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EVALUATION OF PHYSICAL-CHEMICAL TREATMENT ALTERNATIVES TO INCREASE REMOVAL EFFICIENCY OF PRIMARY WASTEWATER TREATMENT

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Abstract

The objective of this paper is to evaluate removal efficiencies of physical-chemical wastewater treatment by adsorption and coagulation-flocculation processes used separately, based on the theoretical research developments and practical applications. The tests have been performed using the effluent from the grit chamber of the Municipal Wastewater Treatment Plant from Garching, Germany, the wastewater being initially characterized for each set of experiments. Batch tests experiments to investigate the adsorption capacity of the four different types of activated carbon were performed. Four types of activated carbon i.e. granular activated carbon GAC F 200 and F 400, powdered activated carbon PAC P GW and extruded activated carbon EAC NORIT RO were used. Equilibrium adsorption isotherms were determined so as to allow adequate choice of the adsorbent and of the dose required. The adsorption capacity of powdered activated carbon was 9.3 mg COD /g PAC, with a COD removal efficiency of 98 %. Theoretical PAC dosage needed for the removal of 70 % of the impurities was 6.78 g/l. Coagulation-flocculation jar test experiments for removal of nutrients and suspended matter present in wastewater were performed. 100 mg/l FeCl₃ was necessary for 95 % of TSS and 86 % of PO₄-P removal. Low COD removal was observed at this dosage. An increasing of dosage is not feasible because of the high quantity of sludge formed during the process. The results of the experiments can be applied for increasing of the removal efficiencies of the primary treatment stage so as to decrease pollutant loads of the secondary treatment or depending on the wastewater matrix, even to eliminate the biological step from the treatment scheme. Another option is to use these processes for wastewater reuse in combination with biological treatment.

Keywords: wastewater treatment, physical-chemical treatment, activated carbon adsorption, coagulation

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