ASSESSMENT OF INDUSTRIAL WASTEWATER QUALITY AND MANAGEMENT

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ABSTRACT

Wastewater is being considered a highly valued water source for irrigation. In this paper, an attempt is made to assess the quality of effluent from Oil & Cattle feed industry in Nanded MIDC region has analyzed during the study period of year 2011 to 2012. The region located on the bank of river Godavari. In this investigation the collected samples were tested for following parameters such as alkalinity, chloride, hardness, total dissolved solids, total suspended solid, pH, electrical conductivity, sulphate, sodium, potassium, biochemical oxygen demand and carbon dioxide. It is necessary to analyze and treat the industrial wastewater because it may deteriorate the groundwater and soil. Also it causes surface water pollution due to its discharge. Except oil & grease all the parameters included in this study were found to be within prescribed discharge limits for industries.

Keywords: Industrial wastewater, Water Quality, Management, Agriculture

INTRODUCTION

Increased population, urbanization, improved living conditions and economic development have driven the generation of increased volumes of wastewater by the domestic, industrial and commercial sectors (Asano et al., 2007; Lazarova and Bahri, 2005). According to the United Nations World Water Development Report, industry accounts for 22% of all global water withdrawals. This varies from 59% in high income countries, to 8% in low-income countries. This is not as much as is used by agriculture, which accounts for about 50% of freshwater use. (Brenda and Lee 2009) In India, only 24 % of wastewater generated by households and industry is treated before its use in agriculture or disposal to rivers (Minhas and Samra, 2003). A large number of wastewater treatment plants dealing with the other one-third are not properly operated and maintained. The reality is that as much as two-thirds of the wastewater generated in the world receives no treatment at all. For example, less than 10% of the existing wastewater treatment plants in Mexico are estimated to be operating satisfactorily (Mario and Boland, 1999). One of the negative environmental impacts associated with wastewater use is groundwater contamination through high concentrations of nitrates, salts and micro-organisms (USEPA 1992).

Wastewater induced salinity may reduce crop productivity due to general growth suppression, at pre-early seedling stage, due to nutritional imbalance and growth suppression due to toxic ions (Kijne et al. 1998). Where exotic vegetables are produced for the market, farmers generally do not consume them and may not be aware of possible health implications from own experience (Drechsel et al., 2006). High levels of nitrogen in wastewater may result in nitrate pollution of groundwater sources used for drinking, which could lead to adverse health effects. Accumulation of heavy metals in soils and its uptake by plants is another risk associated with wastewater irrigation (Khouri et al., 1994). Waste discharged and unwanted materials, result inevitably from human activities, whether domestic or industrial. If wastes are allowed to accumulate on the ground, or if dumped indiscriminately into rivers and other bodies of water, unacceptable environmental problems would result (Eckenfelder, 2000). Major problems are due to wastewater containing heavy metals, toxic chemicals, chloride, lime with high dissolved and suspended salts and other pollutants (Uberai, 2003).

In developing countries like China, Mexico, Peru, Egypt, Lebanon, Morocco, India and Vietnam, wastewater has been used as a source of crop nutrients over many decades (AATSE, 2004; Jimenez and Asano, 2008). Therefore, agricultural use of untreated wastewater has been associated with land application and crop production for centuries (Keraita et al., 2008). Based on information from the countries providing data on irrigated areas, it is estimated that more than 4–6 million hectares (ha) are irrigated with wastewater or polluted water (Jimenez and Asano, 2008; Keraita et al., 2008, UNHSP, 2008). A separate estimate indicates 20 million ha globally, an area that is nearly equivalent to 7% of the total irrigated land in the world (WHO, 2006). In a new review integrating data from Jiménez and Asano (2008) and the UNHSP (2008), 46 countries report the use of polluted water for irrigation purposes. Across major cities in West Africa, between 50 and 90 % of vegetables consumed by urban dwellers are produced within or close to the city (Drechsel et al., 2006) where much of the water used for irrigation is polluted. In Pakistan, about 26% of national vegetable production is irrigated with wastewater (Ensink et al., 2004).

The objective of the present works to analysis and discusses the suitability of industrial waste water for agricultural irrigation.

Material and Method

Study Area

The Nanded is located between 18°.15' and 19°.55' North latitude and 77°.7' to 78°.15' east longitudes. The district has a geographical area of 10528 Sq. Km. Nanded is one of the fastest growing city of Marathwada region of Maharashtra.

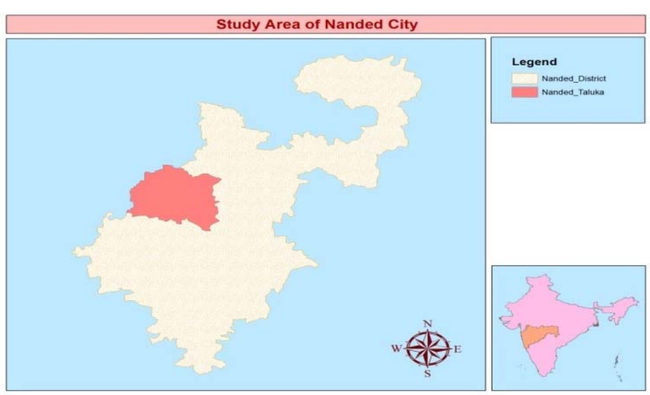


Figure: 1.1 Showing study areas map of Nanded Taluka

Site and Field Selection:

Two sites and three fields were selected to monitor irrigation and nutrient applications and heavy metal build up. Since wastewater which is coming from oil & cattle feed industry which is used in surrounding agriculture area near Vasarni Nanded. The main wastewater had received over a period of thirty years, from the Cattle feed industries which located in (MIDC) Maharashtra & Industrial Development Corporation of (CIDCO) City and Industrial Development Corporation of Maharashtra New Nanded.

Sampling Methods:

For the present investigation the effluent samples were collected from local cattle feed industries, situated in MIDC of Nanded. The physical and chemical parameters were analyzed as per Standard Methods for the Examination of Water and Waste Water, 17^{th} edition, APHA (1989). Sampling was done three times in the year at morning in 2011-12. The pH, temperature, dissolved Oxygen, and Total Dissolved Solids were determined on the spot rest of the parameters were analyzed in the laboratory by standard methods.

Results and Discussion

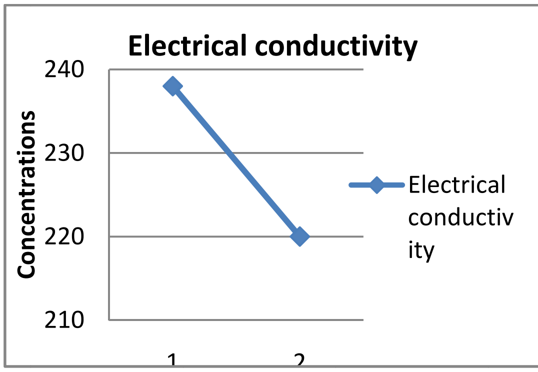
In this study water samples were analyzed from industrial wastewater. The number of physical parameters like total solids, total dissolved solids, Electrical conductivity, and colour was measured. The chemical parameters estimated like pH, carbon dioxide, total hardness, phenolphthalein alkalinity, total alkalinity, salinity, total acidity, oil & grease. Also some ionic parameters like chloride, phosphate, sulphate, calcium, magnesium, sodium, potassium, fluoride, iron, chromium and manganese were determined. Biological properties like standard plate count and most probable number were performed. All effluent samples were blackish in colour. The pH of waste water varies from 6.9 to 8.7 and temperature 20^{o}C to 30 ^{o}C. The total dissolved solid is in the range of 784 to 1730 mg/Lit.

In the present study the data revealed that there were considerable variations in the quality with respect to their physicochemical characteristics. The average value of various waste water quality parameters had been mentioned in Table 1 and represented in graphs. This paper has describes the strong links between wastewater use and management.

Management of Wastewater

By using this wastewater poor farmers can make irrigation in their respective lands. This management approach is applied to our study area in Nanded city. Similar results were found for wastewater irrigation in many countries like Nepal, Cambodia, India, Pakistan and Vietnam etc. In Quetta, Pakistan, farmers paid 2.5 times more for wastewater than for freshwater (Ensink et al., 2004).

The most important benefit to farmers in this semi-arid region is the reliable supply of wastewater, which allows them to grow high-value vegetable crops or agriculture. The wastewater supply runs continuously throughout the year and farmers not only have their own turns in using it, but can also exchange turns with each other to make water availability more responsive to crop water requirements. However, at the tail end of irrigation systems or throughout in the dry season, wastewater may be the only water flowing in the canals in areas such as Haroonabad in Pakistan and Hyderabad in India (Ensink et al., 2004; Ensink, 2006).



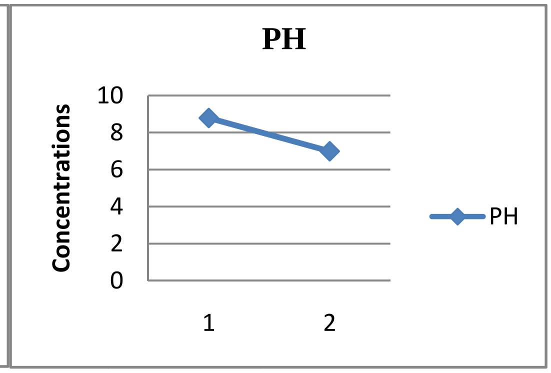
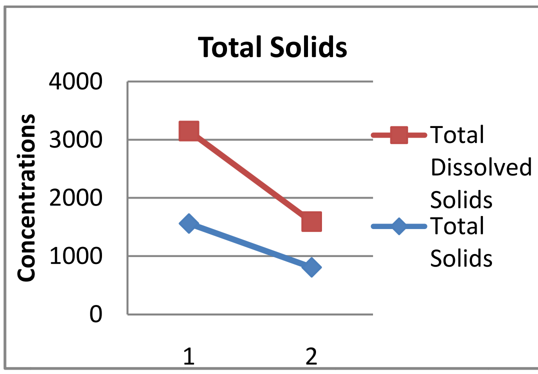


Fig.2: Observed Electrical conductivity. **Fig.3**: Observed pH of Water samples.



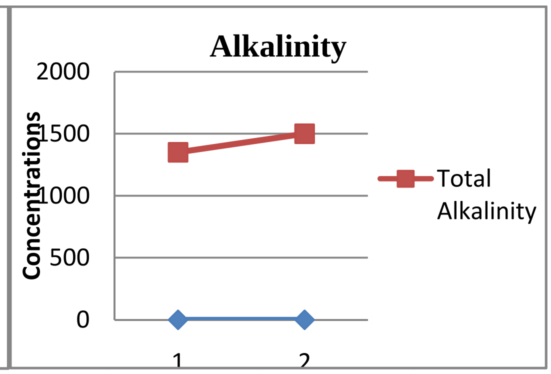
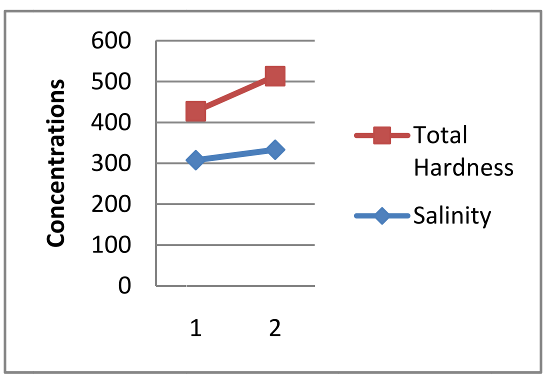


Fig.4: Observed Total solids of samples. **Fig.5**: Variations in Alkalinity content.



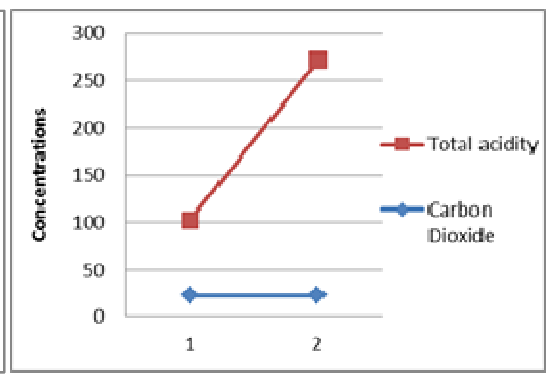


Fig.6: Observed Total Hardness & Salinity. **Fig.7**: Cons of CO_2 & Total acidity.

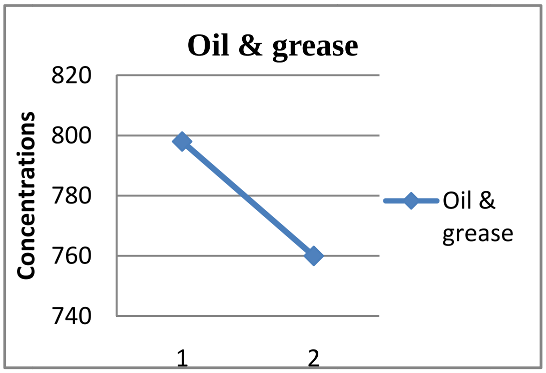


Fig.8: Cons of Oil & grease in sample.

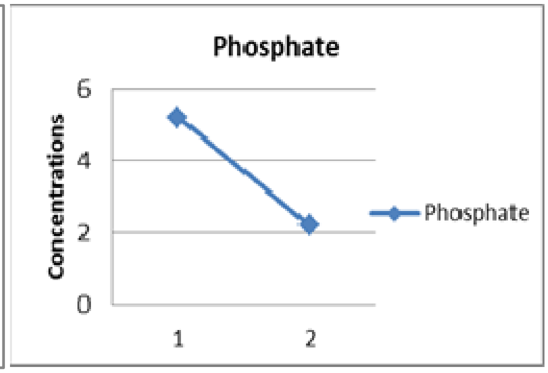


Fig.9: Variations in phosphate content.

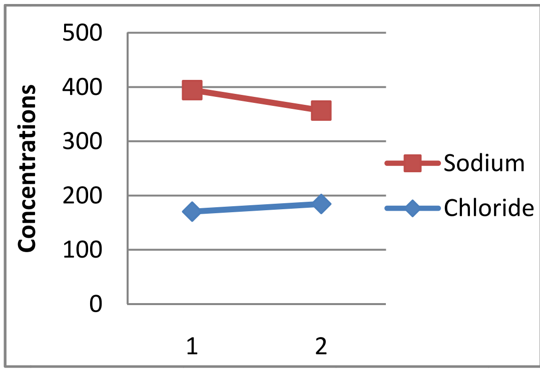


Fig.10: Cons of Sodium & chloride.

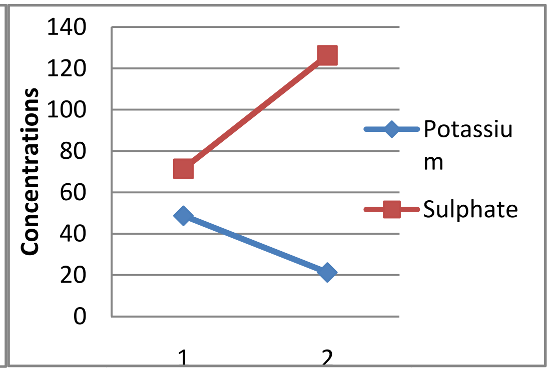


Fig.11: Observed Potassium & Sulphate.

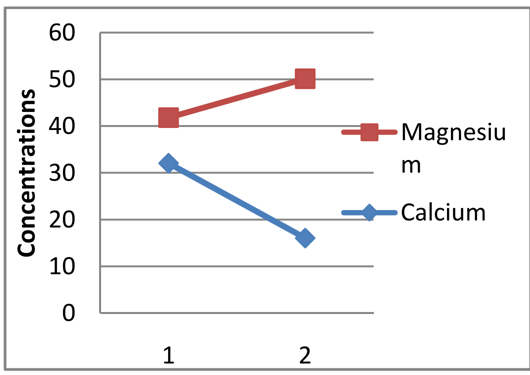


Fig.12: Cons of Calcium & Magnesium.

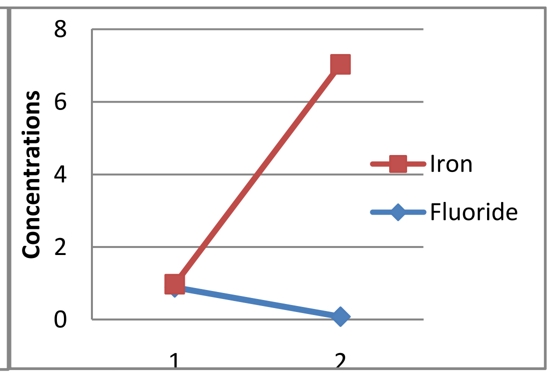
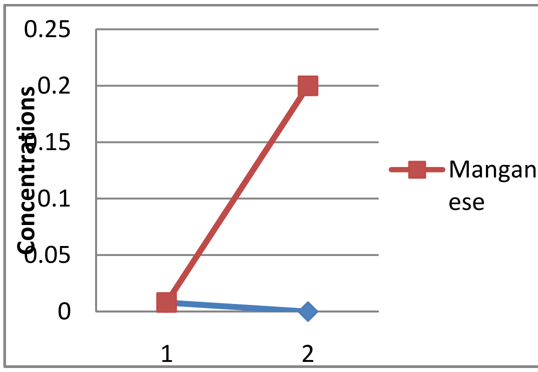


Fig.13: Observed Iron & Fluoride.



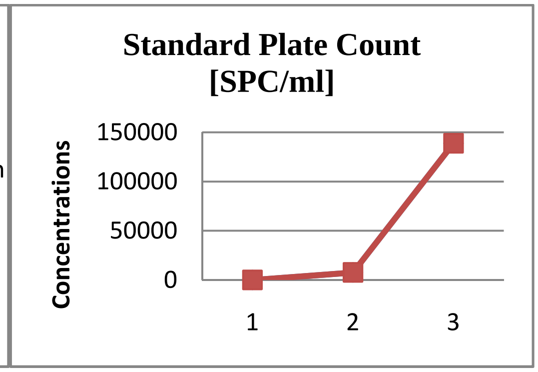


Fig.14: Cons of Manganese & Chromium. **Fig.15**: Observed SPC in water samples.

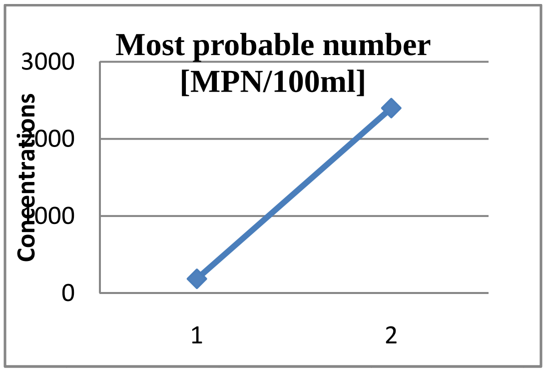


Fig.16: Observed MPN in water samples.

CONCLUSIONS

In Nanded where water is scarce, poor farmers use untreated wastewater and industrial pollution is limited, there is scope for improvement in the use of water and nutrients to further optimize the economic benefits of wastewater use. At the same time adequate measures should be put in place to control various infections in populations exposed to wastewater.

It is concluded that the effluent discharged from oil and cattle feed industry except oil and grease all values prescribed by the Standards of Environmental Protection Act and Ministry of Environment Forest, New Delhi. Therefore, it should take little attention towards here before to disposal in the environment. In order to find common ground and to use knowledge to change perceptions and behavior, farmers and scientists need to work together. Without its proper management, wastewater use poses serious health and environmental risks.

ACKNOWLEDGEMENT

We are grateful to the School of Earth Sciences of Swami Ramanand Teerth Marathwada University, Nanded for providing laboratory and library facilities.

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