

Thesis Title	A Performance Study of Limestone Neutralization of Acidic Wastewater in a Fluidized Bed Reactor		
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Abstract

Effects of acetic acid concentration and wastewater flowrate on the performance of limestone neutralization in a fluidized bed reactor were evaluated in this study. Two laboratory scale models were carried out by using synthetic acidic wastewater which prepared by mixing tap water with acetic acid. The influent concentration of acetic acid used varied between 60–1,200 mg/l while the wastewater flowrate varied between 3–12 m³/m³ of limestone–h. To maintain fluidized bed condition, the wastewater in the reactor was recirculated at the rate of 1,200 m³/m³ of limestone–h which allowed 305 m/h of upflow velocity and 50% of initial bed expansion. The limestone used in this study consisted of 72.73% CaCO₃ and 1.86% MgCO₃. The effective size and non uniformity coefficient of this study were 1.05 mm and 1.20, respectively. Each experiment in this study was carried out continuously until the effluent pH was less than 6.50.

From this study, it was found that when the flowrate of wastewater was kept at $3 \text{ m}^3/\text{m}^3$ of limestone-h and the initial concentration of acetic acid increased from 60 to 540 mg/l, average effluent pH during service time decreased from 7.66 to 6.79. Average effluent acidity and alkalinity increased from 4.55 to 34.80 and 95.64 to 355.05 mg/l as CaCO_3 , respectively. The result also showed that, when the initial concentration was control at 180 mg/l and the flowrate increased from 3 to $12 \text{ m}^3/\text{m}^3$ of limestone-h, average effluent pH during service time decreased from 7.32 to 6.94. Average effluent acidity increased from 7.66 to 16.10 mg/l as CaCO_3 while average alkalinity decreased from 155.98 to 145.60 mg/l as CaCO_3 .

Moreover, when the loading rate of acetic acid was considered, it was found that the increasing of loading rate from 180 to $3,600 \text{ g}/\text{m}^3$ of limestone-h, reduced the service time of limestone from 132 days to 1 day. Neutralization factor of limestone in this fluidized bed reactor at any loading rate was neary the same and was in the range of 1.23–1.86 g calcium carbornate /g of acetic acid.