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# A STUDY ON ZERO LIQUID DISCHARGE OF TEXTILE SECTOR IN INDIA VIZ. ORDERS OF HONOURABLE HIGH COURT OF MADRAS

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## ABSTRACT

**Textile Sector in India is bringing foreign exchange. Foreign Exchange Reserves in India increased to 16573.40 INR Billion in December of 2013 from 16138.40 INR Billion in November of 2013. The textile sector is bringing more foreign exchange than many other sectors. The bleaching & dyeing units are generating trade effluents from their process activities. The Hon'ble High Court of Madras in WP No5494/1998 and 30153/2003 dt.14.7.2007 has ordered in its interim order that all dyeing units shall install electromagnetic flow meters, operate their effluent treatment plants (ETPs) and recover water, properly manage reject and ceases discharge into water body/land and have their records maintained as directed by the Tamil Nadu Pollution Control Board. It means that all dyeing units to provide and operate the Reverse Osmosis (RO) system and Reject Management System (RMS) so as to achieve Zero Liquid Discharge (ZLD) at Erode and Namakkal districts. Similar order is issued by the Hon'ble High Court of Madras to Tirupur district also. The Hon'ble High Court of Madras orders may require certain modifications. The RO and RMS are to be implemented all over India so as to maintain uniformity among the units so as to achieve techno economical feasibilities in their production.**

## INTRODUCTION

Textile Sector in India is scrambling. This consists of ginning units, spinning and weaving mills, sizing units and bleaching and dyeing units. The ginning, sizing and bleaching units are small scale units. The spinning and weaving units, composite bleaching and dyeing units belong to medium and large scale sector. Also, some of the bleaching and dyeing units belong to small scale sector.

The agricultural sector is in deep grievance due to failure of rain, increase in fertilizer/pesticides rates, and non-availability of labourers. The agriculture in India is diminishing trend against the increasing trend of population growth. Hence, the cultivation of cotton is reduced resulting in increase of cost of cotton. The cotton is the main raw material for the textile sector. As the cotton price is increasing the spinning mills are not viable to operate in India. It is an inconvenient factor to other units such as sizing, bleaching,

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dyeing and printing units and thereby reduction in production.

The units such as bleaching, sizing, printing and dyeing units have to provide treatment systems to treat and dispose the trade effluents from their process as per the provisions of the Water (Prevention and Control of Pollution) Act, 1974 and amended therein. For implementing the Water (Prevention and Control of Pollution) Act, 1974 State Boards have been formulated in respect of states and pollution control committee has been formed in the case of Union Territory. The above Board and the Committee are empowered to issue consent to the units for operation/establishment and also to monitor the units on environment angle.

All the State Boards and Union Territories have fixed standards for the effluents disposed arising from dyeing units after treatment. Zero Liquid Discharge (ZLD) describes a process that completely eliminates liquid discharge from a system. The goal of any well-designed ZLD system is to minimize the volume of wastewater that requires treatment, process wastewater in an economically feasible manner, while also producing a clean stream suitable for reusing elsewhere in the facility.

Interest in ZLD technology has grown in the industrial manufacturing sector over the past decade. Companies may begin to explore ZLD because of ever tightening wastewater disposal regulations, company mandated green initiatives and public perception of industrial impact on the environment, or concern over the quality and quantity of the water supply. The implementation of reverse osmosis (RO) system and reject management system (RMS) and intermittent power supply lead to paramount problems to units. As per interim order of the Hon'ble High Court of Madras in WP No5494/1998 and 30153/2003 dt. 14.7.2007, etc., all dyeing units to provide and operate the Reverse Osmosis (RO) system and Reject Management System (RMS) so as to achieve Zero Liquid Discharge (ZLD) at specific districts of Tamil Nadu viz. Tirupur, Namakkal and Erode only. The Hon'ble High Court of Madras has issued orders to implement ZLD systems as decree to cases filed by farmers in Tirupur and Erode districts. The Hon'ble Supreme court of India has upheld the Hon'ble High Court of Madras orders. In this case the other districts units in Tamil Nadu and other States units of India are not implementing the ZLD systems resulting in partiality among the units. A common order is required in the case of the ZLD systems.

## MATERIALS AND METHODOLOGY

The ZLD System removes dissolved solids from the wastewater and returns permeate water to the process, i.e. the permeate water is recycled. Reverse osmosis (membrane filtration) may be used to concentrate a portion of the waste stream and return the clean permeate to the process. In this case, a much smaller volume (the reject) will require evaporation, thus enhancing performance and reducing power consumption. In many cases, falling film evaporation is used to further concentrate the brine prior to crystallization.

Falling film evaporation is an energy efficient method of evaporation, typically to concentrate the water up to the initial crystallization point. The resultant brine then enters a forced-circulation crystallizer where the water concentrates beyond the solubility of the contaminants and crystals are formed. The crystal-laden brine is dewatered in a filter press or centrifuge and the filtrate or concentrate (also called "mother liquor") is returned to the crystallizer. The collected condensate from the membranes, falling film evaporator and forced-circulation crystallizer is returned to the process eliminating the discharge of liquids. If any organics are present, condensate polishing may be required for final cleanup prior to reuse.

In simplicity the ZLD means there should not be any discharge of treated/untreated trade effluents outside the premises; the treated trade effluent is to be reused completely in its process and only about 10% of the reject is to be discharged to Solar Evaporation Pan (SEP) constructed scientifically as per the Central Pollution Control Board (CPCB) norms. The SEP may not give way to seepage to the underground strata.

The Hon'ble High Court of Judicature, Madras has ordered in various cases filed by the public for zero disposals for the dyeing units in Erode, Namakkal, Tirupur districts of Tamil Nadu State. The Water (Prevention and Control of Pollution) Act, 1974 is a Central Act and the Hon'ble High Court of Judicature, Madras is a common body governed by the Hon'ble Supreme Court of India.

The Act is applicable to whole India except few areas, but the mode of disposal of the treated trade effluents is varied from state to state. When a dyeing unit at Erode district or Namakkal district or Tirupur district of Tamil Nadu is achieving zero liquid discharge by providing primary, secondary and tertiary treatment including advanced treatment of Reverse

Osmosis (RO); the other district dyeing units are disposing the treated trade effluents into the lands/sewers/rivers/sea as per the consent order conditions. The units which are achieving ZLD are not in a position to operate the units since the operation by achieving ZLD is commercially not viable. The units which are disposing the treated trade effluents outside the premises as per the Pollution Control Board/Pollution Control Committee consent order conditions are in operation with viability. Thus, the industries located in Erode, Tirupur and Namakkal districts are mostly achieving ZLD; but the units located in other parts of the India are not compelled to achieve ZLD. Hence, it appears that there is a partially between the states/union territories and even within the states.

Among the textile sector units bleaching and dyeing industries are generating heavy quantity of trade effluents from their process. Among the bleaching & dyeing industries; dyeing units are discharging high level of pollutants and the bleaching units are generated medium pollutants to the environment. These bleaching and dyeing units are having either Individual Effluent Treatment Plants (IETPs) or Common Effluent Treatment Plants (CETPs) to treat and dispose the effluents from their member units. At all other states of the India too these units have provided treatment systems; but no ZLD system has been provided properly. Also, there is no court order to implement the ZLD in other states and part of districts in Tamil Nadu.

The cost of installation and annual operation cost of the ZLD system and non-ZLD System for 100 cum./day are arrived as in Table 1.

From the above table it is ascertained that cost per litre of the effluent is 7 paise in the non-ZLD system where as the cost per litre of the effluent is 30 paise in the ZLD system for operation apart from the installation cost. The installation cost is very high in the case of the ZLD system and operation of the ZLD system is also very tedious. The cost of the treatment is increasing year by year as shown in the graph.

Even though the discharge standards are very stringent the actual characters of the effluent discharged from the bleaching and dyeing units are slightly higher than the TNPCB standards as shown in the following table. Hence, the ZLD system is the best treatment to contain the pollution.The treated trade effluent in non-ZLD System is having the characteristics furnished in Table 2.

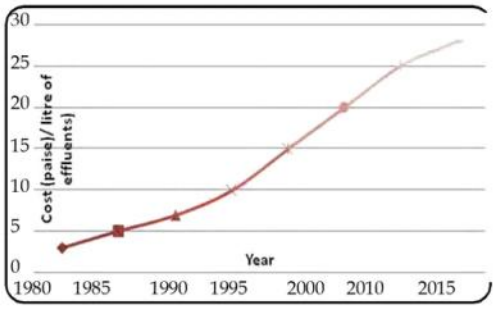


**Fig. 1** Increase in treatment cost

In Tamil Nadu districts viz., Tirupur, Karur, Erode, Namakkal, Salem, Virudunagar and Madurai are having bleaching and dyeing industries totalling to about 2500 Nos. In India the States such as Gujarat, Karnataka, Kerala, Madyapradesh etc., are operating the bleaching and dyeing units. In India about 10,000

**Table 1.** Comparison of cost of installation for ZLD and non-ZLD systems

| S.No. | Details | Non -ZLD System Cost Rs. lakhs | ZLD System Cost Rs. lakhs |
|---|---|---|---|
| 1. | Installation cost | 50 | 200 |
| 2. | Lime | 2 | 3 |
| 3. | Ferrous sulphate | 2 | 3 |
| 4. | Polyelectrolyte | 3 | 5 |
| 5. | Power | 4 | 12 |
| 6. | Fire wood | -- | 4 |
| 7. | Lab chemicals | 1.0 | 4 |
| 8. | Membrane change | -- | 10 |
| 9. | Permeate water reused | -- | (-)0.5 |
| 10. | Salt reused | -- | (-)0.50 |
| 11. | Salary | 4.50 | 16 |
| 12. | Repair & maintenance | 3.50 | 8.0 |
| 13. | LS | 1.0 | 6 |
| | Total excluding installation charges | 21.0 | 72.0 |

**Table 2.** Characteristics of treated effluent in non-ZLD systems

| Sr. No. | Parameters | Actual analytical report (mg/L) | Inland surface water standards of TNPCB (mg/L) |
|---|---|---|---|
| 1 | pH | 7.5 | 5.5-9 |
| 2. | TSS | 150 | 100 |
| 3. | TDS | 2500 | 2100 |
| 4. | BOD | 100 | 30 |
| 5. | COD | 300 | 250 |
| 6. | Chloride | | 1000 |
| 7. | Sulphate | 1500 | 1000 |
| 8. | Nickel | 3.5 | 3 |
| 9. | Chromium (Cr6+) | 0.20 | 0.10 |
| 10. | Lead | 0.30 | 0.10 |

Nos. of bleaching and dyeing units are functioning.

## RESULT AND DISCUSSION

The cost of treatment for primary, secondary and territory excluding advance treatment of R.O. system for bleaching and dyeing units are worked out to be about 7 paise per litre; but for including RO systems and Reject Management Systems (RO & RMS) the cost is increased to about 30- 45 paise per litre. It is the fate of the units which have provided with RO systems and Reject Management Systems. But, there is no doubt that the ZLD System is technically feasible; the cost is the constraint. If the ZLD system is provided, operated continuously and efficiently there is no doubt that the pollution load discharged into the environment is reduced 90% comparing the non-ZLD system.

### Advantages and disadvantages of the ZLD System

#### Advantages

1. Natural water source utilisation is reduced 90 %
2. Salt used in the dyeing process is recovered and reused
3. Permeate water is collected and reused
4. Export order to the companies are increased
5. The Government departments' licences are issued in time
6. No public complaint against the ZLD units
7. No discharge of the waste water into the environment and pollution is reduced

#### Disadvantages

1. Installation cost is high
2. Operation cost is high
3. Power requirement is high
4. RO membrane is to be changed frequently and the cost is high
5. Skilled labours are required for operation of the ZLD systems

### Environment and Sustainable Development (ESD)

Due to the discharge of untreated/partially treated effluents into the environment the receiving body is polluted continuously. The pollutants lead to bio accumulation and bio-magnification and affect the organisms. Sustainable development is required. The sustainable development involves the economic and social development of a country, without-out exhausting the natural resources on which present and feature generation depend. The ESD focuses on these areas to build a relationship between the community and the environment, which is precisely in consonance with natural environment policy and agenda 21 of UNCED. To achieve the goals environment pollution is to be contained by adopting high technology in which the Governments, industrial entrepreneurs and public join together. The treatment and disposal of the pollutants is to be given paramount important to achieve sustainable development and to eradicate the environmental degradation.

## CONCLUSION

Therefore it is concluded that a common rule may be framed all over India to bleaching and dyeing units so as to follow by the said industries which may disappear the partiality shown among the bleaching and dyeing units state to state. The rules shall be notified by the Central Government or by the Central Pollution Control Board. The Hon'ble Supreme Court of India may also pass orders in the cases pending before it. If the ZLD systems are provided, operated continuously and efficiently all over India there is no doubt that the pollution load discharged into the environment is reduced 90% and the country will go towards the sustainable development.

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