

Indoor and outdoor particulate matter concentrations in the vicinity of plastic waste processing industries

Abstract

While plastic recycling has gained conclusive acceptance by various stakeholders as a preferable products' end-of-life management, plastic waste processing industries may contribute to serious air pollutants emission and impair human health, especially if it is in uncontrolled conditions. Apart from toxic gas pollutants, this industry may also emit significant concentration of particulates matter or dust, notably via physical (shredding, sorting, and washing) and melt (re-granulation and reprocessing) processes. Meanwhile, in Sungai Petani, Kedah, Malaysia, public anguish is increasing in recent years due to mushrooming plastic waste recycling industries in its residential area. Thus, a study was conducted to analyse the day- and night-time ambient air PM₁₀ levels and their relationship with selected meteorological parameters (ambient temperature, relative humidity and wind speed) at two different locations (Cinta Sayang Resort Villa, CSRV and Metro Specialist Hospital, HM) in Sungai Petani, Kedah, Malaysia. The mean ambient PM₁₀ levels of Cinta Sayang Resort Villa (CSRV) and Metro Specialist Hospital (HM) were found exceeding the New Malaysia Ambient Air Quality Standard at 150 µg/m³ (24-hours), which were 568.082 ± 266.441 µg/m³ 615.046 ± 355.672 µg/m³, respectively. Distribution of PM₁₀ concentrations between day and night-time were found to be statistically insignificant at both sites. Meteorological parameters have also contributed to the trend of PM₁₀ concentrations at both sites especially at HM. Inverse correlation with PM₁₀ at CSRV was explained by the absence of moisture (or rain) at the site while the positive correlation observed at HM was due to the hot temperature-strong wind association at the site. Temperature was found to be the manipulating factor for PM₁₀ at HM, via linear regression model developed at $PM_{10} = -4352.426 + 170.557 \times Th$ with $F(1, 8) = 15.224$ at $p < .005$, accounting for 65.6% of the variation. Thus, proper attention should be given to the particulates matter emitted in Sungai Petani, believed to be influenced by the uncontrolled emission from the plastic recycling industries.