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POST TREATMENT OF POULTRY SLAUGHTERHOUSE WASTEWATER AND APPRAISAL OF THE ECONOMIC OUTCOME

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Abstract

Recovery of residual ammonium nitrogen ($\text{NH}_4^+\text{-N}$) from dissolved air flotation (DAF) pretreated poultry slaughterhouse wastewater was studied by means of magnesium ammonium phosphate hexahydrate ($\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$, MAP) precipitation in a lab-scale batch study. The maximum recovery values were obtained as 80.2%, 97.1% and 53.6% with the addition of $\text{MgCl}_2 \cdot 6\text{H}_2\text{O} + \text{KH}_2\text{PO}_4$, $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O} + \text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, and $\text{MgOHCO}_3 + 85\% \text{H}_3\text{PO}_4$ at pH 9.5, respectively. Based on the physicochemical findings, subsequent batch experiments were conducted at pH 9.5 for eight different molar ratios ($\text{Mg}^{2+}:\text{NH}_4^+\text{-N}:\text{PO}_4^{3-}\text{-P}$) applied as overdose (1.2:1:1, 1.5:1:1, 1:1:1.2, 1:1:1.5) and underdose (0.5:1:1, 0.8:1:1, 1:1:0.5, 1:1:0.8). Results indicated that the stoichiometric ratio ($\text{Mg}^{2+}:\text{NH}_4^+\text{-N}:\text{PO}_4^{3-}\text{-P} = 1:1:1$) was found to be sufficient to obtain high recovery values. A detailed economic analysis of the present process demonstrated that the cost of $\text{NH}_4^+\text{-N}$ recovery was estimated as 0.297 €/m³ or 1.753 €/kg $\text{NH}_4^+\text{-N}_{\text{removed}}$ for the proposed application. The rate of reaction was found to be very fast, being completed within minutes, and cost effective in large-scale poultry slaughterhouse facilities.

Key words: ammonium nitrogen, dissolved air flotation, magnesium ammonium phosphate, poultry slaughterhouse wastewater

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