

中文摘要

針對北部一家原本未做廢水處理，後經補助設置厭氣發酵加活性汙泥式廢水處理設備之養豬場，首先比較其在無外加碳源下，連續曝氣及間歇曝氣(1:1 hr)對於整體處理系統及曝氣槽單元硝化脫硝及去磷之影響。實驗結果顯示，整套設備，應用連續曝氣法其 T-N、NH₄-N、NO₃-N 及 T-P 之去除率分別為 65.4%、63.2%、98% 及 80%，應用間歇曝氣法其 T-N、NH₄-N、NO₃-N 及 T-P 之去除率為 74.4%、70%、97.4% 及 -20%。曝氣槽在未加碳源下，應用間歇曝氣法(T-N/BOD=2.26)其 T-N、NH₄-N、NO₃-N 及 T-P 之去除率則為 44.5%、42.8%、70.6%、及 -4%，應用連續式曝氣(T-N/BOD=1.46)其 T-N、NH₄-N、NO₃-N 及 T-P 之去除率則為 15%、10.6%、81.4% 及 40%。結果顯示，應用間歇曝氣程序確實較連續曝氣程序能有效去除廢水中之氮。在外加碳原情形下，以間歇曝氣程序評估曝氣槽硝化/脫硝及去磷效率，分別選擇固液分離後之分離水及甲醇為外加碳源。實驗結果指出，以固液分離後之分離水為碳源時，間歇曝氣(1:1 hr)時曝氣槽 T-N、NH₄-N、NO₃-N 及 T-P 之去除率為 14.8%、16%、83.6%、及 40%，若添加甲醇為輔助碳源時，曝氣槽 T-N、NH₄-N、NO₃-N 及 T-P 之去除率為 12%、19%、83.9% 及 40%。此結果顯示添加碳源時，其硝酸態氮去除率(83.9%)較未添加時之 70% 為高，故外加碳源確實為一控制變數，以改進脫硝程序之性能。

關鍵詞：硝化；脫硝；間歇曝氣；外加碳源；TN/BOD 比

Abstract

A methane fermentation plus activated sludge method type pig farm located at north Taiwan region was selected to evaluate the effect of an intermittent aeration process and adding an external carbon source on the rate of nitrification/denitrification and phosphorus removal for swine wastewater. A comparison between continuous aeration process (CAP) and intermittent (1:1 hr) aeration process (IAP) is presented under no addition of external carbon sources. The results show that overall treatment system removal rates of T-N, NH₄-N, NO₃-N, and T-P are respectively 65.4%, 63.2%, 98%, and 80% for CAP, while 74.4%, 70%, 97.4%, and -20% respectively for IAP. The removal rate of T-N, NH₄-N, NO₃-N, and T-P in activated sludge unit are respectively 44.5%, 42.8%, 70.6%, and -4% for IAP(T-N/BOD=2.26), while 15%, 10.6%, 81.4%, and 40% respectively for CAP(T-N/BOD=1.46). Therefore, the performance of IAP in nitrogen removal for swine wastewater is better than that of CAP. The effect of adding an external carbon source on the rate of nitrification/denitrification and phosphorus removal efficiency in an intermittent (1:1 hr) aeration process is also investigated for activated sludge unit. Two external carbon sources were examined, methanol and separated wastewater after solid/liquid separator. The results show that the addition of separated wastewater as the external carbon source to intermittent aeration process resulted in the removal rate of T-N, NH₄-N, NO₃-N, and T-P for activated sludge unit are respectively 14.8%, 16%, 83.6%, and 40%, while 12%, 19%, 83.9%, and 40% respectively for the addition of methanol as an external carbon source. As a result, the NO₃-N removal rate (83.9%) is higher than that of in the absent of external carbon sources (70%). With respect to denitrification, these results indicate that external carbon source addition may serve as a suitable control variable to improve process performance.

Keywords : Nitrification; Denitrification; Intermittent aeration process, External carbon source, T-N/BOD ratio