Effect of Contact Time and Absorbent Dose on Limestone for Removal of Total Dissolved Solids from Industrial Wastewater

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Commonly the food processing industry consumes a huge amount of water. Food industry effluent characterizes high Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), fats, nutrients, oil, and grease. Fish processing wastewater mainly shows high TDS due to releasing of blood, small pieces of fishes, and chemicals at the filtering, cooling, washing, cooking, pre-cooking, and thawing steps. High TDS can be interference for wastewater treatment steps like biological treatment and this situation, a cost-effective pre-treatment is suitable. Adsorption theory has also been used in previous researches to remove TDS, and in this research, the effect of contact time and adsorbent dose were investigated to remove TDS from fish processing wastewater. A batch test was performed using limestone as an adsorbent. Wastewater samples were kept at pH 7 using 0.1 N HNO_3 and 0.1 N NaOH. Using sieve shaker, $\geq$0.063 mm, $\geq$0.125 mm, $\geq$0.15 mm, $\geq$0.5 mm, $\geq$ 1 mm, $\geq$2 mm and $\geq$3.14 mm particle sizes were separated. As $\geq$1 mm particle recorded highest removal efficiency as 83.85% (adsorption capacity 1297.5 mgg^{-1}). $\geq$1 mm particle was used for remaining experiments. When increasing contact time, the highest removal efficiency was recorded at 5-hour contact time as 72.55%. When increasing adsorbent dose, the maximum removal efficiency was recorded at 4 g L^{-1} as 79.64%. The results indicated that the removal efficiency of TDS depends on the adsorbent dose and contact time. Though, limestone is an alkaline material because of containing $CaCO_3$ as a predominant material, with no high increment of pH in the wastewater sample after adsorption. Adsorption data also fitted with Langmuir Isotherm and according to results, this can be indicated as favourable adsorption.

Keywords: Food processing industry wastewater, Limestone, TDS, Adsorption