This thesis reviews the status of ambient air quality in Small Industries Development Corporation (SIDCO) located at Kurichi village of Coimbatore city, Tamilnadu, India. The Coimbatore city is surrounded by mountains on the west and on the north. The mean maximum and minimum temperature varies between 35 °C (95 °F) and 18 °C (64 °F). The city is also known as the Manchester of South India. The city is famous for engineering industries, textile spinning mills, wet grinder units, pump units and motor industry. To cater to the needs of above and to fabricate machineries for the factories, foundry and electroplating sector establishments are emerging.

The Small Industries Development Corporation (SIDCO) is located at longitude 10° 56′ 50′′ North and latitude 76° 59′ 50′′ East in Kurichi village, Coimbatore city in the State of Tamil Nadu. It is 7.0 km from Coimbatore city and it is accessible by Coimbatore-Pollachi highway. In Kurichi, two industrial estates exist, which are developed by SIDCO and private. This industrial cluster area spreads over an area of about 180 acres. In SIDCO industrial estate there is a variety of industries like foundries, engineering based units and petty industries. In SIDCO, there are 11 major foundries. The foundries use coal/electricity for melting and deforming iron. The engineering industries available in SIDCO are engaged in cutting, bending, welding, grinding and plating operations. Apart from the above units, rubber and surface coating units are also functioning. All these industries emit pollutants into the atmosphere. The foundry manufacturing process involves the following steps like Pattern making, Mould preparation and Core making, Melting of metal, Pouring the molten metal into the moulds, Cooling and separation of castings, Shot blasting and grinding, and Quality testing and
dispatch. Except the quality testing, all other manufacturing processes emit pollutants into the atmosphere.

In this thesis work, emphasis is made on the prevailing ambient air quality in the Small Industries Development Corporation Limited (SIDCO), Coimbatore. Based on the prevailing conditions, three ambient air quality monitoring stations were selected in SIDCO. In all the three Monitoring stations, the concentration of PM$_{2.5}$, PM$_{10}$, Total Suspended Particulate Matter (TSPM), Sulphur dioxide (SO$_2$), and Nitrogen oxides (NO$_x$) present in the ambient air were monitored twice a week from January 2011 to December 2012 (24 months). The meteorological parameters like wind speed, wind direction, temperature and relative humidity were measured for the above period.

Respirable dust sampler was used to determine the concentration of particulate matter of size equal to and less than 10 µm (PM$_{10}$) in the atmosphere. They were collected in a pre-weighed glass micro-fibre filter paper. The blower provides a monitoring air flow rate in the range of 1.1 to 1.4 m$^3$/min. Fine Dust Sampler was used to determine the concentration of particulate matter of size equal to and less than 2.5 µm (PM$_{2.5}$) in the atmosphere. They were collected in a pre-weighed teflon filter paper. High volume sampler was used to determine the concentration of Total Suspended Particulate Matter (TSPM). The blower provides a monitoring flow rate in the range of 1.1 to 1.4 m$^3$/min. PM$_{10}$, PM$_{2.5}$ and TSPM were collected in pre-weighed filter papers. Their concentrations were determined by gravimetric method. SO$_2$ and NO$_x$ were absorbed in solutions kept in impingers. The Sulphurdioxide (SO$_2$) concentration was arrived at by modified West and Gaeke method. The concentration of Oxides of Nitrogen (NO$_x$) was arrived at by Jacob and Hochheiser method. Integrated Sensor Suite (ISS) was used to observe and record the meteorological parameters. Meteorological survey was
conducted for a period of two years from January 2011 to December 2012. Using the data obtained from the ambient air quality monitoring, ‘Air Quality Index’ (AQI) were arrived at, using the formula,

\[ \text{AQI} = \frac{1}{3} \left( \frac{PM_{2.5}}{SPM_{2.5}} + \frac{PM_{10}}{SPM_{10}} + \frac{TSPM}{STSPM} \right) \times 100 \]

where SPM_{2.5}, SPM_{10} and STSPM are the corresponding threshold limits.

The Air Quality Monitoring was conducted for 98 days in the year 2011 and for 96 days in 2012. The month-wise mean pollutant concentrations with Air Quality Index were arrived at for each monitoring station. The results obtained during the monitoring have been grouped based on the seasons also. The seasons are Pre monsoon, Monsoon, Post monsoon and Winder season respectively. Time series concentrations line of air pollutant PM_{2.5}, PM_{10}, Total Suspended Particulate Matter (TSPM), Sulphur dioxide (SO_{2}), and Nitrogen oxides (NO_{x}) for 2011 and 2012 were arrived at and discussed.

Based on the monthly mean concentrations, the results are discussed for all the three stations. At MS 1, PM_{10} exceeded the threshold limit of 100 µg/m^3, only in the month of April 2011. The maximum observed value is 100.6 µg/m^3. All the measured values of PM_{2.5}, TSPM, SO_{2} and NO_{x} were within the prescribed limits of (60 µg/m^3, 500 µg/m^3, 80 µg/m^3 and 80 µg/m^3 respectively) in the year 2011 and 2012. The AQI values vary from 38.9 to 65.9, indicating Light Air pollution to Moderate Air Pollution. The maximum AQI value occurred in the month of April 2011 and the value is 65.9. Similar results were arrived at for MS 2 and MS 3.

ANN model has been developed for average value of pollution concentration in all the three Monitoring stations. For the year 2011, ANN
model has been developed using 98 sets of data. Among 98 sets of data, 49 sets were used for training and the remaining 49 sets were used for validation. The error in the predicted values was less than 8%, indicating the developed model is perfect. The $R^2$ value for this model is 0.944.

The following parameters were taken as the independent variables.

- $X_1$ – Concentration of PM$_{2.5}$ in µg/m$^3$
- $X_2$ – Concentration of PM$_{10}$ in µg/m$^3$
- $X_3$ – Concentration of TSPM in µg/m$^3$

The dependent variable was AQI.

Similarly ANN model have been developed for the year 2012 and for the combined data for the years 2011 and 2012.

For the year 2011, Regression model has been developed using 98 sets of data. The regression coefficient ($R^2$) value obtained for this model is 0.713. But the value of $p$ (Probability) is 0.00. Since the probability value (level of significance) is less than 0.01, this model can be used for prediction. Similarly for the year 2012, Regression model has been developed using 96 sets of data. By the end of 2011, many foundry industries erected control measures as instructed by Tamilnadu pollution Control Board. Hence, the PM$_{10}$ values in the year 2012 are less compared to the values at 2011. As per the AQI values obtained, SIDCO, Coimbatore comes under Moderate Air Pollution. Therefore, proper preventive measures must be taken for SIDCO, Coimbatore. The ANN models developed shall be useful for researchers for further investigation. Similarly the Mathematical models arrived at shall also be useful to researchers.