SETTING THE STANDARD FOR CONTINUOUS EMISSIONS MONITORING AND REPORTING

The recent introduction of EN 17255 has provided a much-needed guarantee of uniformity for the performance of continuous emissions monitoring systems. Christoph Becker, Portfolio Manager for ABB Measurement & Analytics, explains more about the standard and why it marks an important development in reducing industrial emissions.

The growing realization of the need to tackle emissions of potentially harmful pollutants from industrial sources has seen an uptake in the adoption of Continuous Emissions Monitoring systems (CEMS) to help both monitor and control levels and ensure compliance with tightening legislation.

Continuous Emission Monitoring (CEM) is regulated in many regions of the world, with the aim of reducing the emission of pollutants that contribute to poor air quality and lead to significant negative impacts on human health and the environment. For that purpose, reduction commitments have been agreed upon in many regions world-wide in the form of various directives and protocols.

Depending on legislation and the type of information companies require, many industries need to use CEM equipment to monitor their emissions, including power generation, waste incineration, oil and gas, chemicals and petrochemicals, pulp and paper, metals and minerals, landfills and biogas, marine and cement production.

Several countries are demanding that polluting facilities and plants install CEMS to meet strict new levels or monitor previously unaddressed pollutants. The Industrial Emission Directive introduced in 2010, for example, places an emphasis on the use of Best Available Technologies (BAT) by companies throughout the EU as a way of reducing emissions of harmful substances to air, water and land that could affect human health and the environment.

Checking CEM accuracy

CEMS solutions are used to quantify levels of pollutants emitted to air. They can range from simple systems monitoring natural gas fired boilers, measuring gases such as carbon monoxide, carbon dioxide and oxides of nitrogen, to more complex systems set up to monitor large waste incinerators.

In each case, it is important to know that the measurements being taken are correct and can be benchmarked against some form of meaningful standard to allow an accurate and effective comparison of performance against regulated requirements. For example, various standards issued by the International Standards Organization (ISO) and the European Committee for Standardization (CEN) describe performance criteria that must be met by Automated Measuring Systems (AMS) in order to meet maximum permissible measurement uncertainties as mandated in corresponding regulations.

AMS installed in the field are connected to a data acquisition and handling system (DAHS), typically a computer-based system that acquires the measurements together with peripheral data and plant status information.

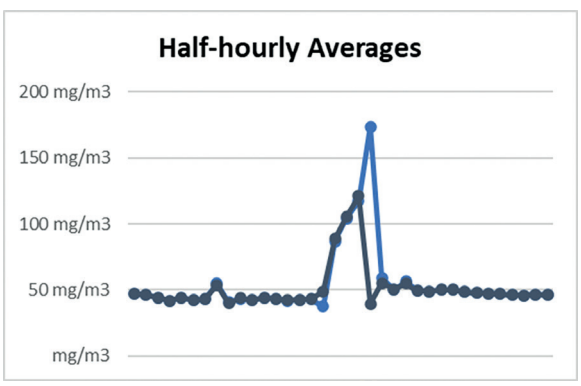
The raw data is then processed and compared with Emission Limit Values (ELV), which set the maximum permissible limits for the concentration of measured waste gases, for example from a power or industrial plant, which can be emitted within a given period. Using this data, an emissions report is then drawn up which forms the basis for operating permits issued to companies.

While AMS provide a good indication of whether a plant is exceeding its permitted ELV targets, it has been difficult to achieve uniformity both in the way that DAHS calculate results and are maintained due to the absence of a single guiding international standard.

Until recently, there has been no international DAHS standard available that specifies the conversion of data from an AMS to reported data, has performance and test criteria for a type test that allows manufacturers to certify their DAHS and mandates QA/QC procedures. That means pollutant concentrations calculated are dependent on the algorithms installed by DAHS manufacturers interpreting the sparse information made available. As a result, emissions reported are a question of the algorithm implemented and therefore data reported is prone to differ from DAHS supplier to DAHS supplier.

The absence of anything to ensure uniformity has contradicted the idea of manufacturer-independent documentation of emissions, or excess emissions.

The figure below uses field data taken from an AMS to illustrate the potential differences in emissions calculations that can arise when different algorithms are applied.



Both curves show a pollutant corrected for oxygen (O_2). The dark blue curve shows correction based on half-hourly averages, whereas the lighter blue curve shows the correction based on minute-by-minute values.

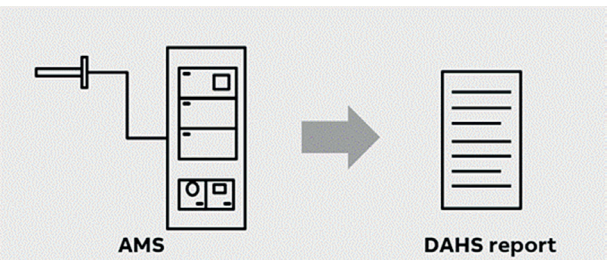
Both curves show similar values except for the two peaks, but both peaks show a significant difference, with the potential to cause different results compared to the daily Emission Limit Value after averaging.

Setting the standard - introducing EN 17255

The European CEN/TC 264 Air Quality handles the Data Acquisition and Handling System (DAHS) standard EN 17255. It is a series of standards which govern the process for the quality assurance and control of DAHS. Properly titled EN 17255 - Stationary source emissions - Data acquisition and handling systems, the standard unifies calculations, identifies performance specifications, sets requirements for certification and has QA/QC requirements to ensure that DAHS deliver comparable emission concentrations, and lead to comparable emission reports.

EN 17255 plugs the gap left by EN 14181 Quality Assurance of Automated Measuring Systems, a European standard that covers certification, calibration, testing and performance of AMS commonly known as CEMS, which had explicitly left open the requirements for DAHS.

The new EN 17255 standard consists of four parts, with parts 1 to 3 already published and part 4 published as a draft. Part 1 specifies the requirements for handling and reporting data and is the most fundamental as it describes the conversion of raw AMS data to a DAHS report.



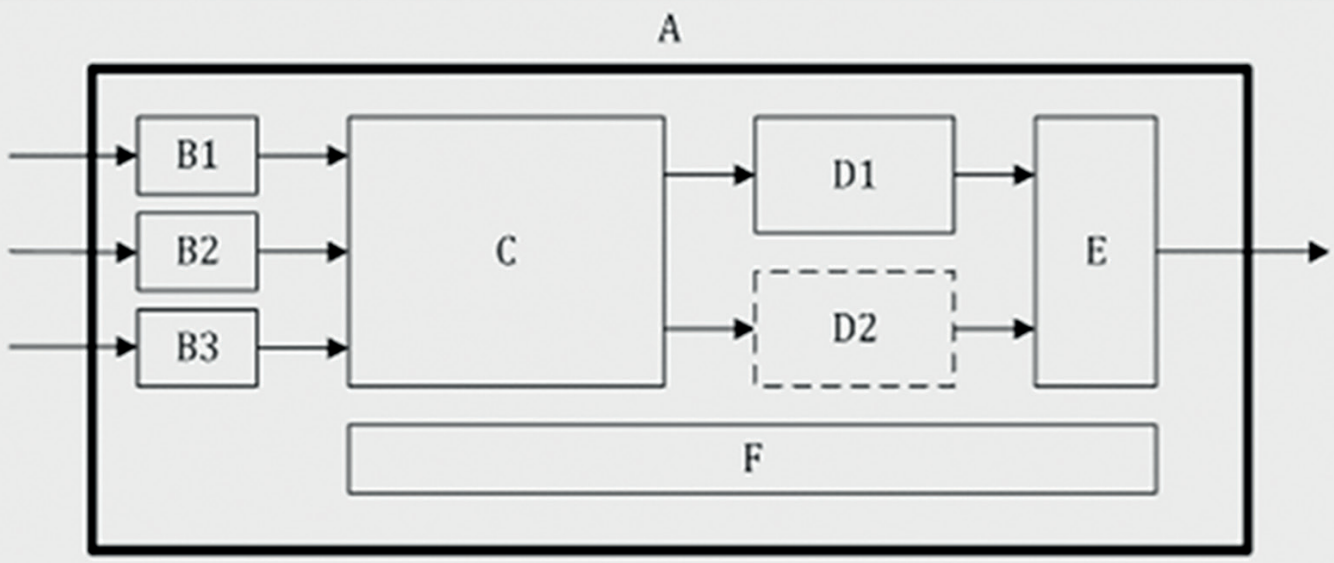
It defines three types of data:

1) First Level Data (FLD), which is the lowest level data and the basis for calculations

2) Reported emission data, which states short- or long-term averages required by legislation to compare against legislative limits, for example, the European Industrial Emissions Directive, or for entry into reporting registers like the European Pollutant Release and Transfer Register (E-PRTR)

3) Reported descriptive data to demonstrate conformance with legislation, for example, data capture requirements or counts of the number of exceeded limits

Part 2 specifies the elements of a DAHS and performance requirements regarding the implementation of procedures for data acquisition, input data processing, reported data, reports, data storage, system functions and end-user documentation.



A DAHS

B1 AMS data interface

B2 peripheral data interface

B3 plant data interface

C input processing and production of FLD

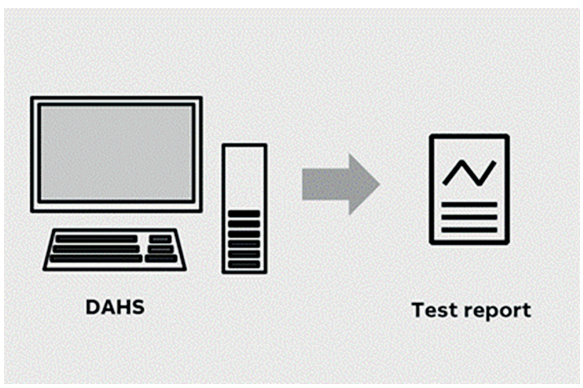
D1 calculation of reported data

D2 optional calculation of add. reported data, e.g. to meet add. reporting requirements

E report generation

F data storage (at least five calendar years)

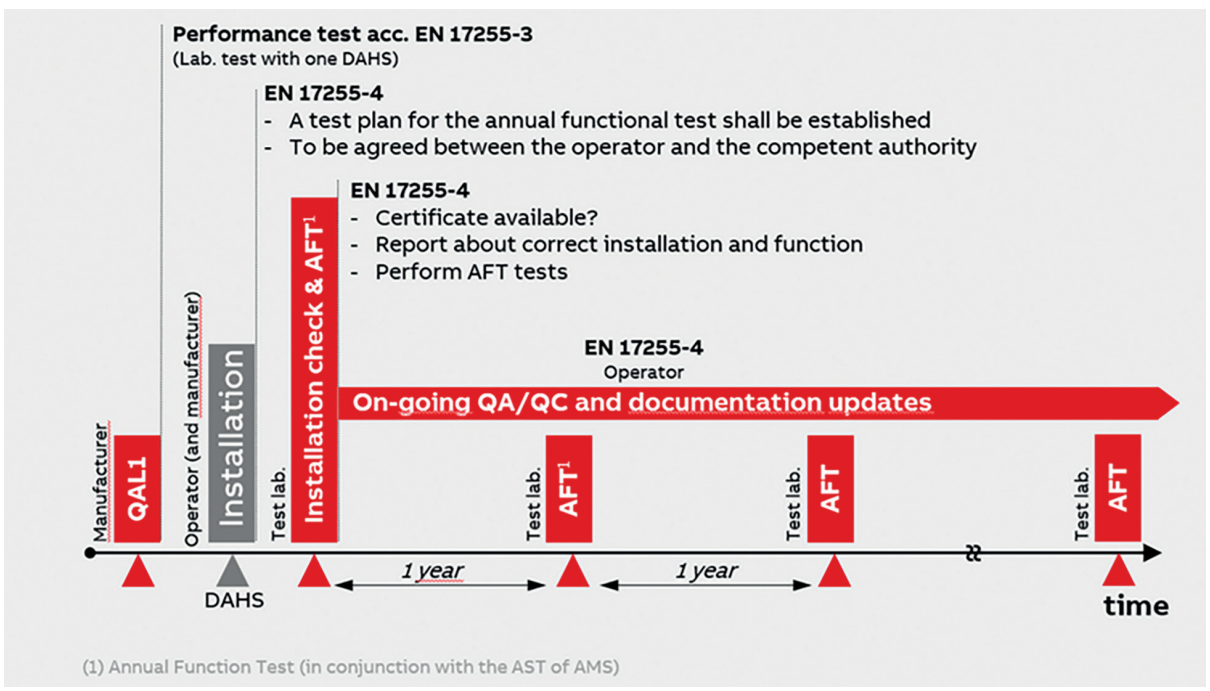
Part 3 specifies the testing procedures, description of laboratory tests and requirements of the testing laboratory to produce a test report, which then gives the DAHS manufacturer the opportunity to apply for a certificate according to EN 15267 Air quality - Certification of automated measuring systems part 1 and 2.



Part 4 specifies the requirements for on-going data acquisition and handling, which includes the requirements for installing QA/QC during QAL2 operation, and an annual functional test as illustrated in the figure below.

Reporting made easy

ABB's CEM-DAS solution is a PC-based data acquisition and handling system for continuous emission monitoring applications that fully addresses the requirements of EN 17255. Scalable from single stack installation up to plants with multiple measuring points, CEM-DAS is a complete networkable system for continuous monitoring and evaluation of emissions data. Field data from gas analyzers, dust monitors and other equipment is acquired via conventional I/Os or via digital communication like Modbus TCP/IP is averaged to five second segments which are then used by CEM-DAS to assess performance. All results and reports are saved in a database as well as an external data storage facility such as the end-user's file system or a Network Attached Storage (NAS) for added redundancy.



For added security of data, the CEM-DAS server can be used with an optional Data Acquisition Unit controller, which can be used to buffer field data. This ensures that the CEM-DAS server will still be able to retrieve and process any data in the event of a network issue or server shutdown, eliminating the risk of potential issues with authorities caused by reports being lost.

Users can view data either on the CEM-DAS server or via a web browser on a client PC, with the same level of functionality for viewing data such as bar and line charts, alarms and reports.

The system is also designed for remote maintenance, with users able to access CEM-DAS for purposes such as commissioning, troubleshooting, or assisting with queries.

Summary

EN 17255 allows DAHS manufacturers to certify their systems and allows end-users to select from certified products. It guarantees that emissions or mass flow reporting is based on a standard that provides reproducible results, regardless of vendor-specific data processing implementation.

Furthermore, the QA/QC procedure ensures the quality of a DAHS over its lifetime. As much as the introduction of EN 14181 and EN 15267 changed the quality of CEM for Automated Measuring Systems, it is expected that EN 17255 will improve the quality of CEM reporting by DAHS. With options such as ABB's CEM-DAS solution now available, users across industry can ensure complete uniformity and consistency of their measurements across their operations.

For more information about ABB's technologies and expertise for CEMS applications, visit https://bit.ly/ABB-CEMS.

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