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Water Security, Challenges & Climate Change Adaptation

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Mathematical Modeling by using Taguchi and Surface Response Methodology (SRM) to treat the distillery spent wash

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Abstract

All over the world distillery industries followed anaerobic treatment to treat distillery spent wash. Distillery spent wash is the unwanted residual effluent generation during alcohol manufacturing. Anaerobic treatment reduces COD about 70% and BOD up to 80 %, but still having a very high COD range from 6000 to 43,000 mg/l and BOD 1500 to 5000 mg/l. As per CPCB, and MoEF effluent cannot be directly discharged into river or water bodies. In the present study post treatment of electrocoagulation [EC] has been investigated in the presence of aeration by using a pair of the aluminum plate. Mini Tab has been implemented to study the effect of different parameters such as pH, voltage, and electrolysis time on the COD and color removal efficiency. A quadratic regression model with estimated coefficient was developed for COD removal and color removal. It was observed that the model prediction matches with the experimental value with an R^2 value of 0.97, 0.875 for COD, and color respectively. Oxidations of organic components are analyzed by using spectrophotometer.

Keywords: - *design expert, distillery spent wash, chemical oxidation demand (COD), anaerobic Treatment, electrocoagulation [EC], biochemical oxygen demand (BOD)*

1. Introduction

Effluent generated from fermentation industries such as ethanol production, bakery yeast processing and breweries is characterized by enormous volumes of intense dark brown colored effluent with a high organic, inorganic content, caramelized and recalcitrant waste containing extremely high COD, BOD, and SS (Satyawali et al. 2010). For the ethanol production utmost distillery industries present in the world are sugar base industries, ethanol production in the distillery industry is only about 5 to 12 % by volume, it means 88 to 95 % effluent contain by volume of alcohol distilled (Wagh et al 2015). For 1 L production of alcohol required about 4 to 10 kg of molasses, sugar molasses is the most common feed stock for industrial fermentation processes, molasses are diluted 1- 3 fold for efficient fermentation process and purification of spirit (Wagh et al 2015). While producing the ethanol and rectified spirit waste water is generated on large scale known as distillery spent wash (DSW). The color of distillery waste water is mainly attributed due to melanoidin alkaline degradation products of hexoses,

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