SOCIO-ECONOMIC, ENVIRONMENTAL AND CLEAN TECHNOLOGY ASPECTS OF TEXTILE INDUSTRIES IN TIRUPPUR, SOUTH INDIA

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Background

Recently, many of the South Asian countries are experiencing severe environmental problems due to their rapid industrialization. This phenomenon is very common where the polluting industries like textile dyeing, leather tanning, paper and pulp processing, sugar manufacturing, etc. thrive as clusters. The effluents discharged by these industries leads to serious pollution of surface water sources, ground water and soils and ultimately affects the livelihood of the poor. Generally, the above-mentioned industrial units are functioning in small/medium scales with high employment generation and foreign exchange potential. But the pollution control mechanisms among these units are extremely weak. To some extent the pollution enforcement agencies (say the Pollution Control Boards in India) followed a lenient attitude to industries on account of its socio economic contributions and low investment capacity towards pollution control. Unfortunately, this approach further discouraged the industries to introduce successful pollution management strategies either through effective effluent treatment or through production process change through cleaner production technologies. This paper is an attempt to examine the socio economic benefits and environmental impacts of the rapid industrial growth in Tiruppur, a major textile industrial cluster in South India. Besides, the limitations of the existing pollution control practices and the scope for cleaner production approaches among these industrial units are also examined.

Knitwear Industry and its Benefits

Tiruppur, the leading cotton knitwear industrial cluster in South India, is located in Tamilnadu State. The industrial activities experienced rapid growth during the last two decades due to its unique nature of decentralization and flexibility. At present more than 9000 small-scale knitwear related units are functioning with the volume of

investment more than US $ 200 million. The city contributes 56% of the total cotton knitwear exports from India. The industry provides socio-economic benefits to the local community and to the nation in the form of employment, income, and foreign exchange. More than 2,00,000 people are directly employed by this industry. During 1997 the industry generated output of US $ 425 million at single shift base. The export value from Tiruppur during the year 2002 was about US $ 957.5 million. Besides a similar quantity of knitwear products is sold in the domestic market. In brief, the economic prosperity of Tiruppur depends highly on this industry and the local people are in one way or another involved in the knitwear business.

Textile Processing and Pollution Load

The environmental problems of textile manufacturing are related to the bleaching and dyeing (textile processing) segment of the industry. In Tiruppur during 1981, only 68 textile processing units were functioning. The number rapidly increased to 450 in 1991 and 866 in 1997. But because of the pressure from the Tamilnadu Pollution Control Board (TNPCB) against the discharge of untreated effluents some units have closed and at present 702 textile processing units are functioning. These units together used around 85 million litre per day (mld) of water and discharge a similar quantity (83 mld) as effluents, which carry considerable volume of chemicals used at the wet processing stage. The quantity of cloth processed by these units is around 15,000 tonnes per month.

The continuous discharge of untreated effluents for more than a decade has accumulated in the soil, ground water, etc. at Tiruppur and surroundings. During 1980 to 2000, the cumulated pollution load discharged by the Tiruppur units, comes to 2.35 million tonnes (mt) of Total Dissolved Solids-TDS-, 1.31 mt. of Chloride, 0.13 mt. of Sulphate, 0.098 mt. of Total Suspended Solids, 0.09mt. of Chemical Oxygen Demand, 0.03 mt. of Biological Oxygen Demand and 0.001 mt. of Oil and Grease. Rainfall (annual average of 617 mm) has only a marginal effect in reducing the severity of the impact in this region.

Environmental Impacts of Textile Effluents

Available studies clearly prove the accumulation effect of pollution in this area. All ground water studies indicate that open wells and bore wells in and around Tiruppur exhibit high levels of TDS (ranging 3000mg/l to 11,000 mg/l) and Chloride (ranging 2000 mg/l to 5000 mg/l) due to industrial pollution and these values are much higher than the background level for this region. The available groundwater in this region is not suitable for domestic, industrial or irrigation use. The surface water studies indicate that the Noyyal river (the river passing through Tiruppur which receives the major share of effluents), downstream reservoir (Orthapalayam) and irrigation tanks have been affected by industrial pollution and the surface water is unfit for the domestic, irrigation or fisheries purpose. The Soil quality study also indicated the pollution concentration and most of the area the soil is alkaline (pH >8.5) or tending to alkaline (pH 8-8.5).

Damage Cost of Pollution

Due to pollution the agriculture, drinking water and fisheries in Tiruppur area and downstream villages of Noyyal river has been affected. The water is injurious (EC >3 mmhos/cm) to agriculture in an area of 146.3 sq.km. and critical (EC 1.1 to 3 mmhos/cm) in 218.3 sq.km. Hence crop productivity has declined substantially, which ultimately affects the welfare of farmers. Recently a downstream farmers organization filed a court case against the industry. The estimated overall damage cost in the agriculture sector is US $ 50 million. Drinking water in Tiruppur town and downstream village are affected. The municipality is bringing 32 mld of water from the neighboring (Bhavani) basin for drinking water supply in town. In affected villages the Water Board has introduced special water supply schemes. Besides villagers are spending a lot of time and effort for fetching fresh water from distant places. The total damage cost in the drinking water sector is about US $ 23.8 million. The fisheries activities in the Noyyal river, tanks and reservoir have been affected. The recent fish mortality at Orthapalayam reservoir compelled the Fisheries Department to stop the fish culture. US $ 0.15 million is the loss of value in the fishery sector. Besides, possibilities of toxicity effect in the available fish are also high and its consumption may lead to severe health problem.

The pollution problem in Tiruppur has very much affected the textile processing units as well. Since the industrial wells are having only "coloured water" they are transporting their major requirement of water (85%) through tankers from peripheral villages located 25-30 kms away from Tiruppur. The overall cost incurred by the industry for purchasing the water is US $165 million. Besides the continuous functioning of "water market" leads to depletion of the water level in villages, which has affected the livelihood of the rural poor. On many occasions villagers have protested against the water transfer. Currently a mega water supply project is progressing under the Tiruppur Area Development Corporation. The total cost of the project is estimated to be US $ 269 million and will be financed by both debt and equity from the consortium and government agencies. Through this scheme 185 mld of water is planned to be transfered to Tiruppur (both industry and domestic) from River Cauvery, an inter state controversial river in India. If this project succeeds, the industry needs to pay more than their current payment of water, which may ultimately end in cost escalation of textile processing. Human health, bio-diversity (aquatic eco-system of river, tanks and reservoir) and livestock are also affected by pollution to a great extent.

Status of Effluent Treatment

Realizing the seriousness of the textile effluent pollution, the Court gave an order against the functioning of polluting units without effluent treatment plants in 1997. After that the state pollution control agency put more pressure on all the units towards effluent treatment, 164 units were closed. Presently out of the 702 units, 278 are treating 38 mld of effluents through 8 Common Effluent Treatment Plants (CEPTs) and 424 are treating 45 mld of effluents through Individual Effluent Treatment Plants (IETPs). For effluent treatment, US $ 10 million was spent for fixed costs, which are highly subsidized by the Government. Besides US $ 6.7 million had been incurred as annual variable/running costs. The cost analysis showed that the variable cost per unit of effluent treatment is much higher than the capital cost both in the IETPs (86% of total cost) and CETPs (73%). Unfortunately the present treatment system is insufficient for reducing the TDS, particularly the Chloride and Sulphates. The average TDS concentration in the treated effluents is as high as 6394 mg/l in IETPs and 6537 mg/l in CETPs, which is far

higher than the TNPCB standard of 2100 mg/l. The same is true of Chloride, which averages 3290 mg/l in IETPs and 3127 mg/l in CETPs whereas the standard is 1000 mg/l.

Towards Cleaner Production

. The above analysis clearly reveals the economic base of the knitwear industry in Tiruppur region along with the magnitude of environmental damage and the inefficiency in existing pollution management efforts. At one stage it was assumed that installation of effluent treatment plants would solve the problem. But this did not happen because plants are not designed to remove TDS. Now pollution is not only the concern of non-industrial sectors but industries too. Water is an unavoidable input factor for textile processing. Since water resources are extremely scarce in Tiruppur region, extraction and transporting a large quantity of fresh water from distance sources and then discharging the entire waste water which leads to pollution, is not a sustainable resource management practice. Since the industrial activities are the major source of employment and income in Tiruppur, the possibilities of public agitation against pollution is also small. Recently, the pollution problem caused by the industry has been of concern to overseas buyers and consumers and their future reaction may be a big challenge too. Anyhow it is a hard time to come up with some solution for the pollution problems in Tiruppur.

Now the industrial units have two options. The first one is to enhance the existing effluent treatment plants through Reverse Osmosis (RO) and the second is to switch over to Cleaner Production Technologies (CPT). Installation of RO might be possible in 8 CETPs, which cover 278 Units, but it is not at all possible in 424 IETPs. The Capital cost needed to RO would be between US $ 89 to US $ 112 for one million litre of effluents, which means the CETPs and IETPs together would have to incur additional capital investment of about US $ 8.9 million. Further US $ 178 to US $ 222 is required as operating and maintenance cost per million litre of effluents, that means an additional cost of US $ 6.7 million per year. However, the major benefits of RO is that the treated effluent is almost as good as raw water and in this way industry can save 80% of fresh

water cost, that is US $18.8 million per year (presently industries are spending US $ 889 for purchasing 1 million litre fresh water).

The current processing technology employed by most of the units in Tiruppur is traditional which require large volume of fresh water and chemicals. But the modern sophisticated processing technologies like "soft flow" machines etc can reduce the water and chemical requirements and ultimately the volume of effluents and pollution load. The application of CPT in textile industry might include some combination of soft flow machines, low salt dyes and membranes filtration. Studies proved that the material to liquor ratio in the soft flow (1:5 to 1:10) is less than the conventional winch is (1:15 to 1:25). In the soft flow dyeing the salt and water requirement per kg. of fabric processed can be reduced up to 50%. But the soft flow is ten times costlier than the current machines. With the combined use of low material liquor ratio machine and low salt reactive dyes the TDS level of the effluents can be reduced by about 40%. Dye bath segregation is another successful method for reducing TDS and requires only minor plant modifications. The cost analysis shows that the textile processing cost in soft flow dyeing is 22-29% lower than the conventional winch. Moreover, soft flow offers excellent process/product quality, which is an additional benefit to the export business. Currently most of the tiny and small units in Tiruppur are not at all aware of these technologies. But around 10 big integrated units, who are also direct exporters, are in the implementation stage of CPT. Besides a few medium scale units are also thinking about it.

Conclusions

The environmental management history of Tiruppur reveals the difficulties faced by the different institutions/actors like State Pollution Control Board, Industrial Organisations, NGOs, Local Government, Water Resources Organisations, etc. in finding a solution for the problem. Otherwise the environmental impacts may not have continued at this level. The above analysis on RO plants and CPT for textile units clearly shows the long run advantage to industries apart from reducing the social costs. These technologies may be implemented by a few large-scale units who have the capacity for investment and

long-term vision about the business. But its affordability among the large number of small and medium units is a big challenge. The knitwear manufacturing is predominantly an export business with high competition. So any investment on RO or CPT increases the cost of production in the short run especially for the smaller units. Moreover finding such big investment, sometime more than 10-20 times greater than their overall capital investment, is very difficult. But the introduction of cleaner production and advanced treatment technology is the only effective long-range solution towards further reduction of environmental impact.

Realizing the above facts, (Viz. the economic benefits of the Tiruppur industry, social costs, constraints in effective pollution management among small scale units, and the need for a critical solution for the pollution problem) an integrated pollution management attempt from different actors who are related to Tiruppur knitwear business is needed. In these circumstances the role of foreign buyers and consumers of Tiruppur garments are very significant. If they raise a strong demand for "pollution free" garments with "green label" and are also willing to pay more, definitely it may provide pressure to introduce clean technology by the industries. A few very small units may have to close down. Others can think of unit modification individually or even jointly. At this stage, proper technical guidelines and financial support is required for the industries from national and international research institutions and donor agencies. Similarly, sincere collaborative efforts from industrial associations, pollution enforcement agencies, NGOs, industrial consultants, etc. are also required. Only than the deep-rooted knitwear industry in Tiruppur can achieve the objective of sustainable development.

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