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ZERO LIQUID DISCHARGE IMPLEMENTATION IN TEXTILE INDUSTRY- CHALLENGES AND WAY FORWARD

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ABSTRACT
Zero Liquid Discharge (ZLD) is an ideal situation of complete closed loop cycle, where discharge of any liquid effluent is eliminated; it is a remarkable effort of every industry who implements it to meet with the environmental regulation in a challenging way. For achieving ZLD system for the industry, certain steps are needed to be taken. These steps include: Analysis of major characteristics of all influent streams entering into ETP, Identification of potentially recyclable streams and highly polluted stream, Segregation of streams on the basis of their characteristics and applicability of 4R (Reduce, Reuse, Recycle and Recover) principle in particular plant. This concept of ZLD is to be implemented in textile industry as India is largest exporter of yarn and finished clothes. Telangana is one of the largest cotton producing states with a large textile industry. This paper will highlight the need for a ZLD based system this will look at the implementation issues regarding textile industry and also look at how water bodies are being destroys owing to the fact of harmful effluents are released. Based on all studies and results of experiments, methodology would be suggested to achieve ZLD in Textile industry.

1. INTRODUCTION

1.1. BACKGROUND

With over 1.2 billion people or 18% of the world's population1, India is the second most populated country in the world and has the potential to be the world's second largest economy by 2050. This is a tremendous challenge considering that India has merely 4% of the world's renewable water resource. Population increase and economic growth imply greater demands for natural resources and even greater challenges to deal with increased pollutions and to mitigate environmental degradation. The Twelfth Five Year Plan (2012-2017) aims to reverse the observed deceleration in growth and return to nine per cent growth by the end of the period in order to realise the vision of 'Faster, Sustainable, and More Inclusive Growth'.Water risks will largely influence India's ability to realise its development vision. About 50 per cent of annual precipitation occurs only in 15 days in a year. Currently, one third of the region lies in water- scarce areas with water availability of less than 1000 m3/person/year. By 2030, India will face 50% aggregate gap between water availability and water demand. India's aspired growth will further strain water availability and brings about further challenges of allocating water among different types of users. Climate change and variability will render even more erratic distribution of precipitation over time and region in India and impose higher water-related risks, such as floods, droughts, and storms. The increasingly scarce resource will make water allocation a very sensitive issue. If trade-offs are not managed well, increasing conflicts among different groups of water users can take place. To a large extent, the mismanagement of water resources has exacerbated the problems of water scarcity and variability, leading to critical situations in many parts of the country. Leakage and inefficiencies in the water supply system account for nearly 50 percent of municipal water use. Over 70 per cent of surface and groundwater resources are contaminated. Low awareness about water scarcity and its social economic values as well a lack of a harmornised perspective in planning, management and the use of water resources underlie this mismanagement. Textile industry is one of the oldest as well most important industries in Indian economy. It accounts for around 2% of GDP, 8% of excise and customs revenue collections, 14% of the industrial production and 12% of the total manufacturing export earnings. The sector employs nearly 35 million employees and it is the second-largest employment generating industry in both rural and urban areas, after the agriculture industry. 6 Since Textile industry is highly water intensive and India had been identified as a highly water scarce region, the long term viability of the Indian Textile industry hinges heavily on sustainable water management in India. Water governance is the key to ensure that beyond the technical engineering solutions, there exists supporting systems of coordinated regulations, institutions and incentives to balance various needs for water.

1.2.OBJECTIVE

This report aims to:

a) Assess physical and regulatory water risks pertaining to the Textile industry in India.

b) Investigate water governance landscape in relation to the Textile industry in India.

c) Implementing ZLD technology in sustainable water management in the Textile

industry in India

2. TEXTILE INDUSTRY IN INDIA

2.1. India's Textile Industry

The significance of the Textile Industry Globally, India is the biggest exporter of yarn in international market and has a share of 25% in the world yarn export market and has a share of 12% in yarn and Textile fiber production in the world. India has the highest capacity of loom and has a share of 61% in the world loomage. India has seen the highest growth as the world's third largest Textiles and clothing exporter (after China and EU28) with 23% growth 2013. 11 Export values of the Textile and clothing industry has grown rapidly in the past 15 years from US$ 10.33 billion in 2000 to US$ 36.08 billion in 2014, contributing to 11.2% to the national total merchandise exports. A number of factors that make India outshine in Textile industry are low cost skilled manpower, availability of cheap raw material, availability of numerous varieties in cotton fiber, a big and potential national and international market and independent Textile industry (Dey and Islam 2015). Nevertheless, its environmental and social sustainability constitute the key challenges of the industry. With a long and complicated supply chain, the industry affects the environment adversely at each stage of the supply chain process. In terms of resource use, freshwater, energy, and other valuable resources are consumed during the manufacturing process. The most significant effects of the Textile industry to the environment are air and water pollution. Most of the water used in the manufacturing is returned to nature elsewhere; the demand affects local availability for other users. In most places where Textile production takes place today, the competition for freshwater between different sectors in society increases rapidly. A large amount of wastewater is generated especially in the dyeing and bleaching processes resulting in polluted effluents that often end up in water bodies. The Textile sector is one of the major industrial polluters, especially due to the many micro, small, and medium sized factory units.

The Outlook for Sustainable Textile Industry The government aims to increase Textile export growth from currently 6-10% to 15-20% by 2019 and to increase export value of Textile and clothing to around US$64 billion by 2017. This goal will be achieved through a number of key initiatives, such as improving competitiveness by upgrading infrastructure to increase labour productivity; Integrated Skill Development Scheme for capacity building of the Textile work force; overall development of the industry through e.g. modernisation and technological upgrade and setting up integrated Textile parks. Some incentive schemes have been established to support those key initiatives, for instance the Technology Upgradation Fund Scheme (TUFS). In essence, the government puts an emphasis on Skill, Scale and Speed – Make in India – Zero defect and Zero effect. The policy on Zero Liquid Discharge (ZLD) for the Textile industry was already started in Tamil Nadu back in 2008. Many businesses were shut down by the order of the state's High Court due to their inability to meet compliance requirements. Surviving businesses set the benchmark on operating with very limited amount of water. ZLD policy has now been expanded to cover nine states along the Ganges basin and applied to five sectors – Textile, pulp and paper, distilleries, tanneries, and sugar – with varying compliance timeline. For the Textile industry, the sector is expected to meet compliance by December 2016.Further details on the ZLD policy are on water governance landscape. India's Textile sector needs a long term roadmap for sustainable growth and increasing competitiveness across each part of the Textile industry value chain. The national Textile policy should provide such a roadmap and have an integrated policy that improve the competitiveness and remove barriers across the diverse 113 Textile clusters across the country. This competitiveness also entails environmental sustainability that meets international regulations for export markets as well as domestic regulatory requirements.

2.2. Textile Industry Water Use In India

Textile Industry as a Large Water User and Pollutant Source The Textile industry is a major contributor of water pollution and is also one of the most water intensive industries known. This issue of water pollution and scarcity, which tags along with the process of wet processing in the Textile industry, is highlighted in a study by the Centre for Science and Environment (CSE). The study estimated that the water consumption by the Indian Textile industry alone is about 200-250 m3/ tonne cotton cloth of water in comparison to the global best of less than 100 m3/ tonne cotton cloth.16 As the Textile industry has a fairly complex supply chain, it is important to understand this supply chain in order to address the water management challenges and to increase the sustainability of the production line. In building the awareness regarding cleaner production in the Textile industry, CSE has done a collaboration with the Swedish Environmental Protection Agency (Naturvårdsverket). This collaboration entails capacity building programme of government officers on environmental governance and producing a film on the Swedish experience in shifting to environmental-friendly Textile production. The production of finished Textile product from fibre involves a long, complicated process comprising of many processes and different permutation and combination of separate processes. Textiles can be broadly classified into three groups

depending on the end use: 1) fashion and clothing; 2) industrial and technical; and 3) furnishing and domestic. Textile production can be vertically and horizontally designed depending on whether all parts of production are done by the one company or different companies specialized in specific aspects of the production. This specialisation is greatly influenced by the industrial history and geographical location of the companies. The supply chain for the industry is sketched below. The wet processing unit of the industry is the most water intensive and has the highest pollution potential. This is the chain that requires most intervention to improve its water management.

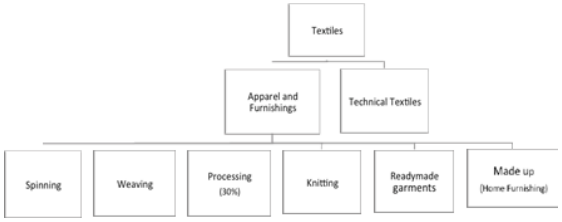

Figure 1 Supply Chain Components for Textile Industry

Textile Industry Wastewater Characteristics

The effluent characteristics for the industry varies based on many factors like the raw materials used, process involved, products manufactured, geographical conditions, and so forth. The average Textile effluent characteristics as per the data available are tabulated below.

Table 1 Textile Industry Effluent Characteristics

Parameter	Units	Standard as per EPA, 1986	Average values
Colour	-	To be removed as much as possible	Colourless
Total Dissolved Solids	mg/l	-	1778
Total Chromium (as Cr)	mg/l	2	Not Detected
pH		5.5 – 9	7.3
Biological Oxygen Demand	mg/l	30	18
Chemical Oxygen Demand	mg/l	250	160
Oil and grease	mg/l	10	6
Total Suspended Solids	mg/l	100	25
Free Residual Chlorine	mg/l	1	Not Detected
Sulphide (as H_2S)	mg/l	2	Not Detected

CONCLUSION

As outlined in the first chapter, this report aims to look at the physical and regulatory water risks as well as the water governance landscape pertaining to the Textile industry in India, with a special focus on the Hyderabad-Warangal cluster in the state Telangana. Based on the desk research as well as interviews to the stakeholders, the report finds that:

1) To a large extent, the key physical water risks related to the Textile industry at the national level are similar to those at the state level and even at the industrial cluster level. The main physical water risks are:

a. Increasing gap between the supply and demand of freshwater that are required to underpin the growth and ambition of the Textile industry.

b. Declining groundwater table due to overexploitation of the resources.

c. Degrading water quality both for surface water and groundwater.

d. Suboptimal performance of existing individual ETPs or CETPs.

There is a vicious circle between declining groundwater table, degrading water quality due to increased salinity or pollution, higher costs of water use in the Textile production due to either declining water table or degrading water quality, and sub-optimal effluent treatment by the industry. It is clear that appropriate intervention is needed to address each of the key water risks and break the vicious circle.

2) The government, both at the national and state level, has had in place a water governance landscape with a broad coverage regarding the types of key actors and their responsibilities, existing laws and regulations, as well as progressive initiatives at the national and state level.

The institutions involved in the governance of water for Textile industry entail beyond the typical line ministries in charge of water resources, but also the Ministry of Textile and the Ministry of Law and Justice. The initiatives target not only the monitoring of the situations of the water resources (both quantity and quality) and stringent effluent standards, but also on upgrading technologies for cleaner production, including efficient water use and effluent treatment at Textile unit as well as at industrial parks.

3) Lack of good water governance contribute to regulatory water risks in the form of:

a. The gap between industry readiness in practice and the expected performance of the industry as required by the regulations, especially but not limited to the small scale industry.

b. Some regulations have not been able to keep up with the fast pace of degrading quantity and quality of water resources, which require timely adjustment of the regulations so as to provide incentives for improved water management by the industry. For example, water price for water abstraction by the industry that does not substantially change over time despite increasing water scarcity; and CETP that allows effluent with high TDS, which ultimately contribute to the suboptimal performance of CETP.

c. Lack of good governance capacities, especially with regard to coordination across government agencies and lack of transparency and accountability in the implementation of the regulations and initiatives. This will add not only higher

costs to the industry and also demotivate the industry in adopting cleaner technologies for better water management in their production processes.

4) The ZLD policy as the most ambitious initiative that the Government of India has launched in terms of sustainable water management has been seen both as opportunities and risks by the stakeholders, especially the affected industry, under the implementation challenges regarding financing, technology and space availability.

RECOMMENDATIONS

Based on the findings of the report and the inputs from the capacity building workshop, the report suggests the following priority areas for capacity building in view of improving industry's readiness toward the ZLD policy:

1) Assessment of appropriate financial instruments and mechanisms to catalyse faster adoption of cleaner technology for the industry, especially for the small scale industry considering its importance in generating employment.

2) Development of guidelines for selecting cost-efficient and appropriate technology for the industry with regard to the scale, characteristics, and production line of the Textile units. The guidelines can facilitate a rapid development of customised or mixed solutions for Textile units. The assessment shall employ Cost Benefit Analysis of potential solutions, including the construction of new ETPs or CETPs or improvement of existing ETPs/CETPs that are suitable to local conditions and current water risk challenges, especially in the view of limited space availability.

3) Improving the skills in operating cleaner production processes and effluent treatment plants, through capacity building activities across the industry. STWI Projects has undertaken such workshops but this needs to be replicated on a wider scale across the industry.

4) Improving communication and harmonisation of regulations across government agencies in order to expedite:

a) learning of best practices from other states (e.g. Tirupur) or countries; b) enhance the efficacy of regulations.

5) Enhancing good water governance through better transparency and accountability of decision making processes as well as the implementation of various initiatives related to the ZLD policy.

6) Financially incentivize uptake of wastewater as make-up water.

7) Need to create standards for water consumption.

8) Test technologies on pilot basis and create a standard user manual to ensure usage of clean and efficient technologies.

9) Individual ZLD facilities are more preferable than common facilities.

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