



Training for Personnel to the MCERTS standard



Level 1 – Technician and Level 2- Team Leader

This course is designed to provide training for personnel that are at trainee level and wish to progress through to Level 1 and then progress to Level 2.
The course duration is based on five days.

Who should attend

This course is for personnel with little or no experience in emission monitoring or who are at the Trainee level of MCERTS and wish to progress to Level 1 and then to Level 2

Syllabus

Introduction to major pollutants

Principal pollutants prescribed for monitoring and their properties. The following pollutants are included: CO, CO₂, O₂, SO_x, NO_x, HCl, TOC, particulate matter, dioxins, PCBs and PAHs.

- typical sources;
- factors affecting formation;
- typical emission concentrations;
- typical ambient concentrations;
- properties affecting sampling and analysis;
- environmental and health effects of air pollution.

Principles of emissions monitoring

Principles of stack-emission monitoring and the reasons it is carried out. This includes:

- purpose of monitoring for regulatory compliance
- an overview of legislation on emissions to air, IPC, PPC, European directives and the MCERTS scheme;
- the nature and use of emissions limits;
- monitoring requirements
 - sampling protocols
 - standard methods
 - MCERTS method implementation documents
 - instrument specification and approval
 - principles of quality assurance and control;
- the importance of representative sampling;

Units and reference conditions

- temperature, pressure, velocity, mass, volume;
- concentration and mass-based units;
- inter-conversion of ppm and mg/m³;
- reference conditions and normalisation
- conversion of wet gas composition to dry gas

- conversion to standard temperature and pressure
- conversion to reference levels of O₂.

Operation of equipment

General requirements for correct operation of measurement equipment and have an understanding of common faults and their effects. This includes:

- use of CEMs;
- instrument theory
 - flow measurement theory of pitots, orifice plates, dry gas meters, rotameters, differential pressure devices
 - temperature measurement, theory of measurement including thermocouple and other devices
 - pressure measurements devices and theory of operation
 - heater technology;
- practical knowledge
 - handling of basic technical equipment
 - training in the handling of instruments
 - practical demonstration of the different applications of sampling.

Introduction to extractive manual sampling

The candidate should demonstrate general knowledge of the equipment used for sampling particulates, multi-phase emissions and gases/vapours. This includes:

- principle of operation;
- general arrangement of the sample train
 - sample (hot) box or oven
 - cold box or ice bath
 - umbilical cord
 - control unit;



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- general methodology for determination of substances
 - particulates
 - dioxins and PCBs
 - PAHs
 - trace metals including mercury
- gases/vapours using manual and instrumental techniques
- water vapour and presence of droplets
- preparation of sampling equipment
 - filter preparation
 - polymeric resin trap preparation
 - glassware preparation
 - probe liner preparation
 - nozzle preparation
 - preparation of sampling train and leak check
 - example arrangements of sampling trains.

Principles of manual stack-emission monitoring

- special characteristics of particulates;
- the need for and principle of isokinetic sampling;
- effects of water droplets;
- sampling plane and sampling points;
- measurement of stack gas velocity and pressure;
- calculation of flow rate (orifice plate, manometer);
- setting flow rate (setting charts, calculators, portable computer equipment and the like);
- calibration of instrumental techniques;
- sample conditioning and sample integrity.

Monitoring legislation, standards and methods

Legislation relevant to monitoring, the applicable standards, and the different monitoring techniques for gaseous pollutants. This includes:

- knowledge of appropriate methods for emission monitoring;
- what to do if no standard method is available;

- deviation/modification of methods;
- hierarchy of methods
 - CEN
 - BSI
 - ISO
 - other methods such as ASTM, AFNOR, DIN, USEPA and VDI
- current standards;
- future standards;
- types of sampling systems.

Analytical techniques and limits of detection

Analytical techniques used to support pollutant measurements in the field. This includes:

- definitions and units;
- implications of analytical sensitivity for sample amounts and sampling times;
- limits of detection;
- sample handling;
- liaison with analysis laboratories;
- proficiency-testing schemes.

Abatement systems and their effects on monitoring

Abatement systems used for the control of the principal pollutants from industrial processes and their impact on emission levels. Systems include:

- centrifugal separators (cyclones);
- electrical gas cleaning (for example, electrostatic precipitation);
- fabric filters;
- scrubbers;
- flue gas desulphurisation.

Choice of sampling location and timing

Plant configurations, their impact on monitoring results, and where to carry out sampling. This includes:

- achieving representative sampling;
- positional requirements for particulate matter and gaseous species;
- criteria for locating sample plane;
- surveying the sample plane;
- number of sampling points.

Undertaking a measurement campaign

- Factors to be addressed when undertaking a measurement campaign. These include:
 - determining the objectives of the sampling exercise;
 - deciding on the parameters to be measured;



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- reviewing process parameters;
- selecting sampling and analysis techniques;
- batch sampling;
- continuous direct reading instruments;
- arranging sample positions, safe access and essential services;
- liaison with plant operators;
- safety on site;
- transport of samples to laboratory;
- analysis;
- evaluating results;
- report writing.

Choice of sampling method, technique and equipment

Monitoring approaches, techniques, published methods, equipment and which factors influence their selection. This includes:

- monitoring approach
 - periodic monitoring methods
 - continuous emission monitoring methods;
- choice of monitoring technique
 - manual
 - instrumental;
- choice of monitoring method and equipment.

Types of process operation and process details

Types of process operation and relevant process details. These include:

- types of operation
 - continuous (steady state, variable or cyclic)
 - batch process;
- process details
 - timescale of operation
 - awareness of inputs, outputs and mass flows
 - fuel composition
 - stack gas conditions.

Developing site-specific protocols

The candidate must demonstrate knowledge of the requirements to be considered when undertaking a measurement campaign at a specific site. These include:

- site review;
- process knowledge;
- sampling-site details;
- risk assessments;
- regulatory permits;

- method validation;
- site-specific issues;
- quality management.

Processing measurement results, calculation procedures

Procedures used for processing measurement data leading to monitoring results. These include procedures for processing:

- analytical reports;
- report components;
- measurement traceability;
- precision;
- internal variability/repeatability;
- external variability/reproducibility.

Principles of calculating uncertainty

Principles of calculating uncertainty. This includes:

- basic terminology;
- Agency approach to compliance assessment;
- rules for combining uncertainties;
- confidence limits and statistically defined uncertainties;
- tests using certified reference materials;
- repeat measurements using paired instruments and comparison with certified reference method;
- building an uncertainty budget from estimates of component uncertainties;
- assessing deviations from a standard method;
- effect of number and duration of samples on accuracy.

Quality assurance techniques, UKAS, auditing and MCERTS

The candidate must demonstrate knowledge of the systems for quality assurance and quality control in stack-emission monitoring and the implications for data accuracy. These include:

- quality management for emissions monitoring;
- organisation and management;
- quality systems;
- the MCERTS performance standard for organisations;
- staff;
- equipment;
- measurement traceability and calibration;



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- sample storage and transport;
- quality audits and reviews;
- horizontal audits;
- spot-check audits;
- system audits;
- vertical audits;
- reports;
- calculations;
- original observations;
- equipment;
- monitoring results file;
- personnel.

Health and safety requirements

Risk-management approach to minimising hazards at work. This includes the use of:

- Risk-assessment and risk-management principles;
- COSHH assessments
- permanent platforms and scaffolding;
- lifting and slinging;
- personnel protective equipment assessments;
- permits to work.



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Suggested documents

MCERTS documents

EA Examination Syllabuses for Manual Stack-Emission Monitoring, available on STA web site

EA Manual Stack Emission Monitoring Performance Standard for Organisations, available on STA web site

EA Personnel Competency Standard for Manual Stack Emission Monitoring, available on STA web site

EA MCERTS for manual stack emission monitoring leaflet, available on STA web site

EA Manual Stack-Emission Monitoring Guidance for Personnel and Organisations, available on STA web site

Guidance documents

EA Technical Guidance Document (Monitoring) M1: Sampling requirements for monitoring stack emissions to air from industrial installations, available on STA web site

EA Technical Guidance Document (Monitoring) M2: Monitoring of stack-emissions to air

STA Annual Guide 2002, available from STA main office

Text books

Industrial Air Pollution Monitoring

Dr Andrew Clarke, ISBN 0-412-63880-0

Continuous Emission Monitoring

James A. Jahnke ISBN 0-442-00724-8

CoGDEM Gas detection and Analysis

CoGDEM, contact Samantha for details

Costs

Five day level 2 course £1165.00 (STA members)*, £2330.00* (non-STA members)

***There is a 10% discount for payment within 30 days**

Course dates and availability.

The Level 2 course is run every month or on demand. The minimum number of candidates for the course to run is 4 with a maximum of 8. The STA web site has dates of when the courses are to be held. Courses are held at the STA offices.

How to book

Please fill out the STA training application form, to download our application form please visit:

www.s-t-a.org/application

Notes

Payment for courses for non-STA members are required in advance.
