

# Particulate Monitoring

Particles in the atmosphere consist of either solid or fine liquid droplets. They include, smoke, fumes, dust, flyash, condensed vapours and pollen. Suspended particulates in ambient air serve as a vehicle for organic and inorganic chemical compounds. Unlike gaseous pollutants particulate matter (PM) can be a mixture of different sizes and chemical composition with varying health implications. It can be strongly affected by complex secondary interaction involving temperature, humidity, sunshine, gases and particulate composition.

Particles in the atmosphere are characterized according to size. (Figure 1). Particulates can be divided into four major categories. Settleable particulates (Dustfall), Total Suspended particulates (TSP), Inhalable Particulate (PM<sub>10</sub>), Respirable Particulate (PM<sub>2.5</sub>). Larger particulates such as Dustfall are more a soiling or aesthetics problem than health related. Particulate less than PM<sub>2.5</sub> micron are related to health problems. Particulates less than 100 micron are usually present in the ambient air.

Air monitoring networks for particulates can be used to assess health impacts for protection of human health, to observe trends in support of abatement programs and assist in identifying potential sources.

Monitoring equipment capable of separating each particulate category is required to assess air quality concerns related to particulate. The measurement of ambient particulate matter has taken on new significance in light of new scientific evidence linking particle exposure with human health effects.

Particulate mass concentrations can be measured continuously in real-time as part of an air monitoring network. Real-time particulate data can be averaged over 5, 10, 30 min and 1 hour sampling periods. The 24 hourly readings can be averaged for a daily PM average. Various non continuous filtration and gravimetric samplers are used to calculate total particulate loading and elemental composition such as; Nickel, Iron, Copper and Chromium.

A High Volume sampler is the most common particulate sampler to measure (TSP) Total Suspended Particulate. Air is drawn through a pre-weighed filter. Air flow through the system is maintained at a constant rate by a mass flow controller

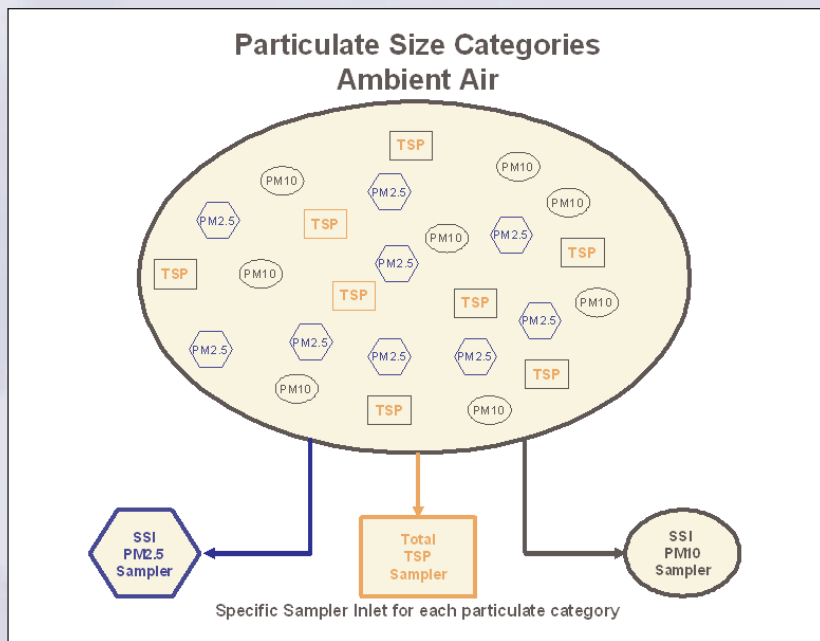


Figure 1 - Particulate Size Categories

which automatically adjust motor speed to correct for variations such as; line voltage, temperature, pressure and filter loading.

Standard High Volume samplers can be modified for Inhalable (PM<sub>10</sub>) and Respirable (PM<sub>2.5</sub>) measurements, with the addition of a specific (SSI) Size Selective Inlet. (Figure 2). Filter analysis will be expressed as a total loading in ug/m<sup>3</sup>. Laboratory elemental analysis can be preformed on the filters. A combination of non continuous PM<sub>10</sub> and PM

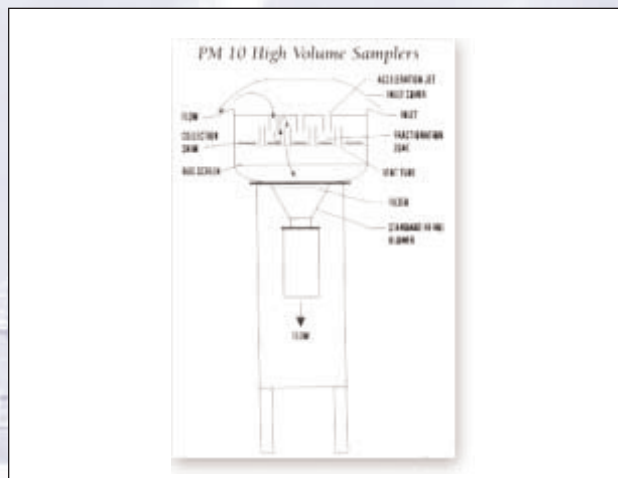


Figure 2 - (PM<sub>10</sub>) and Respirable (PM<sub>2.5</sub>)

2.5, virtual impactor samplers and several real-time particulate monitors provide a complete assessment of particulate data.

**Rotek Environmental Inc.** provides all the services and/or equipment to operate, maintain and repair a full line of particulate samplers. These samplers include TSP, PM10 (inhalable) and PM2.5 (Respirable), combination PM10/PM2.5 dichots, cascade impactors, and real time TEOM particulate monitors.

**Rotek** provides highly specialized services such as;

- install, operate, service and repair of all particulate samplers
- perform the required audit and/or calibration to MOE and US EPA protocols
- selection of required filter medium for specific elemental analysis
- in-house repairs to High Volume motors, timers and flow controllers
- work with client to assist in network development in assessing particulate emissions

**Rotek** can assist with site selection and installation of upwind / downwind samplers that work in conjunction with meteorological sensor control mechanisms for critical wind vectors (Figure 3).

Filter-based techniques have been used for decades to measure the mass and composition of airborne particulate matter (Figure 4). However, it has long been recognized that no single filter substrate or analytical technique can measure a wide range of particulate matter present in the atmosphere. As a result, several different filter substrates and analytical techniques must be used to quantify and qualify aerosol composition at a given time and location.

Air monitoring networks designed to assess particulate emissions should be made up a number of filter-based non-continuous TSP and SSI High Volume samplers. These samplers should work in-conjunction with real-time particulate monitoring instrumentation.



Figure 3 - Directional PM 2.5 Monitors



Figure 4 - PM10 and TSP Sampler

**Rotek** has an inventory of available real-time and non-continuous particulate samplers for the monitoring of TSP, PM10 and PM2.5. We provide full monitoring services for assessment of particulates or will rent/lease equipment to clients to meet their monitoring objectives.