ABSTRACT

The textile industry with its global presence in terms of production and labour is rated among the largest in the world. It represents India's largest industrial sector and in 1999, 20% of India's industrial output as well as 38% of total export earnings were contributed by the textile industry.

Industrial and economic growth are important, but while supporting industrialisation on a large scale in different sectors, it is of concern that pollution of the environment and unchecked exploitation of resources such as groundwater may nullify the effects of industrial growth. The rapid growth of the textile industry in the last decade made its own demands on the environment.

In this study, Tirupur town, a main cotton knitwear export hub was chosen as it is a classic example of an industrialised region affected by severe pollution due to the cumulative effect of the effluent discharges. More than 700 textile-finishing units are discharging their effluents in and around the industrial cluster of Tirupur. The estimated amount of 100,000 m³ per day of effluent contain high amounts of inorganic salts, unfixed dyes, and different other additives. The contamination of water bodies and groundwater with Total dissolved Solids (TDS) having an extremely high sodium content (about 163 tonnes per day are emitted) leads to severe degradation of water and land. Tirupur is situated in a semi-arid showing a negative water balance, i.e. water is already scarce.

For these complex pollution problems, a comprehensive and integrated approach was formulated in this study to tackle the problems of pollution at source reducing the use of water, chemicals and energy, minimising the waste and exploring the possible reuse and recycle options.
Among air and solid waste pollution the effluents of the textile finishing industry represent the main source of pollution. In this study the necessity for the segregation of effluent streams was stressed. Individual treatment strategies were explored for the high pollution load low volume effluent stream and recycling options for the low pollutant load – high volume streams were investigated.

The study proved that even for the highly concentrated effluent, biological treatment in the form of anaerobic digestion in a fixed bed up-flow reactor with halophile micro-organisms successful in cleaving azo-dyes, reducing the colour of the effluent. The effluent with less pollution load was treated in a RZTP system which was able to remove colour and the COD, but the retention time and space are constrains for implementation in the industry.

The low pollution load effluent was treated with membrane technology in order to recycle the water. About 65% of the process water can be reclaimed and used in the process. 35% of the volume remain as concentrate (reject) which may either be added to the high concentrated effluent stream or treated further like investigated in this study involving a solar based High Rate Brine Concentrator (HRBC) and an electrolysis cell. The electrolysis cell converts the salt, which was considered as a waste, into a product with commercial value.

In can be concluded that the integrated approach chosen in this study involving cleaner production methods and focussing on effluent segregation, biological treatment and membrane technology combined with reject management can substantially contribute to the reduction of the overall pollution in the region and is economically feasible.