Industrial ventilation

Industrial ventilation generally involves the use of supply and exhaust ventilation to control emissions, exposures, and chemical hazards in the workplace. Traditionally, nonindustrial ventilation systems commonly known as heating, ventilating, and air-conditioning (HVAC) systems were built to control temperature, humidity, and odors.

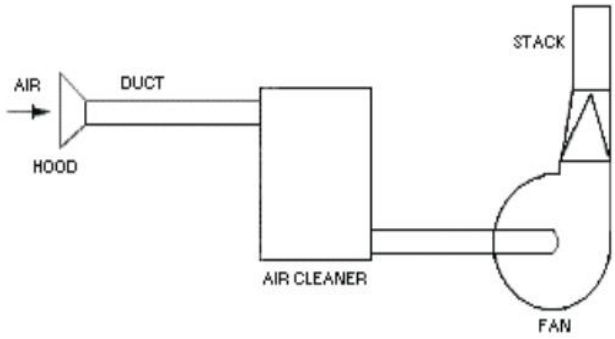
A. Ventilation may be deficient in:

- confined spaces;
- facilities failing to provide adequate maintenance of ventilation equipment;
- facilities operated to maximize energy conservation;
- windowless areas; and
- areas with high occupant densities.

Any ventilation deficiency must be verified by measurement.

B. There are five basic types of ventilation systems:

1. dilution and removal by general exhaust;
2. local exhaust (see Figure III:3-1);
3. makeup air (or replacement);
4. HVAC (primarily for comfort); and
5. Recirculation systems.



C. Ventilation systems generally involve a combination of these types of systems.

For example, a large local exhaust system may also serve as a dilution system, and the HVAC system may serve as a makeup air system .

Health Effects

Inadequate or improper ventilation is the cause of about half of all indoor air quality (IAQ) problems in nonindustrial workplaces (see Section III, Chapter 2, Indoor Air Quality). This section of the manual addresses ventilation in commercial buildings and industrial facilities.

A. Indoor Air Contaminants

Indoor Air Contaminants include but are not limited to particulates, pollen, microbial agents, and organic toxins. These can be transported by the ventilation system or originate in the following parts of the ventilation system:

- wet filters;
- wet insulation;
- wet undercoil pans;
- cooling towers; and

- evaporative humidifiers.

People exposed to these agents may develop signs and symptoms related to "humidifier fever," "humidifier lung," or "air conditioner lung." In some cases, indoor air quality contaminants cause clinically identifiable conditions such as occupational asthma, reversible airway disease, and hypersensitivity pneumonitis.

B. Volatile Organic and Reactive Chemicals

Volatile Organic and Reactive Chemicals (for example, formaldehyde) often contribute to indoor air contamination. The facility's ventilation system may transport reactive chemicals from a source area to other parts of the building. Tobacco smoke contains a number of organic and reactive chemicals and is often carried this way. In some instances the contaminant source may be the outside air. Outside air for ventilation or makeup air for exhaust systems may bring contaminants into the workplace (e.g., vehicle exhaust, fugitive emissions from a neighboring smelter).

Basic rules and requirements which govern the chemical industries

The government has certain human safety and environmental regulations in place, which chemical manufacturing units in India need to adhere. The Bhopal gas tragedy in 1984 was one of the worst accidents in the history of the chemical industry in India. This disaster was an eye-opener after which human safety regulations for factories in India were tightened considerably.

The first human safety regulation in the country was the Explosives Act 1884. This act regulates the manufacture, use, and transport of explosives. Similarly, the Indian Factories Act of 1948

deals with worker health and welfare. Specification standards for storage vessels and transportation of compressed gases are dealt under the Static & Mobile Pressure Vessels Rules of 1981.

Regulations on Environment and Human Safety

S.No.	Acts	Objectives
1.	Indian Factories Act,1948	To deal with worker welfare, health and to introduce safety culture
2.	Explosives Act,1884	To regulate the manufacture ,use and transport ,import of explosives
3.	Static and Mobile Pressure Vessels Rules ,1981	To specify standards for storage vessel and license requirement for storage and transportation of gas.
4.	Environment Protection Act ,1986	To protect the environment by preventing major incidents
5.	Air Act, 1987	To prevent and control air pollution and abatement of air pollution
6.	Hazardous Waste Management and Handling Rules ,1989	To provide guidelines for management and transport of hazardous waste
7.	Public Liability Insurance Act,1991	To insist operators to carry insurance to cover any incident that has an impact on the residents in the vicinity.

Plant Layout

1. Layout planning should be in sequential process flow order so that piping required is minimum.
2. The blocks representing flammable gases should be located in such a way that the gases are not carried by wind to ignition source.
3. Main process unit should be centrally located.
4. Storage tanks should be grouped according to product classification.
5. Provide at least 60 m distance between tanks and equipments .Distance between two floating roof tanks should be a minimum distance of 30 m. Such spacing provides room for good drainage .
6. Plant utilities such as heaters, compressed air supply, cooling towers etc., should be located adjacent to main process unit.
7. Fire stack should be on the upwind side from process units.
8. Effluent treatment units should be on the downwind side and at lower elevation than process units. It helps to have gravity flow.
9. Furnaces, heaters should be located upwind of process units, while cooling towers , dusty operations should be located in downwind direction .
10. High hazard places should be clearly marked

Emergency Response System

Large chemical process plants usually have an emergency response team with required equipments and materials. This trained team has to play a key role in major emergencies

or disasters. The team co-ordinator determines the measures that need to be taken during emergencies and he co-ordinates the activities of various departments and services.

The objective of emergency plan are

1. Control the hazard
2. Safeguard the lives
3. Minimize damage to process plant
4. Minimize damage to environment.
5. Start rescue operations and offer medical treatment.
6. Identify the affected personnel, offer them financial assistance , inform their relatives.

Emergency plans can be divided into

1. On-site emergency plan
2. Off-site emergency plan

On-site emergency plan

It deals with emergencies which have been envisaged. It considers circumstances , size ,complexity of the unit, nature of process, materials handled, type of personnel working and location of the unit.

Off-site emergency plan

It deals with major emergencies and disasters. It also considers minor emergencies which can turn into major ones.