

On-line monitoring of floc formation in various flocculants for piggery wastewater treatment

Thipsuree Kornboonraksa, Seunghwan Lee*, Songeok Lee, Hongshin Lee

*Department of Environmental Engineering, School of Civil and Environmental Engineering, Kumoh National Institute of Technology, 1 Yangho-dong, Gumi, Gyeongbuk 730-701, Korea
Tel/Fax +82 (54) 478 7629; email: dlee@kumoh.ac.kr*

Received 24 January 2008; accepted revised 20 June 2008

ABSTRACT

In this study photometric dispersion analyzer (PDA) was used to monitor floc size variation during the flocculation process for piggery wastewater treatment. Three types of flocculants, alum, $\text{Fe}_2(\text{SO}_4)_3$ and FeCl_3 , were used to investigate the effects of flocculant type and dosage, mixing intensity and temperature on floc formation. From the analysis of the floc size index (FSI) at the optimum dosage, FeCl_3 was proved to produce the larger floc formation and better settling efficiency than $\text{Fe}_2(\text{SO}_4)_3$ or alum. It took 7.5 min in FeCl_3 , 18.5 min in $\text{Fe}_2(\text{SO}_4)_3$ and 22.0 min in alum for complete floc settlement. FeCl_3 produced the most easily settled flocs. As the mixing intensity increased from 200 to 400 rpm, FSI value reduction rate was 50% in alum, 21% in $\text{Fe}_2(\text{SO}_4)_3$ and 10% in FeCl_3 . As well, floc formation produced by FeCl_3 had lower degree of disaggregation at high mixing intensity. Alum and $\text{Fe}_2(\text{SO}_4)_3$ were less effective in floc settling at low temperature while FeCl_3 showed no significant effect related to temperature. It could be concluded that FeCl_3 flocs did not affect from high shear force and low temperature due to the unaltered characteristics of turbulent flocculation, fluid dynamics and solubility of FeCl_3 . It made FeCl_3 a better flocculant compared to alum and $\text{Fe}_2(\text{SO}_4)_3$. In terms of particle removal, turbidity and TP removals increased with the decrease of mixing intensity and with the increase of temperature. Mixing intensity and temperature have shown no significant effect on the removals of COD and $\text{NH}_3\text{-N}$ in piggery wastewater.

Keywords: Photometric dispersion analyzer (PDA); Floc size index (FSI); Mixing intensity; Temperature; Piggery wastewater

* Corresponding author.