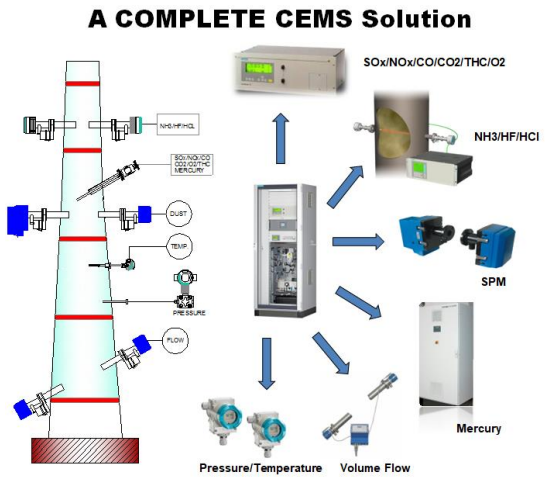
ADAGE

TOTAL ENVIRONMENTAL SOLUTION PROVIDER

CEMS, AAQMS, EFFLUENT

ENVIRONMENTAL SOLUTIONS

- ANALYSER SHELTER
- HOT EXTRACTION CEMS
- DILUTION EXTRACTION CEMS
- DRY EXTRACTION CEMS
- HOT WET CEMS
- INSITU LASER BASED CEMS
- AAQMS – CONVENTIONAL
- AAQMS – COMPACT
- MERCURY ANALYSERS
- DUST & SPM MONITORS
- STACK FLOW METERS
- EFFLUENTS MEASUREMENTS



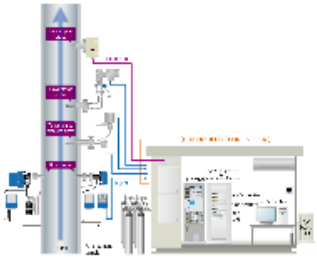
Technology Partners

- Siemens AG, Germany for Gas Chromatographs & CGA and Laser analyzers
- Ametek Inc, USA for SRU & Sulphur analyzers, Process Moisture Analyser, Zironium Based O_2 Analyser, Mass Spectrometers
- ICON Scientific , UK for Physcial Property analyzers
- ENVEA Polluting Instruments for AAQMS
- Guided Wave NIR, Analect (AIT-Schnieder FT-NIT/FTIR), Extrel Mass Spectrometer, LAR TOC Analysers
- H2Scan Solid State Based Process H2 Analyser
- Airoptic Tunable Laser Diode Based Process Analysers
- UNION Germany for Caloriemeters & Biogas

MONITORING SYSTEM OPERATED BY INDUSTRY

Air Pollution Monitoring System

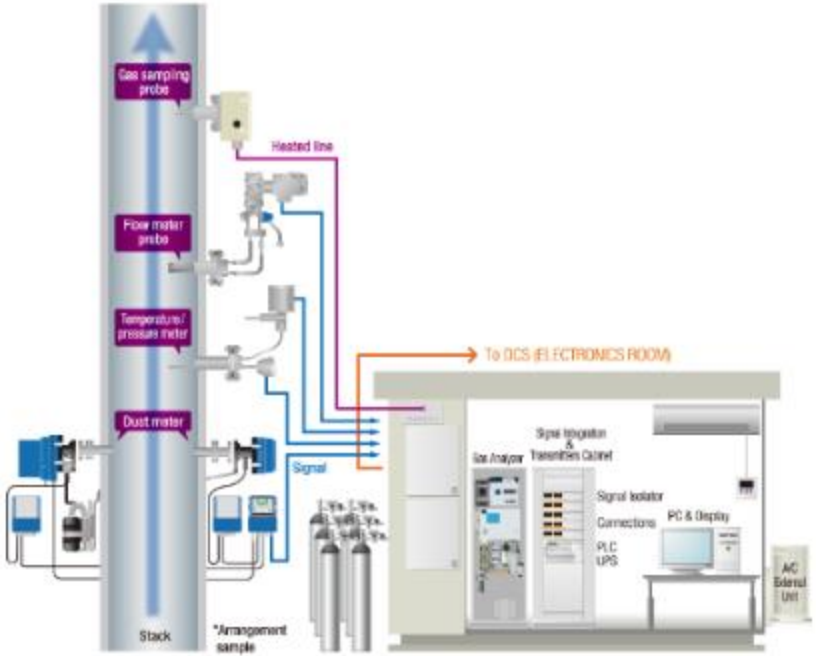
- Continuous Emission Monitoring System
- Ambient Air Quality Monitoring System



Water Pollution Monitoring System

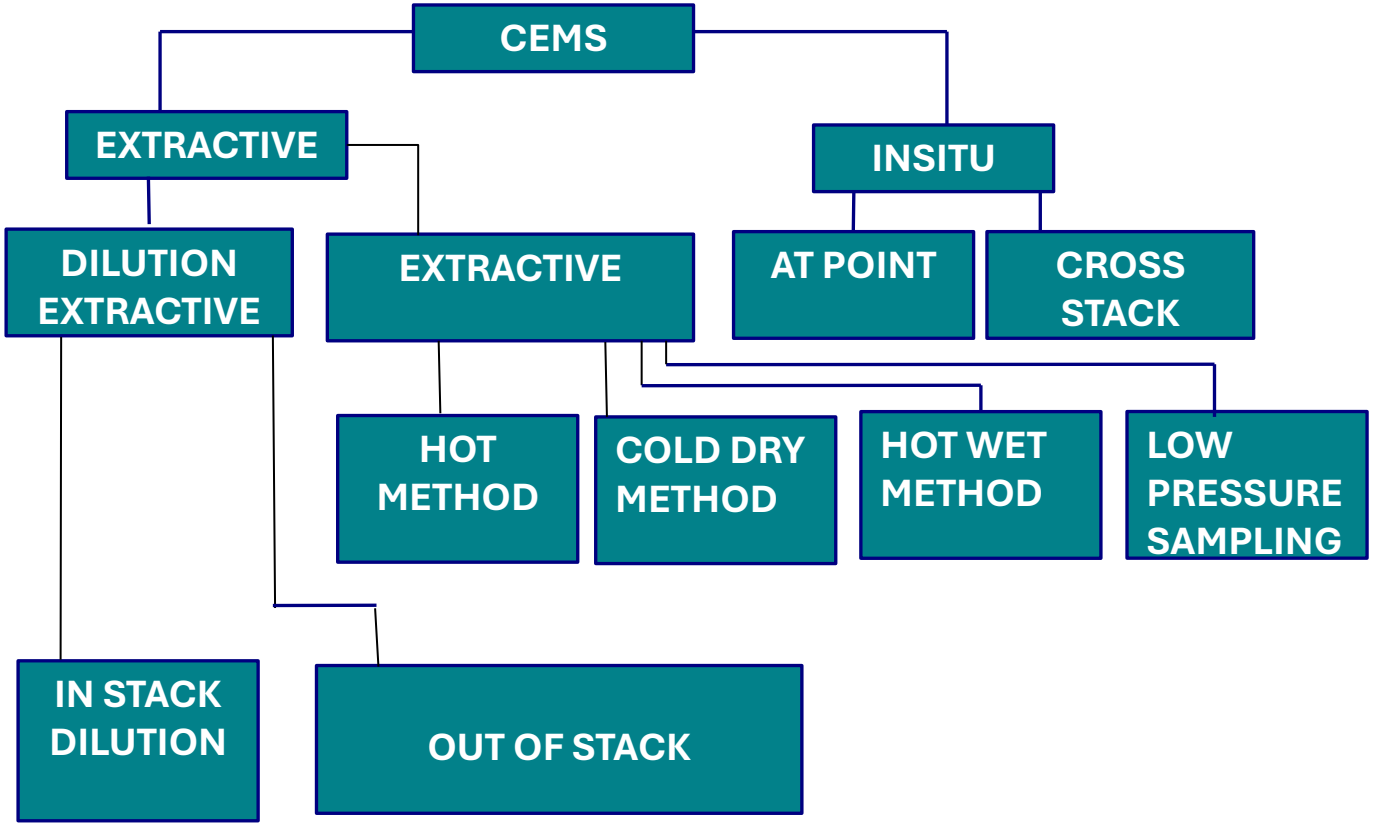
- Effluent Monitoring System

What Is Cems ?



A continuous emission monitoring system (CEMS) is the total equipment necessary for the determination of a gas or particulate matter concentration or emission rate using pollutant analyser measurements and a conversion equation, graph, or computer program to produce results in units of the applicable emission limitation or standard

Type Of Cems Technique



Plenty of pollutants need to be measured:

- **Particulates:**
  - **Total Dust or Opacity, Heavy Metals**
- **Inorganic Compounds:**
  - **CO, CO_2, SO_2, NO/NO_2/NO_x, NH_3, HCl, HF, Total Hg**
- **Organic Compounds:**
  - **THC, Dioxins & Furans**
- **Reference Values:**
  - **O_2, H_2O, Temperature, Pressure, Gas Velocity / Flow**

What Are The Requirements?

- All Analysers are provided as individual units and/or Multi-Component Analysers
- CEMS Gas Analysers require suitable Sample Handling & Conditioning units
- Data Acquisition, Handling & Transmission is required

Reliable and Accurate Data

How to get that?

- Application-optimized Sample Handling & Conditioning Units
- Reliable Analysers
- Accurate Integration into the Monitoring System (CEMS)
- Availability of Support, Service, Maintenance, AMCs

What Are the Common Stack Pollutants?

- SO_2 SULPHUR DI OXIDE
- NO_X OXIDES OF NITROGEN
- CO CARBON MONO OXIDE
- PM PARTICULATE MATTER
- HCL HYDROGEN CHLORIDE
- NH3 AMMONIA
- HF HYDROGEN FLUORIDE
- TOC TOTAL HYDRO CARBON
- Hg MERCURY

What are the CPCB Guidelines

Table 7: Parameter specific Emission Standards for industries need to install CEMS

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits			Options available for CEMS
1	Aluminum	Raw Material Handling	PM	PM 150 mg/NM^3			PM CEMS as per matrix Table no:4
		Calcination	PM, CO	PM 250 mg/NM^3 and CO 1% (Max)			PM CEMS as per matrix Table no:4
		Green Anode Shop	PM	PM 150 mg/NM^3			PM CEMS as per matrix Table no:4
		Anode Bake Oven	PM	PM 50 mg/NM^3			PM CEMS as per matrix Table no:4
			Total fluoride (F)	0.3 Kg/MT of Al			Extractive FTIR In-situ IR-DOAS,TDLS
		Pot room	PM	PM 150 mg/NM^3			PM CEMS as per matrix Table no:4
			Total Fluoride (as F)	Vertical Stud Soderberg (VSS)		4.7 Kg/MT	Extractive FTIR
				Horizontal Stud Soderberg (HSS		6.0 Kg/MT	In-situ IR-DOAS,TDLS
				Prebacked Side Worked (PBSW)		2.5 Kg/MT	Extractive FTIR
				Prebacked Centre Worked PBCW)		1.0 Kg/MT	In-situ IR-DOAS,TDLS
2.	Cement Plant (without co processing), Standalone Clinker Grinding Plant or, Blending Plant	Rotary Kiln – without co processing	Parameter	Date of Commissioning	Location	Emission Limits mg/Nm3	CEMS Options
			PM	on or before or after the date of notification (25.8.2014)	anywhere in the country	30 mg/Nm3	PM CEMS as per matrix Table no:4
			SO_2	Irrespective of date of commissioning	Anywhere in the country	100, 700 and 1000 mg/Nm3 when pyritic sulphur in the limestone is less than 0.25%, 0.25 to 0.5% and more than 0.5% respectively	In-situ NDIR / IR GFC/UV-DOAS
							Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
							Dilution extractive

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits			Options available for CEMS
			NOx	After the date of notification (25.8.2014)	Anywhere in the country	600 mg/Nm3	In-situ UV-DOAS, NDIR, IR GFC
							Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
							Dilution Extractive - Chemiluminescence
				Before the date of notification (25.8.2014)	Anywhere in the country	(a) 800 for rotary kiln with In Line Calciner (ILC) technology. (b) 1000 for rotary kiln using mixed stream of ILC, Separate Line Calciner (SLC) and suspension preheater technology or SLC technology alone or without Calciner.	In-situ UV-DOAS, NDIR, IR GFC
							Extractive – NDUV / FTIR, IR GFC, NDIR-CFM
							Dilution Extractive - Chemiluminescence
	Cement Plant with co-processing of wastes	Rotary Kiln – with co-processing of Wastes	Parameters	Date of Commissioning	Location	Emission Limits mg/Nm3	CEMS Options
			PM	on or after the date of notification (25.8.2014)	Anywhere in the country	30 mg/NM^3	PM CEMS as per matrix Table no:4
			SO_2	before the date of notification (25.8.2014)	critically polluted area or urban centres with population above 1.0 lakh or within its periphery of 5.0 kilometer radius	100, 700 and 1000 mg/Nm3 when pyritic sulphur in the limestone is less than 0.25%, 0.25 to 0.5% and more than 0.5% respectively	In-situ NDIR / IR GFC/UV-DOAS
							Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
							Dilution extractive UV-Fluorescence

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits			Options available for CEMS
			NOx	After the date of notification (25.8.2014)	Anywhere in the country	600 mg/Nm3	In-situ UV-DOAS, NDIR, IR GFC Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM Dilution Extractive - chemiluminescence
			NOx	before the date of notification (25.8.2014)	anywhere in the country	(a) 800 mg/Nm3 for rotary kiln with In Line Calciner (ILC) technology. (b) 1000 mg/Nm3 for rotary kiln using mixed stream of ILC, Separate Line Calciner (SLC) and suspension preheater technology or SLC technology alone or without calciner.	In-situ UV-DOAS, NDIR, IR GFC Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM Dilution Extractive - chemiluminescence
			Parameters	Implementation Date	Location	Emission Limits	CEMS Options
			HCl (mg/NM^3)	NA	Anywhere in the country	10 mg/Nm^3	In-situ IR DOAS, TDLS, Hot Extractive FTIR
			HF (mg/NM^3)	NA	Anywhere in the country	1 mg/Nm^3	In-situ IR DOAS, TDLS, Hot Extractive FTIR
			TOC (mg/NM^3)	NA	Anywhere in the country	10 mg/Nm^3	Hot Ext. FID
3	Distillery	Boiler Stack	PM	150 mg/NM^3			PM CEMS as per matrix Table no:4

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
4	ChlorAlkli	(Hyper tower) (HCl Plant)	Cl_2, HCl	Cl_2-15 mg/NM^3 HCL-35mg/NM3		IR DOAS, TDLS, Hot Extractive FTIR
5	Fertilizers	Phosphate	PM	PM-150 mg/NM^3		PM CEMS as per matrix Table no:4
			Fluoride	Total Fluorides-25 mg/NM^3		Extractive FTIR In-situ IR-DOAS,TDLS
		Urea (Old Plants) before 01/01/1982	PM	150 mg/NM^3		
		Urea (New Plants) after 01/01/1982	PM	50 mg/NM^3		
6	Integrated Iron & Steel Plants	Coke oven plant New Batteries at GF sites Rebuild Batteries Existing Batteries	PM	50 mg/NM^3		PM CEMS as per matrix Table no:4
			SO_2	800 mg/NM^3		In-situ NDIR / IR GFC/UV-DOAS Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM Dilution extractive UV-Fluorescence
			NO_x	500 mg/NM^3		In-situ UV-DOAS, NDIR, IR GFC Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM Dilution Extractive - chemiluminescence
		Sintering Plant	PM	150 mg/NM^3		PM CEMS as per matrix Table no:4
		Blast Furnace		Existing Units	New Units (after 31 March 2012)	
			PM	50 mg/NM^3	30 mg/NM^3	PM CEMS as per matrix Table no:4

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
			SO_2	250 mg/NM³	200 mg/NM³	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	150 mg/NM³	150 mg/NM³	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive - Chemiluminescence
			CO	1% (Max)	1% (Max)	NDIR Insitu Extractive FTIR
		Steel making shop-basic oxygen furnace	Parameters	Existing Units	New Units (after 31 march 2012)	
		Blowing/lancing operation	PM	300 mg/NM³	Should be with gas recovery	PM CEMS as per matrix Table no:4
		Normal operation	PM	150 mg/NM³	Should be with gas recovery	PM CEMS as per matrix Table no:4
		Dedusting of desulphurisation	PM	100 mg/NM³	50 mg/NM³	PM CEMS as per matrix Table no:4
		Rolling mill	PM	150 mg/NM³		PM CEMS as per matrix Table no:4
		Re-heating (reverberatory) furnaces	PM	Sensitive Areas	Other Areas	PM CEMS as per matrix Table no:4
				150 mg/NM³	250 mg/NM³	
		Arc furnaces	PM	150 mg/NM³		PM CEMS as per matrix Table no:4

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
		Induction Furnace	PM	150 mg/NM³		PM CEMS as per matrix Table no:4
		Cupola Foundry		< 3 MT / hr Melting capacity	> 3 MT / hr Melting capacity	
			PM	450 mg/NM³	150 mg/NM³	PM CEMS as per matrix Table no:4
			SO2	300 mg/NM³ Corrected to 12 % CO2		In-situ NDIR / IR GFC/ UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
				Capacity upto 40 Tonne / day	Capacity above 40 Tonne / day	
		Calcination plant/lime kiln / dolomite kiln	PM	500 mg/NM³	150 mg/NM³	PM CEMS as per matrix Table no:4
		Refractory unit	PM	150 mg/NM³		PM CEMS as per matrix Table no:4
	Sponge Iron Plants	Rotary Kiln	PM	100 mg/NM³ (Coal based)		PM CEMS as per matrix Table no:4
				50 mg/NM³ (Gas based)		PM CEMS as per matrix Table no:4
7	Oil Refinery	Furnace boiler and captive power plant gas based		Before 2008	After 2008	
			PM	10 mg/NM³	5 mg/NM³	PM CEMS as pe matrix Table no:4
			SO_2	50 mg/NM³	50 mg/NM³	In-situ NDIR / IR GFC/ UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
			NO_x	350 mg/NM^3	250 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV/ FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive - chemiluminescence
			CO	150 mg/NM^3	100 mg/NM^3	NDIR Insitu
						Extractive FTIR, NDIR GFC / NDIR CFM
			H_2S	150 mg/NM^3	150 mg/NM^3	**TDLS/FTIR/IR DOAS However H2S and SO2 can not be measured simultaneously.**
		Furnace boiler and captive power plant liquid Fuel based		Before 2008	After 2008	
			PM	100 mg/NM^3	50 mg/NM^3	PM CEMS as pe matrix Table no:4
			SO_2	1700 mg/NM^3	850 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	450 mg/NM^3	350 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive - chemiluminescence
			CO	200 mg/NM^3	150 mg/NM^3	NDIR In situ
						Extractive FTIR, NDIR GFC / NDIR CFM

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
		Sulphur Recovery Unit (SRU)	Parameters	Existing SRU	New SR (after 1.1.2008)	
			H_2S	15 mg/NM^3	10 mg/NM^3	TDLS/FTIR/IR DOAS However H_2S and SO_2 cannot be measured simultaneously.
			NO_x	350 mg/NM^3	250 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive – Chemiluminescence
			CO	150 mg/NM^3	150 mg/NM^3	NDIR In situ
						Extractive FTIR, NDIR GFC / NDIR CFM
8	Petrochemical	Furnace, Boiler, Heater, Vaporizer Liquid Fuel based		Existing Plant	New / Expansion (after 9th Nov. 2011)	
			PM	100 mg/NM^3	50 mg/NM^3	PM CEMS as per matrix Table no:4
			SO_2	1700 mg/NM^3	850 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	450 mg/NM^3	350 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive - Chemiluminescence
			CO	200 mg/NM^3	150 mg/NM^3	NDIR In situ
						Extractive FTIR, NDIR GFC / NDIR CFM

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
		Furnace, Boiler, Heater, Vaporizer Gas based		Existing Plant	New / Expansion	
			PM	10 mg/NM^3	5 mg/NM^3	PM CEMS as per matrix Table no:4
			SO_2	50 mg/NM^3	50 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	350 mg/NM^3	250 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive - Chemiluminescence
			CO	200 mg/NM^3	150 mg/NM^3	NDIR In situ
						Extractive FTIR, NDIR GFC / NDIR CFM
9	Power Plant **	TPP installed before 31/12/2003		Less than 500 MW	More than 500 MW	
			PM	100 mg/NM^3	100 mg/NM^3	PM CEMS as per matrix Table no:4
			SO_2	600 mg/NM^3	200 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	600 mg/NM^3	600 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive – Chemiluminescence

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
			Hg	0.03 mg/NM^3	0.03 mg/NM^3	Total Gaseous Mercury. Always Hot extractive system A) Pre-treatment options Gold Amalgamation Followed by chemical/ thermal desorption (B) Adsorption in other media followed by Thermal desorption and measured using either atomic absorption/ atomic fluorescence / atomic absorption / UV DOAS / UV measurement (after removal of SO2 interference / Zeeman correction) are acceptable. For atomic absorption, Mercury lamp (NOT UV LAMP) should be used as energy source
		TPP Installed on & after 01/01/2004 upto 31/12/2016		Less than 500 MW	More than 500 MW	
			PM	50 mg/NM^3	50 mg/NM^3	PM CEMS as per matrix Table no:4
			SO_2	600 mg/NM^3	200 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	300 mg/NM^3	300 mg/NM^3	In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive – Chemiluminescence

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
			Hg	0.03 mg/NM^3	0.03 mg/NM^3	Total Gaseous Mercury, Always Hot extractive system A) Pre-treatment options Gold amalgamation Followed by chemical/ thermal desorption (B) Adsorption in other media followed by Thermal desorption and measured by either Cold vapour atomic fluorescence / Cold Vapor atomic absorption / UV DOAS / UV measurement (after removal of SO2 interference) are acceptable. For atomic absorption, Mercury lamp (NO UV LAMP) should be used as energy source
		TPP to be installed from 01/01/2017	PM	30 mg/NM^3		PM CEMS as per matrix Table no:4
			SO_2	100 mg/NM^3		In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			NO_x	100 mg/NM^3		In-situ UV-DOAS, NDIR, IR GFC
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive – Chemiluminescence

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
			Hg	0.03 mg/NM³		Total Gaseous Mercury, Always Hot extractive system A) Pre-treatment options Gold amalgamation, followed by chemical/ thermal desorption (B) Adsorption in other media followed by Thermal desorption and measured by either Cold vapour atomic fluorescence / Cold Vapor atomic absorption / UV DOAS / UV measurement (after removal of SO_2 interference) are acceptable. For atomic absorption, Mercury lamp (NO UV LAMP) should be used as energy source
10	Zinc	Smelter, SRU		Existing Units	New Units (after 2nd May 2011)	CEMS options available
			PM	100 mg/NM³	75 mg/NM³	PM CEMS as per matrix Table no:4
			SO2 (for upto 300 T /day)	1370 mg/NM³	1250 mg/NM³	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			SO2 (for > 300 T /day)	1250 mg/NM³	950 mg/NM³	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits		Options available for CEMS
11	Copper	Smelter, SRU	Parameters	Existing Units	New Units (after 2nd May 2011)	CEMS options available
			PM	100 mg/NM^3	75 mg/NM^3	PM CEMS as per matrix Table no:4
			SO2 (for upto 300 T /day)	1370 mg/NM^3	1250 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
			SO2 (for > 300 T /day)	1250 mg/NM^3	950 mg/NM^3	In-situ NDIR / IR GFC/UV-DOAS
						Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
						Dilution extractive UV-Fluorescence
12	Biomedical waste Incinerator	Incinerator Stack	PM	50 mg/NM^3		PM CEMS as per matrix Table no:4
			NO_x	400 mg/NM^3		In-situ UV-DOAS
						Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
						Dilution Extractive – Chemiluminescence
			HCl	50 mg/NM^3		IR DOAS, TDLS,
			Temp. P.C.C.	800 °C		Temperature probe
			Temp. S.C.C.	1050 ± 50 °C		Suitable Temperature Probe
			Combustion Efficiency CO and CO_2	99%		Extractive NDIR
13	Common Hazardous Waste Incinerator	Incinerator Stack	PM	50 mg/Nm3		PM CEMS as per matrix Table no:4
			HCl	50 mg/Nm3		In-situ IR DOAS, TDLS
						Hot Extractive FTIR, IR
			SO_2	200 mg/Nm3 -30 minute average		In-situ NDIR / IR GFC/UV-DOAS

What are the CPCB Guidelines

S. No.	Industries/ Facilities	Units of Operation	Parameters Prescribed	Emission Limits	Options available for CEMS
					Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
					Dilution extractive UV-Fluorescence
			NOx	400 mg/Nm3	In-situ UV-DOAS
					Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
					Dilution Extractive - chemiluminescence
			HF	4.0 mg/Nm3	In-situ IR DOAS, TDLS
					Hot Extractive FTIR
			TOC	20 mg/Nm3	Hot Extractive FID
			CO	100 mg/Nm3 -30 minute average 50 mg/Nm3 -24 Hrly average	NDIR In situ
					Extractive FTIR, NDIR GFC / NDIR CFM
14	Sugar	Boiler	PM	150 mg/NM^3	PM CEMS as per matrix Table no:4
15	Sugar, Cotton Textile, Composite Woolen Mills, Synthetic Rubber, Pulp & Paper, Distilleries, Leather Industries, Calcium Carbide, Carbon Black, Natural Rubber, Asbestos, Caustic Soda, Small Boilers , Aluminium	Boiler (Other fuels)	SO_2	600 mg/NM^3 at 6% dry O2, for solid fuel and 3% dry O2 for liquid fuel	In-situ NDIR / IR GFC/UV-DOAS
					Extractive NDUV / FTIR / NDIR / IR-GFC / IR-CFM
					Dilution extractive UV-Fluorescence
			NO_x	600 mg/NM^3 at 6% dry O2, for solid fuel and 3% dry O2 for liquid fuel	In-situ UV-DOAS, NDIR, IR GFC
					Extractive – NDUV / FTIR, NDIR GFC, NDIR-CFM
					Dilution Extractive – Chemiluminescence

Overview of Technologies

Method	Technique	Technology	Gases Measured
Non-Dispersive Infrared (NDIR)	Hot Extraction Cold dry Extraction In-situ	Beer Lambert Law Filter photometer	SO2, NOx, CO, CO2
Non-Dispersive Ultraviolet	Hot Extraction Cold dry Extraction In-situ	Beer Lambert Law Filter Photometer	H2S, SO2,
UV Fluorescence	Cold Dry Extractive Dilution Extractive	Excitation (214nm) and Fluorescence (300 nm)	H2S, SO2
Chemiluminescence	Dilution Extractive	Converter	Oxides of Nitrogen
Dispersive Ultraviolet	In-Situ	Beer Lambert Dispersive	SO2, NH3, H2S
Enhanced Laser	Extractive / Insitu	OFCEAS / ICL / QCL	H2S, HF, NH3, HCl, HCN, SO2, SO3, NO,NO2,CO, CO2, O2
TDLS	Insitu	Wavelength Modulation Spectroscopy	H2S, HF, NH3, HCl, O2, CO,CO2, H2O
Flame Ionization Detector (FID)	Hot Wet Extractive	Hydrogen flame and measure hydrocarbon	THC, VOC

Overview of Technologies

Method	Technique	Technology	Gases Measured
Fourier Transform Infra Red (FTIR)	Hot Wet Extractive	Beer Lambert Law Filter photometer	H2S, HF, NH3, HCl, HCN, SO2, NO,NO2,CO, CO2, O2, H2O
Gas Chromatography	Hot Wet Extractive Hot Extraction Cold Dry Extraction	GC separation and FID detection	VOC, THC, H2S, HF, NH3, HCl, HCN, SO2, NO,NO2,CO, CO2, O2, H2O
Mass Spectrometry	Hot Wet Extractive Hot Extraction Cold Dry Extraction	Ionisation	VOC, THC, H2S, HF, NH3, HCl, HCN, SO2, NO,NO2,CO, CO2, O2, H2O
Atomic Absorption	Hot Wet ex-situ Cold Dry ex-situ	Resonance Mercury emission/absorption	Hg
Atomic Fluorescence	Hot Wet ex-situ	fluorescence analyzer	Hg
Paramagnetic	Hot Extraction Cold dry Extraction	Measures unique magnetic effect of oxygen	O2
Zirconium Oxide	Hot Extraction Cold dry Extraction In-Situ	Transport of oxygen ions (Nernst Eqn)	O2
Electrochemical	Hot Extraction Cold dry Extraction	Chemical reaction	O2

World's Largest ever CEMS Project in terms of count of the Number of Stacks

Large Scope

1. 150+ stacks to be measured including SRU Stacks
2. 200 + CGA & Laser
3. 77 Dust Monitors
4. 8 nos of Analyzer Shelters with 4 nos of HVAC
5. 34 nos of RAID 1 processor based SCADA stations
6. Zone 1 & Zone 2 systems with ATEX components
7. 45 km of RS 485 Cables , 15 km of heated sample line , 25 km of FO cable , 15 km of field SS tubes , 20 km of power & signal cables

Here are some of the different Technologies for CEMS

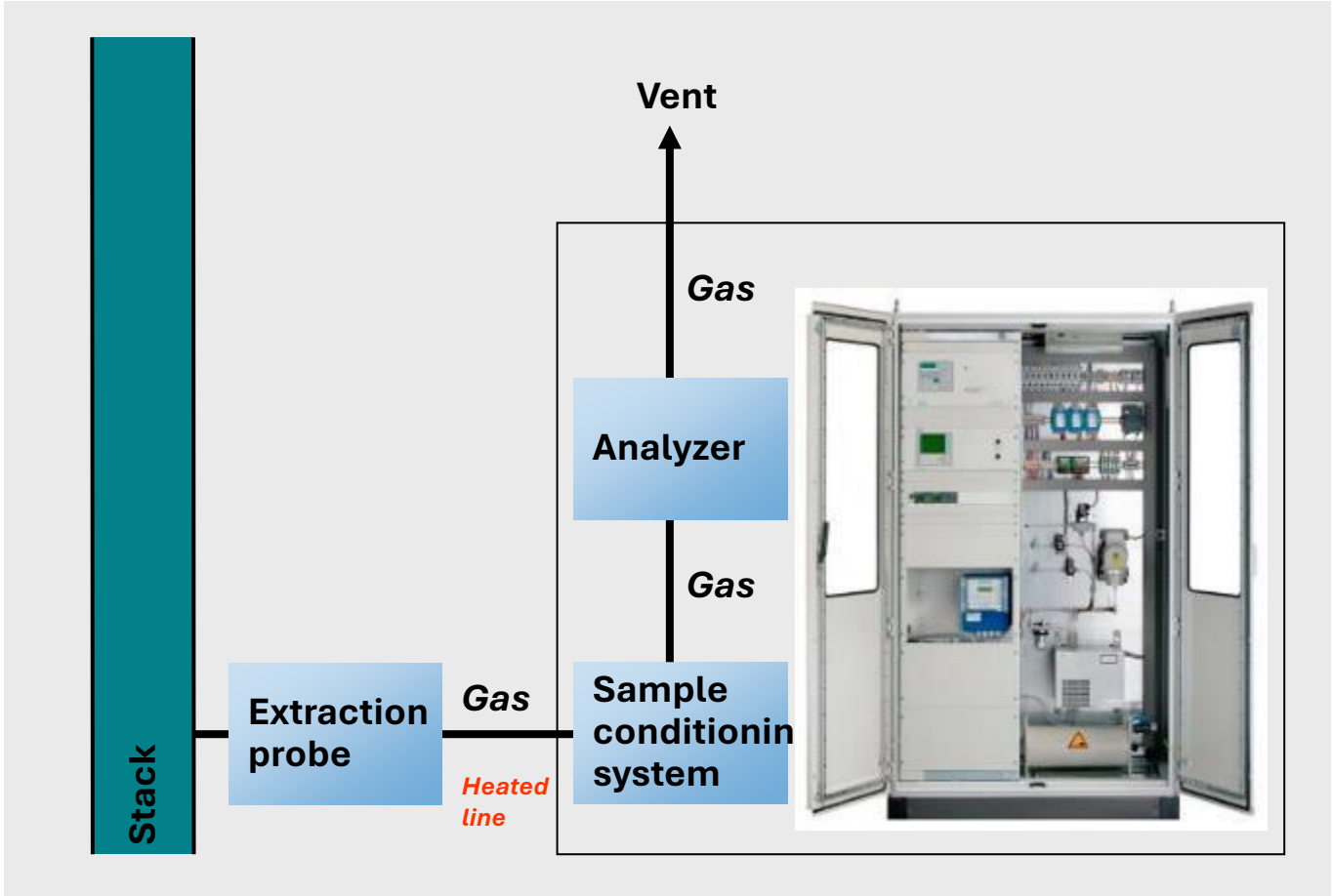
&

Examples for flow diagrams of completed CEMS

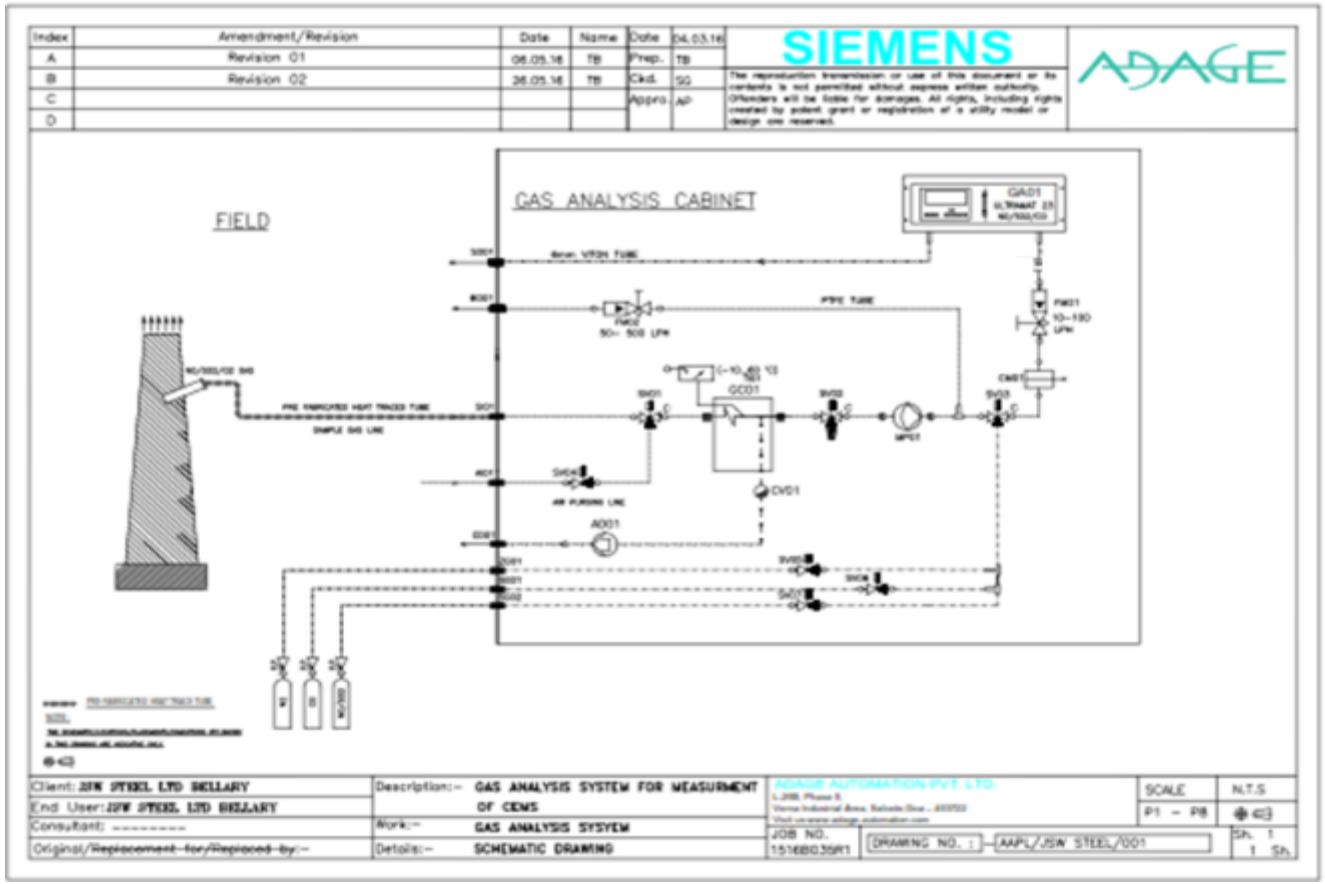
Technology Option : A

EXTRACTIVE - HOT EXTRACTION METHOD OF SAMPLING

Extractive - Hot Extraction Method Of Sampling



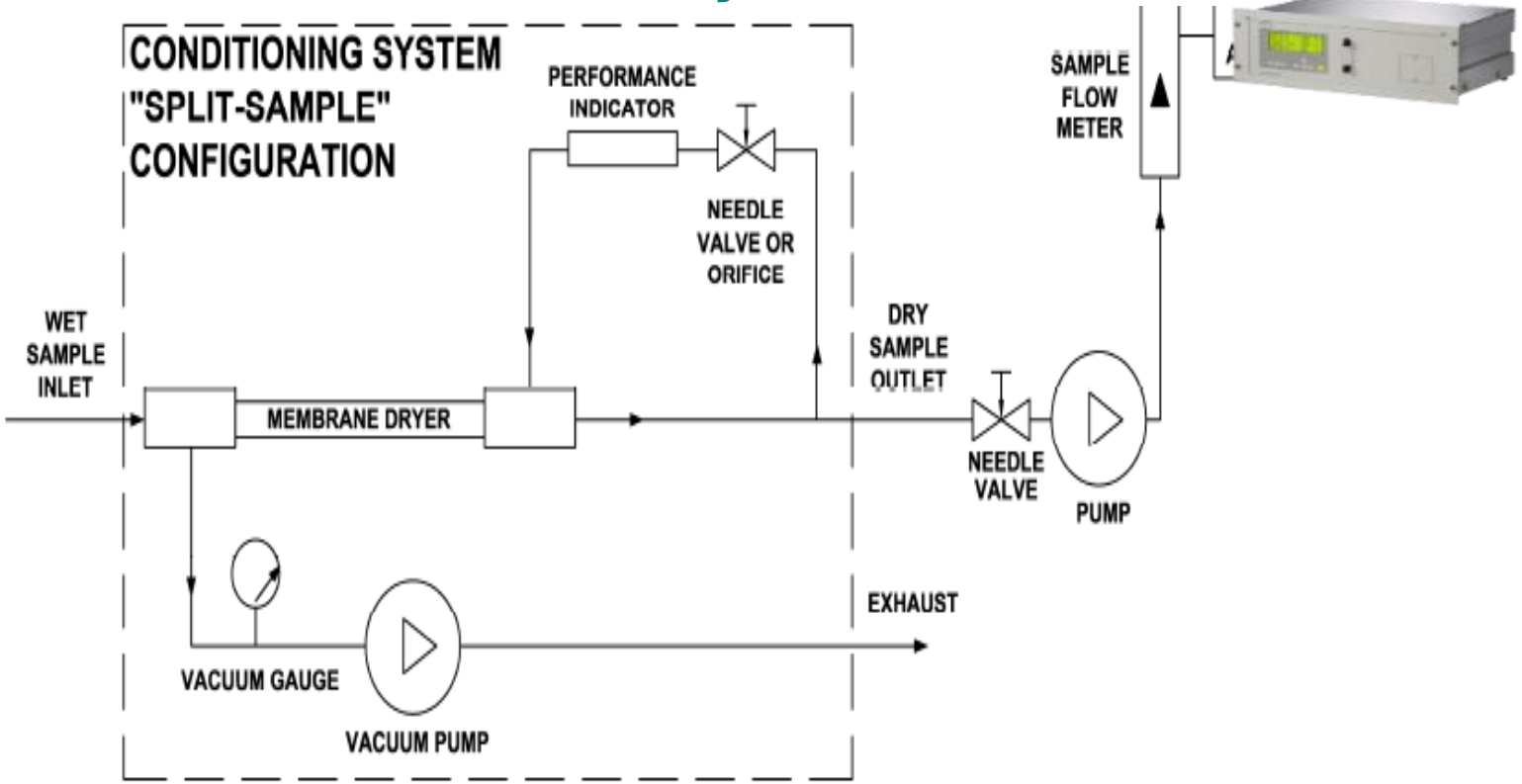
Typical SHS Design for Hot Extractive CEMS



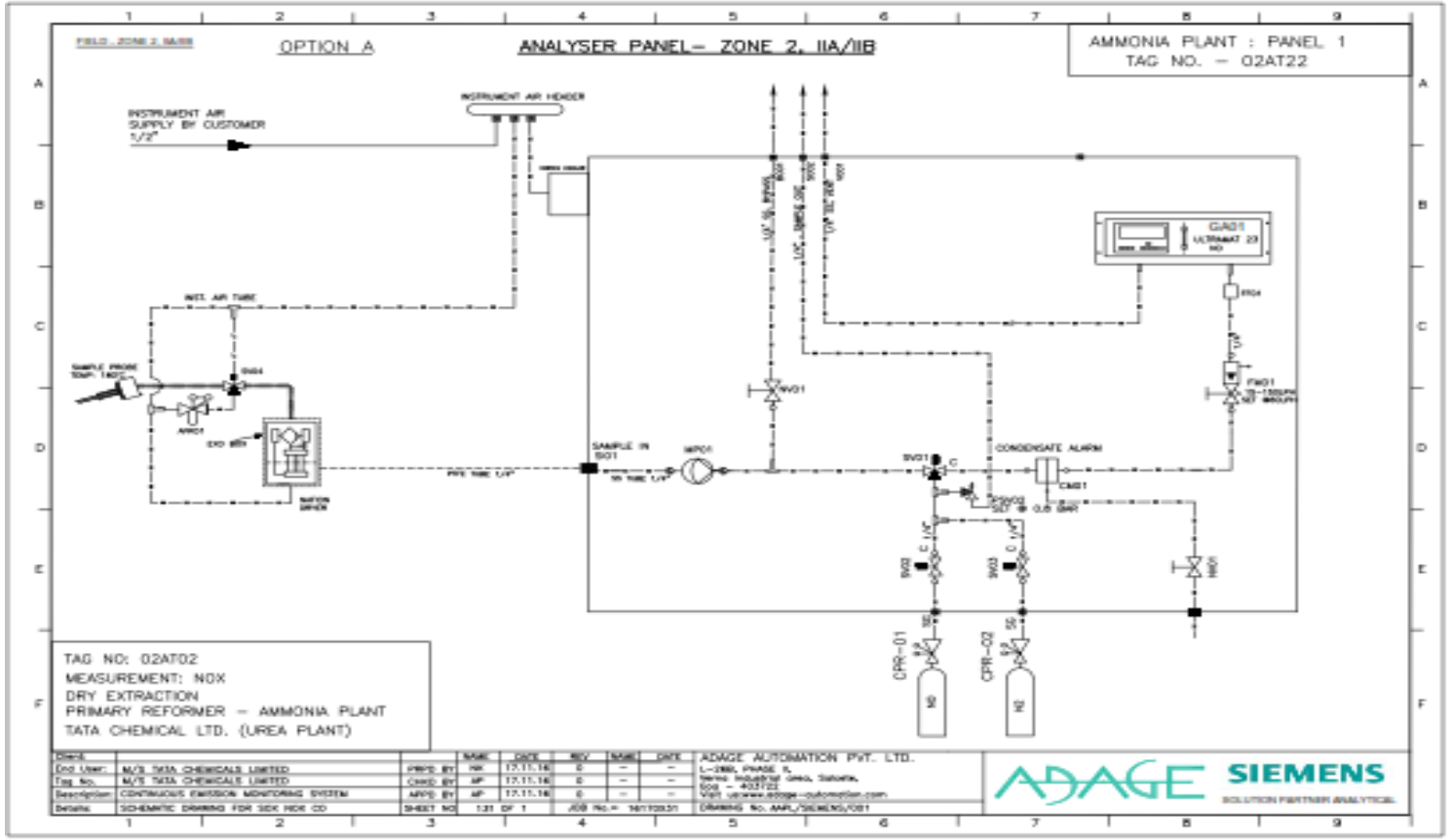
Technology Option : B

EXTRACTIVE ....COLD DRY METHOD OF SAMPLING

Extractive Based On Cold Dry Method



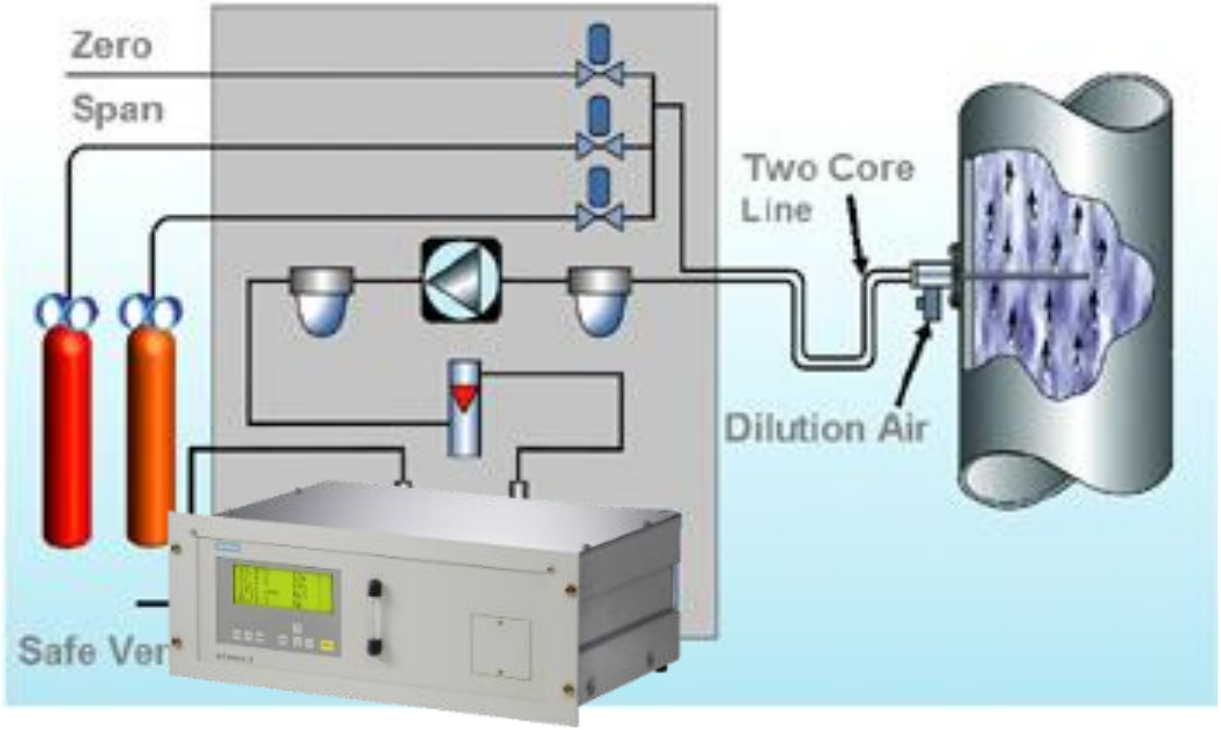
Typical SHS Design for COLD DRY METHOD



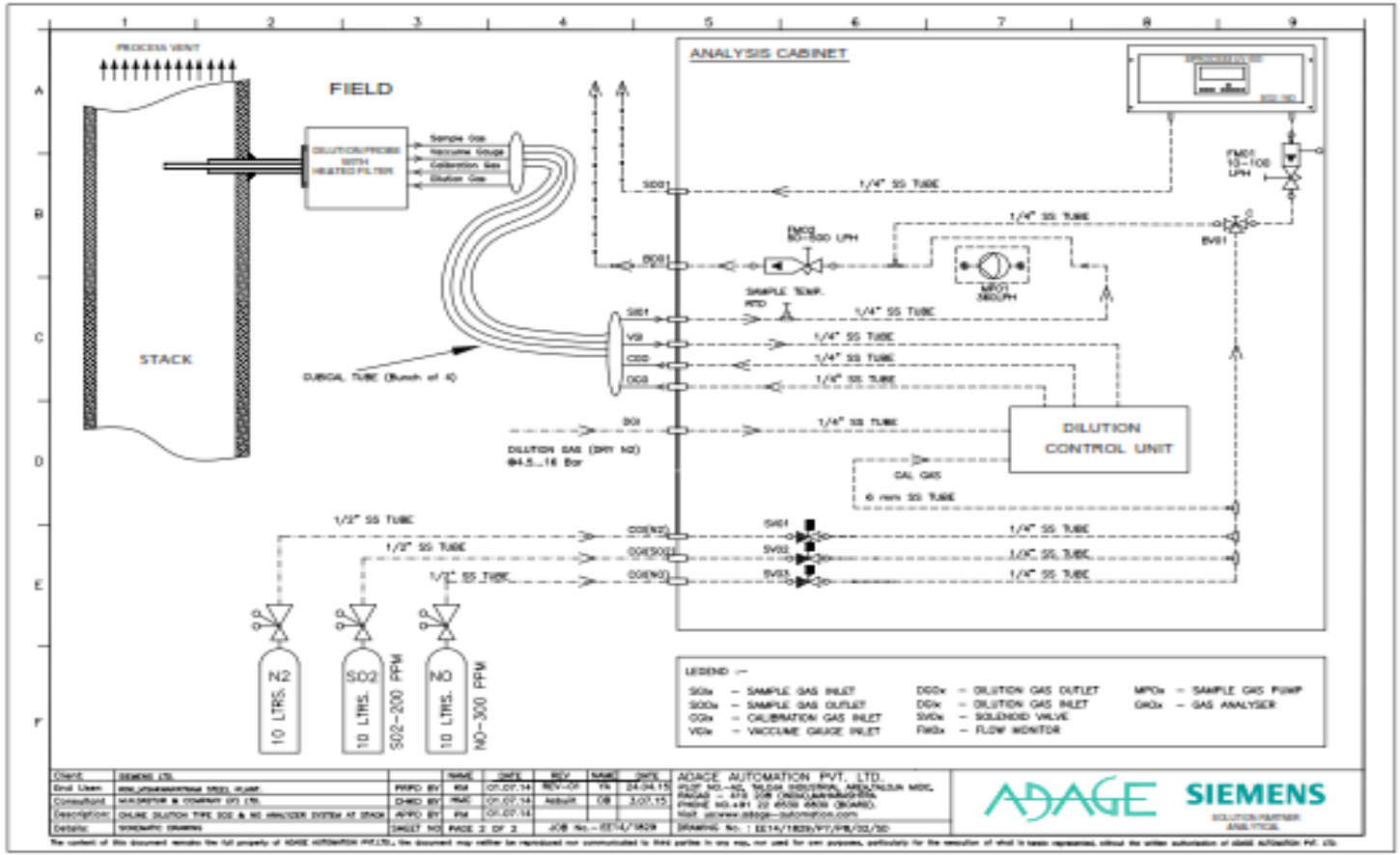
Technology Option : C

In Stack Dilution System

Measurement Based On Dilution Technique



Typical SHS Design for Dilution based CEMS



Technology Option : D

Insitu - Method Of Measurement

Path Type Insitu Cems :

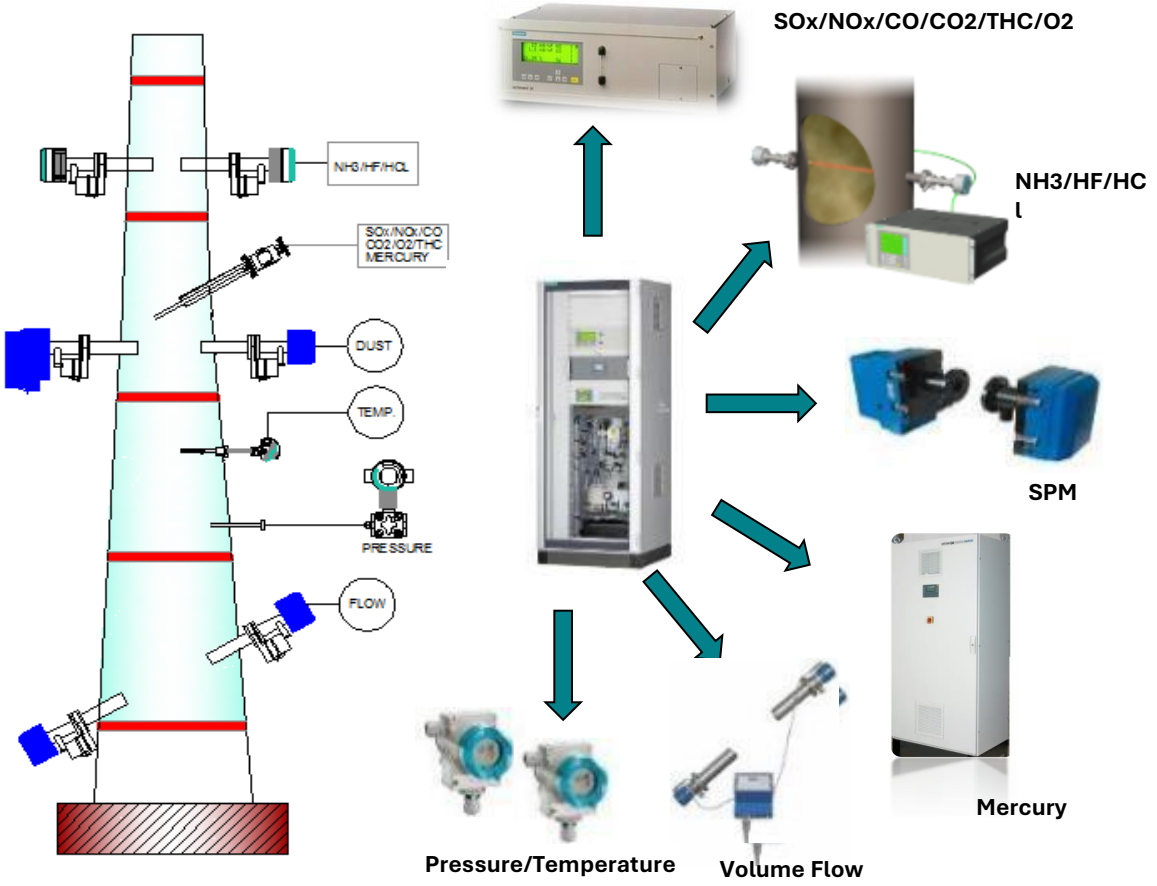
TDLS System Design for SOx,Nox,CO,O2, H2O, NH3, HF, HCL

- **Insitu Single-line molecular absorption spectroscopy**
- **Absorption Technology – Wavelength Modulation Spectroscopy**
- **Fast Response time**
- **Zero Drift – No Calibration**

ADAGE offers a comprehensive CEMS portfolio with all different Sampling Techniques

For No Two applications are identical

Adage offers complete CEMS Solution



CERTIFIED ANALYZERS

- Analyzers are Certified according to EN 14181/ EN 15267 by TUV.
- Analyzers are Certified according to MCERTS, UK
- Analyzers are compliant to US EPA

- **Analysers**

- **Standardized CEMS**

- **Experience & Compliance**

SIEMENS

Set CEM 1 - Certificate some details…

Set CEM 1

Standard system for continuous emission measuring

Report No. 1204119 (July 2008)

Manufacturer:

Siemens AG Industry Sector Industry Automation, Karlsruhe

TÜV Süd Industrie Service GmbH is herewith certifying that the analysing system Set CEM 1 is in accordance with EN ISO 14956, Jan. 2003 and fulfils QAL1 of EN 14181 for the following measurement ranges:

Analyser Type	Smallest tested measurement range	Licensed for measurements at plants according regulations for:	Published at:
Ultramat 23-7MB 233 (SO_2, NO, CO and O_2)	0-400 mg/m³ SO_2 0-250 mg/m3 NO 0-150 mg/m³ CO 0-10/25 Vol.% O_2	13. BImSchV, TALuft (2001/80/EG, TI Air)	GMBl Nr.1/98 and GMBl Nr.22/99
Ultramat 23-7MB 2335/ 2337 (NO, CO, O_2)	0-100 mg/ m3 NO 0-150 mg/m³ CO 0-10/25 Vol.% O_2	13./ 27. BImSchV, TALuft (2001/80/EG, TI Air)	BAZ 81/ 2005 and BAZ 38/ 2008

Industry Sector

And these are examples, when they were completed for

Indoors installation

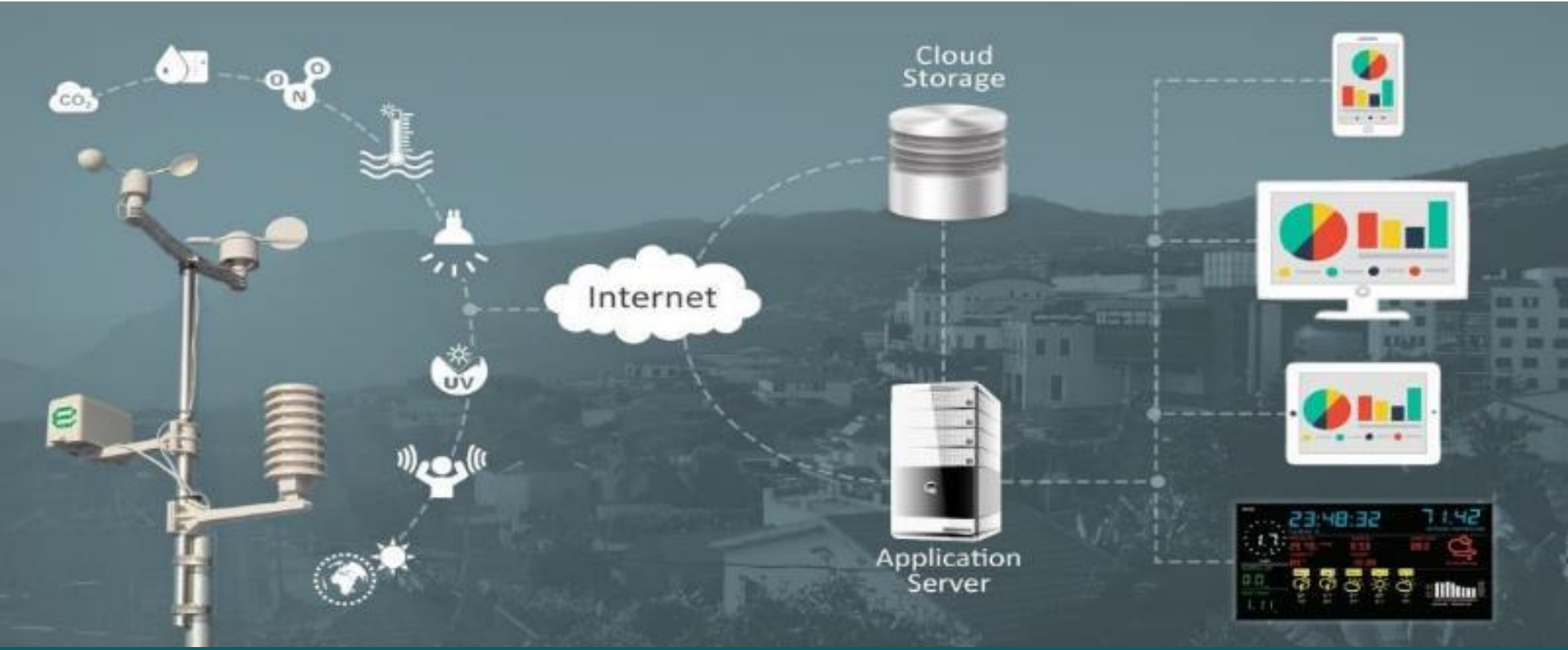
or

Outdoors installation

Completely Integrated Free Standing CEMS Cabinets for Hazardous areas integrated with Certified Hazardous Area Air Conditioners

Free Standing Analyzer Cabinets

Hazardous Area CEMS Shelter



AMBIENT AIR QUALITY MONITORING SYSTEM

Air Quality Air pollution

Air pollution comes from many different sources: stationary sources such as factories, power plants, and smelters and smaller sources such as dry cleaners and degreasing operations; mobile sources such as cars, buses, planes, trucks, and trains; and naturally occurring sources such as windblown dust, and volcanic eruptions, all contribute to air pollution.

Air Quality can be affected in many ways by the pollution emitted from these sources. These pollution sources can also emit a wide variety of pollutants.

The CPCB / EPA has these pollutants classified as the principal pollutants (or criteria pollutants-as they are also known). These pollutants are monitored by the CPCB, as well as Industries, State and local municipal organizations.

POLLUTION

Finding out if the Air we Breathe is Clean

The criteria pollutants addressed in the NAAQS are Carbon Monoxide, Oxides of Nitrogen, Ammonia, Ozone, Sulfur Dioxide, Hydrogen sulphide, Particulate Matter (PM10 & PM 2.5), and Benzene.

The Air Pollution Monitoring program monitors all of the criteria pollutants. Measurements are taken to assess areas where there may be a problem, and to monitor areas that already have problems. The goal of this program is to control areas where problems exist and to try to keep other areas from becoming problem air pollution areas.

What Are the Common Air Pollutants?

O3	OZONE
SO_2	SULPHUR DI OXIDE
H2S	HYDROGEN SULPHIDE
NO_X	OXIDES OF NITROGEN
CO	CARBON MONO OXIDE
SPM & RSPM	PARTICULATE MATTER
C6H6	BENZENE
NH3	AMMONIA
Hg	MERCURY

National Ambient Air Quality Standards 2009

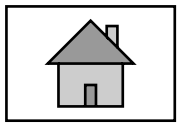
Pollutants	Time Weighted	Concentration in Ambient Air			Units
	Averages	Industrial Areas	Residential, Rural & other areas	Sensitive areas	
Sulphur Dioxide	Annual Average	80.00	60.00	15.00	Micro-gm/m^3
	24 Hours	120.00	80.00	30.00	
Oxides of Nitrogen	Annual Average	80.00	60.00	15.00	Micro-gm/m^3
	24 Hours	120.00	80.00	30.00	
Suspended Particulate Matter	Annual Average	360.00	140.00	70.00	Micro-gm/m^3
	24 Hours	500.00	200.00	100.00	
Resipirable Particulate Matter	Annual Average	120.00	60.00	50.00	Micro-gm/m^3
	24 Hours	150.00	100.00	75.00	
Carbon Monoxide	Annual Average	5.00	2.00	1.00	Milli-gm/m^3
	24 Hours	10.00	4.00	2.00	

National Ambient Air Quality Standards 2009

Pollutants	Time Weighted Averages	Concentration in Ambient Air			Units
		Industrial Areas	Residential, Rural & other areas	Sensitive areas	
Ozone	8 Hours	100.00	100.00	100.00	Micro-gm/m^3
	1 Hour	180.00	180.00	180.00	
Ammonia	Annual Average	100.00	100.00	100.00	Micro-gm/m^3
	24 Hours	400.00	400.00	400.00	
Benzene	Annual Average	5.00	5.00	5.00	Micro-gm/m^3

Methods of Measurement mentioned in CPCB guidelines for various parameters measurement

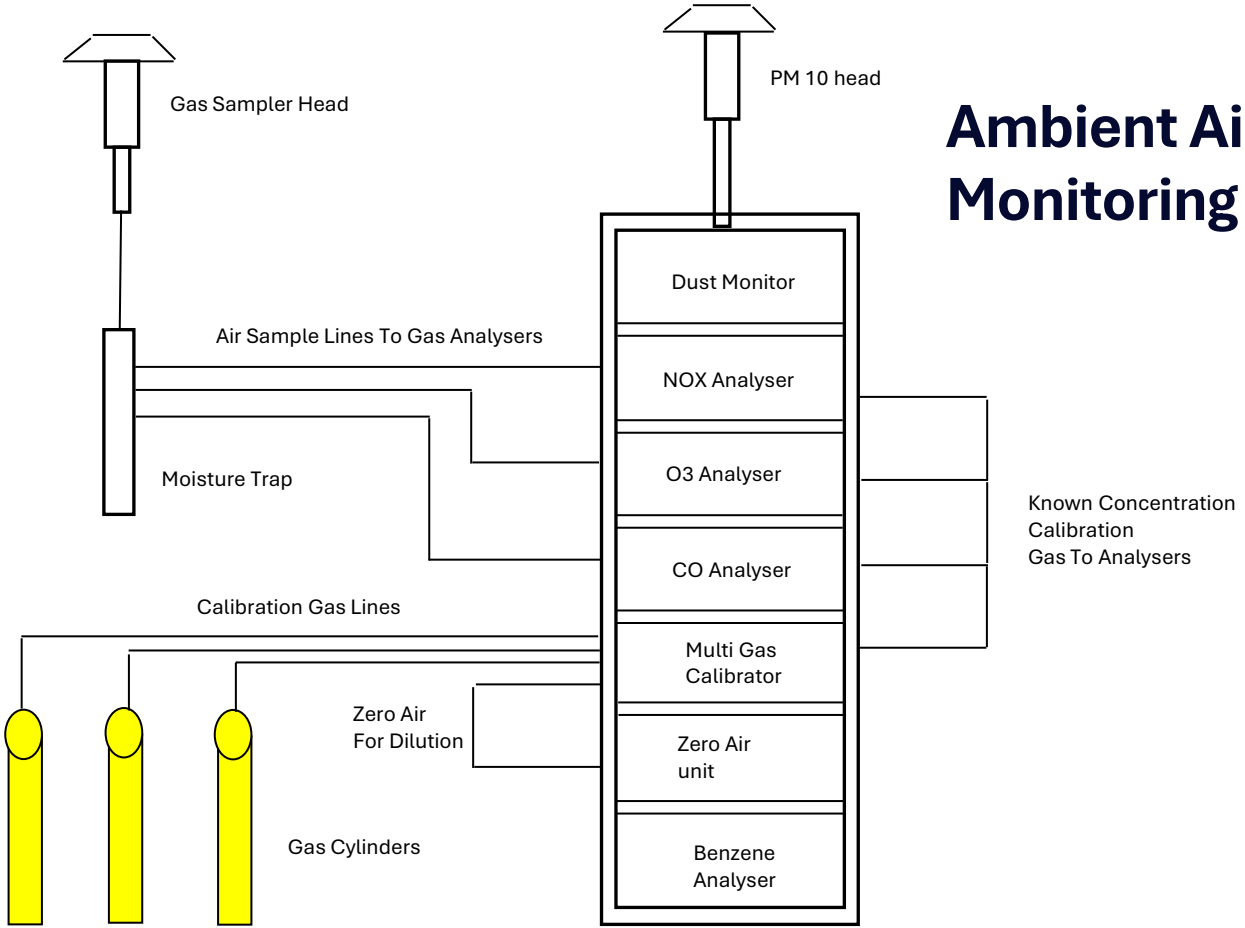
Pollutant	Methods of Measurement
(SO2), ug/m3	• Improved west & gaeke • **Ultraviolet fluorescence**
(NO2), ug/m3	• Modified Jacob & Hochheiser (Na – Arsenite) • **Chemiluminescence**
(CO), ug/m3	Non Dispersive infrared Red (NDIR) spectroscopy
(NH3), ug/m3	• **Chemiluminescence** • Indophenol blue method
(O3), ug/m3	• UV Photometric • **Chemiluminescence** • Chemical method
(PM10), ug/m3 (PM2.5), ug/m3	• Graviemtric • Tapered element oscillating microbalances (TOEM) • Beta Attanuation
(C6H6), ug/m3	• **GC based measurement** • Adsorption & desorption followed by GC analysis



Overview of an AAQMS system

- Analysers (NOX, SO2, CO, PM 10, PM 2.5)
- Dilution Calibrator
- Zero Air Generator
- Sample Handling System
- Calibration Gas Cylinders with Regulators
- Local data logging System (If only one system is installed)
- Central data logging system (If multiple AAQM systems are to connected to a central server PC for CPCB / SPCB data transfer)
- Communication hardwares (GSM, OFC etc)
- Rack, sample tubes, communication cables
- Weather Monitoring Station
- Shelter with AC (In case air conditioned room is not available)
- Display board (optional)

Ambient Air Quality Monitoring Station - Typical



What PM 10 & PM 2.5 ?

PM_{10} is particulate matter 10 micrometers or less in diameter, $PM_{2.5}$ is particulate matter 2.5 micrometers or less in diameter. $PM_{2.5}$ is generally described as fine particles.

By way of comparison, a human hair is about 100 micrometres, so roughly 40 fine particles could be placed on its width.

Particles in this size range make up a large proportion of dust that can be drawn deep into the lungs. Larger particles tend to be trapped in the nose, mouth or throat.

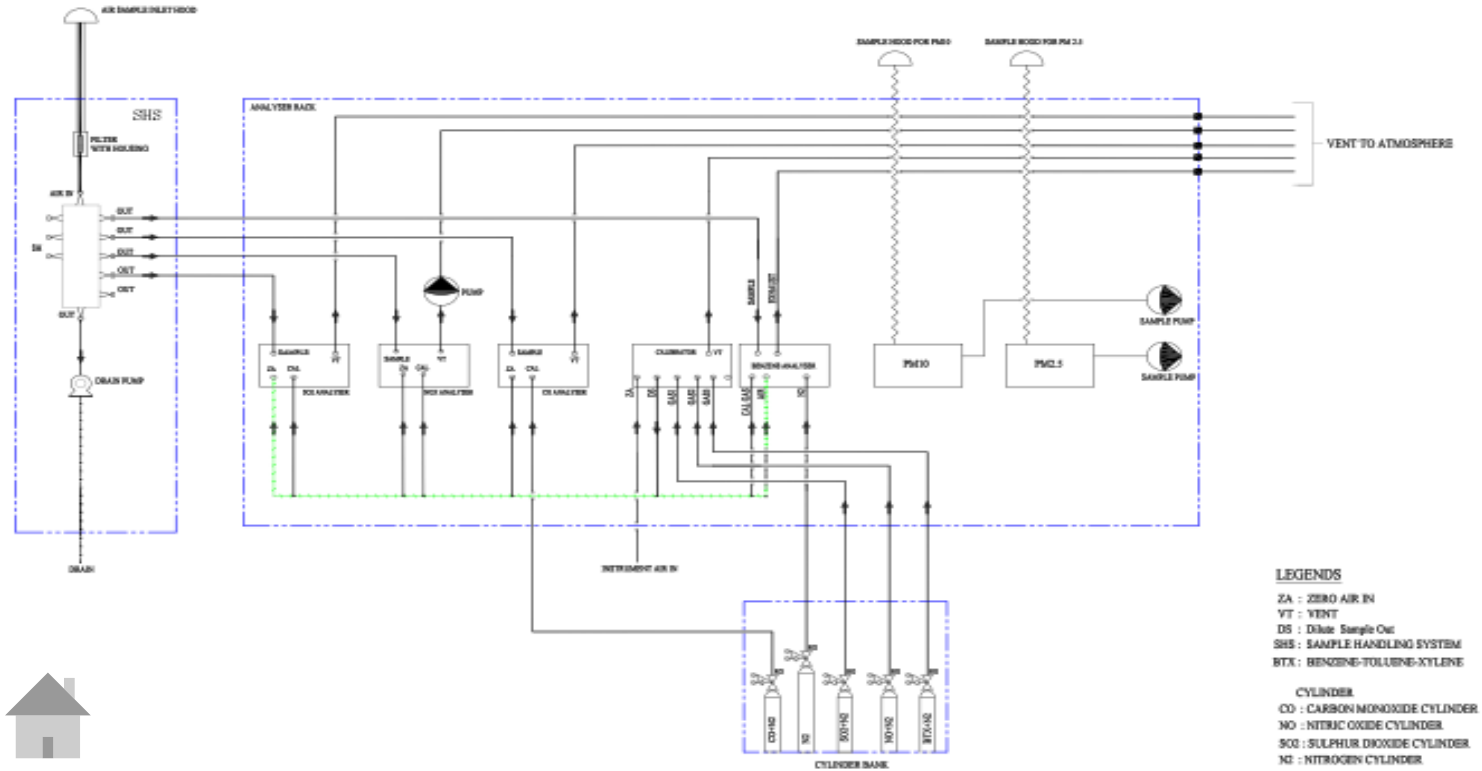
Hydrocarbons

Most commonly measured HC in Ambient application

- Methane
- Non Methane
- Benzene
- Toluene
- Ethylbenzene
- Xylene.

Also termed as VOC

Typical scheme of AAQMS system with analysers



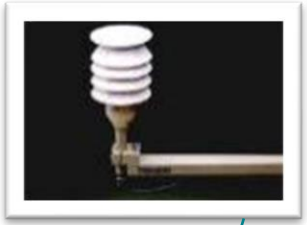
Weather Monitoring Station

PARAMETERS MEASURED

- WIND SPEED
- WIND DIRECTION
- RAINFALL
- TEMPERATURE & HUMIDITY
- SOLAR RADIATION
- BAROMETRIC PRESSURE

WIND SPEED &
WIND
DIRECTION

AIR
TEMPERATURE



RELATIVE
HUMIDITY

RAIN GAUGE

SOLAR RADIATION

PRESSURE
SENSOR

To DAS PC.

Press
Release

21.02.2024

ENVEA & ADAGE DECIDE TO JOIN HANDS FOR THE INDIAN AAQMS MARKET

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Almost all Large Industry in India is ADAGE's

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Our Customers

Our Customers

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