AIR SAMPLING :

Atmospheric air is sampled & monitored usually for the estimation of

(I) Undesirable gaseous constituents :

These constituents are introduced into the atmosphere by human activity as well as through natural processes. CO, NO_x, SO_2, H_2S, HCs etc. are the most undesirable.

(II) Particulate matter or air borne solids in the atmosphere :

These include dust particles, organic debris, carbon particulates, fly-ash, fibres of asbestos, silica, visible spores, pollens etc.

In order to obtain a reasonably accurate idea of the quality of air at any locality, a representative sample of air is very imp. This sample should be large enough so as to yield adequate amount of various pollutants in concentrations which fall within the range of analytical methods being used for monitoring.

The rate of sampling i.e. the amount of air ~~sampled~~ sampled per unit time is also very imp. in collecting a good & representative sample of air. A large vol. of air sucked in by a powerful aspirator in a short time, may yield misleading results, as it could represent simply a chance variation. A sample collected over a long time at a slower rate is usually considered more reliable. For most of the practical purposes, a sample collected over a period of 2.5 - 4.00 hours is considered to be the most reliable

(I) AIR SAMPLING FOR ANALYSES OF UNDESIRABLE GASES AND VAPOURS:

The techniques used for this purpose are

(i) Sampling using Absorption Technique:

In this technique, atmospheric air is drawn by some suction device at a known rate & is allowed to bubble through some liquid, like water. The pollutants present in air are trapped by the liquid which is recovered & analysed later.

A variety of pollutants can be trapped in this way by using different types of solutions for absorbing different types of gaseous constituents. Acidic gases are completely absorbed in alkaline sol^{n}. Acidic sol^{n} trap alkaline vapours & gases effectively. Various oils & solvents may be used for the collection of HCs.

By decreasing the rate of input of air or raising the period for which gases remain in contact with the liquid, a very effective collection of pollutants can be achieved.

(ii) Sampling using Adsorption Technique:

When a mixture of gases is passed over a suitable solid surface, many of its constituents are adsorbed on it. This property is used for collecting various pollutant gases & vapours present in the atmosphere.

The stream of air drawn by a pump is passed through a column packed with charcoal granules at a known rate of flow. Charcoal is an efficient adsorbent for a undesirable constituents of the atmospheric air. Polluting gases adsorbed/

trapped by charcoal is washed with suitable solvent like CS_2 to remove the pollutants. A typical adsorption tube consists of charcoal granules packed within a space of 4-8 cm capped on either side by glass wool plugs. The solvent of undesirable materials of air after recovery from charcoal granules, may be analysed by Gas Chromatography or any other suitable technique.

Alumina, silica gel & molecular Sieves may also be used as adsorbent for the purpose of sampling.

(iii) Method using Chemiluminiscence of Excited Atoms

This method is based on chemiluminiscence produced by the reaⁿ of NO with O_3 which gives rise to electronically excited NO_2 molecules. These excited molecules produce reaⁿ in the range of 600-3000 nm which can be measured by a photomultiplier tube. The intensity of these radiations is proportional to the amount of excited NO_2 produced which is dependent upon the amount of NO present in the sample.

$$NO + O_3 \rightarrow NO_2^{*} + O_2$$

$$NO_2^{*} \rightarrow NO_2 + \text{Energy}$$

NO is almost always associated with NO_2 in air samples. It is necessary to change NO_2 to NO before the analysis. This is done in thermal converters which reduce NO_2 & NO. Samples treated in thermal converters provide an estimate of NO & NO_2 together. By deducting the conc. of NO, as obtained from analysis of samples which have not been subjected to thermal conversion, from NO+NO_2 content, the conc. of both NO & NO_2 can be obtained.

(II) SAMPLING FOR SPM:

If a glass slide lying in open, is leaved, a layer of dust collects over it within a few hours. Particles suspended in air settle down under the influence of gravity over the slide giving an idea of the load of particulates present in air. ~~However, the dust which settles down on the slide~~

Air Sampling using freezing Technique:

Undesirable gaseous constituents present in air can be sampled by freezing technique also. Atmospheric air drawn in with the help of some pumping device at a known flow rate is allowed to enter slowly into vessels or collectors maintained at successively lower temperatures. The initial collector is maintained at 0°C & the last collector at -196°C in a bath containing liquid nitrogen. Most of the gaseous constituents get liquified & are trapped in collecting vessels. fractionation is also achieved in the assembly of collectors as constituents which turn into liq. state at relatively higher temperatures. get collected in initial vessels while those which liquify at lower temperatures, near the freezing point of nitrogen, get collected in the last vessel.