PHOTO-CATALYTIC TECHNOLOGICAL ASPECT USED IN INDUSTRIAL WASTEWATER TREATMENT PROCESS

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A B S T R A C T

In the present investigation, it is observed that insufficient water used by industry in India creates lot of problems. The quantity could be reducing to a minimal by recycling the wastewater after treatment. Recent treatment process does not aim at sufficient treatment required recycling of water but it concentrates on achieving the Bureau of Indian Standards (BIS). The study concentrates on sufficient in-situ treatment to industrial wastewater and recycling of water for low grade applications in industries. Photo-catalytic experiments were carried out using laboratory photo-reactor for degradation of dyes from industrial wastewater. The result shows that TiO_2 catalyst for different concentration of dye in the wastewater ranging from 100 to 900ppm. It was also observed that the complete degradation of dye is possible in a given time period i.e. less than 4 hrs. when concentration of dye $\leq$ 100ppm.

.**Keywords:** *Wastewater, Dyes, COD, TiO_2 and Photo-catalytic*.

INTRODUCTION:

According to the central pollution control board, the annual water consumption in Indian industry is 40 billion cubic meters. So far every cubic meter of water consume by Indian industry is 0.77 cubic meters of wastewater and annual wastewater discharges about 30.7 billion cubic meters. Also manufacturing unit wastes, sewage and a wide range of artificial chemicals and dyes, contaminate substantial parts of water resources. The menace of water-borne diseases and epidemics still threatens the well being of population. Thus, the quality as well as the quantity of clean water supply is of vital significance for the welfare of mankind. The enigma for the community, scientists and academicians is how to undertake the contaminants that jeopardize the environment. The advancement in science and technology, since industrial revolution, has enabled humans to exploit natural resources[7]. The worlds ever increasing population and progressive adoption of an industrial based lifestyle led to an increased anthropogenic impact to the environment [9]. In tropical country like India ($8^{o}4'$ N latitude), highest level of global solar UV emission is expected. Sufficient amount of solar UV emission is received for almost 10 months in a year. Average mean peak irradiance of solar UV-A is 47 W/m^2-22W/m^2 and average mean peak irradiance of cosmological UV-B is 0.195W/m^2-0.3384W/m^2corresponding to field condition[3]. Nearly 95-98% of the sun ultraviolet radiation reaching the earth's surface is UV-A. Only2-5% of UV light at the earth's surface is solar UV-B. Basically all of UV-C and much of UV-B is absorbed by the ozone and the atmosphere. However, In the present study it was decided to work on photo-catalytic activities in textile industrial wastewater treatment process. thou, the wastewater discharges represents a quality that can recycled for lower grade of industrial or agricultural use.

MATERIAL AND METHODS:

Experiments were carried out by using different concentration of various mixed dyes *i.e.,* 100, 300, 500, 700 and 900ppm in a 8W UV tubular photo-catalytic reactor comprising of an UV lamp with diameter about 18.0mm and length 294mm. A quartz tube is placed surrounding the lamp with the length of about 290mm and diameter of 21.8mm. The outer reactor has an inner diameter of about 32.8mm surrounding the quartz tube. The experiments were conducted in batch mode and photo-catalytic degradation time at which mixed dye completely treated was determined. The time taken for complete degradation was 4hrs. when the dye concentration was $\leq$ 100ppm. The COD was measured for every one hour time period and the results of COD versus time was recorded which is shown in fig. 1 and 2 with catalyst and without catalyst on 8W reactor respectively.

RESULTS AND DISSCUSSION:

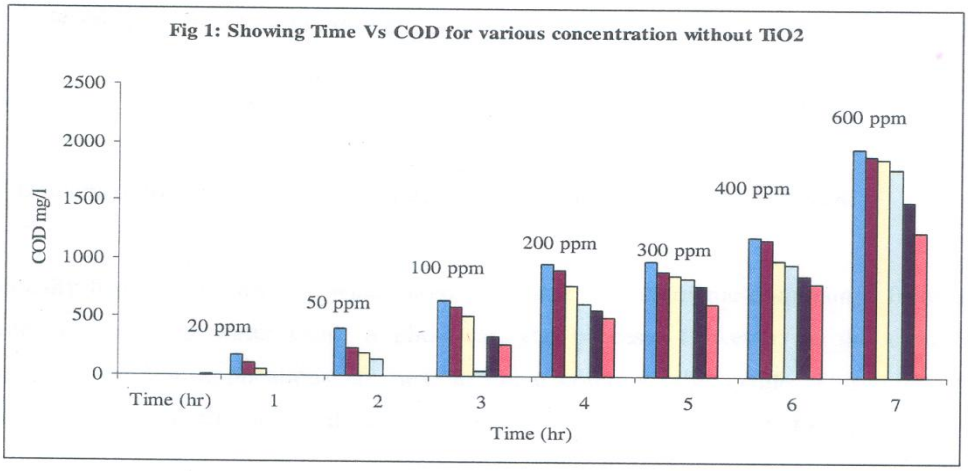
In solar photo-catalytic treatment process the engineering objectives are the focus and main innovations due to the lack of specific technological developments as the existing technology came from the solar thermal technology just with some minor modifications;

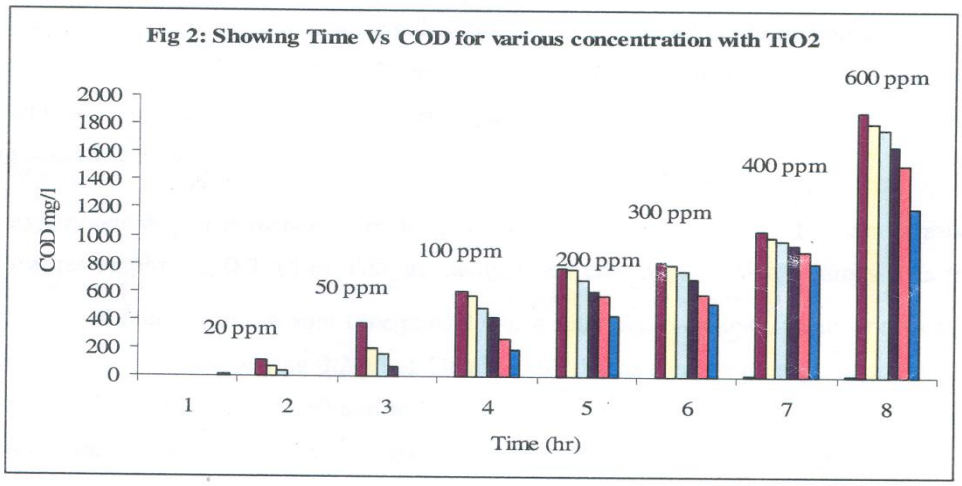
- High UV transmissivity reactor with solar UV range.
- Solar collector design.
- Catalyst upgrading and supporting.
- Highly capable UV insightful surface.
- Exhibition of technical and economical viability under real conditions.

It is technically feasible to remove a wide range of organic and inorganic compound from textile mix dyes waste contaminated water using a photo-catalytic process. However, at the current state of development only a few applications are near to being commercially viable. This number could be expanded with significant process by the improvement of the photo-efficiency of the process[1,2].

In order for a solar process to complete with comparable system using electric lamps, significant progress, must be made in reducing the cost of solar collectors. Suitable catalyst could be employed to utilize the maximum amount of solar UV radiation. To make the process more effective solar UV radiation and then utilizing solar visible light using suitable catalyst.

From the experimentation it is revealed that for photo-catalytic treatment using 100ppm of mixed textile dyes wastewater employing 0.2 g/l of TiO_2 as catalyst and employing 8W UV lamps it is possible to reduce the COD completely in a 4 hour time period. For a solar photo-catalytic treatment, using 100 ppm of textile dyes wastewater employing 0.2 g/l of Titanium dioxide as catalyst an experiment was conducted in month of July 2010 from 11.30 a.m. to 05.30 p.m. in repeated trials under actual solar radiation in Jalgaon field conditions. The similar results have been obtained by various workers working in this field of Photo-catalytic technological aspects used for industrial waste water treatment [4,5,6,7,8]. The COD was monitored for every one hour time period and complete degradation of dyes wastewater was possible in 4 hours. The results indicate that even in the month of July when solar intensity was quite low it proved that the degradation of mixed dyes wastewater was possible in 4 hours by employing agitation of the reaction mixture. Though it was a rainy season the result were up to the mark so we concluded that the mixed dye effluent can degrade in any season.





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