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Primary and Secondary Treatment Unit of Effluent Treatment Plant: A case study

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ABSTRACT: *A general overview on the potentiality of membrane processes in the treatment of aqueous solutions coming from the leather industry is reported. The wet operations of the leather cycle which can be combined with or modified by membrane processes, such as microfiltration, ultrafiltration (UF), nanofiltration (NF) and reverse osmosis, have been described on the basis of consolidated applications and experimental tests on laboratory and industrial pilot scale. Some new applications are also proposed. Most of the river basins are closing or closed to severe water shortages, brought on by the simultaneous effects of agricultural growth, industrialization and urbanization. Performance of state-owned effluent treatment plants, for treating municipal waste water, and common effluent treatment plants, for treating effluent from small scale industries, is also not complying with prescribed standards. Thus, effluent from the treatment plants, often, not suitable for household purpose and reuse of the waste water is mostly restricted to agricultural and industrial purposes. The development of innovative technologies for treatment of wastewaters from various industries is a matter of alarming concern for us. Although many research papers have been reported on wastewater pollution control studies, but a very few research work is carried out for treatment of wastewater of steel industries, especially in reference to development of design of industrial effluent Treatment Plants (ETP) system. Another beneficial aspect of this research work will be recycling, reuse of water and sludge from steel industry The whole technologies for treating industrial wastewater can be divided into four categories: - Chemical, Physical, Biological and mathematical approaches.*

KEYWORDS: *effluent Treatment Plants (ETP) system, microfiltration, ultrafiltration (UF), nanofiltration (NF)*

INTRODUCTION

The main purpose of ETP is to decrease the treatment price for individual units though caring for the environment. Further, as a communal entity, ETP can get the subsidies from Central and State Govt., which are otherwise deprived for establishment of the individual effluent treatment plant. The release of crude tannery effluents and other wastes is a matter of high worry to the society. Leather clusters are found started showing their disapproval against detrimental effects of the effluents on human health and environment.

There is need to implement proper treatment technology for the tannery effluents. Schjolden remarked that in Kanpur, the number of tanneries has doubled over the past 15 years. Most of the tanners in Jajmau Area Has expanded their production capacity.

Initially They Started Only with Leather Tanning. Almost half of them have expanded to production non leather, leather components and products, like shoe uppers or shoes, bags, saddlery and harness goods. The diversification of production is also more common amongst the medium and large firms. Here, 100% have engaged in the production of leather products of some kind, either directly in the same company as the tannery, orasa separate unit owned by the same family or group. In Kanpur, leather tanning particularly blossomed during British colonial rule, when many cantonments were located in this area, and the need for boots, saddlery and harness equipment is high. Most the tanneries are located in Jajmau, an area south- east of the city, close to the military cantonment area, and on the southern bank of the river Ganges.

Today, the area of Jajmau is crowded, not only with tanneries, but also with the houses of the people living there, mostly the saree tannery workers who suffers from various health problems. Chromium

from leather tanning can make its way into air, soil, food and water and the most common forms of exposure are through inhalation of dust or fumes and ingestion of or contact with contaminated water. Workers in tanning facilities can inhale airborne chromium and can also be exposed through dermal contact. Effluent Treatment Plant (ETP) is the concept of treating effluents by means of a collective effort mainly for a cluster of small- scale industrial units.

LITERATURE REVIEW

This literature review on wastes from water treatment plants discusses previous literature reviews on the subject, sources and types of waste, characteristics of each type of waste, and waste management. The discussion of management of sludge (waste) covers minimizing sludge production, methods of sludge treatment, and ultimate sludge disposal.

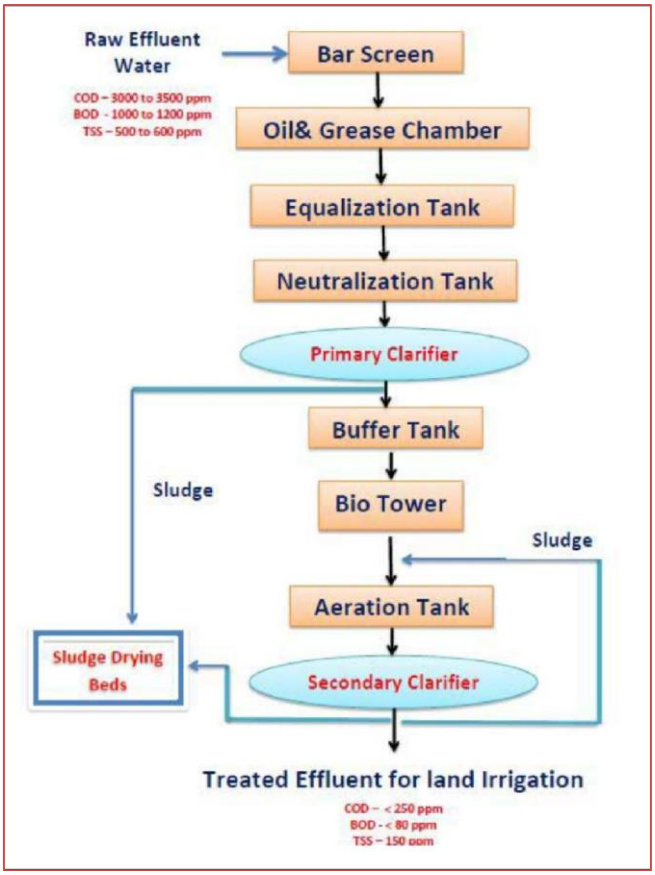
Tanning is the process of turning animal hide into leather. The manufacturing process leads to the generation of wastewater, which must be treated before discharge. The treatment processes of this wastewater in India were examined. A systematic review based on Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines was carried out on the electronic database Google Scholar from 2010 to 2020. Wastewater treatment practices in Indian tanneries were looked for and 64 relevant reports and articles were shortlisted and studied. The results showed that coagulation with alum and ferric chloride gave the best results in primary treatment, aerobic and anaerobic processes gave the best results when combined, and tertiary treated water could be reused.

METHODOLOGY

The aim of the present study is to determine the properties of the physical and chemical properties of the effluent discharged to the ETP of the thermal power station located about 20- 25 kms from city. Data obtained could be helpful in defining future waste management practices in the plant. ETP wastewater samples were collected during the period of the study procedures used for the collection, preservation and analysis of the samples were Water and Wastewater Standards Methods.

The wastewater samples were collected in plastic containers previously cleaned by washing in non-ionic detergent, followed by rinsing with tap water and later soaked in 10% HNO3 for 24 hours and finally rinsed with demonized water prior to usage. During sampling, sample bottles were rinsed with sampled water three times and then filled to the brim. The samples were labeled and transported to the laboratory, stored in the refrigerator at about 40C prior to analysis.

The samples were analyzed in G.H.Raisoni College/Environmental Engineering laboratory.



Determination of parameters:

In the present analysis temperature, pH, COD, Suspended solids, TDS and heavy metals determined. Temperature & pH were determined using a pH meter, while the levels of total dissolved solids (TDS) were determined by using conductivity meter at the point of sample collections. Chemical Oxygen Demand (COD) was determined by using closed reflux method.

Chemical Oxygen Demand (COD):

It provides a measure of the oxygen equivalent of that portion of the organic matter in a water sample that is susceptible to oxidation under the conditions of the test. It is an important and rapidly measured variable for characterizing water bodies, sewage, industrial wastes and treatment plant effluents.

COD was determined using closed reflux method. COD mg/l= (A-B) N X 8000 /V

Where,

A= Volume in ml. Ferrous ammonium sulphate for blank B= Volume in ml. Ferrous ammonium sulphate for Sample

V= Volume of Sample N=Normality of ferrous ammonium sulphate

MATERIALS AND METHOD

Samples collected from a municipal wastewater treatment. plant receiving effluents produced by various leather industries, located in the centre region of Portugal (Alcanena), were used as. inocula for the enrichments.

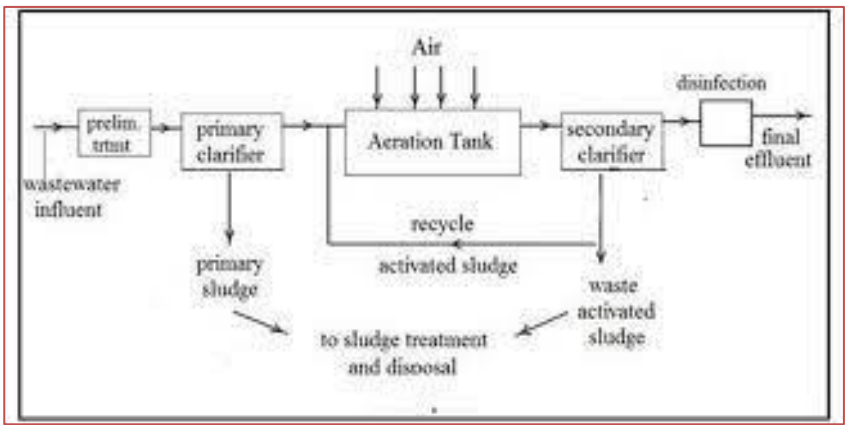
The microbial enrichments targeted the VOCS arising in gaseous emissions from a leather industry. Two main products, a solvent-based product and an aqueous based product, are used in the pro duction process and can contribute to the VOC gaseous emissions. Information obtained on these two products indicated that the sol vent-based product consisted of a cream liquid mixture constituted mainly by butylacetate, silicon, nitrocellulose, ethyl glycol and mineral oils and the aqueous based product consisted of a black liquid mixture constituted mainly by pigments, silica, wax, poly urethane resin, acrylic resin and cellulosic esther.

Microbial enrichments on the solvent-based product were established by using the samples mentioned above, previously centrifuged and resuspended in a mineral salts medium (MM) (Caldeira et al., 1999). 250 ml flasks containing 100 mL of MM were inoculated with a 10% inoculum and supplemented with 10 μL of the solvent-based product, as the sole carbon and energy source. Cultures were incubated on a rotary shaker at 100 rpm.

Preliminary Treatment level Purpose: Physical separation of big sized impurities like cloth, plastics, wood logs, paper, etc. Common physical unit operations at Preliminary level are: Screening: A screen with openings of uniform size is used to remove large solids such as plastics, cloth etc. Generally maximum 10mm is used. Sedimentation: Physical water treatment process using gravity to remove suspended solids from water. Clarification: Used for separation of solids from fluids.

Primary Treatment Level Purpose: Removal of floating and settleable materials such as suspended solids and organic matter. Methods: Both physical and chemical methods are used in this treatment level.. Chemical unit processes: Chemical unit processes are always used with physical operations and may also be used with biological treatment processes. Chemical processes use the addition of chemicals to the wastewater to bring about changes in its quality. Example: pH control, coagulation, chemical precipitation and oxidation. pH Control: To adjust the pH in the treatment process to make wastewater pH neutral.- For acidic wastes (low pH): NaOH, Na2CO3-, CaCO3or Ca(OH)2. For alkali wastes (high pH): H2SO4-, HCl. Chemical coagulation and Flocculation: • Coagulation refers to collecting the minute solid particles dispersed in a liquid into a larger mass. Chemical coagulants like A12 (SO4)3 (also called alum} or Fe2 (SO4)3 are added to wastewater to improve the attraction among fine particles so that they come together and form larger particles called flocs. A chemical flocculent (usually a polyelectrolyte) enhances the flocculation process by bringing together particles to form larger flocs, which settle out more quickly. Flocculation is aided by gentle mixing which causes the particles to collide.

Secondary Treatment Level Methods: Biological and chemical processes are involved in this level. Biological unit process To remove, or reduce the concentration of organic and inorganic compounds. Biological treatment process can take many forms but all are based around microorganisms, mainly bacteria. Aerobic Processes Aerobic treatment processes take place in the presence of air (oxygen). Utilizes those microorganisms (aerobes), which use molecular/free oxygen assimilate organic impurities i.e. convert them in to carbon dioxide, water and biomass. Anaerobic Processes the anaerobic treatment processes take place in the absence of air (oxygen). Utilizes microorganisms (anaerobes) which do not require air (molecular/free oxygen) to assimilate organic impurities. The final products are methane and biomass.



CANCLUSION

Their chrome recovery unit is also very efficient as stated by them. It recovers more than 99.5% chromium that would otherwise be discharged as waste. The recovered chromium is re-used with BCS resulting in safeguarding the environment and reducing cost. In response to the question asked about the approximate amount of the treated effluent disposed per day, it was reported by the respondent of private ETP owner of selected leather unit as 12.60 K.L. Further, it was confirmed by them that the capacity of ETP at their leather unit is sufficient to treat the waste water.

The present study provided significant information regarding the degradation of tannery wastewater in terms of COD, BOD, color, salinity, sulfide and total chromium by microbial treatment with T. ferrooxidans alone, AOP (Fenton's reagents) alone and in combination treatment. The combination treatment (AOP followed by T. ferrooxidans) showed synergistic effect in reduction of different pollution parameters studied. T. ferrooxidans showed maximum 77% COD removal in 21 d treatment, whereas in combination treatment, the %COD removal has enhanced up to 93% in 3 d only. This indicates the pretreatment with Fenton's reagent is stimulating the biodegradability and reducing the treatment time by T. ferrooxidans. Another important finding in combined treatment is the reduction of use of H2O2 comparing to Fenton's treatment alone with enhanced efficiency in degradation of waste. The sludge production by Fenton's treatment alone can also be reduced in combination treatment.

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