

Real Time Particulate Matter Concentration Measurement using Laser Scattering

ABSTRACT

Particulate Matter (PM) is the sum of all solid and liquid particles suspended in air. It can be classified into PM_{1.0}, PM_{2.5}, and PM₁₀ based on the size of the particles. Smaller particles are extremely hazardous as they can penetrate into our respiratory system causing adverse health effects. In this paper, a real time, portable and cost effective PM sensor system is designed for the monitoring of air particulate matter concentration. To achieve the objectives, a particulate matter monitoring device was constructed using PM Sensor SEN0177, Temperature and Humidity Sensor DHT11, Arduino Mega, DS1307 RTC and TFT LCD for data visualization. The system can simultaneously measure the concentration of PM at varying sizes. Besides, it is also equipped to measure RH and ambient air temperature. Built in real time clock and data logging system was also included as added function. The system employs a real time monitoring system for particulate matter using laser scattering technique and interfaced using MIE theory algorithm. The completed prototype was tested with TE 600 PM₁₀ Air Sampler and General consumer for accuracy test. The system offers particulate matter detection based on laser scattering principle with a considerable accuracy of 87.7% in comparison when being compared with the TE6001 PM₁₀ air sampler. The main advantage of this system is its ability to provide real time monitoring to obtain in situ data on the PM concentration together with RH and temperature readings which are crucial factors in the air quality monitoring.