Towards water Sustainability-A Case Study Of Common Effluent Treatment Plant

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ABSTRACT
Environmental Pollution is a topic of great concern in the present conditions prevailing in the rural as well as urban India. There are different types of environmental pollution such as air, water, noise, soil etc. these pollution types pose a great threat to the human life as well as of the flora and fauna. Amongst them, water pollution is a serious problem witnessed in the developing regions where a large number of small scale industries, medium scale industries as well as large scale industries are in operation. The effluents from these industries contain different types of pollutants and thus the effluent should be properly treated in an ETP so that it can be discharged into the natural streams safely. And also as per the Water Act of 1974 and its subsequent amendment in 1988 these industries were compelled to meet the stringent effluent discharge norms set up by the Central Pollution Control Board (CPCB) and the State Pollution Control Board (SPCBs). However such ETPs cannot be afforded by each and every individual small or medium scale industries due to the heavy cost. Thus the need for a CETP i.e. Common Effluent Treatment Plant was felt.

Keywords:
Environmental Pollution, Different types of pollutants, CPCB, CETP

I.INTRODUCTION

Taloja CETP Co-operative Society Ltd. has cluster of 1036 Member Industries. These units are mainly involved in manufacturing of viz. chemicals, Bulk drugs, drug Intermediates, Fertilizers, Glass, Petrochemicals, Pigments, Dyes and Intermediates, Specialty chemicals, Engineering and Textile, Food and Fish processing. The product range results in a set of individual effluents, which have to be provided for a combined treatment. Under the guidelines from Ministry of Environment & Forests, New Delhi, the Common Effluent Treatment Plant facility for industries in Taloja MIDC area was proposed in 1994. The CETP initially was conceptualized for Small Scale Industries considering their space, financial and technical constraints of effluent treatment. Later on the large and medium scale industries were made the part of CETP due to common effluent collection and disposal line and considering their treated effluent as a dilutant of effluent to make the treatment scheme feasible.

II. LITERATURE REVIEW

1. Mohd Fahrul Hassan, Muhamad Zameri Mat Saman, Safian Sharif. Badrul Omar (2012): Since the development of engineered, discrete and physical products is the major cause of today's environmental problem in over the world, many approaches have been introduced to make a more sustainable product. To design new sustainable products, which may have several important sustainability concerns refer to environment, economic and social aspects, selecting the highest sustainability index among the new products generated is a multi-criteria decision-making problem.

2. Marc A. Rosen and Hossam A. Kishawy(2012): An investigation is reported on the importance of integrating sustainability with manufacturing and design, along with other objectives such as function, competitiveness, profitability and productivity. The need of utilizing appropriate tools like design for environment, life cycle assessment and other environmentally sound practices that are cognizant of the entire life cycle of a process or product is highlighted.

3. Marcus Wagner (2005): This paper discusses the relationship between environmental and economic performance and the influence of corporate strategies with regard to sustainability and the environment. After formulating a theoretical model, results are reported from an empirical analysis of the European paper manufacturing industry.

4. Hameed O. Adebambo, Hasbullah Ashari & Norani Nordin (2014): Theoretical evidence shows that a considerable amount of attention has been given to environmental issues in academic researches in the past years and the link between sustainable environmental practices and firm performance remains inconclusive. This study investigates the moderating effect of environmental regulation on the relationship between sustainable environmental manufacturing practices and firm performance.

5. Vestal Tutterow (2007): This paper will discuss the best practices of organizations that have ingrained sustainable practices throughout their organizations, as well as their experiences balancing the triple bottom line. The paper will examine barriers and opportunities encountered by organizations when considering sustainability programs. Costs and benefits – financial and other – that facilitate and impede sustainability actions will be examined.

6. Dr. MD. Zulfequar Ahmad Khan (2013): To project or forecast the human consequences of global change at some point in the relatively distant future, one would need to know at least the future state of the natural environment, social and economic organization and the responses that humans will have made in anticipation of global change or in response to on going global change.

7. K. Muduli and A. Barve(2011): All the activities involved in extraction, production and distribution contribute to environmental concerns**.**Traditional supply chains which were only acting as links that connect organization**'**s inputs to its outputs have extended their operations to meet various challenges of lowering costs, ensuring timely deliveries, reducing adverse environmental impacts and waste disposal to satisfy regulators, customers and environmental advocacy societies**.** The economy is often given priority in policies and society and environment are neglected by the extractive industries**.** However these three factors are interconnected and balance between these three is essential to attain sustainable development**.**

8.Risto Rajala , Mika Westerlund , Tommi Lampikoski(2016): The findings delineate the change in the company's business model, stressing the role of managerial agency in organizational identity formation and in making a favourable change in the ecosystem. Hence, the study examines the links between managerial agency, organizational identity, and business ecosystems with regards to business model greening, and it discusses how shifts in managerial thinking have enabled the company to build the capabilities needed for the change. The article concludes by linking the findings to the body of knowledge on strategic change and providing a new conceptualization of a company's business model greening.

9.Bulent Sezen, Sibel Yildiz Cankaya(2013): Firms have had to review their production processes as a result of pressures from the community and governments. This pilot study investigated the influence of green manufacturing and eco-innovation on corporate sustainability performance (economic, environmental, and social). Data were collected through a questionnaire-based survey across 53 companies from automotive, chemistry and electronic sectors in Turkey. The empirical model was tested using regression analysis, to verify the hypothetical relationships of the study.

10. I.D.Paul, G.P.Bhole, J.R.Chaudhari(2014): The paper gives the survey of green manufacturing, what is green manufacturing why it is needed and methods of green manufacturing that reduces the waste and even pollution. The paper focus on the green design for environment of green manufacturing system, energy conservation, development of product with less wastage. The paper also highlights the use of green manufacturing to form a sustainable product and to reuse the product, shorter life cycle.

III. PROBLEM DEFINITION AND OBJECTIVES:

The area of study selected in the present investigation is Kasardi River which receives heavy discharge of waste effluent from the nearby Taloja industrial belt which is one of the fastest developing industrial belt of Mumbai. It was observed that concentration of most of these heavy metals are much higher than the maximum permissible limits. These heavy metals have created threat to the aquatic life and through bio magnifications may enter the food chain thereby affecting the human beings as well. The research work is extended further to study the physico-chemical properties like temperature, pH, solid content, chloride, oil / grease content, BOD and COD values of the river water. The study points out that as India moves towards stricter regulation of industrial effluents to control water pollution, there is a need to implement common objectives, compatible policies and programmes for improvement in the industrial waste water treatment methods. Objectives can be summarised as:

1. Determination of sustainability indices
2. Optimization of parameters using PAC dosing technique
3. Determination of various parameters like pH, COD, BOD
4. Determination of other parameters like Oil/Grease, TDS, TSS

IV. RESEARCH METHODOLOGY

Stepwise Treatment Process:

Step1:The waste water effluents which are being generated from the different industries in the Taloja MIDC area is collected in two effluent collection sumps located at two different phases, Phase I and Phase II. This effluent is collected by means of a closed pipe line by flow of gravity.

Step2: The effluent from the collection sump at the Phase II is subjected to Preliminary treatment by passing the effluent through Grit chamber for the removal of grit particles, Mechanical bar screens for the removal of large size matter and Oil and Grease Traps provided with oil skimmers for removal of oil and grease.

Step3: The effluent is then pumped to the collection tank at Phase I through a HDPE pipeline.Now this effluent is then treated in two separate plants viz. Plant I and Plant II.

A. Plant-I

Primary Treatment:

- The effluent flows by gravity to the equalization tank(2Nos.)of capacity10000cu.m which is being used to dampen the variations in the quality and flow rate.In order to keep the effluent suspended solids away from settling and to ensure proper mixing, floating aerators are installed. The pH correction is carried out in the same tank.
- The effluent is being pumped to flash mixer wherein PAC is dosed for rapid mixing and led to Clariflocculator to flocculate & settle suspended solids as well as remove certain portion of organic matter.
- The Suspended Solids settle down in Primary Clariflocculator of capacity1356cu.m leaving the clear supernatant flow from the weir to get the primary treated effluent.

Secondary & Tertiary Treatment*:*

- The primary effluent then goes to Aeration Tank of capacity 9000cu.m for secondary biological treatment. The settled sludge is scrapped with scrapper mechanism and pumped to Sludge sump which is further dewatered with centrifuge decanter.The filtrate is taken to Equalization tank for further treatment.
- In Aeration Tank, the Biomass is developed which is the

culture of aerobic bacteria. The oxygen required for bacteria is supplied by diffused aeration system.The bacteria consume the organic matters present in the effluent as the source of their food producing the new bacterial cells and Carbon Dioxide and water as by-products.

- The over flow of Aeration Tank goes to Secondary Clarifier where Biomass (MLSS) settles down leaving clear supernatant at the top, which is treated water.The settled sludge is partially recycled back to Aeration Tank for maintaining the MLSS concentration and partially wasted in Sludge sump and treated with primary sludge.
- The clarified water is discharged to the disposal sump.

Plant-II:

Primary Treatment:

- The effluent from the collection tank is pumped to the equalization tank having capacity 6000cu.m through neutralization channel which is being used to dampen the variations in the quality and flow rate. In order to keep the effluent suspended solids away from settling and to ensure proper mixing, coarse diffused aeration is provided. The pH correction is carried out in the same tank.
- The effluent by gravity goes to flash mixer where in PAC is dosed for rapid mixing and led to Clariflocculator to flocculate & settle suspended solids as well as remove certain portion of organic matter.
- The Suspended Solids settle down in Primary Clariflocculator leaving the clear supernatant flow from the weir to give the primary treated effluent, which goes to Aeration Tank for secondary biological treatment.

Secondary and Tertiary Treatment:

- The settled sludge is scrapped with scrapper mechanism and pumped to Sludge sump which is further thickened in and dewatered with Centrifuge Decanter. The filtrate is taken to Equalization tank for further treatment.
- In Aeration Tank ,the Biomass is developed which is the culture of aerobic bacteria.The oxygen required for bacteria is supplied by diffused aeration system.The bacteria consume the organic matters present in the effluent as the source of their food producing the new bacterial cell sand Carbon Dioxide and water as by-products.
- The over flow of Aeration Tank goes to Secondary Clarifier of capacity 2120 cu.m where Biomass(MLSS) settles down leaving clear supernatant at the top, which is treated water. The settled sludge is partially recycled back to Aeration Tank for maintaining the MLSS concentration and partially wasted in Sludge sump and treated with primary sludge.
- The clarified water is discharged to the disposal sump.

V.RESULTS AND DISCUSSIONS

Assessment of wastewater quality is necessary when reusing the water for crop irrigation or leaving it in flowing water. It plays vital role in environmental sustainability because while maintaining the manufacturing excellence we should take care of aquatic life also. Industrial Effluents entering the water bodies is one of major sources of environmental toxicity. It not only affects the quality of drinking water but also has deleterious impact on the soil micro flora and aquatic ecosystems. Performance of the CETP plant is studied by analyzing samples collected over three months.

1.pH:
Already the waste water was having very high pH value, so it was very impossible to leave such acidic or alkaline water in clean river water in order the save the aquatic life. So it is always properly maintained. The calculated value of pH is 5.5-9.0.

2. COD:
This is the Chemical Oxygen Demand and the maintained value is 250mg/lit.At first it was very high that is 600-800mg/lit.

3. BOD:
This is the Biological Oxygen Demand and after the analysis we maintained it to 100mg/lit

4 .Oil/Grease:
If the amount of oil or grease like particles is more in the treated water, we cannot use such water for any purpose like irrigation or drinking even. So in the CETP plant this value is regulated up to 10mg/lit.

5. Total Suspended Solid (TSS):
These are the colloidal impurities present in the waste water so has to analyze well. And its value should not exceed 100mg/lit

6. Total Dissolved Solids (TDS):
These are the dissolved impurities present in the waste water so has to analyze well. And its value should not exceed 100mg/lit

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