

A Study on Environmental Sustainability in Textile Processing Industries of South India

A. John Rajan^{1*}, K. T. Anand¹, K. V. Narayanan¹ and B. R. Ramesh Babu²

¹Department of Mechanical and Production Engineering, Sathyabama University, Chennai - 600119, Tamil Nadu, India; profajr.prod@sathyabamauniversity.ac.in, ktanandppc@gmail.com, coe@sathyabamauniversity.ac.in

²R&D, Chennai Institute of Technology, Kundratur, Chennai - 600069, Tamil Nadu, India; brrbapu.aero@gmail.com

Abstract

Background/Objectives: This paper is concerned with the analysis of various factors which are involved in assessing the performance of processing houses located in Tiruppur and Karur. **Methods/Statistical Analysis:** The methodology involved collection of data from 10 industries and from each 11 respondents were considered. Thus 110 data which were collected by using a questionnaire were processed to elicit the impact of various factors on stakeholders. Multiple regression analysis was conducted to find out the overall performance of these industries. **Findings:** The results show that multiple correlation coefficient obtained is highly significant in that 82% of the variables account for ineffective performance of the industries. Parameters such as TNPCB (Tamil Nadu Pollution Control Board), Financial Management, Government Support, Higher TDS (Total Dissolved Solids) Content and failure in assessing the environmental impact account for the major factors impacting the stakeholders performance. Of these, TNPCB (Tamil Nadu Pollution Control Board) show a highly significant factor followed by Government Support, Higher TDS (Total Dissolved Solids) Content and failure in assessing the environmental impact. Financial Management has the least impact on stakeholders' business efficiency and its significance is noticed at 5% level. **Applications/Improvements:** The findings of the study will, doubtless be of use to processing industries located in Tamil Nadu to take appropriate action.

Keywords: Environment, Multiple Correlation, Stakeholders, Textile Processing, TNPCB

1. Introduction

Textile industry contributes nearly 14% of the total industrial production in India. There are about 10,000 garment manufacturers and 2100 bleaching and dyeing industries in India. The textile industry of India operates largely in the form of clusters with roughly 70 textiles clusters producing 80% of the country's total textiles. Majority are concentrated at Tiruppur and Karur in Tamil Nadu, Ludhiana in Punjab and Surat in Gujarat¹.

In recent years, there have been sounding of alarm bells from the various sites of society in the above regions because of toxic effluent which has been dumped into the river which provides the source for irrigation, drinking and live-stock rearing. This creates major environmental problems and also affect the right to the life of the people

and also the farmers. In view of the above, the question of sustainability of these processing industries plays a very important role. Also the fact the Madras High Court has ordered the closure of 720 small and medium dyeing and bleaching industries in Tiruppur, Karur and other industries functioning in the neighbourhood speaks about the gravity of the situation².

This legal move of the farmers and the general public also affect the livelihood of 50,000 workers who depend on the proper functioning of these industries. At present, only a few dyeing and bleaching industries function in Tamil Nadu, particularly, in Tiruppur and Karur in view of the major restrictions imposed by Tamil Nadu Pollution Control Board.

*Author for correspondence

2. Review of Literature

In³ have conducted a very interesting study on the impact of dyeing industrial effluents on the ground water quality in Kancheepuram (India). In⁴ have reported an investigation of water quality parameters discharged from textile dyeing industries. In⁵ have looked at textile dyeing industries in Bangladesh in connection with sustainable development. Toxicity assessment and microbial degradation of azo dyes have been studied⁶. In⁷ have studied the impact of dyeing industry effluents on soil and crop. A study on the Influence of dyeing and printing industrial effluent on physicochemical characteristics of water has been reported⁸. A very interesting study on the effects of bleaching powder with dyeing industries' effluents has been conducted⁹. A general paper on environmental pollution: Its effects on life and its remedies are discussed¹⁰. Since there is a dearth of study in this area, the present study was undertaken with the following objectives.

- To know the functional status of the dyeing and bleaching industries and the crisis involved in the textile processing industries.
- To analyse the activities of the textile process supply chain and how the inefficient activities of dyeing and bleaching units affect the river eco-system and the other socio-environmental aspects of Tiruppur and Karur of Tamil Nadu and how it acts as a barrier in taking supply chain decision.
- To apply the statistical methods to assess the level of efficiency of the textile stakeholder who are involved in the sustainable development of dyeing and bleaching units in Tiruppur and Karur with a view of finding out the factors which affect the efficiency level of the stakeholders.

This paper also addresses the problems involved in the processing industries which deal with the dyeing and finishing of fabrics and the effluent problem that is encountered as a result of them.

3. Research Problem under Study

In order to collect data from the stakeholders, a questionnaire was prepared to collect information on COD (Chemical Oxygen Demand), BOD (Biological Oxygen Demand), TDS (Total Dissolved Solids), the level of financial assistance under CETP (Common Effluent

Treatment Plan), non support from the government, and failure in estimating the effect of climate change. Thus the study covers all the financial activities and the other innovative initiatives taken by all the supply chain partners as stakeholders of the textile industries. For assessing the functional performance of dyeing industries, the performance rating scale was adopted for the data collected from industries and also from common effluent treatment plant and individual effluent treatment plant. The ideas and contents of performing scale were crystallised by making more visits to the dyeing industrial clusters located in the two industrial towns namely Tiruppur and Karur. Also, observation was made indirectly for clear understanding about the functional status of those industries and to learn the method of functioning of dyeing industries to process the textile yarn and cloths and the ways of utilizing the water for dyeing and bleaching processes and type of liquid effluent which was emitted from their various dyeing and bleaching processes. Besides this, the functional status of CETP and IETP (Individual Effluent Treatment Plant) was also studied.

4. Study Area

A total of 10 processing industries were selected for this exercise. Various problems which affect the processing industries located in Tiruppur and Karur are briefly discussed under each heading.

5. Status of Knitting and Processing Industries in Tiruppur

A case study has been published on the emergence of Tiruppur as the export hub of knitted garments in India. It is concluded that Tiruppur's foray into the world market is much less an outcome of any strategic government intervention as compared to other clusters in India. It is pointed out that due to competition from other markets, Tiruppur Knitting industries started producing T-Shirts for the international market.

6. Problems of Water Pollution

The bleaching and dyeing units in Tiruppur generate around 100-120 MLD (Million Litres per Day) of effluents and these have high BOD (Biological Oxygen Demand),

COD (Chemical Oxygen Demand), colour, acids and salt content. In 1997, a common effluent plant was installed for the benefit of processing industries. It is disappointing to note that these effluent treatment plants were not able to effectively treat the effluents and the effluent had high salt content, Total Dissolved Salts (TDS) particularly the chlorides and sulphates and other organic contaminants.

There are 9000 small scale units in Tiruppur which produce one third of total apparel export from India. There are 729 bleaching and dyeing units. Tiruppur's textile industry uses bleaching liquids, soda ash, caustic soda, sulphuric acid, hydrochloric acid, sodium peroxide and various dyes and chemicals for its dyeing and bleaching processes. Other harmful substances include a number of dyes, many based on benzidine structures or heavy metals both known to be toxic.

Most of these chemicals are not retained in the finished hosiery goods but are discharged. The waste water is acidic and contains dissolved solids which increase biological and chemical oxygen demand in water. With no fresh water available for dilution, the ground water from Coimbatore and Tiruppur is no longer suitable for irrigation.

7. TNPCB (Tamil Nadu Pollution Control Board)

TNPCB is meant for preventing air and water pollution and to lay down, modify or annul effluent standards for the sewage trade effluents. Its job is to collect samples of effluents and to analyse the same for specific parameters. Training programmes are organized regularly for personnel related to prevention, control or abatement of water pollution.

8. Government Support

Tamil Nadu Government has extended its support by providing funds for modernizing Knitting industries. On an average in the case of new investments, 60% to 70% funds are raised from Banks. Banks offer yeoman services to knitted industries.

9. Failure in Assessing the Environmental Impact

It is a pity that this factor has a great impact on the processing industries in Tiruppur. The main reason is lack

of environmental auditing and tourism. Another reason is the unsustainable anthropogenic activities resulting in substantial public health problems. Also poor education and research in Tiruppur has contributed to this situation.

10. Method of Data Collection and Sample Design used in the Present Study

The number of questions and statements were 52 relating to energy utilizations processes, pollution controlling techniques, waste water generation and treatment methods followed in CETP and IETP. The number of respondents or stakeholders were 110 which represent a fairly wide group.

11. Analysis of the Data

Correlation and multiple regression analysis were carried out on the data to find out the factors which have an impact on stakeholders. The equation, which is given below, gives details of independent and dependent variables.

Table 1 gives correlation matrix from which it is noticed that highly significant correlations between the variables have been noticed.

The correlation between TNPCB performance, Financial management, Government support and the views of stakeholders are positive while those between higher TDS content, failure in assessing the environmental impact and the views of stakeholders are negative. These revelations are startling which underscore the importance of undertaking remedial measures to set matters right. They also provide an up to date idea of the existing scenario in the processing industries located in Tiruppur and Karur.

Table 1. Correlation among parameters

Variables	Correlation Coefficient
TNPCB Performance	+0.81**
Financial Management	+0.91**
Government Support	+0.81**
Higher TDS Content	-0.92**
Failure in assessing the environmental impact	-0.94**

Note : ** - Significant at 1% level,*

Table 2. Multiple regression analysis - stakeholders

Sl. No.	Variables	Coefficients	SE (Standard Error)	't' value	'p' Value
	Constant	1.948	0.320		
1	TNPCB Performance	0.348	0.092	3.780	0.000**
2	Financial Management	0.194	0.088	2.194	0.030*
3	Government support	0.241	0.083	2.905	0.004**
4	Higher TDS Content	-0.269	0.085	-3.154	0.002**
5	Failure in assessing the environmental impact	-0.328	0.092	-3.580	0.001**
	R Value	0.906			
	R ² Value	0.820			
	F Value	102.65**			

Note : ** - Significant at 1% level, * - Significant at 5% level;

The resultant equation is formulated as follows:

Stakeholders' Business efficiency = 1.948 + 0.348 (TNPCB Performance) + 0.194 (Financial management) + 0.241 (Government Support) - 0.269 (Higher TDS Content) - 0.328 (Failure in assessing the environmental impact)

It could be noted from the analysis that stakeholders' efficiency has been predicted from TNPCB performance, financial management in their company, government support, higher TDS Content and decrease of failure in assessing the environmental impact. Of all these, the ineffectiveness of TNPCB is greater as the 'p' value is highly significant. Government support accounts for the major chunk followed by TDS Content.

On the basis of the multiple correlation coefficient, it is apparent that 82% of the variables account for the dismal performance of the processing industries as reflected in the views of the stakeholders in Tiruppur and Karur (Table 2).

12. Conclusion

This paper has addressed the various issues which are involved in assessing the performance of processing industries in Tiruppur and Karur. There exists a very good correlation between various parameters and

stakeholders' performance. This shows that these factors need consideration for assessing the efficiency of energy and pollution management techniques and the functional status of textile processing units located in Tiruppur and Karur. It is hoped that this study will be useful to all those who are involved in processing of knitwear. The ineffectiveness of the various components has been highlighted and projected.

13. References

1. Tamil Nadu cracks down on polluting dyeing factories. Available from: <http://www.sify.com/Finance/National>
2. Manufacturing practices, waste generation and effluent treatment in textile industries – A report on textile dyeing units. Available from: <http://www.ceteddd.iitm.ac.in/targeted-msmes/textile-dyeing-industry>
3. Balakrishnan M, Antony SA, Gunasekaran S, Natarajan RK. Impact of dyeing industrial effluents on the ground water quality in Kancheepuram (India). *Indian Journal of Science and Technology*. 2008; 1(7):1–8.
4. Munna A, Islam MS, Tusher TR, Kabir MH, Molla MAH. Investigation of water quality parameters discharge from textile dyeing industries. *J Environ Sci and Natural Resources*. 2014; 7(1):257–63.
5. Islam MM, Mahmud K, Faruk O, Billah MS. Textile dyeing industries in bangladesh for sustainable development. *International Journal of Environmental Science and Development*. 2011; 2(6):428–36.
6. Puvaneswari N, Muthukrishnan J, Gunasekaran P. Toxicity assessment and microbial degradation of azo dyes. *Indian Journal of Experimental Biology*. 2006; 44:618–26.
7. Jolly YN, Islam A, Mustafa AI. Impact of dyeing industry effluent on soil and crop. *Universal Journal of Environmental Research and Technology*. 2012; 2(6):560–8.
8. Sharma N, Sharma SK, Gehlot A. Influence of dyeing and printing industrial effluent on physicochemical characteristics of water – Case study on the printing cluster of Bagru, Jaipur (Rajasthan), India. *IOSR-JAC*. 2014; 7(4):61–4.
9. Hannan MA, Rahman MA, Haque MF. An investigation on the effects of bleaching powder with dyeing industries' effluents. *Journal of Civil Engineering (IEB)*. 2011; 39(1):77–89.
10. Khan MA, Ghouri AM. Environmental pollution: Its effects on life and its remedies. *Journal of Arts, Science and Commerce*. 2011; 2(2):276–85.