**AIM:** To understand wind rose diagram

**THEORY:**

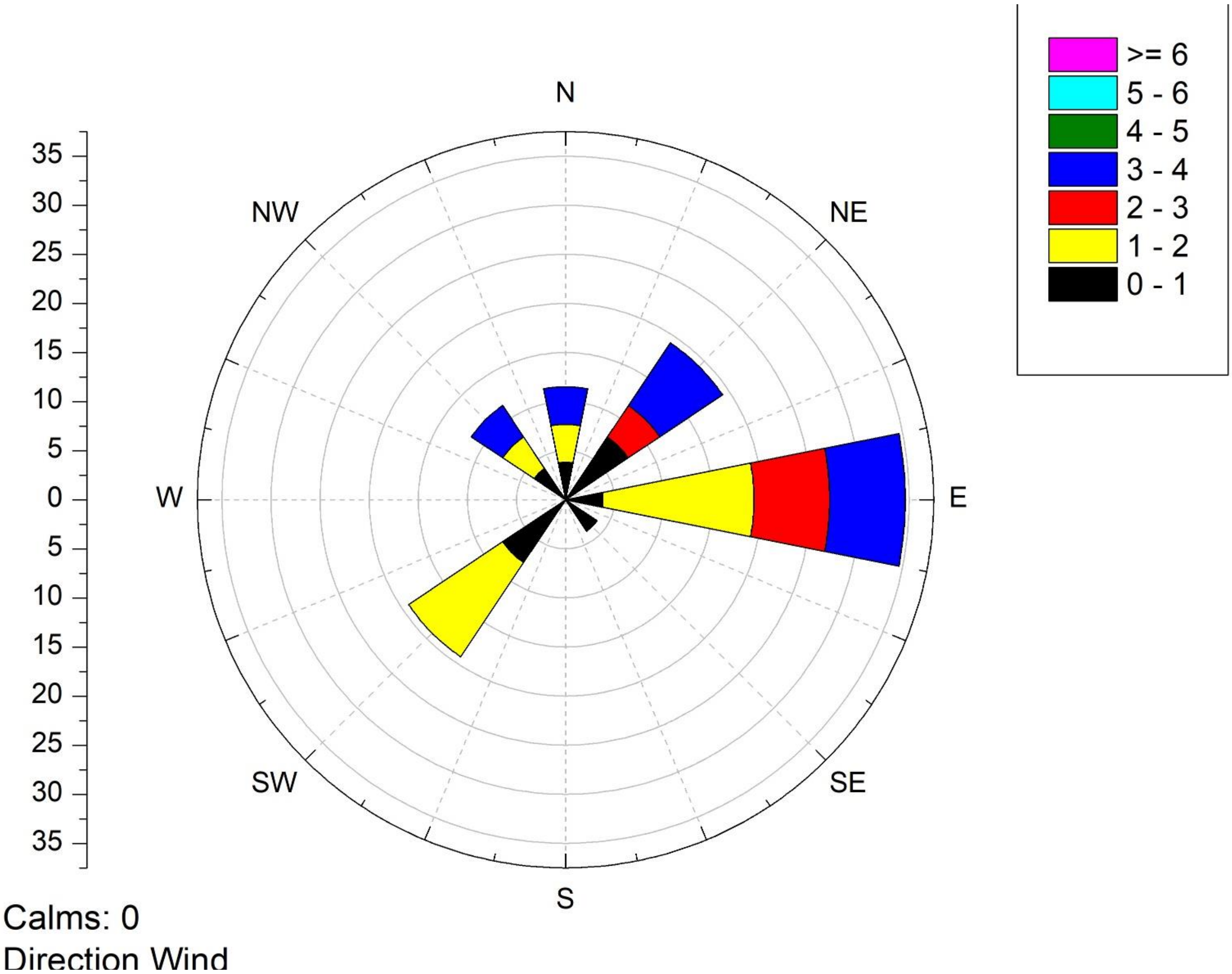
A wind rose diagram is a tool which graphically displays wind speed and wind direction at a particular location over a period of time. The diagrams normally comprises of 8 or 16 radiating spokes, which represent wind directions in terms of the cardinal wind directions (North East South West) and their intermediate directions.

Meteorologist use wind rose diagrams to summarise the distribution of wind speed and direction over a defined observation period**.** Data is taken from a weather station, which should be a near as possible to your project /site.

Each ‘Spoke’ shows:

1. How often the wind blows from each direction
2. How often the wind blows at each pre-defined wind speed bins (shown by the colour bands) for each wind direction

A wind rose diagram uses a polar coordinate system, whereby data is plotted a certain distance away from the origin at an angle relative to north. It is possible to create these plots using costly purpose-made software or, alternatively, very basic wind rose diagrams can be made using Microsoft Excel (see here). Wind Rose Excel intends to form a half way solution: a means to produce wind rose plots which are professional and informative, while also ensuring providing excellent value.



35
30
25
20
15
10
5
0
5
10
15
20
25
30
35
N
NE
E
SE
S
SW
W
NW
>= 6
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1
Calms: 0
Direction Wind


**CONCLUSION:**

**AIM:** Demonstration of high volume sampler used for measurement of particulate matter in ambient atmosphere

**EQUIPMENT:** High Volume Sampler

**THEORY:**

Research on the health effects of TSP in ambient air has focused increasingly on particles that can be inhaled into the respiratory system, i.e., particles of aerodynamic diameter less than 10 µm. The health community generally recognizes that these particles may cause significant adverse health effects. Recent studies involving particle transport and transformation strongly suggest that atmospheric particles commonly occur in two distinct modes: the fine (< 2.5 µm) mode and the coarse (2.5 – 10.0 µm) mode. The fine or accumulation mode (also termed the respirable particulate matter) is attributed to growth of particles from the gas phase and subsequent agglomeration, while the coarse mode is made of mechanically abraded or ground particles. Particles that have grown from the gas phase (either because of condensation, transformation, or combustion) occur initially as very fine nuclei--0.05 µm. These particles tend to grow rapidly to accumulation mode particles around 0.5 µm which are relatively stable in the air. Because of their initially gaseous origin, particle sizes in this range include inorganic ions such as sulphate, nitrate, ammonia, combustion-form carbon, organic aerosols, metals, and other combustion products. Coarse particles, on the other hand, are produced mainly by mechanical forces such as crushing and abrasion. Coarse particles, therefore, normally consist of finely divided minerals such as oxides of aluminium, silicon, iron, calcium, and potassium. Coarse particles of soil or dust mostly result from entrainment by the motion of air or from other mechanical action within their area. Since the size of these particles is normally > 2.5 µm, their retention time in the air parcel is shorter than the fine particle fraction.

PM10 and TSPM are measured by passing air at flow rate of about 1 litres per minute (lpm) through high efficiency cyclone which retains the dust particles greater than 10 micron size and allow only fines (less than 10 micron particles) to reach the glass microfibre filter where these particles are retained. The instrument provides instantaneous flow rate and the period of operation (on-time) for calculation of air volume passed through the filter. Amount of particulates collected is determined by measuring the change in weight of the cyclone cup and filter paper.

**PROCEDURE:**

- Perform leak check of the instrument before starting the sample.
- Filter paper need to be inspected for pin holes.
- Filter conditioning need to be done at 20-25ºC temperature and less than 50% Relative Humidity.
- Never fold filter completely.
- Do not touch filters by dirty hands always use disposable hand gloves.
- Under take regular cleaning of key components of the machine.
- Ensure stable power supply to the machine. Do not leave loose contact of supply wire to the machine.
- Always fill up distilled water in manometer assembly.
- Do not switch on and off machine using Timer Switch.
- Clean impinge and rotameter regularly and also clean manifold once in two months.
- Do not take flow reading immediately after switching on the machine. Give 5 minute for flow stabilization and for heat up the blower components.
- Always attach a new weighed cyclone cup with every filter change.
- Do not switch on machine without filter paper.
- If machine is not expected to be operated within 48 hrs drain out the manometer water and store machine with water in the manometer tank.
- Do not run machine during rain in open atmosphere.

**AIM:** To calculate air quality index (AQI) of a city

**THEORY:**

Air quality monitoring procedures and protocols, Indian National Air Quality Standards (INAQS), and dose-response relationships of pollutants, an AQI system is devised. The AQI system is based on maximum operator of a function (i.e. selecting the maximum of sub-indices of individual pollutants as an overall AQI). The objective of an AQI is to quickly disseminate air quality information (almost in real-time) that entails the system to account for pollutants which have short-term impacts. Eight parameters (PM10, P M2.5, N O2, S O2, C O, O3, $NH_3$, and Pb) having short-term standards have been considered for near real-time dissemination of AQI. It is recognized that air concentrations of Pb are not known in real-time and cannot contribute to AQI. However, its consideration in AQI calculation of past days will help in scrutinizing the status of this important toxic. The proposed index has six categories with elegant colour scheme, as shown below.

Table: Proposed Breakpoints for AQI Scale 0-500

| AQI Category (Range) | $PM_{10}$ 24-hr | $PM_{2.5}$ 24-hr | $NO_2$ 24-hr | $O_3$ 8-hr | CO 8-hr (mg/m$^3$) | $SO_2$ 24-hr | $NH_3$ 24-hr | Pb 24-hr |
|---|---|---|---|---|---|---|---|---|
| Good (0-50) | 0-50 | 0-30 | 0-40 | 0-50 | 0-1.0 | 0-40 | 0-200 | 0-0.5 |
| Satisfactory (51-100) | 51-100 | 31-60 | 41-80 | 51-100 | 1.1-2.0 | 41-80 | 201-400 | 0.5 –1.0 |
| Moderately polluted (101-200) | 101-250 | 61-90 | 81-180 | 101-168 | 2.1- 10 | 81-380 | 401-800 | 1.1-2.0 |
| Poor (201-300) | 251-350 | 91-120 | 181-280 | 169-208 | 10-17 | 381-800 | 801-1200 | 2.1-3.0 |
| Very poor (301-400) | 351-430 | 121-250 | 281-400 | 209-748* | 17-34 | 801-1600 | 1200-1800 | 3.1-3.5 |
| Severe (401-500) | 430 + | 250+ | 400+ | 748+* | 34+ | 1600+ | 1800+ | 3.5+ |

**One hourly monitoring (for mathematical calculation only)*

**OBSERVATION AND CALCULATIONS:**

Date of data:

City:

| Sr. No. | Pollutant | Concentration | AQI Sub index |
|---|---|---|---|
| 1. | $PM_{10}$ | | |
| 2. | $PM_{2.5}$ | | |
| 3. | $NO_2$ | | |
| 4. | $O_3$ | | |
| 5. | CO | | |
| 6. | $SO_2$ | | |
| 7. | $NH_3$ | | |
| 8. | Pb | | |

AQI =

**CONCLUSION:**

**AIM:** To measure sound intensity at different locations

**APPARATUS:** Sound level meter

**THEORY:**

Nearly everyone has heard the word decibel, but a relatively small percentage of the people who have heard the word (or perhaps even of those who use the word) know what it means. In our lecture class, we have discussed what the word decibel means, so you are probably better informed in this respect than the average person, but you still probably do not have a good "feeling" for what the significance of the term decibel really is. The purpose of this lab is to provideyou with a better feeling for what is meant when a sound intensity level or pressure level is described as being a certain number of decibels, so that you do not feel completely ignorant when you encounter this term in a newspaper article or elsewhere. The sound intensity level (SIL) (in dB) of a sound is given by

$$\mathrm{SIL} = 10 \log\left(\frac{I}{I_0}\right)$$

where I is the intensity of that sound in Watts/m2, and $I_o$ is the threshold intensity, which is defined as $10^{-12}$ Watts/m$^2$. The threshold intensity is a rough indication of the softest sound (in the vicinity of 1000 Hz) which can be heard by a person with normal hearing. Thus basically, the intensity level of a sound (in decibels) provides information on how that sound level compares with the softest sound level (or threshold level) which a person can hear.

The sound level meter gives an indication of a quantity called the sound pressure level (in dB). For our purposes, and to a good approximation, the sound pressure level and the sound intensity level have the same value, so we can take the value of the sound pressure level (in dB) created by a particular sound as also being the value of the intensity level of that sound. The sound level meter which you will use in this experiment is provided with three "weighting networks" referred to as A and C weighting, any one of which can be selected by depressing the appropriate switch on the meter. "A weighting" strongly discriminates against low--frequency sounds. This type of weighting is frequently used in sound level measurements because readings made with A weighting correspond reasonably well to the subjective impression of a person listening to the measured sound. "C weighting" is nearly independent of frequency from 32 Hz to 8 kHz and thus gives an indication of the true (unweighted) over--all sound pressure level.

**OBSERVATIONS:**

| Sr. No. | Location | Sound intensity (dB) |
|---|---|---|
| | | |
| | | |
| | | |

**RESULTS:**