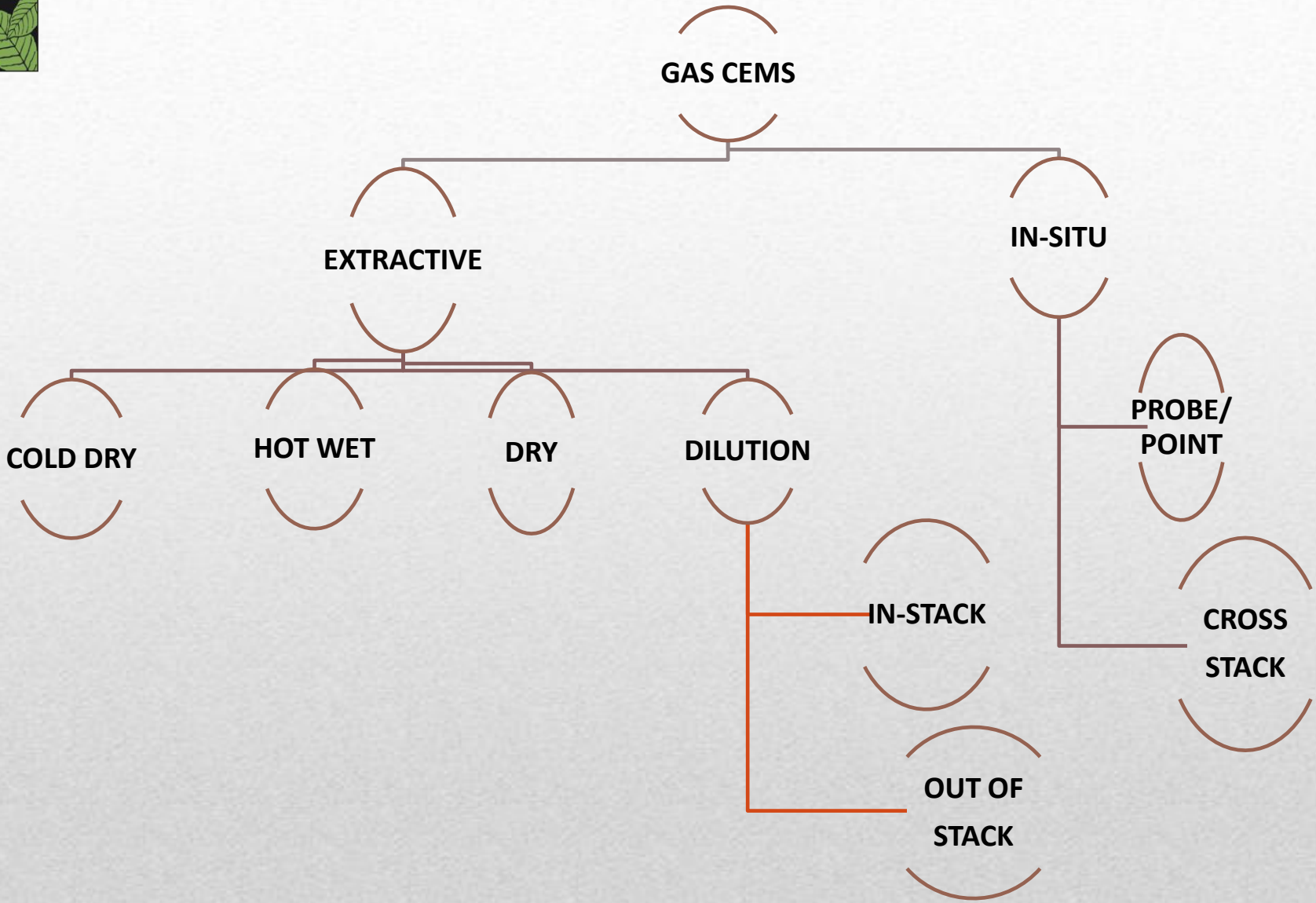
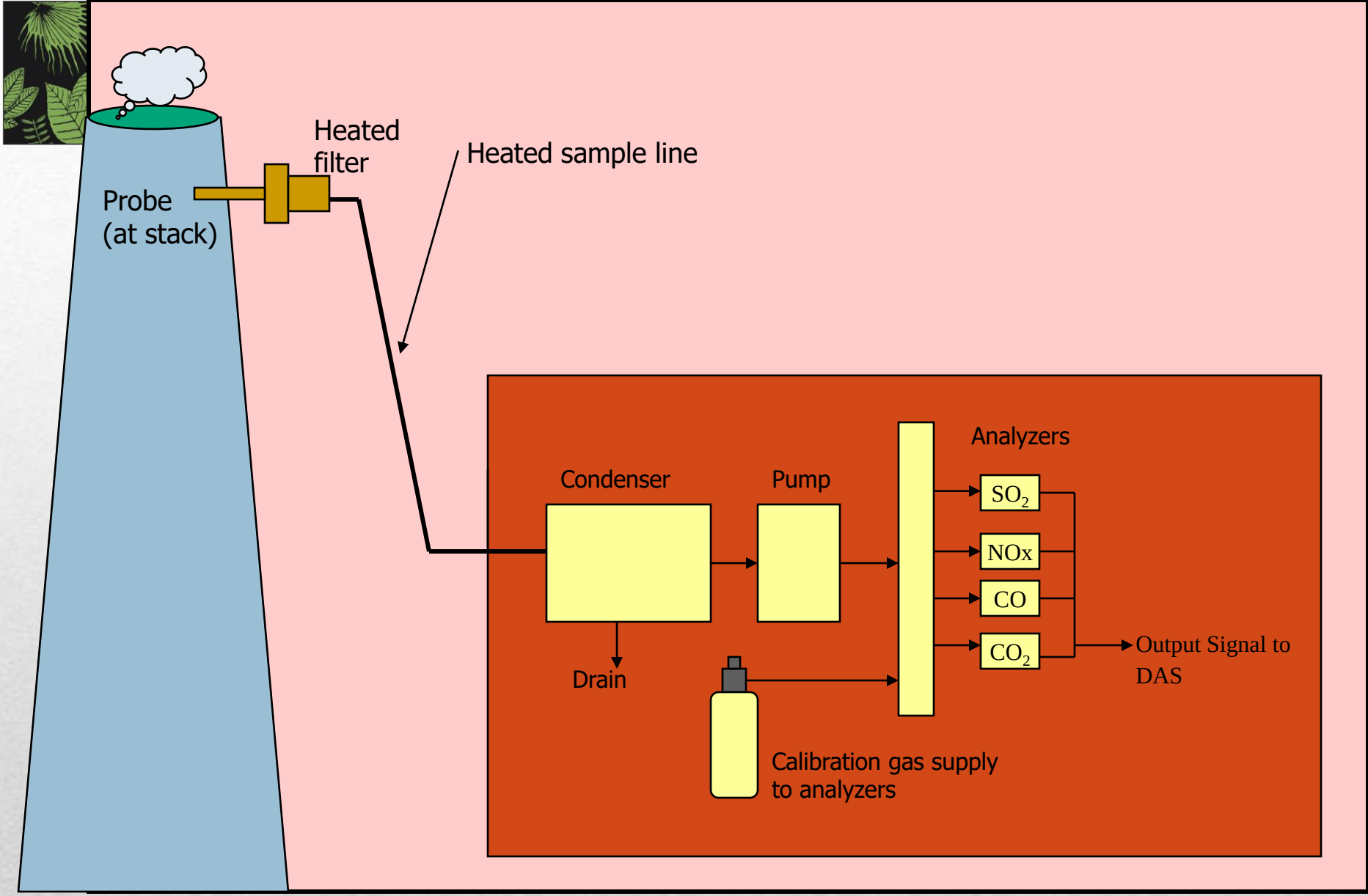
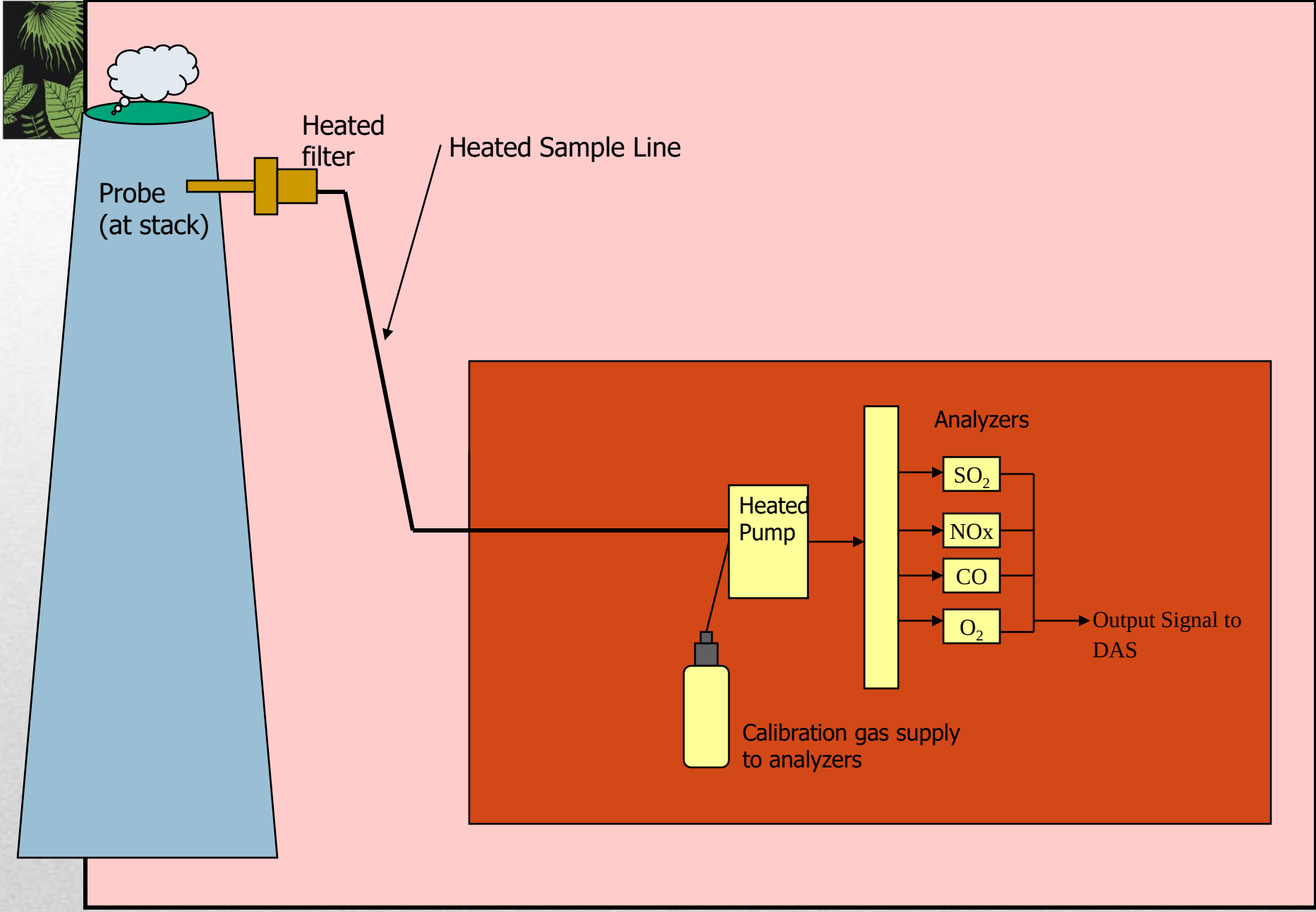


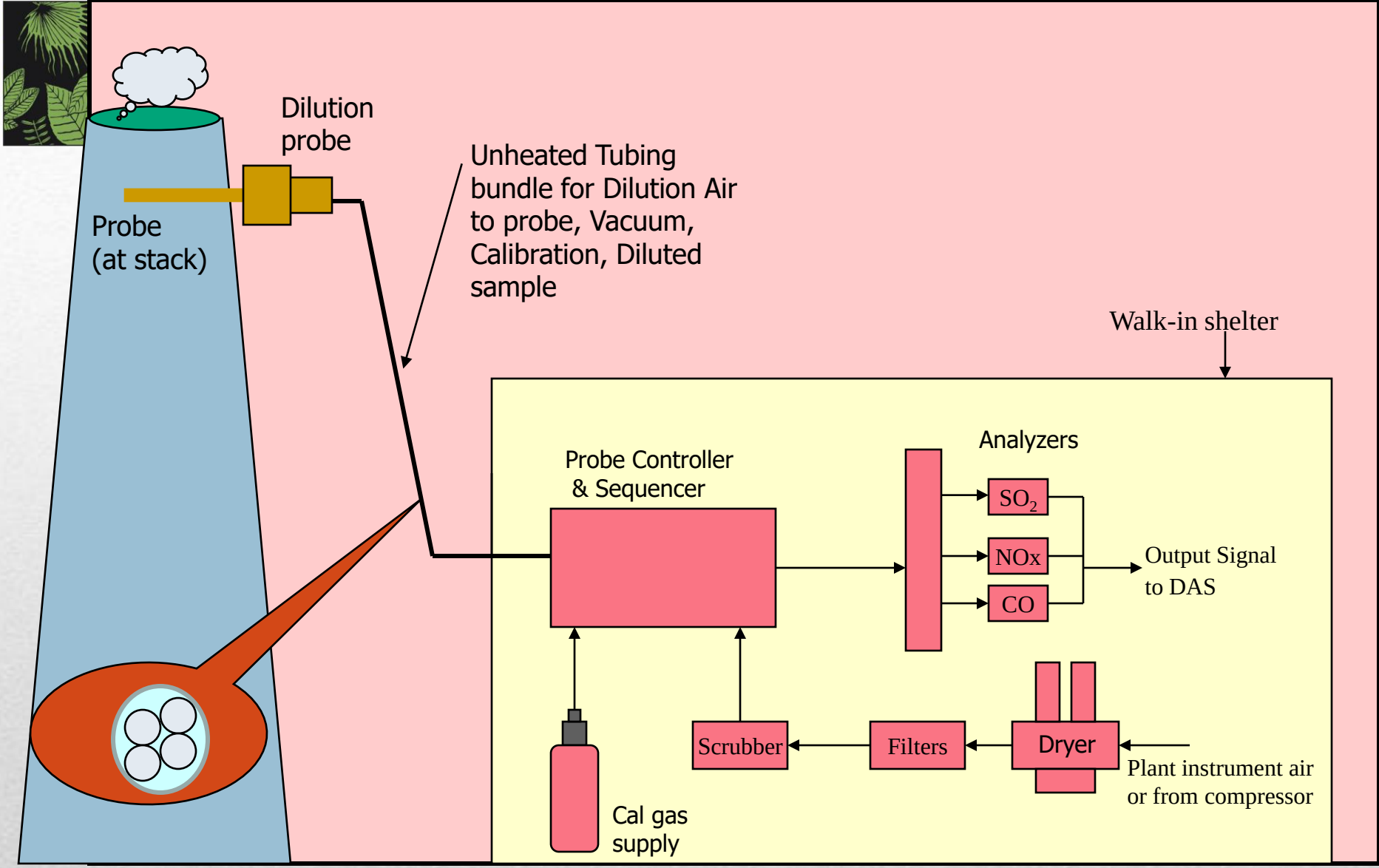
Gaseous CEMS technology



Cold Dry stack monitoring



Hot Extractive stack monitoring

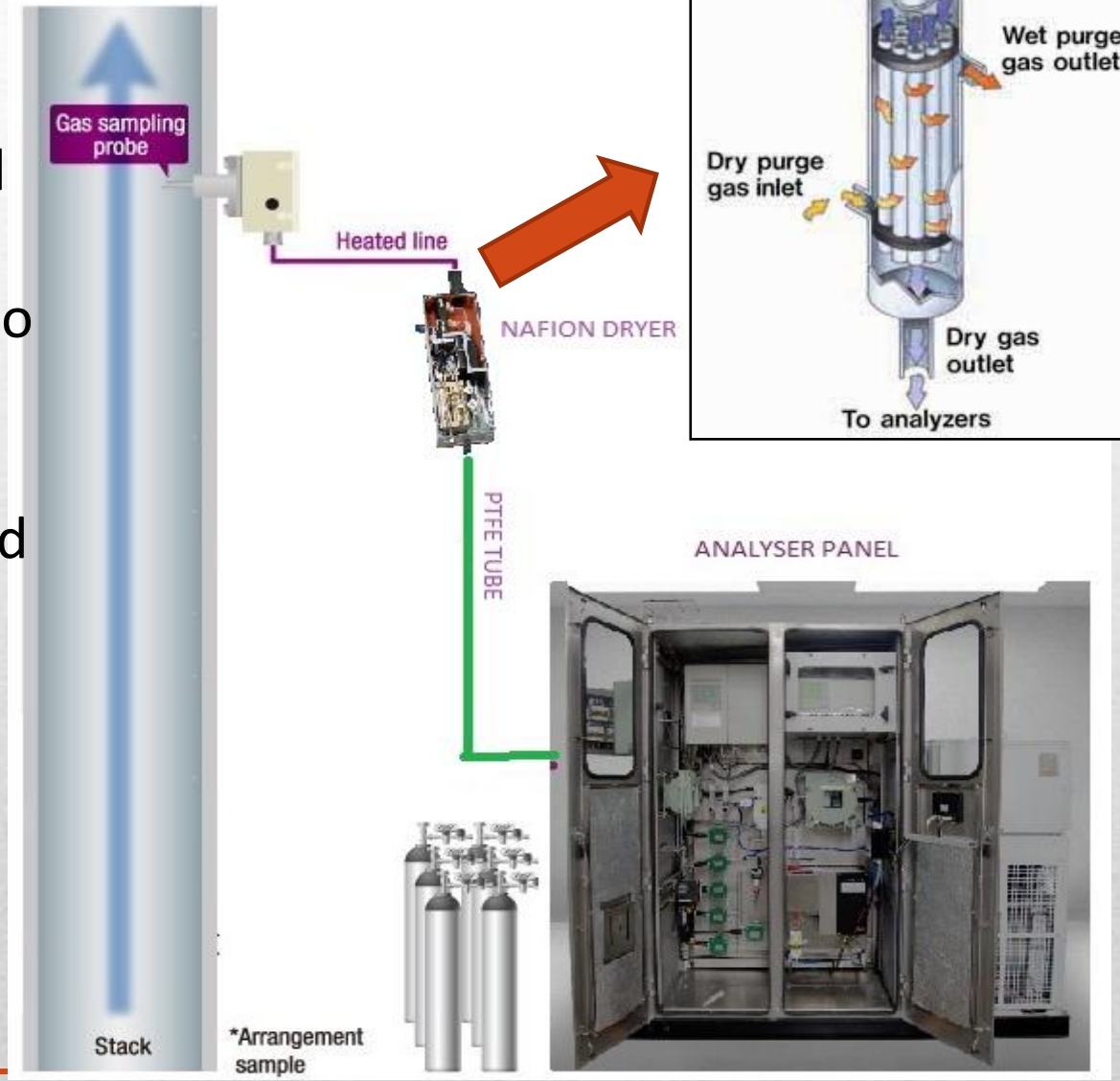


Extractive Dilution stack monitoring

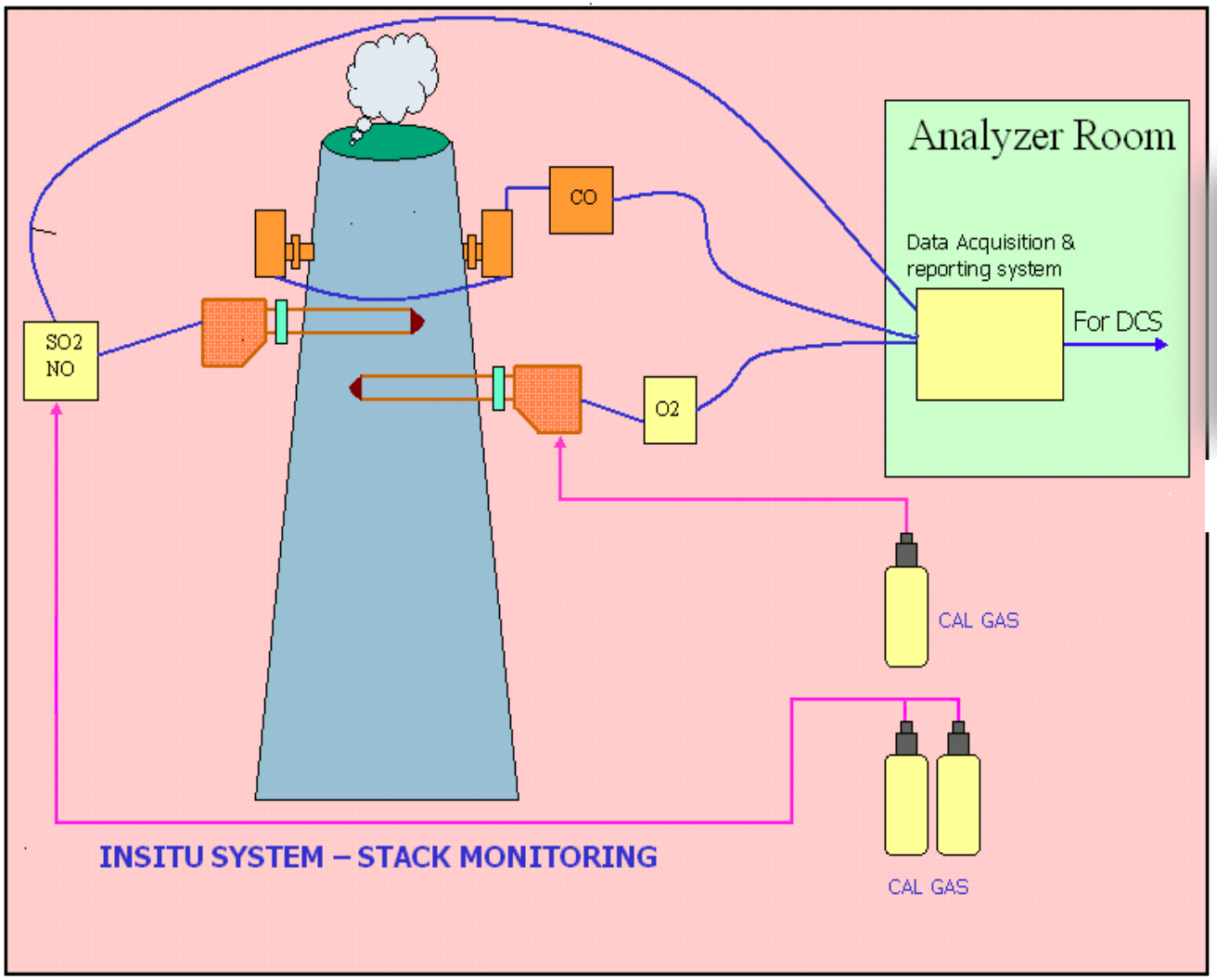
The Heated Tube is to start from the Probe and continue till the Nafion Dryer. There should be no Cold Spots.

Air to Nafion Drier should be moisture free – Dry.

Line should be checked and Leakage free Line should be ensured

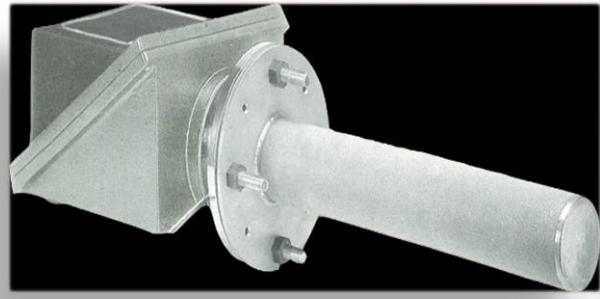


Dry extraction- stack monitoring



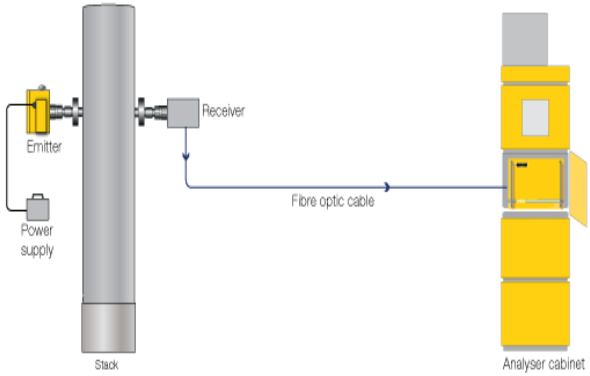
POINT SYSTEM- IR/UV

SO2/NOx/CO/CO2/O2



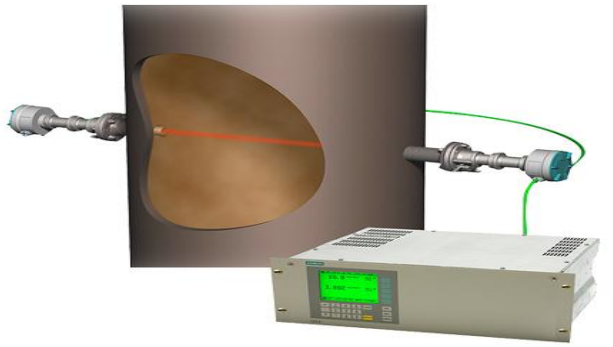
PATH SYSTEM- DOAS

SO2/ NOx/ CO/CO2/NH3



PATH SYSTEM- TDLS

NH3 / HCL / HF /CO/CO2



In-situ stack monitoring

Calibration

Need: Certified- zero gas, span gas, calibration gas cylinder

1. Manual Calibration:

A person physically opens the Calibration cylinders and lets the gasses pass through the Analyser, and once the readings in the Analyser has stabilised, calibration is done by correcting the drift.

2. Automatic Calibration:

This is termed so that the calibration is performed by the Analyser Automatically. Automatic Calibration can be triggered in 2 ways- time based or by external input.

Some Analysers are equipped with calibration Cuvette (pre-filled in the with zero and Span gases) which comes in light path.

Optical methods

> Simple Non- Dispersive Infrared (NDIR)

> Luft Detector NDIR

> Photoacoustic Detector

> Gas Filter Correlation (GFC) NDIR

> Differential Optical Absorption Spectroscopy (DOAS)

> Fourier Transform Infrared Spectroscopy (FTIR)

> Non Dispersive Ultraviolet (NDUV)

> Chemiluminescence Analysers

> Flame Photometric

> Derivative Spectroscopy

Non- optical methods

Electrochemical cells <

Conductivity Analyser <

Flame Ionisation Detector (FID) <

Photo Ionisation Detector (PID) <

Gas Chromatography <

Mass Spectrometry <

Ion-Mobility Spectrometry <

High Temperature Electrochemical Cells <

Paramagnetic Analysers (Thermomagnetic, Differenetial Pressure, Automatic null Balance) <

Potentiometric Analysis <

Electrochemical Fuel Cells <

Zirconium Oxide (ZrO_2) <

Methods for Gaseous CEMS

Flow Rate

- Pitot tube
- Averaging differential pressure probes
- Thermal sensing systems
- Ultrasonic flow monitors
- Time-of-flight
- Balance technique
- Stack Venturi
- Vortex shedding flow meters
- Pneumatic bridge flow meters
- Electrodynamic cross-correlation

Water Vapour

- Non dispersive IR photometry (NDIR)
- Dispersive photometry in-situ
- Automatic psychrometry.

Temperature

- Thermocouples or Resistance thermometers.

Pressure

- Electronic pressure transducers
- Liquid-in-glass manometers

Methods for other Flue Gas Characteristics

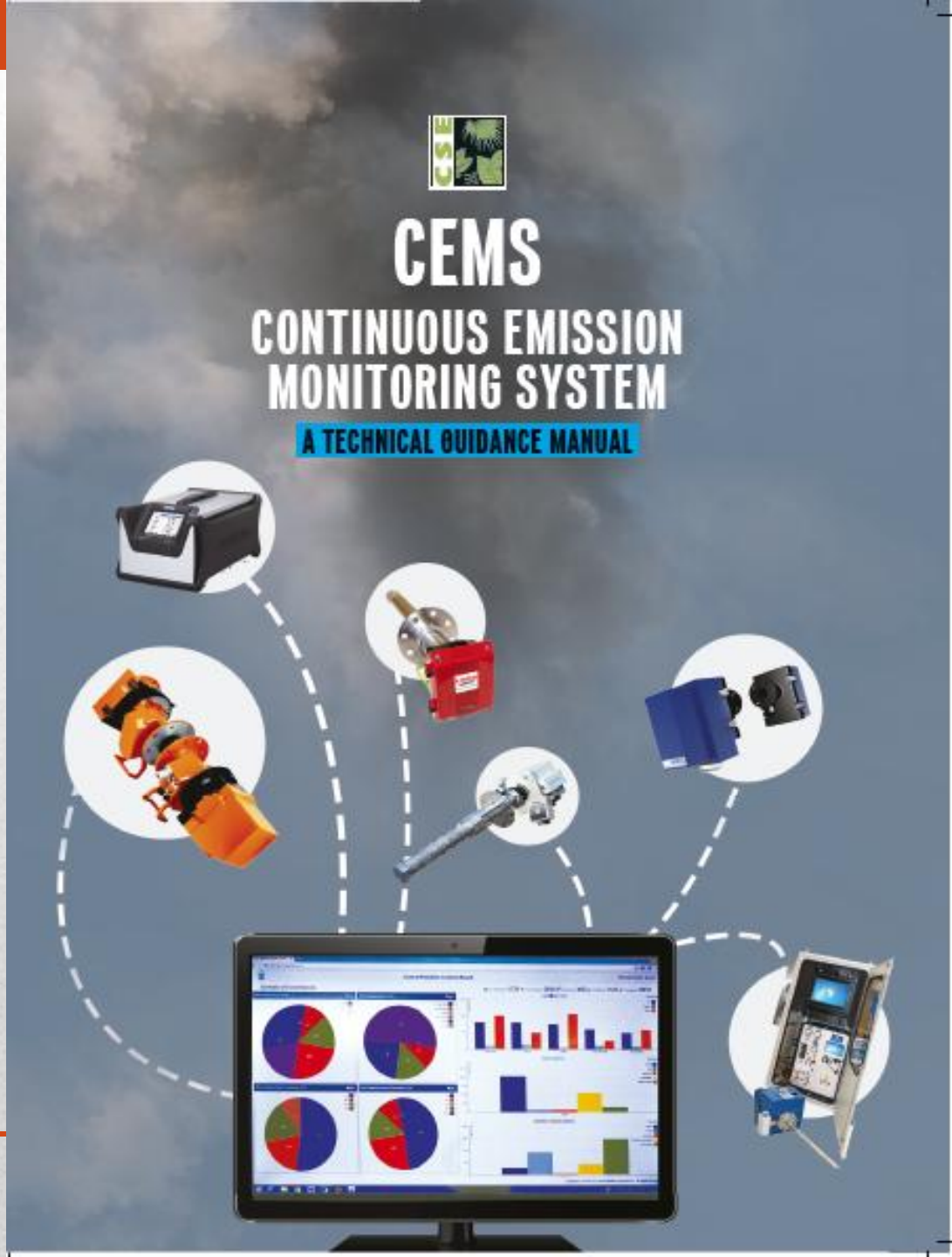
- **Flue gas characteristics:** Temperature, Moisture, Dew Point, Dust content, Presence of corrosive components
- **The Range of the Analyser** (2.5 times of limit or 125% of maximum emission value)
- **The Area Classification (Safe Area or in Zone)**
- **Maintenance requirement of the Analyser**
- **Measuring location**
- **Analyzer mounting position**
- **Calibration ports on the stack**
- **Platform availability**
- **Wall thickness of stack**
- **Double- or single-walled stack**
- **Coated or not coated stack**
- **Stack material**
- **Insulation thickness**
- **Power supply**
- **Signal distribution**
- **Instrument air availability**

Key points for Selection of analyzer

Operation	Options for CEMS
Rotary Kiln without co-processing	PM CEMS Insitu FTIR based hot wet technique to measure CO, CO2, SO2, NO, NO2, (HCl)*, (HF)*, (NH3)*, VOC, H2O, etc. (FID for THC) & O2 Analysers can be added *in-situ laser based method may be preferred for lower concentration. Hot wet extractive gaseous CEMS Preferable as given above. Paramagnet for O2 When NOx-SNCR implanted NH3 must be measured on the stack preferably with TDLAS/ FTIR NDIR / NDUV/ FTIR for multigas analysis (SO2, NOx)
Rotary Kiln with co-processing of Wastes	PM CEMS FTIR based hot wet technique to measure CO, CO2, SO2, NO, NO2,(HCl)*, (HF)*, (NH3)*, VOC, H2O, etc. (FID for THC) & O2 Analysers can be added *in-situ laser based method may be preferred for lower concentration. Hot wet extractive gaseous CEMS Preferable as given above. Paramagnet for O2 When NOx-SNCR implanted NH3 must be measured on the stack preferably with TDLAS/ FTIR NDIR / NDUV/ FTIR for multigas analysis (SO2, NOx)

CEMS technology options for Cement industry

CEMS: A Technical Guidance Manual



Industry Training on CEMS and CEQMS

Thank you

Training on

CONTINUOUS EMISSION AND EFFLUENT QUALITY MONITORING SYSTEM

Continuous Emission Monitoring System (CEMS) and Continuous Effluent Quality Monitoring System (CEQMS) are mandatory for 17 categories of industries and common pollution treatment facilities in India. Grossly polluting industries (GPI) also need to install CEQMS. In near future, the real time data will become the basis for compliance check. In addition, it can also help industries in process optimization and timely pollution control measures.

Since CEMS and CEQMS are complex and expensive technologies, implementation challenges and associated risks are high. Proper implementation is not limited to the issue of correct technology selection but also installation, operation, maintenance and data handling. Therefore, adequate knowledge and skill becomes most crucial factor for industries, regulators and associated parties.

Centre for Science and Environment (CSE) recognizes this need and announces a one-week training programme on CEMS and CEQMS for environment professionals. The training methodology will include technical classes by experts, technology demonstration, group exercises and presentation, and guided industry visits for practical experience.

OPEN FOR

Environment professionals from industries, consultants, environmental laboratories, regulators, academia and others interested participants.

KEY TAKEAWAYS

- Pollution monitoring regime in India and developed countries like US, Europe
- Available technologies, working principles, their suitability and limitations
- Correct installation, operation and maintenance of CEMS and CEQMS
- Requirement and procedures of calibration, zero and span drift and other maintenances
- Correct ways of data acquisition, handling, reporting and quality check
- Self assessment of CEMS implementation, compliance check and improvement
- Certificate of training will be awarded to the participants

Application Deadline: 30th December 2017

Date: **15-19th January 2018**

Duration: **5 days, (10:00am -5:30pm)**

Venue: **Anil Agarwal Environment Training Institute (AAETI), Tijara (Rajasthan)**

Course Fee: **₹35, 000**
(Includes double sharing accommodation, food, guided site visits, group pick-up and drop)

Centre for Science and Environment
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Fax: 91-11-29955879
Contact: Vinay Trivedi, Senior Researcher
vinay.trivedi@cseindia.org, Mobile- +91-8404083785