

Continuous Emission Monitoring (CEM)



Components to be measured

- NO, CO, O₂, dust
- NO, CO, SO₂, O₂, dust
- NO, NO₂, N₂O, CO, SO₂, O₂, H₂O, NH₃, HCl, HF, VOC, dust

ABB Solution

- ACX
- ACF5000
- ACX plus LS4000

Measurement made easy

Introduction

When burning coal, petroleum products, natural gas as well as municipal and hazardous waste pollutants is created, that is emitted with flue gas. In most countries many types of plants ranging from power stations, steel works, cement plants, chemical and petrochemical plants etc. down to smaller production units or municipal facilities are liable to comply with legal regulations regarding emission of pollutants into the atmosphere. In most countries laws and regulations exist that govern allowable limit values and volume flow of pollutants – gaseous components and particulate matter – in the cleaned flue gas.

Typically affected plants

- power plants
- waste incinerators
- cement plants
- nitric acid plants
- sulfuric acid plants
- refineries
- steel & iron
- pulp & paper

Continuous Emission Monitoring System (CEMS)

A CEM system is the total equipment necessary for the determination of a gas and / or dust (particulate matter) concentration and a conversion (e. g. computer program) to produce results in units of the applicable emission limitation. Depending on the kind of fuel and local environmental regulations, a number of gas components, preferably CO, NO_x and SO₂ are to be monitored continuously in the flue gas at the stack along with dust, gas flow, temperature and O₂ (sometimes H₂O as well).

Continuous Emission Monitoring

(CEM)

01 Schematics of the flue gas line in a power plant

In case of co-incineration of alternative fuels, additional components such as HF, HCl, Hg and Volatile Organic Compounds (VOC) may be required to be monitored as well (e. g. emission monitoring in waste incineration). Measuring data are transferred to a specific Data Acquisition and Handling System (DAHS) for further processing and reporting to the authorities.

Components of a CEMS

- continuous gas analyzers (CGA) such as photometers, oxygen analyzers and flame ionization analyzers arranged in a cabinet to measure NO, NO₂, SO₂, CO, CO₂, O₂, and Hydrocarbons
- CGAs and FTIR analyzers arranged in a cabinet to measure NO, NO₂, N₂O, NH₃, SO₂, CO, CO₂, O₂, HF, CH₄ etc.
- in-situ cross-stack laser (typically TDL technology) analyzer if components should be measured directly in the process, e. g. soluble components such as NH₃, HCl, H₂O
- dust analyzers
- equipment to measure reference values temperature, pressure and volume flow
- Data Acquisition and Handling System (DAHS), typically a computer

Motivation

Document compliance to regulations to

- attain and keep plant permits
- get credit for pollutant trading programs

ABB Solutions

ACX or ACF5000 based upon the number of gas pollutants to be monitored.

ACX is a complete system solution for extractive continuous gas analysis. The system can be fully operated from the outside. Inside, the well-established reliable analyzers of the Advance Optima series work with the proven components for sample conditioning. The ACX system is particularly easy to maintain as a result of the standardized design. Comprehensive digital communication allows global remote maintenance and control with Analyze^{IT} Explorer. System performance can be checked and calibrated with calibration cells without test gas.

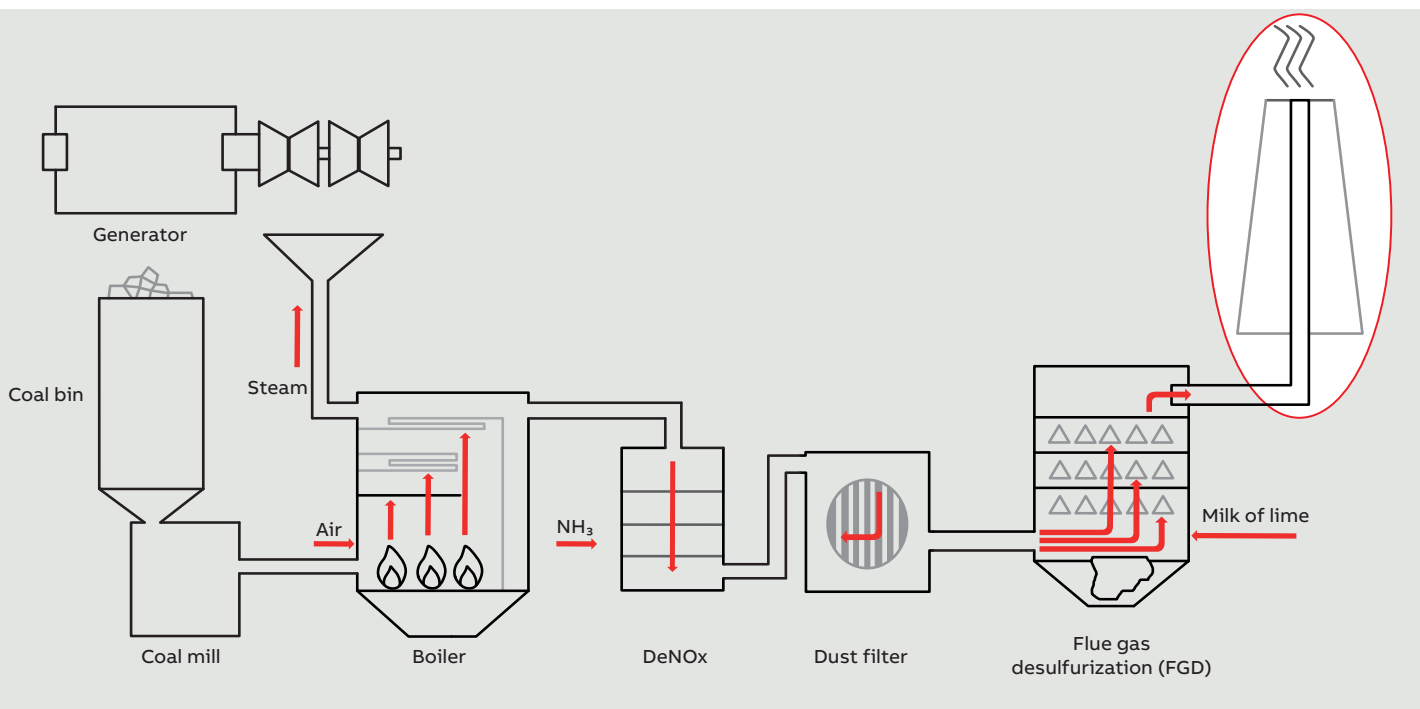
Typical components:

- NO, NO₂, SO₂, CO, CO₂, CH₄, O₂, VOC
- Additional components through LS4000:
- NH₃, H₂O

In accordance with:

- EN 14181,
- EN 15267
- US EPA performance specifications

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ACF5000 combines the advantages of an infrared spectrometer using Fourier transformations with the proven technology of FID and ZrO₂ analyzer modules. There is no need for frequent calibration. The high resolution FTIR spectrometer provides selective infrared measurement of the active gas molecules with great sensitivity and stability. Comprehensive digital communication allows global remote maintenance and control with Analyze^{IT} Explorer.

System performance can be checked with validation cells with all FTIR components without test gas.

Typical components:

- NO, NO₂, N₂O, NH₃, SO₂, CO, CO₂, CH₄, O₂, HCl, HF, VOC

In accordance with:

- EN 14181
- EN 15267
- US EPA performance specifications

LS4000 is an in-situ laser analyzer which selectively measures the NH₃ concentration in the low ppm range.

The laser operates according to the principle of single-line spectroscopy. For measurement purposes a single absorption line is selected from the gas to be measured in the near infrared spectral range, at which no cross-sensitivity from other gases occurs. The absorption line is scanned and the receiver located opposite detects the absorption caused by the sample gas and calculates the gas concentration from this.

LS4000's in-situ installation provides easy measurement of soluble components such as H₂O, NH₃, directly in the process.

LS4000's cross-stack installation ensures more representative measurement than single point measurement. Local concentration spots in the duct can be detected.

Typical components:

- NH₃, and H₂O

DURAG D-R series for dust measurement

Dust is typically measured with an In-situ application, like the Durag D-R series.

The system operates according to scattered light method. The modulated light from a halogen lamp illuminates the dust particles in the exhaust duct/ line. Scattered light, reflected from the particles is measured and assessed. Typical measuring ranges are 0 to 10 mg/m³ or 0 to 200 mg/m³.

The devices of the D-R series are approved according to the EN 15267.

ABB CEM-DAS / DURAG D-EMS 2000

for emission evaluation (DAHS)

An emission monitoring system needs the evaluation of the continuously acquired emission values which have to comply with the relevant legal requirements. Essential evaluation criteria are:

- continuous acquisition of the parameters and reference values
- generation of standardized, oxygen reference integrated values (10 / 30 / 60 min)
- validation of the integrated values
- generation of daily average values
- monitoring of the equipment failure and logging in daily and annual statistics

CEM-DAS is ABB's solution for monitoring plants followings the European regulations. D-EMS 2000 is the solution for regions following regulations according to US EPA.

DURAG HM-1400 TRX for Hg - measuring

Measuring of Hg becomes more and more important, especially with the new IED 2010/75/EC and the new NESHAP rules. More coal fired power plants and cement plants will have to monitor Hg continuously. The HM 1400 TR is a fully-automatically operating system for mercury analysis in smoke gas by using the UV-absorption method. In the HM-1400 TR the sample gas is converted into mercury vapor by a combination of thermal and dry chemical treatment.

Typically measuring ranges are 0 to 45 / 0 to 500 µg/m³

The HM-1400 TRX is approved in accordance with EN 15267.

The complete system is an assembled steel sheet cabinet like the ACF or ACX.

ABB Stackmaster (TORBAR) for flow measurement

TORBAR is a multiport self-averaging flow meter with the well-known design based on the pitot tube concept of flow measurement. TORBAR produces an averaged differential pressure (DP) signal proportional to the square of the flow rate.

Additional equipment

- pressure, Temperature, Volume flow
- Data Acquisition Handling System

Customer benefits

- type approved equipment
- at lowest cost of operation

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