



**GENERAL REQUIREMENTS**  
**OF**  
**CONTINUOUS EMISSION MONITORING**  
**(CEM) SYSTEM**

Environmental Protection Department  
Air Policy Group

December 2009

# 1. APPLICATION

For effective process control and measurement of air emissions from industrial operations / facilities, CEM systems have been widely used by the industries and the regulating bodies to monitor plant performance or emission compliance. Some Specified Processes (SP) are required to implement CEM for their air emissions under licensing requirements. The following sets out the general requirements of CEM system in respect of equipment selection, quality control and reporting for the public power utilities and waste incinerators.

## 2. CEM SYSTEM REQUIREMENTS

### 2.1 Acquisition of CEM system

It is necessary to ensure suitable CEM system which is proven to be suitable for the intended application being selected and deployed for compliance monitoring. Generally, such system shall have type approval or certification at the appropriate measuring range(s) for the specific measurements by recognized international or national certification body, such as MCERTS in the UK, TUV in Germany or other body acceptable to the Authority.

For CEM system already in service, the Authority may accept continuation of the use of the existing CEM system, provided that it can be demonstrated to the satisfaction of the Authority that such system is capable of producing representative measurement results of relevant determinands. In any case, all CEM systems will need to comply with the performance standards set out in Section 2.2 'Measurement Uncertainty' below, and have the means for tests for linearity, zero and span drift.

### 2.2 Measurement Uncertainty

The CEM system shall meet the measurement uncertainty requirements as specified in the following Directives of the European Union (EU) or other equivalent requirements acceptable to the Authority:

- *Directive on the incineration of waste (2000/76/EC)*<sup>1</sup> for incineration processes, including those for hazardous waste, co-incineration, municipal waste and clinical waste
- *Directive on the limitation of emissions of certain pollutants into the air from large combustion plants (2001/80/EC)*<sup>2</sup> for combustion processes

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<sup>1</sup> EU Directive 2000/76/EC is available at [http://www.central2013.eu/fileadmin/user\\_upload/Downloads/Document\\_Centre/OP\\_Resources/Incineration\\_Directive\\_2000\\_76.pdf](http://www.central2013.eu/fileadmin/user_upload/Downloads/Document_Centre/OP_Resources/Incineration_Directive_2000_76.pdf)

<sup>2</sup> EU Directive 2001/80/EC is available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0001:0001:EN:PDF>

For example, for power plant which is categorized as large combustion plant under the EU Directive 2001/80/EC, the CEM system's measurement uncertainty for SO<sub>2</sub> and NO<sub>x</sub> shall not exceed 20% of the emission limit values at 95% confidence level, as specified in paragraph A(6) of the Annex VIII of the said EU Directive.

Please refer to Annex 1 for the requirements on the measurement uncertainty of CEM system under the aforementioned EU Directives.

The SP Licence holder shall demonstrate conformance to the CEM system's measurement uncertainty requirements once the system is installed and whenever the concerned plant is in operation.

### 2.3 Quality Assurance and Quality Control (QA/QC)

The SP Licence holder shall develop a quality assurance plan (QAP) for the facility with details of the appropriate QC procedures to ensure the data quality of the CEM system. Suitable QA scheme with reference to the relevant EU Directives and EU Standards (such as EN 14181 – Quality Assurance of Automated Measuring Systems), or other equivalent international or national standards acceptable to the Authority shall be adopted and implemented. These QC procedures aim to demonstrate the correct selection, installation, calibration, and continuously valid operation of the CEM system on the plant.

The QA/QC test results including on-going QAP implementation records shall be properly documented and maintained in a manner acceptable to the Authority.

## 3. **REAL-TIME DATA TRANSMISSION TO THE AUTHORITY**

The CEM data shall be transmitted to the Authority for real-time monitoring of the emissions from the licensed plant(s). The transmitted data, at the averaging time specified by the Authority, shall be directly measured by the CEM system and without correction to reference conditions where applicable. The corresponding data of peripheral measurements (for example, the data of flue gas moisture and oxygen contents) for conversion to reference conditions should also be transmitted to the Authority for assessment of licence compliance.

## 4. **OTHER REQUIREMENTS**

The Authority may impose additional requirements on the CEM system and its implementation as and when appropriate.

## **ANNEX 1 - REQUIREMENTS ON THE MEASUREMENT UNCERTAINTY OF CEM SYSTEM**

1.1 The values of the 95% confidence intervals of a single measured result under the corresponding EU Directives shall not exceed the following percentages of the emission limit values:

<b>Parameter</b>	<b>Directive 2000/76/EC Annex III</b>	<b>Directive 2001/80/EC Annex VIII</b>
Carbon monoxide	10%	-
Sulphur dioxide	20%	20%
Nitrogen oxides / Nitrogen dioxide	20%	20%
Dust/Total dust	30%	30%
Total organic carbon	30%	-
Hydrogen chloride	40%	-
Hydrogen fluoride	40%	-