Treatment of High-Strength Condensate from Tofu Residue Processing Using UASB Coupled with Activated Sludge System

Ping-Heng Hsieh[1*], Ping-Chi Su[1], Jhih-Jie Jheng[1], Yu-Lun Pan[1], Ming-Jhe Chiang[1],

Dept. of Environmental Science and Engingp3eering, National Pingtung University of Science and Technology, Pingtung, Taiwan

Email: pinghenghsieh@mail.npust.edu.tw

Tel: +886-8-7703202 ext. 7515

Abstract:

Tofu residue, a byproduct from soybean processing, is commonly repurposed into high-nutritional animal feed. During the feed production process, steam generated from cooking carries high concentrations of volatile organic acids (VFA) and chemical oxygen demand (COD). When condensed through water scrubbers, the resulting condensate contains elevated levels of organic pollutants. Without proper treatment, this wastewater can overload downstream treatment systems and cause operational issues such as clogging. This study investigates the treatment performance of a combined Up-flow Anaerobic Sludge Bed (UASB) reactor and an Activated Sludge (AS) system for this high-strength condensate. Operating under a volumetric loading rate of 3 kg-COD/m^3·d, stable performance was achieved after 58 days, with the effluent COD consistently below 150 mg/L. The combined anaerobic-aerobic system demonstrated effective removal of organic matter and compliance with Taiwan's effluent discharge standards. These results suggest that the UASB-AS system is a feasible and efficient solution for treating condensate wastewater from tofu residue processing, offering valuable guidance for wastewater treatment facility design in related industries.

Keywords:

Tofu residue, condensate wastewater, UASB, activated sludge, volatile fatty acids, COD removal, biological treatment