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能源和环境工程

改良UCT分段进水脱氮除磷工艺性能及物料平衡

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摘要

采用改良UCT分段进水试验装置研究了该工艺处理实际生活废水的脱氮除磷性能，建立了该系统碳（COD）、氮、磷的物料衡算公式，并以稳态条件下试验数据为基础分析评价了各指标的物料分布情况。结果表明，工艺出水水质稳定，抗冲击负荷能力较强，平均出水COD、总氮、总磷含量分别为43.5、8.51、0.29 mg·L^{-1}，满足国家城镇生活污水一级A排放标准。此外，根据建立的物料衡算公式及工艺各反应区污染物指标的转化途径分析发现，高达67.1%的反硝化脱氮作用（包括缺氧反硝化和好氧同步硝化反硝化）是该工艺深度脱氮的根本原因;系统反硝化和释磷过程利用的COD占总去除量的62.1%，体现了该工艺充分利用原水碳源的优势;氮素和COD的平衡率均高达99.8%，证明了所建立的公式的有效性。系统对磷的去除主要依赖于排放的剩余污泥，占总量的71.7%。

关键词

分段进水 脱氮除磷 UCT 物料平衡

分类号

Performance and material balance of modified UCT step feed enhanced biological nitrogen and phosphate removal process

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Abstract

The removal of wastewater nutrients in the modified UCT step feed process was investigated when treating municipal wastewater.Based on experimental data under steady-state conditions, the equations for calculating material balances of COD, nitrogen and phosphate were established.These three material distributions in the system were also evaluated.The results indicated that with stable effluent quality and good capacity of resistance to shock load, the effluent concentrations of COD，TN and TP were 43.5, 8.51, 0.29 mg·L^{-1} on average, respectively, which the first level A discharge standard of pollutants for municipal wastewater treatment plant was met.Furthermore, according to calculation equations and transformation pathways of nutrients, it was found that approximately 67.1% of nitrogen was successfully removed during the denitrification process, including anoxic denitrification process and simultaneous nitrification and denitrification (SND) process, which greatly contributed to high nitrogen removal efficiency.COD consumed in the denitrification and phosphate release process accounted for 62.1%, which embodied the advantage of sufficient utilization of influent carbon sources.Both nitrogen and COD balance ratios were as high as 99.8%, which confirmed the validity of equations established.Phosphate removal was mainly achieved by the discharge of excess sludge, accounting for 71.7% of the total.

Key words

step feed nitrogen and phosphate removal UCT material balance

扩展功能

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