Industrial Air Pollution Control: Scrubbers, ESPs, SCR and VOC Oxidisers

7 – 11 March 2027
Dammam - Eastern Province five-star



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Introduction:

Industrial air pollution control decides whether a boiler house, kiln, refinery unit or coating line can meet tighter emission limits without losing output. Many existing plants run undersized cyclones, fouled electrostatic precipitators, bypassed scrubbers or ageing burners, and abatement projects are chosen on vendor claims rather than on inlet loads and gas conditions. This Core Concept course equips engineers to quantify particulate, SO2, NOx and VOC loads, compare abatement technologies, size and retrofit them, and keep them running. Participants produce an Emission Control Options Study for a case industrial facility.

Course Objectives:

- Quantify stack and fugitive loads of particulate matter, SOx, NOx, VOCs, CO and hazardous air pollutants using emission factors and mass balances
- Rank abatement options through the control hierarchy, starting with fuel switching, process changes and combustion tuning before end-of-pipe equipment
- Select and size particulate collectors, including cyclones, electrostatic precipitators, fabric filters and venturi scrubbers, from dust properties and gas conditions
- Compare wet limestone, spray-dry and dry sorbent injection desulphurisation and low-NOx burner, SNCR and SCR denitrification routes for a given flue gas
- Specify thermal oxidisers, catalytic oxidisers, carbon adsorption and condensation for solvent and VOC-laden vent streams
- Plan retrofit, operation and maintenance of abatement trains so removal efficiency holds between shutdowns

Target Audience:

- Environmental engineers who define emission reduction projects for operating plants
- Process engineers who manage combustion, kiln, reactor and solvent vent streams feeding abatement equipment
- Plant and utilities engineers who operate and maintain precipitators, baghouses, scrubbers and catalyst beds
- Project engineers who scope and evaluate abatement retrofits on existing units
- Technical services engineers who troubleshoot rising stack readings and abatement bypass events

Course Outline:

Day 1: Industrial Air Pollutants, Emission Loads and the Control Hierarchy

- Pollutant Profiles: Particulate Matter Size Fractions, SOx, NOx, CO, VOCs and Hazardous Air Pollutants
- Source Emission Inventory Using Emission Factors, Fuel Analysis and Mass Balance
- Flue Gas Characterisation Sheet: Flow, Temperature, Moisture, Dew Point and Dust Loading
- Control Hierarchy: Fuel Switching, Process Modification, Combustion Tuning and End-of-Pipe Abatement
- Existing Abatement Baseline Review and Removal Gap Calculation

Day 2: Particulate Collectors: Cyclones, Precipitators, Baghouses and Venturi Scrubbers

- Cyclone and Multicyclone Cut Size, Pressure Drop and Grade Efficiency Curves
- Electrostatic Precipitator Dust Resistivity Bands, Migration Velocity and Specific Collection Area
- Fabric Filter Air-to-Cloth Ratio, Pulse-Jet Cleaning and Filter Media Selection
- Venturi and Packed Wet Scrubber Liquid-to-Gas Ratio and Throat Pressure Drop
- Particulate Collector Selection Matrix by Dust Stickiness, Temperature and Resistivity

Day 3: SO2 and NOx Abatement: Desulphurisation and Denitrification Routes

- Wet Limestone Flue Gas Desulphurisation: Slurry Chemistry, Forced Oxidation and Gypsum By-Product
- Spray-Dry Absorber and Dry Sorbent Injection with Hydrated Lime or Sodium Bicarbonate
- Low-NOx Burners, Staged Air, Flue Gas Recirculation and Combustion Control Measures
- SNCR Urea and Ammonia Injection: Temperature Window and Residence Time
- SCR Catalyst Types, Reagent Handling, Ammonia Slip and Catalyst Poisoning

Day 4: VOC Destruction, Retrofit Constraints and Abatement Reliability

- Regenerative Thermal Oxidiser and Recuperative Oxidiser Destruction Efficiency and Heat Recovery
- Catalytic Oxidiser Catalyst Deactivation and Activated Carbon Adsorption Breakthrough
- Solvent Condensation, Refrigerated Recovery and Vent Gas Collection Hoods
- Retrofit Space, Draught Fan Capacity, Duct Corrosion and Tie-In Shutdown Planning
- Abatement Failure Modes: Bag Blinding, Precipitator Sparking, Scrubber Scaling and Catalyst Plugging

Day 5: Case Study: Emission Control Options Study for an Industrial Facility

- Case Facility Pack: Boilers, Cement Kiln, Refinery Heater Stack and Coating Line Vents
- Load Reduction Scenarios and Technology Shortlist per Emission Point
- Abatement Performance Verification Plan with CEMS Data Checks and Stack Test Points
- Operating and Maintenance Plan: Reagent Consumption, Spares and Inspection Routines
- Emission Control Options Study Drafting and Peer Challenge Panel

Skills You Will Gain:

- Emission Load Quantification
- Flue Gas Characterisation
- Particulate Collector Sizing
- Desulphurisation Route Selection
- NOx Reduction Engineering
- VOC Abatement Specification
- Abatement Retrofit Planning
- Abatement Fault Diagnosis

Why Attend This Course:

- Leave with an Emission Control Options Study built on a case facility with boilers, a kiln and solvent vents
- Challenge vendor removal claims with your own inlet load, gas condition and pressure drop figures
- Recognise bag blinding, precipitator sparking, scrubber scaling and ammonia slip before stack readings climb
- Exchange abatement lessons with engineers from power, cement, refining, chemicals and manufacturing plants

Conclusion:

Emission limits are met at the stack only when abatement is matched to the real gas stream and kept in condition. The course moves from pollutant profiles, emission factors and the control hierarchy, through cyclones, precipitators, baghouses and wet scrubbers, to desulphurisation, low-NOx combustion, SNCR and SCR, then VOC oxidisers, adsorption, condensation, retrofit constraints and failure modes. The final day applies these methods to a case facility and produces an Emission Control Options Study ready to adapt to participants' own plants.