Application of cement kiln dust for chemically enhanced primary treatment of municipal wastewater

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ABSTRACT

Chemically enhanced primary treatment (CEPT) involves the use of chemical coagulants to enhance the coagulation or flocculation of wastewater particles. Chemicals of aluminum sulfate (alum), cement kiln dust (CKD), and cationic polymer were studied with jar test to select the most suitable coagulant for effective treatment of municipal wastewater. The results reveal that CKD at dose $50 \text{ mg l}^{-1}$ could remove about 58.7% of chemical oxygen demand (COD) and 60% of biochemical oxygen demand (BOD). The addition of $50 \text{ mg l}^{-1}$ of CKD and of $0.2 \text{ mg l}^{-1}$ of polyacrylamide flocculant (PAM) could provide a reduction of BOD, COD, phosphorous, and fecal coliform (FC) with percentages higher than 79, 85, 95, and 99.9%, respectively. Heavy metals, salinity, sodicity, phosphorous concentrations, and pH of the treated wastewater by (CKD + PAM) are within the acceptable range for irrigation. FC numbers was 1400 Most Probable Number (MPN)/100 ml for the CEPT effluent, and it is not meeting the WHO guideline for FC of 1000 MPN/100 ml. The experimental results confirmed that CEPT can be used as a simple low-cost technology, and as an effective treatment of municipal wastewater, to improve the efficiency of recycled CKD.

Keywords: Municipal wastewater; Irrigation; Cement kiln dust; Chemically enhanced primary treatment (CEPT)