

# Air Pollution- *Challenges in Compliance*



# Air pollution

The introduction of chemicals, particulate matter, or biological materials that ***cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment***, into the atmosphere

## Air Pollutant

Any ***solid, liquid or gaseous substance including noise*** present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.



# Air pollution – Health impacts

**SHORT-TERM EFFECTS** include irritation to the eyes, nose and throat, and upper respiratory infections such as bronchitis and pneumonia. Other symptoms can include headaches, nausea, and allergic reactions.

**LONG-TERM EFFECTS** can include chronic respiratory disease, lung cancer, heart disease, and even damage to the brain, nerves, liver, or kidneys. Continual exposure to air pollution affects the lungs of growing children and may aggravate or complicate medical conditions in the elderly.



# Causes of Air Pollution



- Increasing traffic,
- Growing cities,
- Rapid economic development
- **Industrialization**



# Causes of Air Pollution

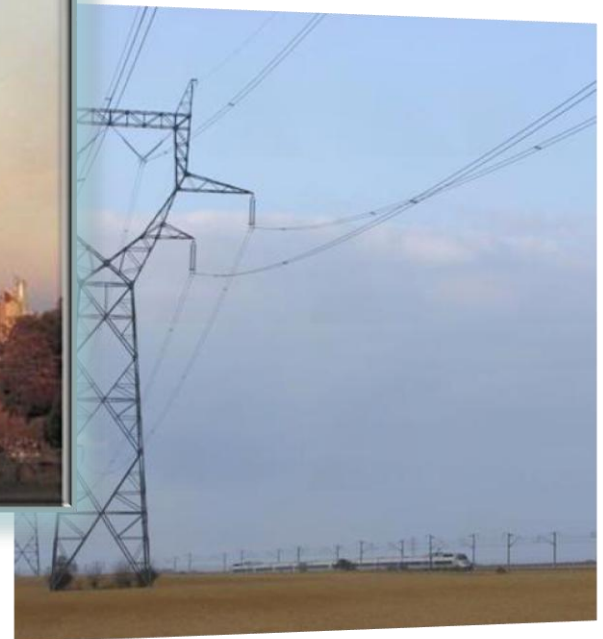
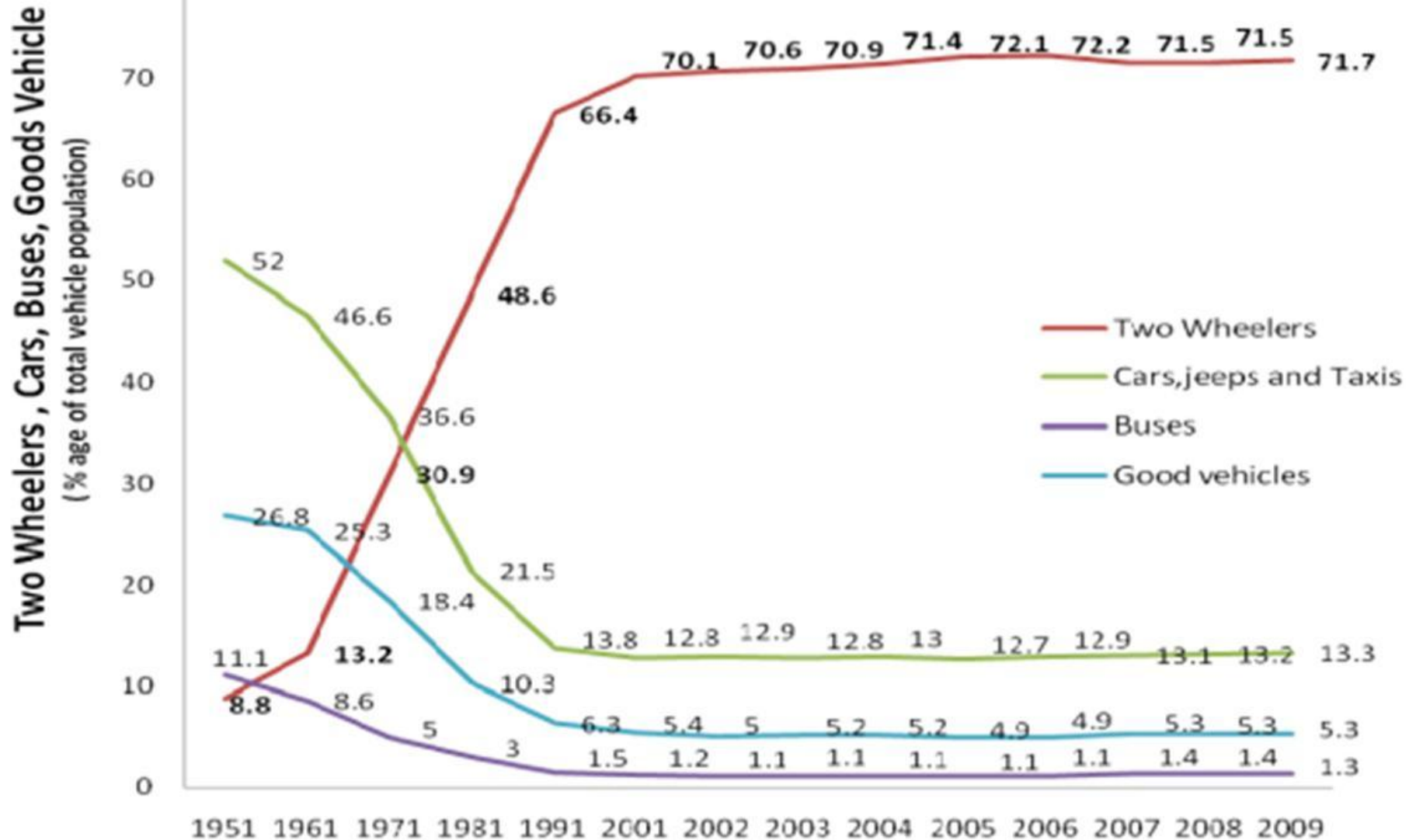
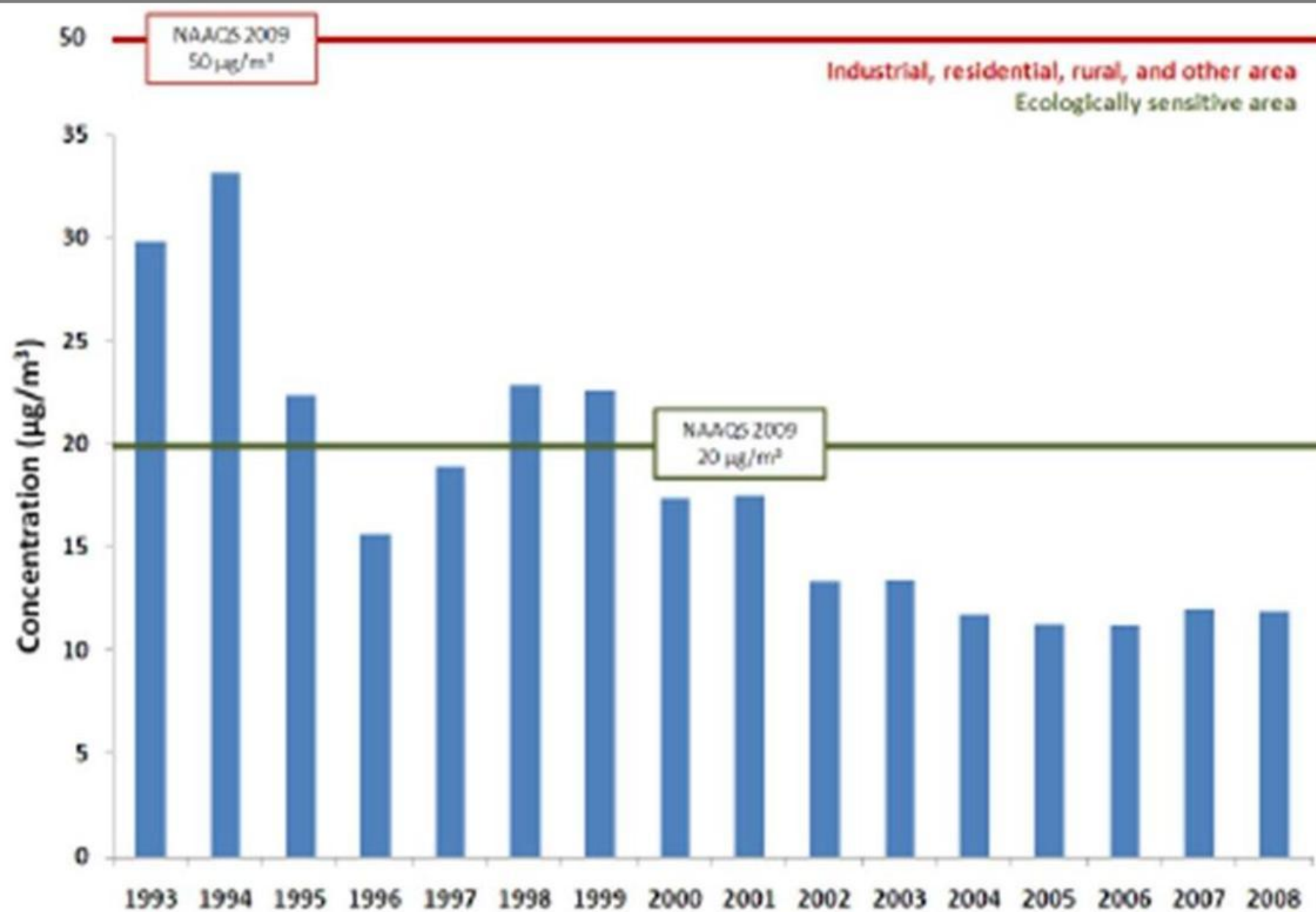
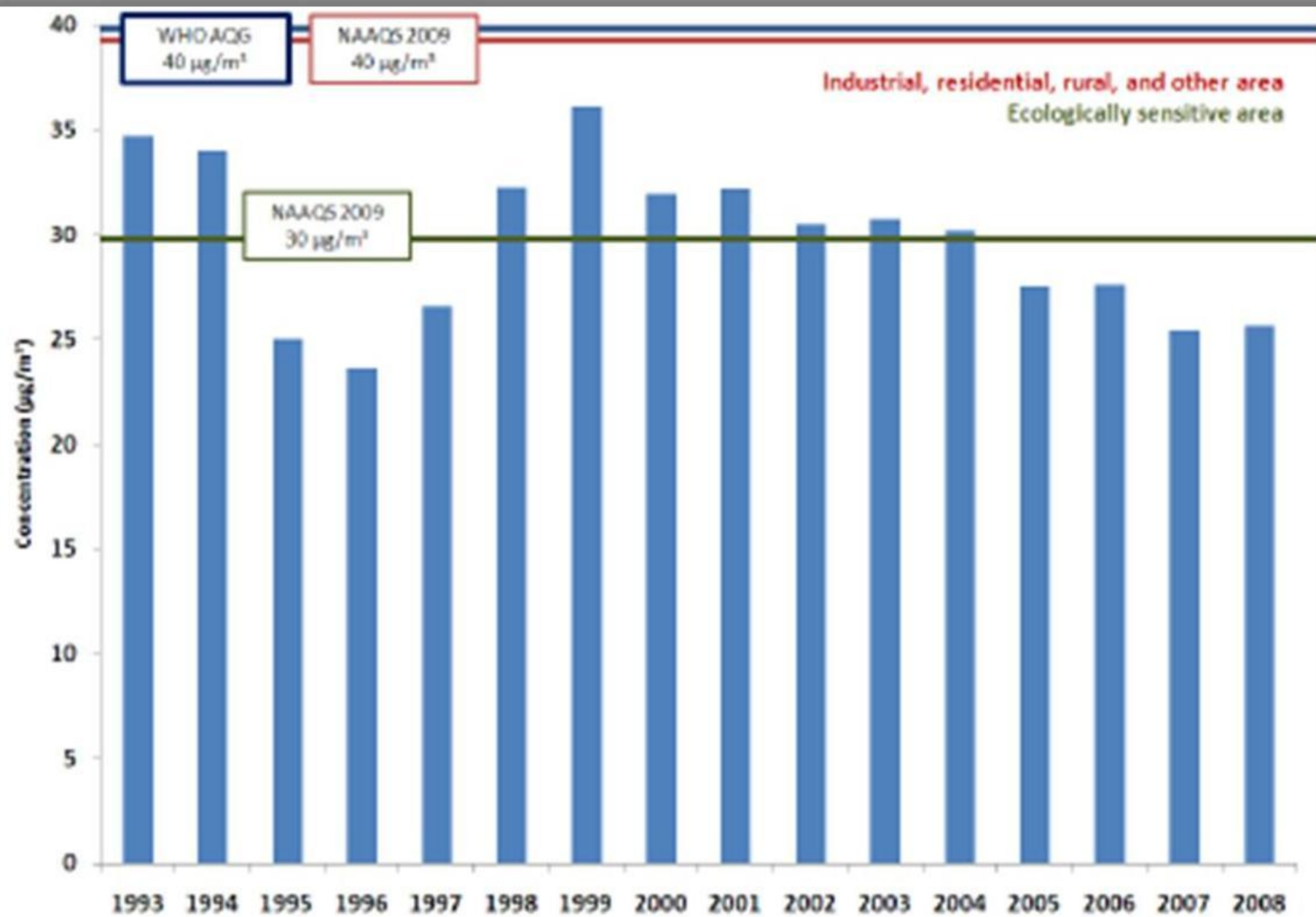


Chart-1-India : Composition of Registered Motor Vehicle Population ( % of total)

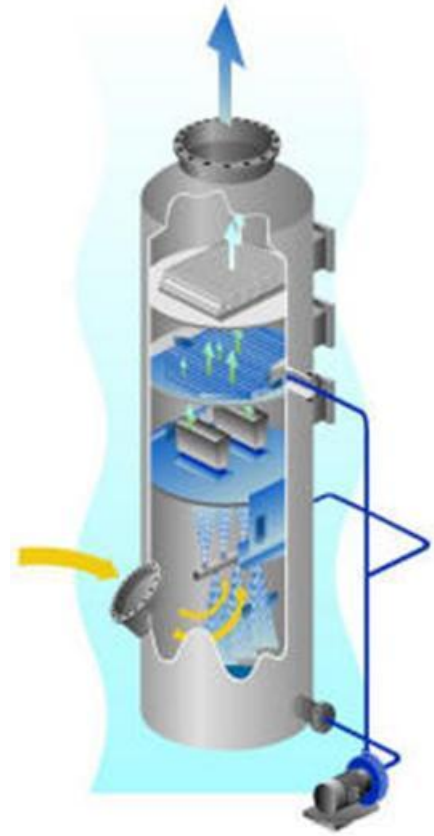
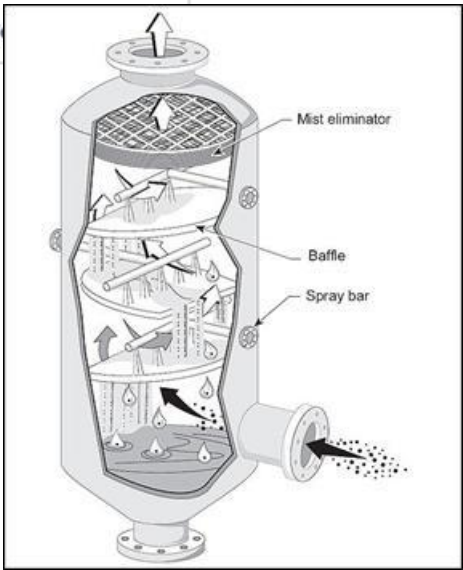
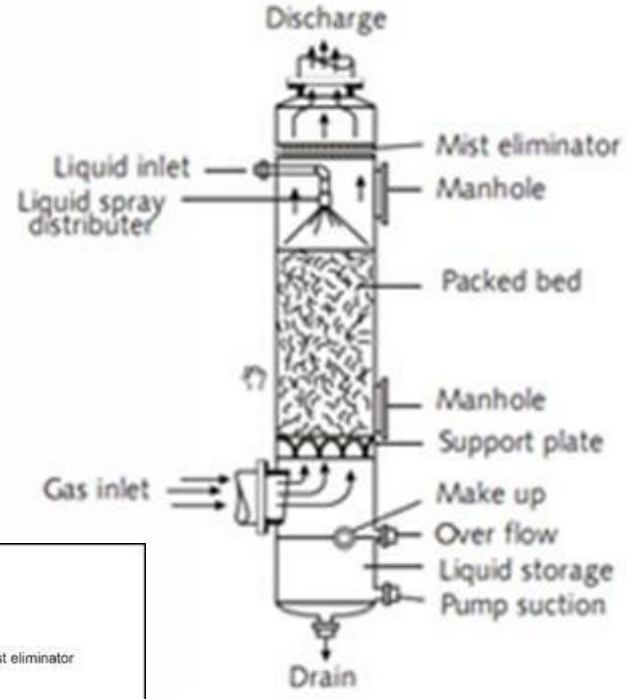
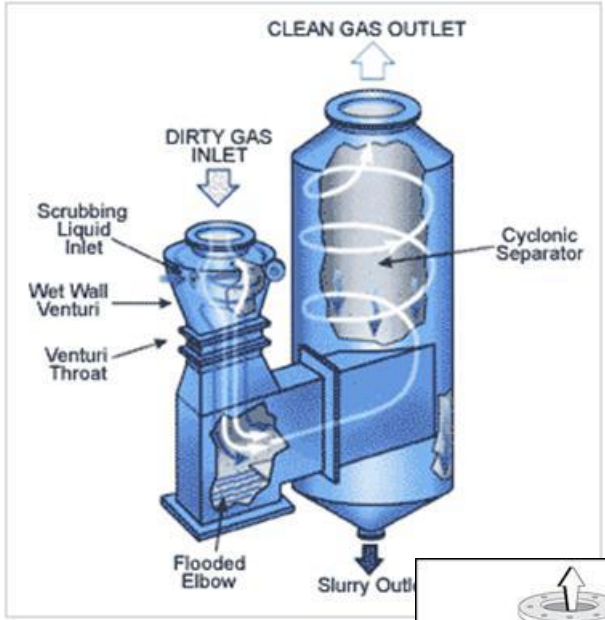








# Industrial Air Pollution – Control techniques...



# Industrial Air Pollution – Control techniques...

1 Reverse current flow scrubbers

1.1 Packing material

1.2. Demister

2 Fan

3 Pump

4 Stack

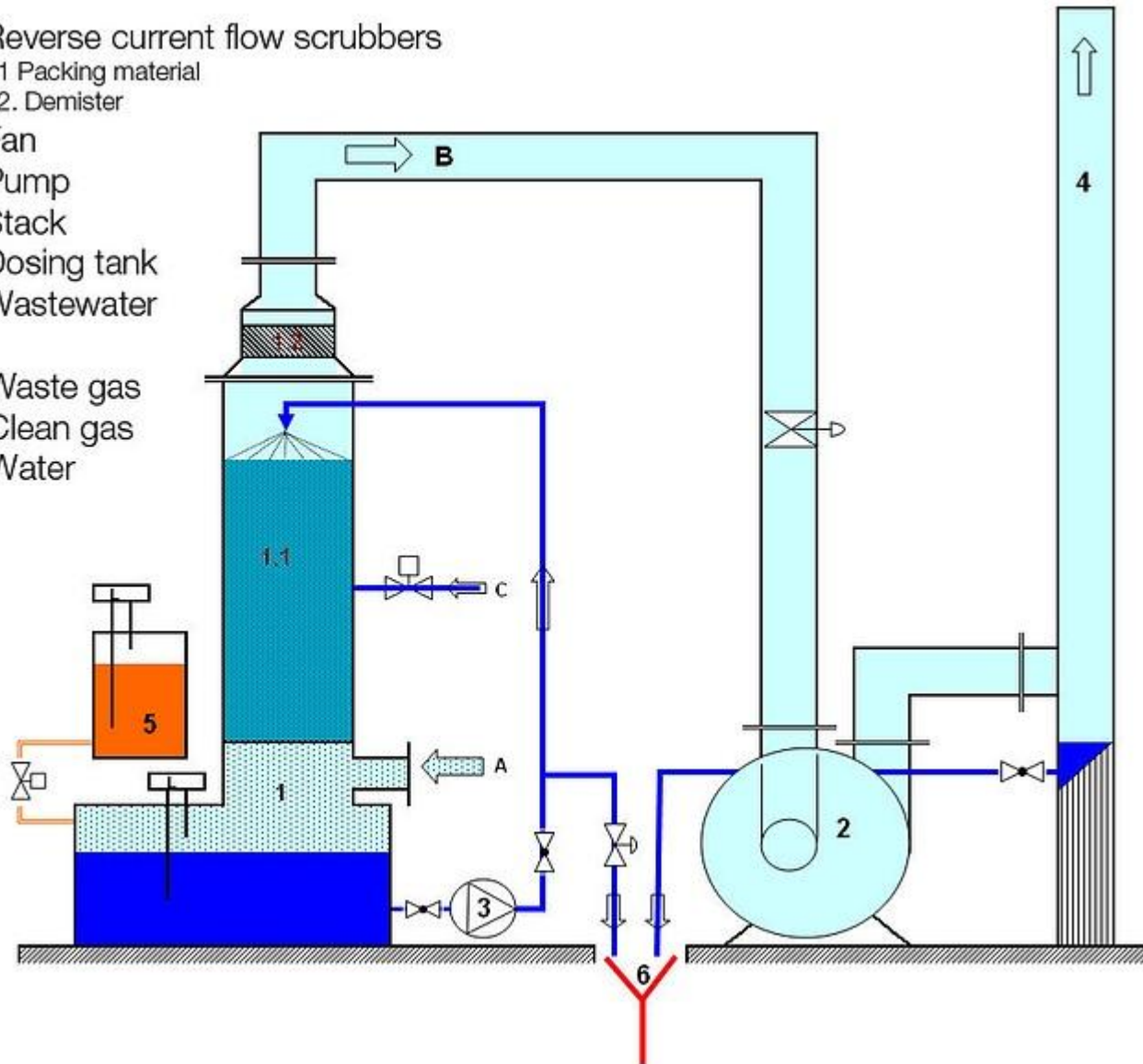
5 Dosing tank

6 Wastewater

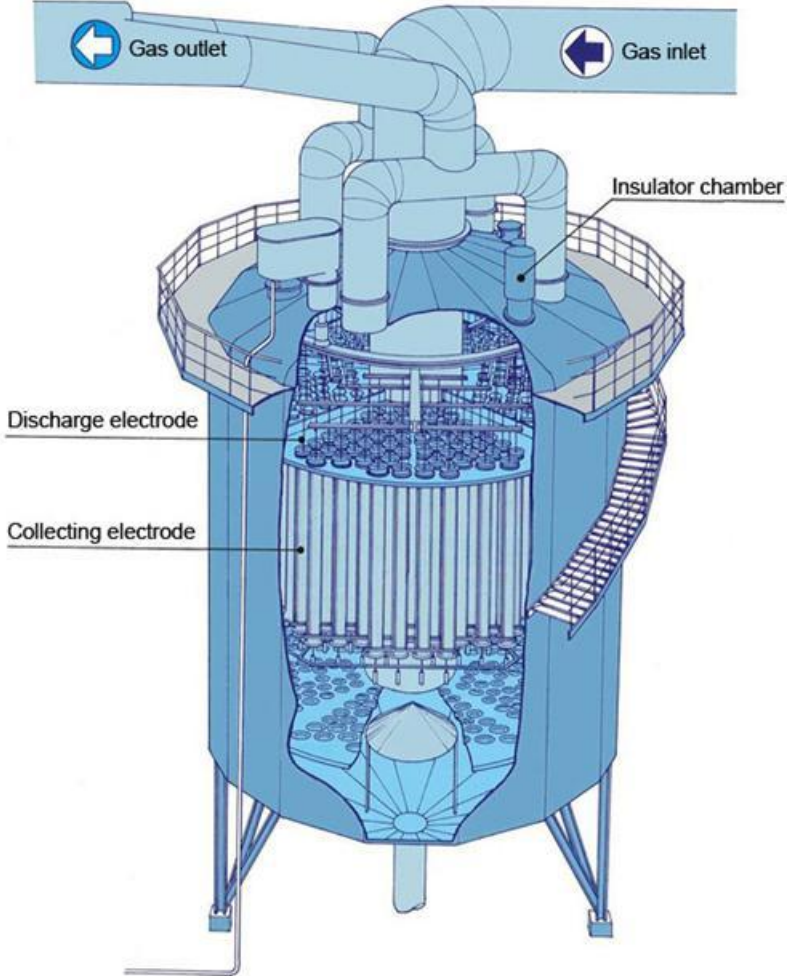
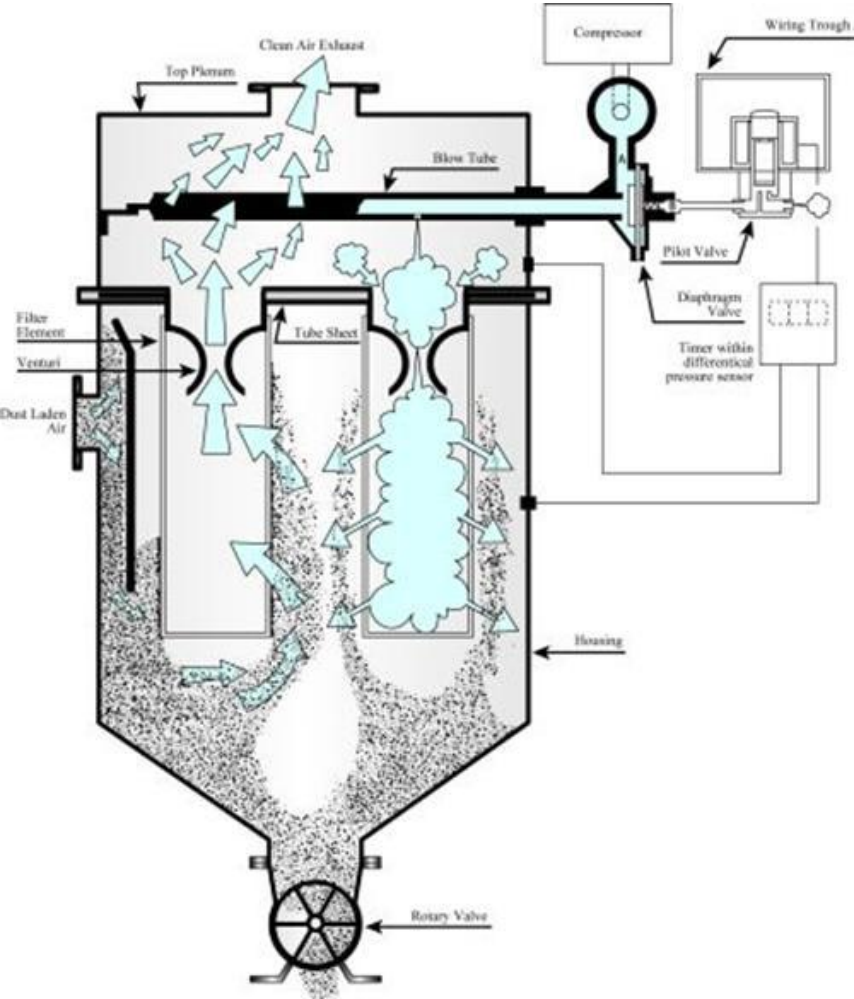
A Waste gas

B Clean gas

C Water



# Industrial Air Pollution – Control techniques...



# Control for Air Pollution - Compliance

**1948 – The Factories Act and Amendment in 1987** was the first to express concern for the working environment of the workers. The amendment of 1987 has sharpened its environmental focus and expanded its application to hazardous processes.

**1981 - The Air (Prevention and Control of Pollution) Act** provides for the control and abatement of air pollution. It entrusts the power of enforcing this act to the CPCB .

**1982 - The Air (Prevention and Control of Pollution) Rules** defines the procedures of the meetings of the Boards and the powers entrusted to them.

**1986 – E P Act and Rules** – Define various requirements for emissions and discharges from the industries



# The Factories Act and Rules

- Specifies requirements for maintaining dust and fume free environment
- Employer has to ensure all adequate precautions have been taken to protect the employee from exposures
- Ensure circulation of fresh air in the work area
- No internal combustion engine to be operated in the work area unless exhaust is conducted in to the open air



# The Factories Rules - Legal Angle....

The evidence of actual injury to health is not necessary if the dust and fume exist in such quantity as must necessarily be injurious to health in the long run.

In a foundry, the employer has taken all necessary measures to prevent the workmen from inhaling the dust from his foundry. But one of them developed ilicosis. They filed a case for damages, citing breach of statutory breach of dust of not preventing the inhalation. It was held that the employer has taken all necessary precautions at the outset ***as far as possible till they were aware of.***

*But the court of appeal reversed the judgement and held that the employer has not taken all practicable measure to protect the worker.*



# The Air Act and Rules

- Obtain the consent after applying to the State Pollution Control Board
- After obtaining the consent –
  - Install and operate the air pollution control equipment as specified by the SPCB
  - Do not alter the existing the systems without consent of SPCB
  - Maintain the equipment in good working conditions
  - Inform of any disruption in the operation of the equipment
  - Meet all the standards as laid down by the SPCB, either through consent or as specified in the EP Rules
  - Inform the SPCB in case of change of occupier
  - Submit emission reports on a regular basis, as specified by SPCB



# The E P Act and Rules

- No industry shall discharge or emit any environmental pollutant in excess of such standards as prescribed in this
- Furnishing information on excesses
- Submit environmental statement before the due date
- Comply with standards in Part D of Schedule VI, if the industry specific standards are not available. If industry specific standards are available in previous schedules, comply with them





Pollutants	Time-weighted average	Concentration in ambient air		
		Industrial Areas	Residential, Rural & other Areas	Sensitive Areas
Sulphur Dioxide (SO <sub>2</sub> )	Annual Average*	80 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	15 µg/m <sup>3</sup>
	24 hours**	120 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	30 µg/m <sup>3</sup>
Oxides of Nitrogen as (NO <sub>2</sub> )	Annual Average*	80 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	15 µg/m <sup>3</sup>
	24 hours**	120 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	30 µg/m <sup>3</sup>
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m <sup>3</sup>	140 µg/m <sup>3</sup>	70 µg/m <sup>3</sup>
	24 hours**	500 µg/m <sup>3</sup>	200 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>
Respirable Particulate Matter (RSPM) (size less than 10 microns)	Annual Average*	120 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	50 µg/m <sup>3</sup>
	24 hours**	150 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>
Lead (Pb)	Annual Average*	1.0 µg/m <sup>3</sup>	0.75 µg/m <sup>3</sup>	0.50 µg/m <sup>3</sup>
	24 hours**	1.5 µg/m <sup>3</sup>	1.00 µg/m <sup>3</sup>	0.75 µg/m <sup>3</sup>
Ammonial	Annual Average*	0.1 mg/ m <sup>3</sup>	0.1 mg/ m <sup>3</sup>	0.1 mg/m <sup>3</sup>
	24 hours**	0.4 mg/ m <sup>3</sup>	0.4 mg/m <sup>3</sup>	0.4 mg/m <sup>3</sup>
Carbon Monoxide (CO)	8 hours**	5.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>	1.0 mg/ m <sup>3</sup>
	1 hour	10.0 mg/m <sup>3</sup>	4.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>

\* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

\*\* 24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

# Air Pollution – Compliance requirements...

S No	Pollutant	Time weighted Average	Concentration in Ambient Air	
			A	B
1	Sulphur Dioxide (SO <sub>2</sub> ), μ g/ m <sup>3</sup>	Annual	50	20
		24 hours	80	80
2	Nitrogen Dioxide (NO <sub>2</sub> ), μ g/ m <sup>3</sup>	Annual	40	30
		24 hours	80	80
3	Particulate Matter (size less than 10 μm) or PM <sub>10</sub> , μ g/ m <sup>3</sup>	Annual	60	60
		24 hours	100	100
4	Particulate Matter (size less than 2.5 μm) or PM <sub>2.5</sub> , μ g/ m <sup>3</sup>	Annual	40	40
		24 hours	60	60
5	Ozone (O <sub>3</sub> ), μ g/ m <sup>3</sup>	8 hours	100	100
		1 hour	180	180



# Air Pollution – Compliance requirements...

S No	Pollutant	Time weighted Average	Concentration in Ambient Air	
			A	B
6	Lead (Pb), $\mu\text{g}/\text{m}^3$	Annual	0.5	0.5
		24 hours	1.0	1.0
7	Carbon Monoxide (CO), $\text{m g}/\text{m}^3$	8 hours	2	2
		1 hour	4	4
8	Ammonia ( $\text{NH}_3$ ), $\mu\text{g}/\text{m}^3$	Annual	100	100
		24 hours	400	400
9	Benzene ( $\text{C}_6\text{H}_6$ ), $\mu\text{g}/\text{m}^3$	Annual	5	5
10	Benzo Pyrene (BaP), particulate phase only, $\text{n g}/\text{m}^3$	Annual	1	1
11	Arsenic (As), $\text{n g}/\text{m}^3$	Annual	6	6
12	Nickel (Ni), $\text{n g}/\text{m}^3$	Annual	20	20

# EMISSION STANDARDS FOR DIESEL ENGINES (ENGINE RATING LES THAN 0.8 MW (800 KW))

Capacity of diesel engines	Date of implementation	Emission Limits (g/kw-hr) for				Smoke Limit (light absorption coefficient, $m^{-1}$ ) (at full load)	Test Cycle	
		NO <sub>x</sub>	HC	CO	PM		Torque %	Weighting Factor
Upto 19 kW	1.7.2005	9.2	1.3	3.5	0.3	0.7	100	0.05
							75	0.25
>19 kW upto 176 kW	1.1.2004	9.2	1.3	5.0	0.5	0.7	50	0.30
	1.7.2004	9.2	1.3	3.5	0.3	0.7	25	0.30
>176 kW upto 800 kW	1.11.2004	9.2	1.3	3.5	0.3	0.7	10	0.10



# EMISSION STANDARDS FOR DIESEL ENGINES (ENGINE RATING MORE THAN 0.8 MW (800 KW))

Parameter		Area Category	Total engine rating of the plant (includes existing as well as new generator sets)	Generator sets commissioning date		
				Before 1.7.2003	Between 1.7.2003 and 1.7.2005	On or after 1.7.2005
NO <sub>x</sub> (as NO <sub>2</sub> ) (At 15% O <sub>2</sub> , dry basis, in ppmv)	A	Up to 75 MW	1100	970	710	
	B	Up to 150 MW				
	A	More than 75 MW	1100	710	360	
	B	More than 150 MW				
NMHC (as C) (at 15% O <sub>2</sub> ), mg/Nm <sup>3</sup>		Both A and B	150	100		
PM (at 15% O <sub>2</sub> ), mg/Nm <sup>3</sup>	Diesel Fuels- HSD & LDO	Both A and B	75	75		
	Furnace Oils- LSHS & FO	Both A and B	150	100		
CO (at 15% O <sub>2</sub> ), mg/Nm <sup>3</sup>		Both A and B	150	150		



# STANDARDS FOR DIESEL ENGINES

(ENGINE RATING MORE THAN 0.8 MW (800 KW))

Category A: Areas within the municipal limits of towns/cities having more than 10 lakhs and also up to 5 km beyond the municipal limits of such towns/cities.

Category B: Areas not covered by category A.

**Stack height shall be maximum of the following, in metre:**

- (i)  $14 Q^{0.3}$ , Q=Total SO<sub>2</sub> emission from the plant in kg/hr.
- (ii) Minimum 6m.above the building where generator set is installed.
- (iii) 30m.



# Standards for Diesel Generators

The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity up to 1000 KVA, manufactured on or after the 1<sup>st</sup> January 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.

Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.

The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side.

The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/room, and then averaged.



# Standards for Diesel Generators

The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A).

No person shall sell, import or use of a product model, which is not having a valid Type Approval certificate and Conformity of Production certificate.

The conformance label must contain the following information:

- (a) Name and address of the [manufacturer] (if the address is described in the owner's manual, it may not be included in the label.)
- (b) Statement "This product conforms to the Environment (Protection) Rules, 1986".
- (c) Noise limit viz. 75 dB(A) at 1 m.
- (d) Type approval certificate number.
- (e) Date of manufacture of the product.





# Air Pollution – Compliance requirements...

**Streamlined emissions** are emissions through stacks and scrubbers which are identified as air pollution emissions points.

**Fugitive emissions** are emissions of gases or vapors from pressurized equipment due to leaks and other unintended or irregular releases of gases, mostly from industrial activities



# Air Pollution – Stack requirements...

**Stack Emissions** – for various processes

Guidelines clear about how a stack should be

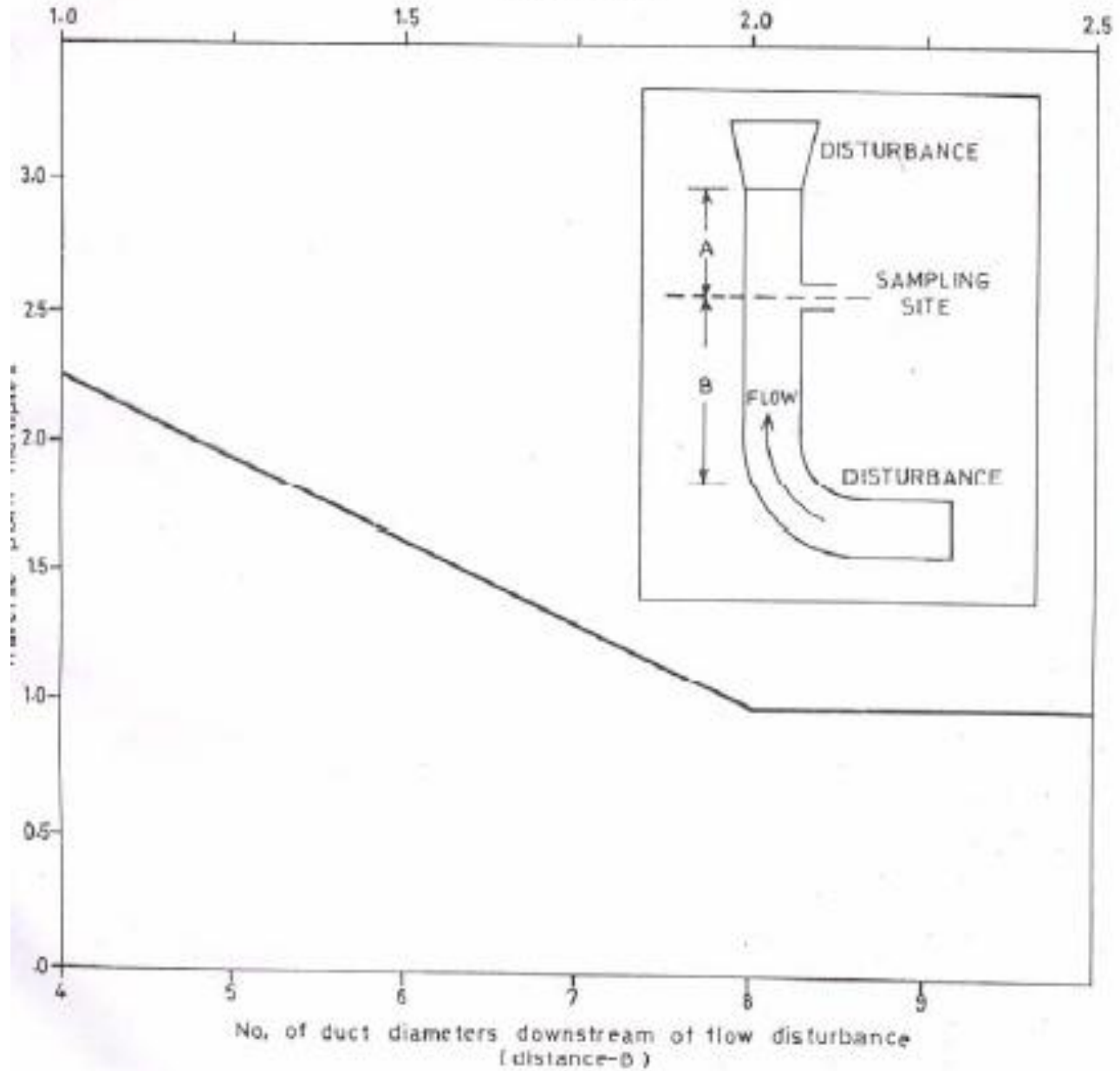
Where the sampling port should be and how many

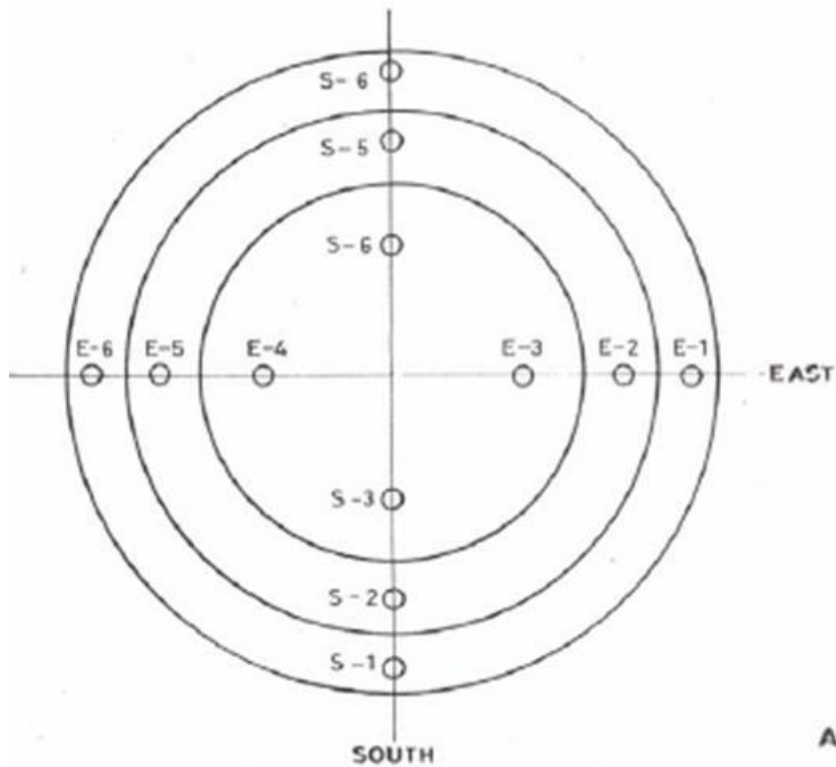
How many measurement points to consider for the stack based on the diameter of the stack

General support for the team for measurement of stack emissions



No. of duct diameters upstream of flow disturbance  
(distance-A)





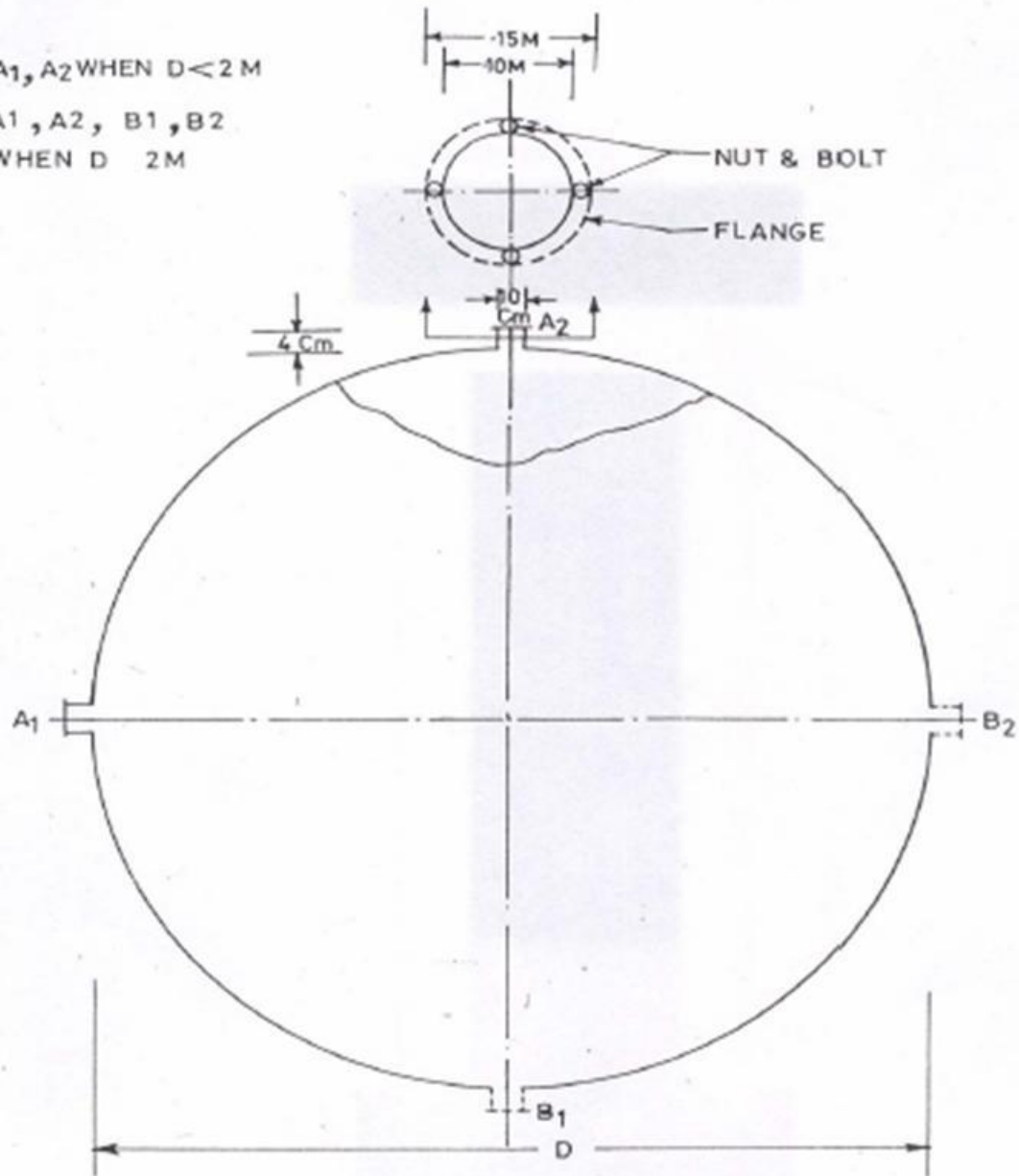
**Location of traverse points on circular and rectangular cross sections**

A	A-1 ○	A-2 ○	A-3 ○	A-4 ○
B	B-1 ○	B-2 ○	B-3 ○	B-4 ○
C	C-1 ○	C-2 ○	C-3 ○	C-4 ○



(1)  $A_1, A_2$  WHEN  $D < 2M$

(2)  $A_1, A_2, B_1, B_2$   
WHEN  $D \geq 2M$



SAMPLING PORTS

- A. 2 PORTS, 90° W/ DIAMETER  
LESS THAN 3M + PORT LENGTH
- 4 PORTS 90° APART W/ DIAMETER  
OVER 3M + PORT LENGTH

AT LEAST TWO STACK DIAMETERS  
BELOW STACK EXIT

AT LEAST EIGHT STACK DIAMETERS  
ABOVE LAST OBSTRUCTION

WORK AREA CLEARANCE

WORK PLATFORM

- A. AT LEAST 1M WIDE (1.2M WIDE FOR  
STACKS WITH 3M OR GREATER LD.)  
AND CAPABLE OF SUPPORTING  
3 PEOPLE AND 91Kg OF TEST  
EQUIPMENT
- B. SAFE GUARDRAIL ON PLATFORM WITH  
ACCESS BY SAFE LADDER OR OTHER  
SUITABLE MEANS IF LADDER IS USED  
LADDER WELL MUST BE LOCATED AT  
LEAST 1M FROM PORTS
- C. NO OBSTRUCTIONS TO BE WITHIN 1M  
HORIZONTAL RADIUS ON PLATFORM  
BENEATH PORTS



- PORT DIMENSION REQUIREMENTS
- 0.5M MIN
  - 2M MAX. LINESS A±TF VALVE INSTALLED
  - 0.1M ID (MIN) INDUSTRIAL FLANGE CAPPED  
WHEN NOT IN USE
  - INSTALL GATE VALVE IF STACK CONTAINS  
DANGEROUS GASES OR GASES OVER 200F  
UNDER POSITIVE PRESSURE

STRENGTH REQUIREMENTS

- 23 Kg SIDE LOAD
- 23 Kg RADIAL TENSION LOAD
- 91 Kg VERTICAL SHEAR LOAD
- 105 Kg M MOMENT

AT LEAST ONE STACK DIAMETER ±  
PLUS 0.9M FROM STACK CIRCUMFERENCE



POWER SOURCE  
220V 15A SINGLE PHASE 50 HZ AC  
LOCATED ON PLATFORM

# The Noise Pollution Rules

- Identify all the equipment that generate noise levels
- Ensure protection of employees working in identified noise zones through engineering, administrative and PPE controls.
- Carry out audiometry tests for the employees on a regular basis
- Affix signages for general awareness
- Monitor the noise levels regularly to ensure conformance to the requirements as specified.
- Provide acoustic chambers where necessary



# The Noise Pollution Rules

Area Code	Category of Area / Zone	Limits in dB (A) Leq	
		Day time	Night time
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone	50	40





# The Noise Pollution - Legal Angle....

The Gujarat High Court in ***GIDC Housing Association case*** had **something interesting to contribute**. In a writ petition filed by the residents of the housing association complaining about noise pollution caused by an Iron and steel factory, the court went into the fact 'who came first' rule.

According to this rule a person who goes to a place of nuisance cannot complain unless the nuisance began after the resident colony was established. Since the housing colony was within the Industrial estate and was established after the factory was functioning, the court held that the residents had come to the place of nuisance, hence cannot complain. *The Court asked the Company on the other hand to stick to standards for noise emission under the Environmental Protection Act.*



*Thank you !!*



Serving the Environment