(a)	0.890354	0	350.789	0	0
01/09/2005 10:33:08	1.04858	-3.1089	(a)	0.890354	0	350.789	0.9761	43.8205
01/09/2005 10:28:27	1.25245	3.08509	(a)	0.951679	0	42.7626	0.9761	2.44039
01/09/2005 10:26:14	1.25245	3.08509	(a)	0.951679	0	42.7626	0.9761	2.44039
01/09/2005 10:19:20	1.04858	-3.1089	(a)	0.890354	0	350.789	0	0
01/09/2005 10:03:09	1.04858	-3.1089	(a)	0.890354	0	350.789	0	0

Close

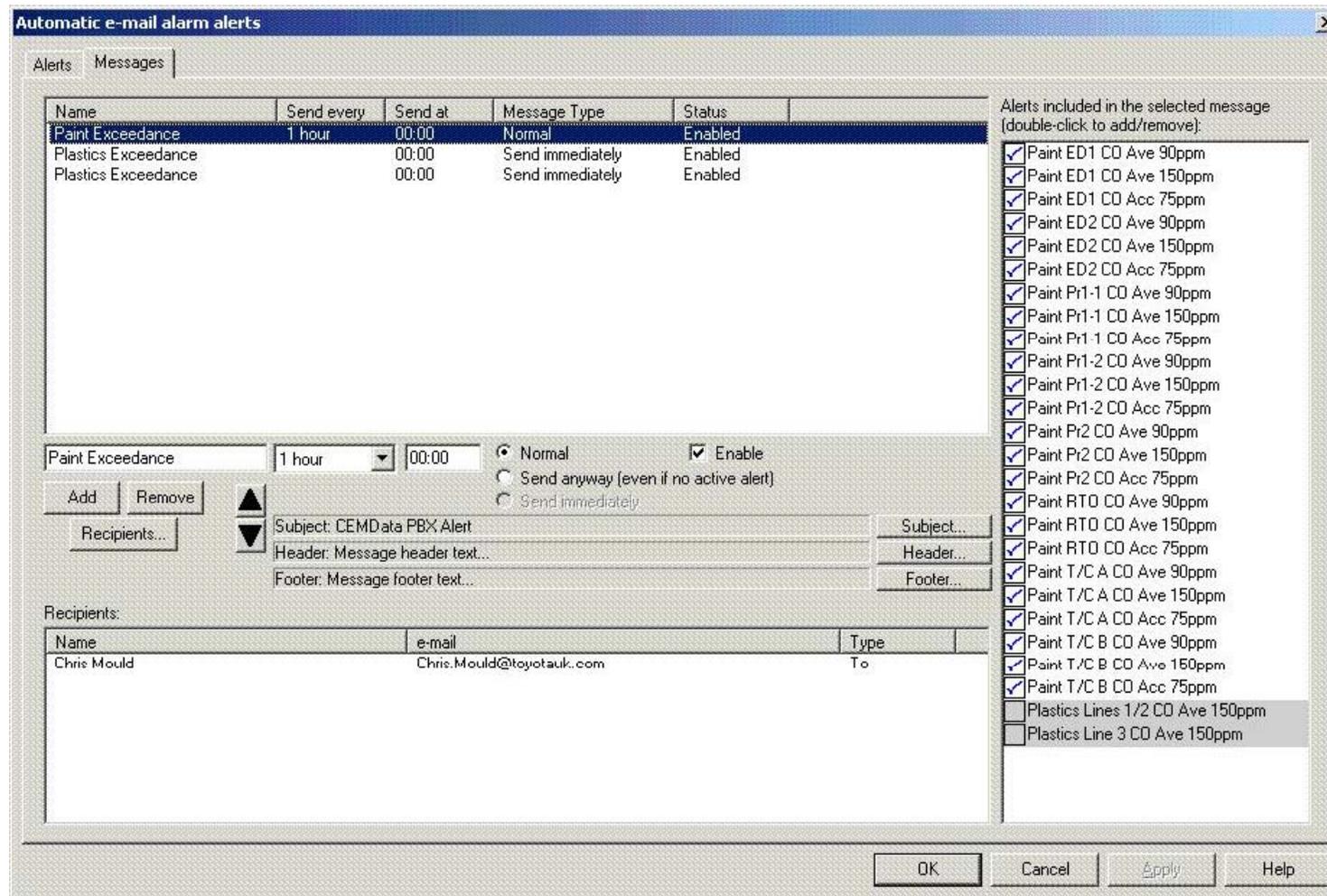
BS EN14181 - QAL3



Auto e-mail of alarm messages



Auto e-mail of alarm messages



Invalid and excluded data



- ⌘ The DAHS must remove from emissions calculations all data which are invalid.
- ⌘ Invalid data include those obtained during
 - ☒ Any occurrence that prevents the measurement from representing actual stack conditions

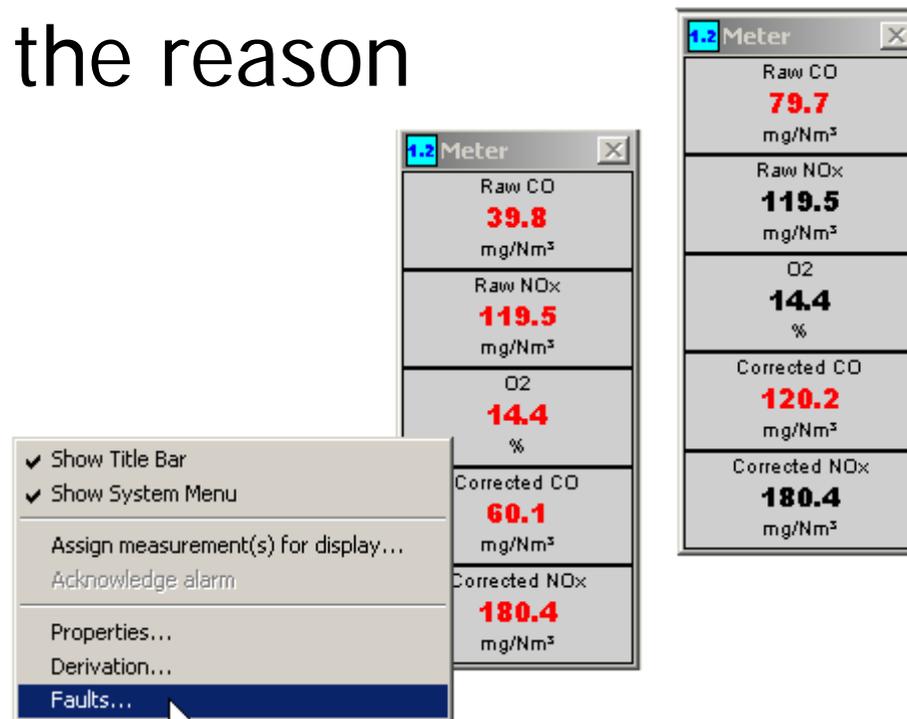
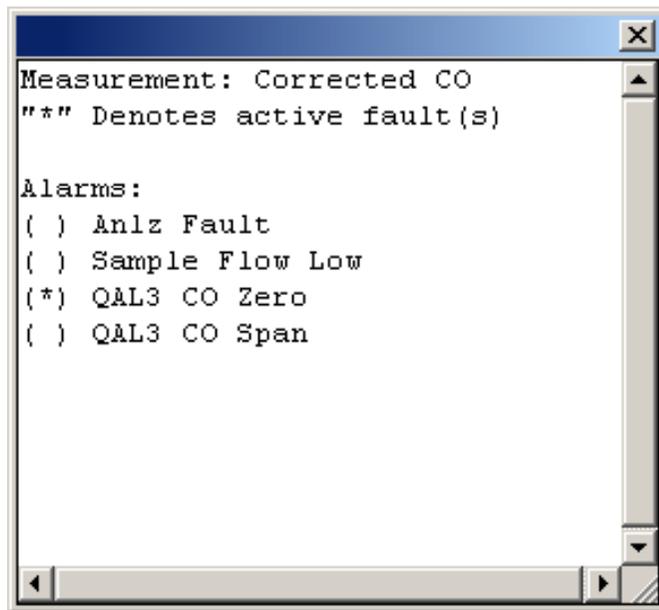
Basic principles – Data validity



- Every analogue input value, however transmitted, ***must*** be accompanied by at least one digital value to indicate the validity of the analogue value (“fault” signal).
- ***No measurement is of any use unless it is known whether or not the value can be relied upon.***
- For “live zero” analogue signals, non-validity may be designated by an “out-of range” signal, e.g. 2mA for a 4-20mA signal. The value may be decoded to indicate a binary “fault” condition.
 - Different values in the 0-4mA range can indicate different faults.

Data validity

- ⌘ The DAHS should:
- ⌘ Give immediate indication of invalid data
- ⌘ Be able to display the reason



Exclusions



- A permit may define certain conditions during which data are not to be included in the analysis for compliance
 - e.g. Gas turbines during start-up
 - (operation at <70% full load)
- Other conditions need to be definable for reporting, e.g.
 - Incinerator not burning waste

Exclusions



- ⌘ Data which may be perfectly valid (i.e. truly representing the stack conditions) may nevertheless have to be excluded ***from a report*** if relating to a period of operation (or non-operation) outside the reporting requirements of the permit.
- ⌘ The data may be required for other purposes, or be eligible for inclusion in a different kind of report.
- ⌘ The DAHS must be able to provide automatic data exclusion based on plant status or other signals.

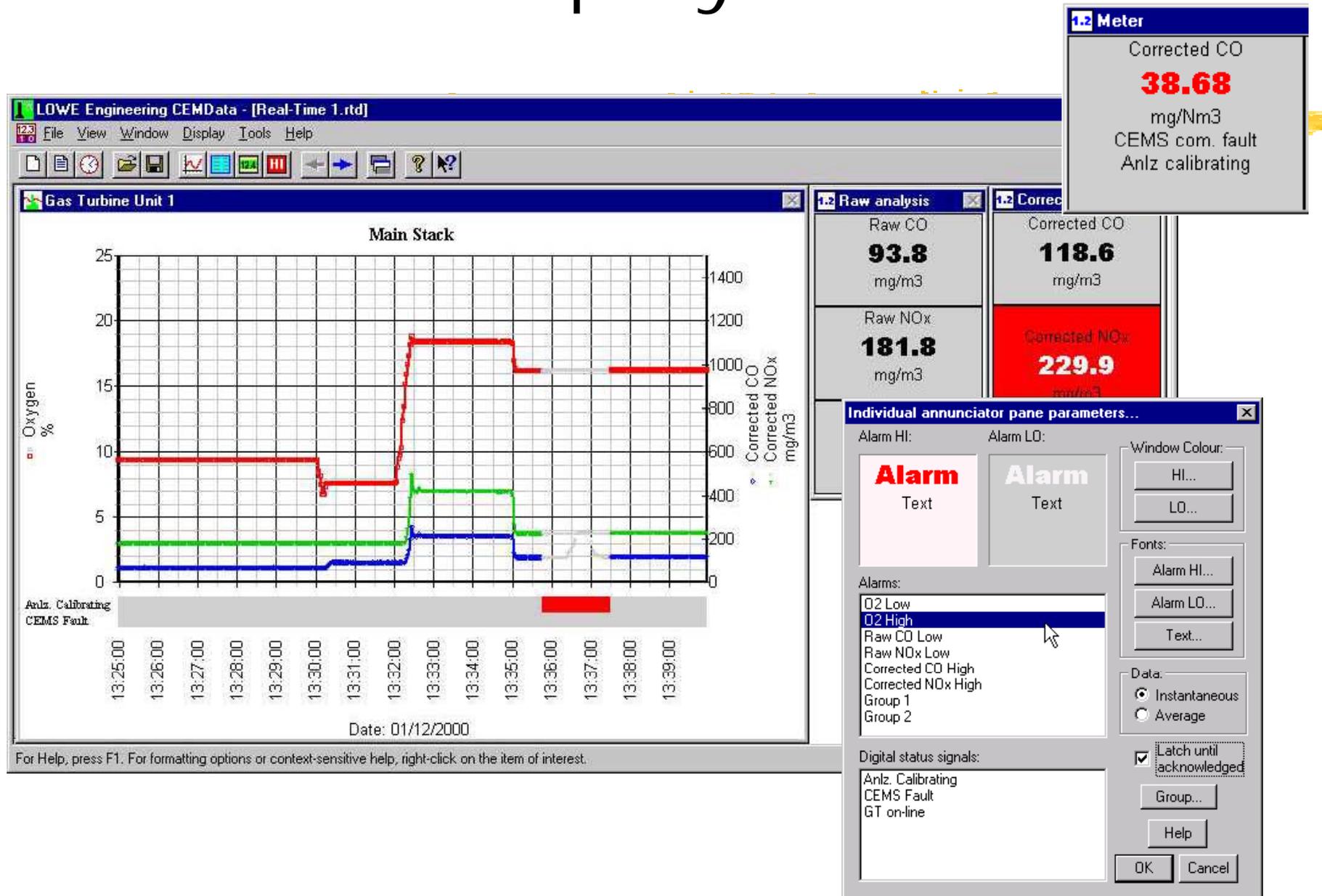
So... a good DARS/DAHS

(Data Acquisition and Reporting/Handling System):

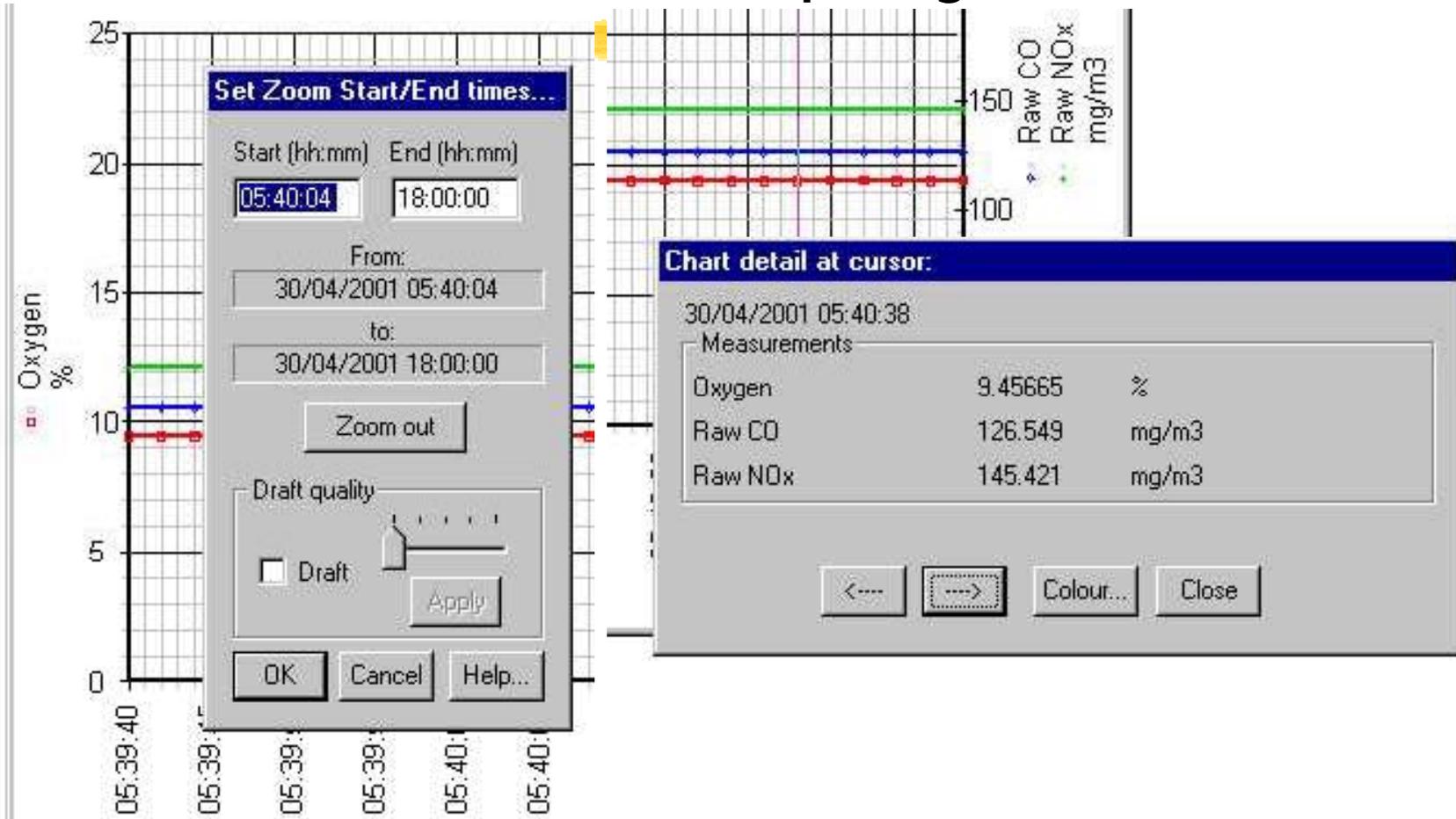


- Handles data acquisition, storage, archiving, security, retrieval
- Performs calculations
- Produces reports
- Provides a helpful, user-friendly interface between (often non-technical) users and the complex requirements of evolving legislation
- Provides comprehensive real-time display features to assist compliant operation
- Can be expanded/upgraded to suit legislative/plant changes, e.g. support of BS EN 14181
- Special features, e.g. Auto e-mail of alarm messages

Real-time displays

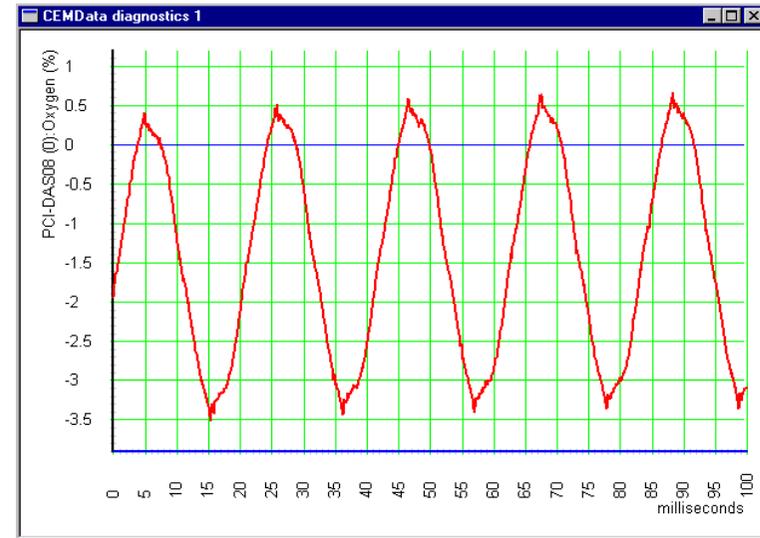


Historical data displays



Maintenance tools for hardwired I/O

- Includes virtual maintenance tools:
 - Physical check of all physical I/O
 - Instant on-line measurement and display of noise, etc.



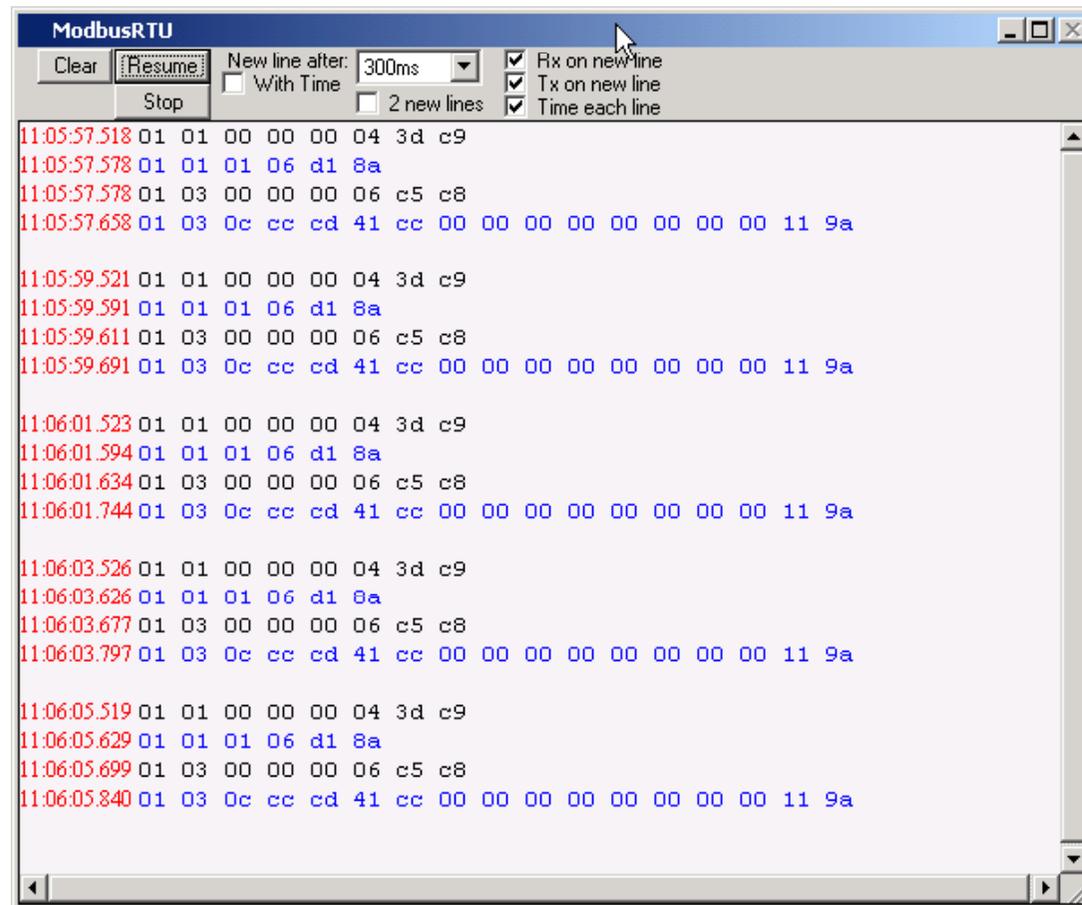
Every [CEMData](#) installation includes:

A virtual digital storage oscilloscope, software-assignable to each hard-wired analogue input

Tools for testing analogue/digital outputs without affecting data acquisition

Maintenance tools for serial data

⌘ Built-in DataScope (sniffer)



Reporting

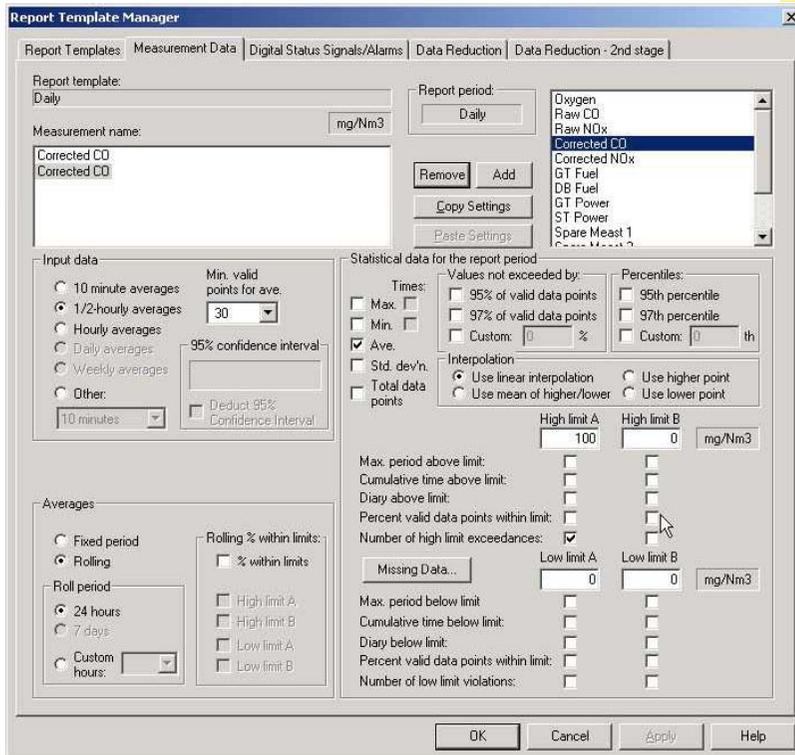
The screenshot displays the 'Report Template Manager' window with the 'Measurement Data' tab selected. The main configuration area is divided into several sections:

- Report Templates:** Shows 'Daily emissions' as the selected template with a measurement unit of 'mg/m3'. The 'Measurement name' field contains 'Corrected CO' and 'Corrected NOx'. Buttons for 'Remove', 'Add', 'Copy Settings', and 'Paste Settings' are present.
- Report period:** Set to 'Daily'.
- Data acquisition system availability:** A separate dialog box on the right lists various parameters with checkboxes: Max. period off-line, Cumulative time off-line, Diary off-line, and Percent availability, all of which are checked.
- Input data:** A section on the left lists averaging options: 10 minute averages, 1/2-hourly averages, Hourly averages, Daily averages, Weekly averages, and Other. The 'Other' option is selected, and a dropdown menu is open showing a list of time intervals from 1 minute to 2 hours. The '1 minute' option is currently selected.
- Statistical data for the report period:** Includes checkboxes for 'Maximum', 'Minimum', 'Average', and 'Total data points'. The 'Maximum' checkbox is checked. Under 'Values not exceeded by', '95% of valid data points' is checked. The 'Percentiles' section has '95th percentile' checked. The 'Interpolation' section has 'Use mean of higher/lower' selected.
- Averages:** Includes 'Fixed period' and 'Rolling' options. The 'Rolling' option is selected. A 'Roll period' of '24 hours' is chosen. There are also checkboxes for 'Rolling % within limits' and 'Deduct 95% Confidence Interval'.
- Limits:** 'High limit A' is set to 50 and 'High limit B' to 150. 'Low limit A' and 'Low limit B' are both set to 0. All units are 'mg/m3'. Checkboxes for 'Max. period above limit', 'Cumulative time above limit', 'Diary above limit', and 'Percent valid data points within limit' are checked for both high and low limits.

At the bottom of the window are buttons for 'OK', 'Cancel', 'Apply', and 'Help'.

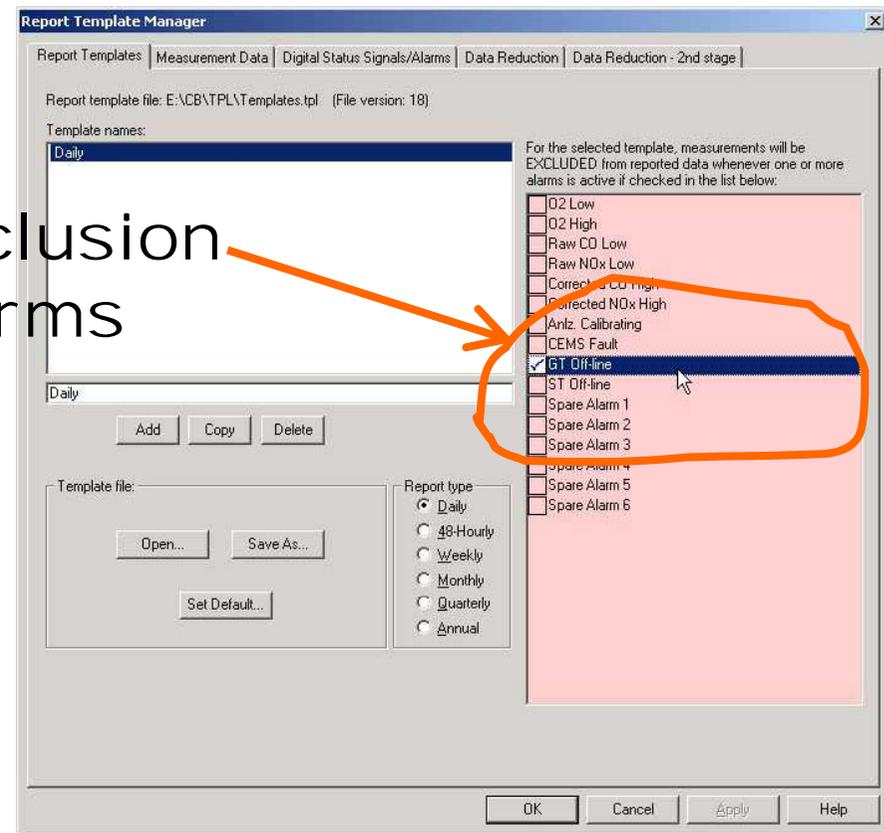
Report generation

CEMData

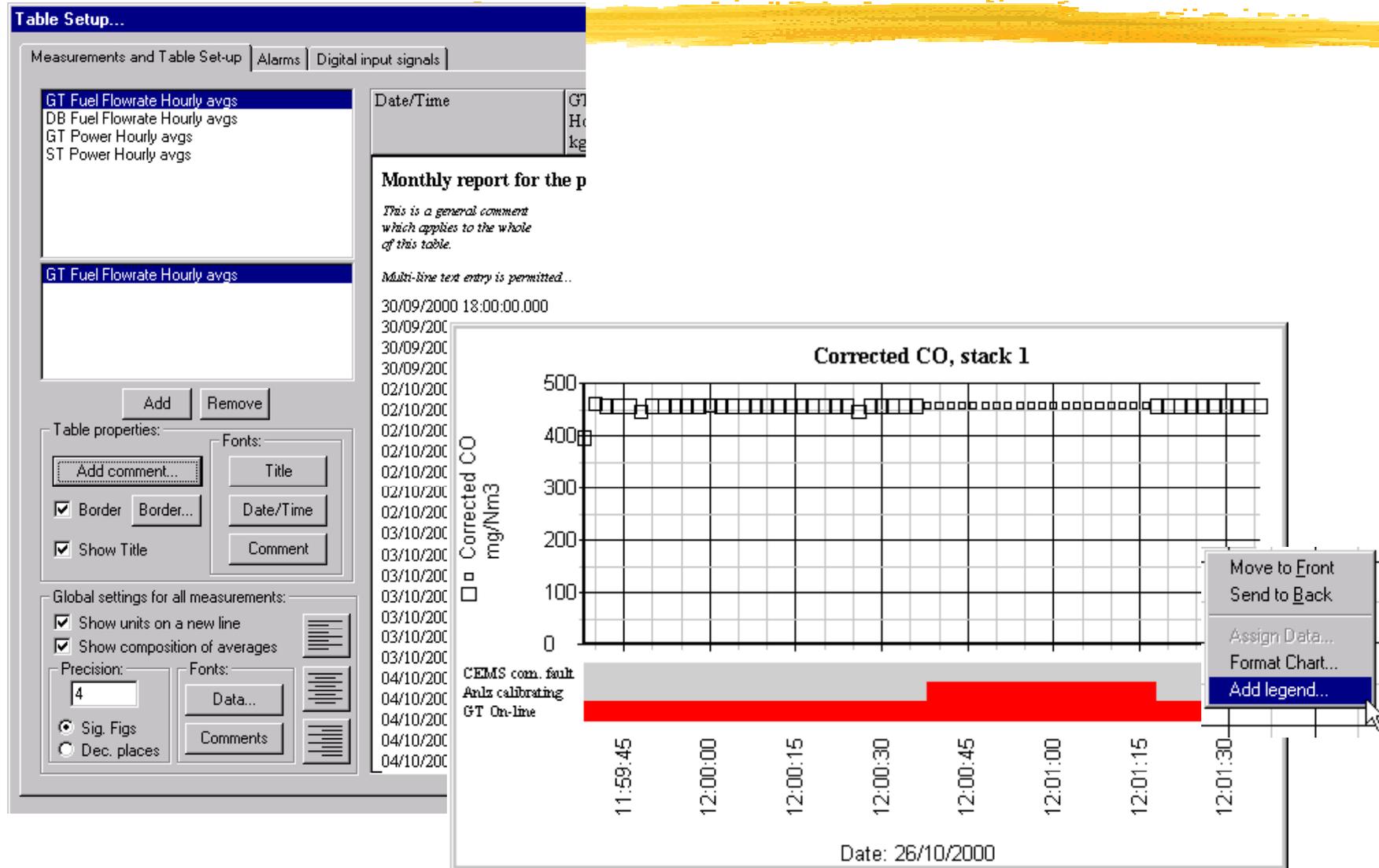


Point-and-Click to select:
Measurements
Average period and type
Statistical data

Exclusion
alarms



Reporting

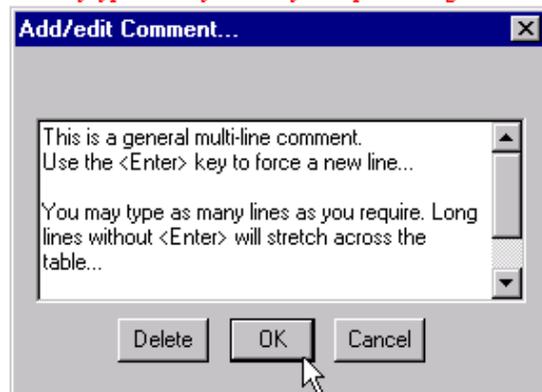


Reporting

Monthly report for the period ending Tuesday 31 October 2000 00:00:00

*This is a general multi-line comment.
Use the <Enter> key to force a new line...*

You may type as many lines as you require. Long lines without <Enter> will stretch across the table...



03/10/2000 10:00:00.000

30/10/2000 12:40:00	HI	
30/10/2000 12:50:00	HI	
30/10/2000 13:00:00	HI	
30/10/2000 13:10:00	HI	
30/10/2000 13:20:00	HI	
30/10/2000 13:30:00	HI	
30/10/2000 13:40:00	HI	
30/10/2000 13:50:00	HI	
30/10/2000 14:00:00	HI	
30/10/2000 14:10:00	HI	
30/10/2000 14:20:00	HI	
30/10/2000 14:30:00	HI	
30/10/2000 14:40:00	HI	
30/10/2000 14:50:00	HI	
30/10/2000 15:00:00	HI	

Single-line comment on the data at 12:40:00



Set Required Schedule:

AutoReport Name: Rohm_Haas Auto report

Report Template Name: Daily emissions

Report Period: Daily

Report(s) ending at 00:00 on:

the first

the last

the selected day/date:

Every: Day

in: January, February, March, April, May, June, July, August, September, October, December

Generate at time: 08:30 hh:mm

on the same day

on the next day

on the following

first

last

selected day/date:

Monday

the same month

the next month

the month of:

January

Ready reckoner

To check your set-up parameters, use the controls below to calculate the first date and time at which a report will be generated following the date entered.

The Ready Reckoner does not affect your Auto Report set-up parameters in any way

Date (dd/mm/yyyy): 24/05/2001

Time (hh:mm): 10:08

Following the above date, this AutoReport will first be generated at:

Monday 28 May 2001 08:30

Calculate

For...

- ⌘ User-friendliness
- ⌘ Low cost
- ⌘ Enthusiastic technical support
- ⌘ Rapid response
- ⌘ State-of-the-art

The market leader...

CEMData

