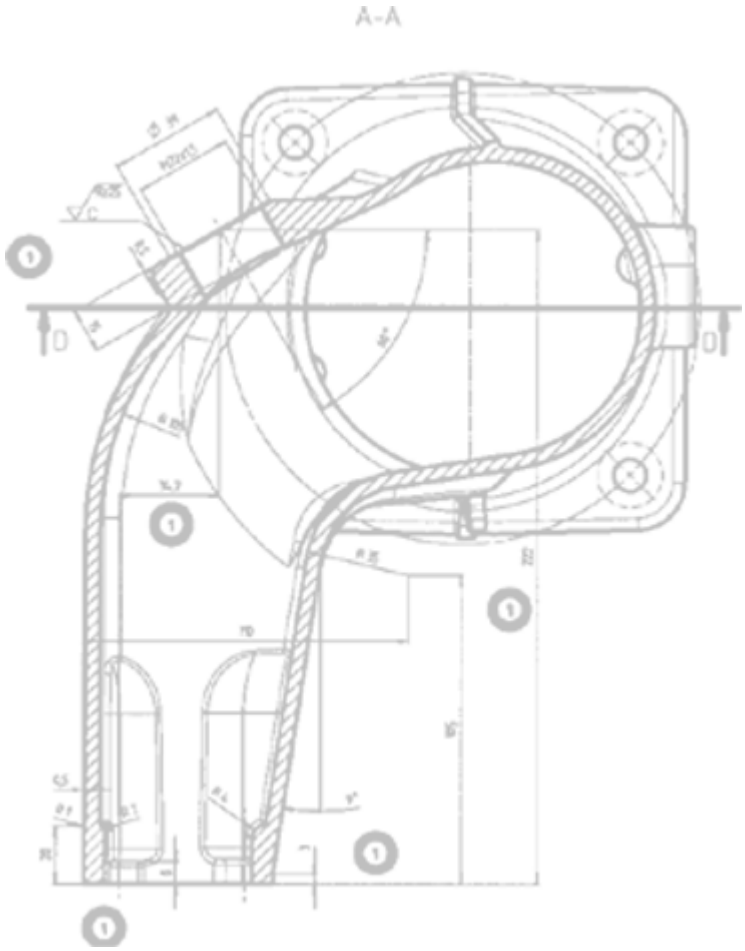
Emission Monitoring

- Periodical (Intermittent)
- Continuous Measurement
- Quality assurance of CEMS

July 9, 2008



General I

IFC *[1]* page 10: " *A systematic planning process is recommended to ensure that the data colected are adequate for their intended purposes (and to* ***avoid collecting of unnecessary data****)".*

EU IPPC Document *[2]*, page 7:

- *- "… When choosing between different approaches for emission monitoring there must be a balance between availability of the method, reliability, level of confidence, costs and environmental benefits".*
- *"… When determining the monitoring regime, or intensity, the main elements influencing the risk of having an actual emission higher the ELV are:*
  - *The likelyhood of exceeding the ELV*
  - *The consequences of exceeding the ELV (i.e. harm to the environment)"*
  - *"… Items to consider when assessing the consequences of exceeding ELV include:*
    - *"… acute effects of the substitute ..*
    - *" location of the installation (proximity of neighbourhoods)*
    - *dilution ration in the receiving media*
    - *Meteorological conditions"*

General II

EU IPPC document /2/ page 37: " *.. The continuous measurement of these parameters may sometimes be waived if these from experience show only deviations which are negligible for emission assessments or if they can be* ***determined by other methods*** *with sufficient certainty*"

CIMAC /4/ appendix 4:

- "Reciprocating engine can be considered a stable process"
- ".. Many technical challenges still have to be resolved before CEM systems for engine applications can be considered a feasible way of collecting reliable measurement data"
- **→ CIMAC paper recommends use of surrogate monitoring between periodical (intermittent, e.g. yearly) stack measurements**.

In Euromot /3/ document and CIMAC /4/ appendix 4 "surrogate parameters" or alternative approaches to CEMS are listed.

Euromot Position paper /5/ **recommendation:**

- **for big ≥ 600 MWth plant: only NOx measured continuously in degraded-air sheds (where emissions are critical). Other emissions in liquid mode to be measured twice/year. In non-degraded zones twice a year measurements.**
- **Other plants: use of "surrogate parameters" and periodical (intermittent) emission measurements e.g. annually.**

CEMS

Engine driven plants consist often of multiple units (operated with same fuel and thus having about equal flue gas properties) and are situated in locations where the level of the infrastructure is not at such a level that the quality assurance verification is easily done.

- Following items will make CEMS for big plants more practical and cost-effective:

1. Introduction of **time-shared analyzers** (common analyzer and flue gas conditioning units for several engine units).

2. Introduction of a practical **simplified quality assurance procedure** in order to secure that focus is on main items such as long-term maintenance of the equipment and not mainly on ”endless” calibrations and validations.

Quality assurance I

Steps:

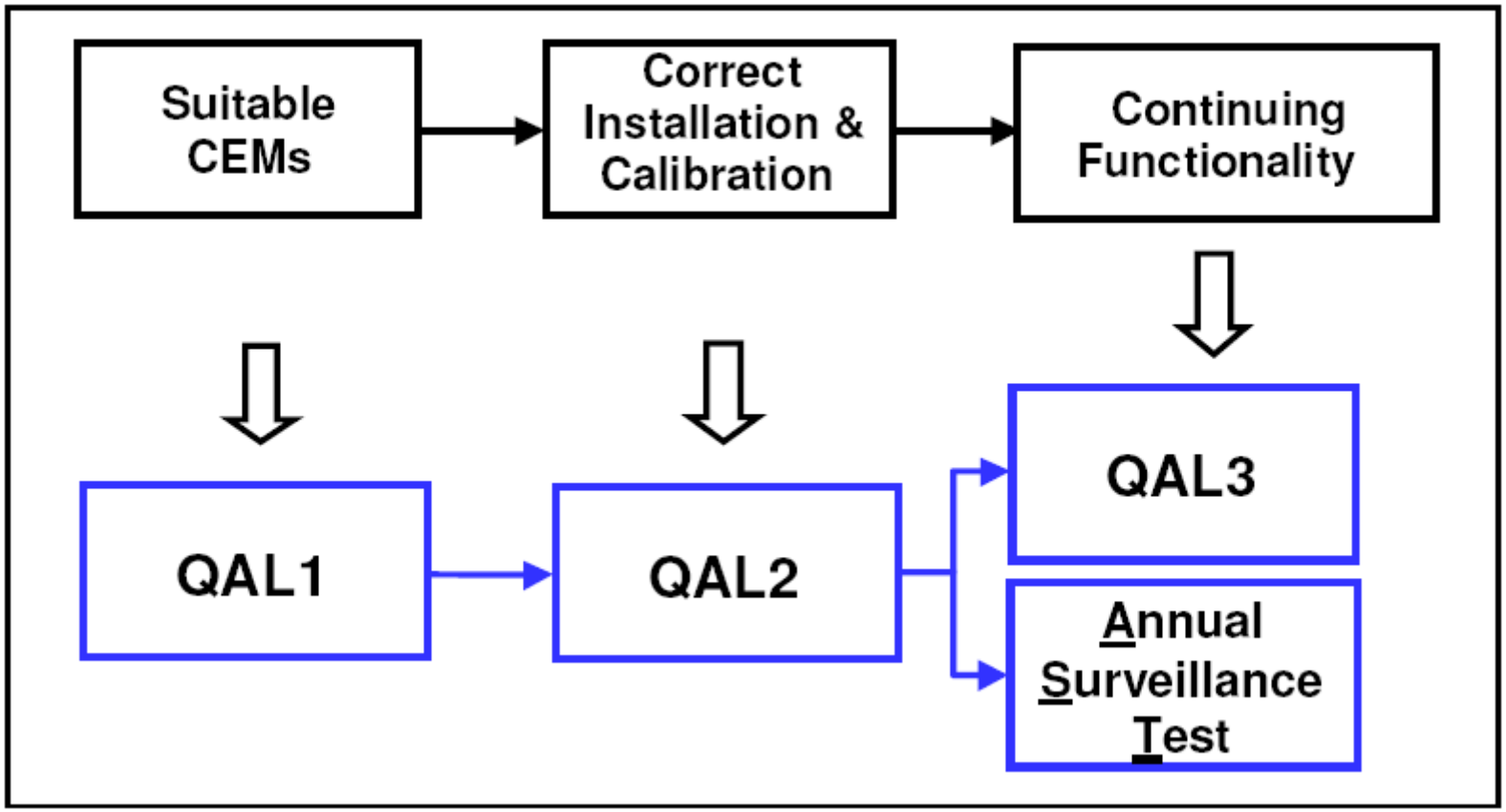
1. Careful evaluation of the purpose of the monitoring in order to choose correct monitoring approach.

2. Selection of equipment recognizing the specific features & requirements of the application.

3. On-going assurance of the quality of the monitoring system and of the monitoring data.

Emission monitoring involves potential errors and therefore equality assurance standards have been introduced in EU and US: EN14181, US EPA 40 CFR 60 and 75. In figure 1 EN 14181 steps are shown.

Quality assurance II (Figure I) (sequence in EN 14181)



Quality Assurance III (sequence in EN 14181)

QAL 1: ”Fit for the purpose check”

- Measurement uncertainty requirement is to be fulfilled
- Procedure is described in ISO 14956

QAL 2: Onsite validation of measurement equipment after installation

- Validation of installation
- Calibration of system by standard reference methods.

Calibration curve of at least 15 data pairs of standard and monitored datas over a minimum 3 day period to be done.

- Statistical calculated data variability of system to fulfil set limits

QAL 3: Maintain & demonstrate quality during operation

- zero and span characteristics checking

AST: ”Annual Surveillance Tests”

- Evaluating that systems function performance is correct

”Simplified Quality Assurance Procedure” I

Fulfillment of US EPA 40 CFR 60 or EU EN 14181 standards is very worksome and demanding. In countries where infrastructure is not at an appropriate level to support these standards a **simplified practical approach** should be followed. The minimum requirement should be that the system is working properly and maintains this status.

An external ”trained” party (consultant, etc.) should preferable perform the quality assurance inspections.

Time-shared analyzers (for sources operating at equal conditions):

- Only one in-depth calibration of a complete path containing analyzer, sampling, sampling conditioning and analyzer should be done. For other paths connnected to the same analyzer only a functional check (leak check, etc.) of the sampling system should be done.

”Simplified Quality Assurance Procedure” II

I <u>Verification of the installation</u>

- Measurement ranges, etc. should be in order.

II <u>Functional checks</u>

- Verification of zero and span calibrations
- Function of the system is verified by a single comparison to the data of the reference method. Data gathered during plant compliance performance testing could be used for this purpose.

III <u>Continuous Quality Assurance</u>

- Assign, commit and train emission monitoring resources
- Service and maintenance should be performed on a regular base and only trained personnel used.
- Procedure for calibration checks to be regular, frequency dependent on monitoring system in use and plant size.
- Quality Assurance documentation to be in place (registering maintenance actions, performed calibrations, malfunctions, etc.). All checks should be registered (also ”OK ones”)

Sources

/1/ General EHS Guidelines, IFC April 30 2007

/2/ EC IPPC – Reference Document on the General Principles of Monitoring, July 2003, at http://www.jrc.es/pub/english.cgi/d946763/11%20Reference%20Document%20on%20General%20Principles%20of%20Monitoring%20%28adopted%20Jul%202003%29%20-%201%20Mb

/3/ Euromot CEMS slides at

http://www.euromot.org/download/news/positions/stationary_engines/EIPPCB_BREF_backup_document_CEMS_jun03.pdf

/4/ CIMAC paper Number 23: Standards and Methods for Sampling and Analysing Emission Components in Non-Automotive Diesel and Gas Engine Exhaust Gases – Marine and Land based Power Plant Sources, February 2005. can be ordered at http://www.cimac.com/services/Index1-techpaperdatabase.htm

/5/ Euromot Position paper at

http://www.euromot.org/download/news/positions/stationary_engines/WB_Thermal_Power_Plants_Guideline_final_position_Euromot_080509.pdf