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## TREATMENT OF DIGESTED PIGGERY WASTEWATER WITH A MEMBRANE BIOREACTOR

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### Abstract

A submerged membrane bioreactor (MBR) was applied to treat digested piggery wastewater (DPW). The removal of chemical oxygen demand (COD), ammonium-nitrogen (NH<sub>4</sub>-N), two kinds of heavy metals and ten kinds of antibiotics were studied. The hydraulic retention time (HRT) was gradually shortened from 12 days to 2.7 days, by which correspondingly the volumetric COD loading rate was increased from 0.4±0.1 to 2.8±0.6 kg/(m<sup>3</sup>·d) and volumetric NH<sub>4</sub>-N loading rate was increased from 0.13±0.04 to 0.49±0.07 kg/(m<sup>3</sup>·d). Results showed that effluent concentrations of COD, copper and zinc remained low and stable at all loadings. The effluent NH<sub>4</sub>-N concentration remained below 10 mg/L at a volumetric loading rate of 0.33±0.06 kg NH<sub>4</sub>-N/(m<sup>3</sup>·d), but suddenly rose to 403 mg/L as the loading rate was increased to 0.49±0.07 kg NH<sub>4</sub>-N/(m<sup>3</sup>·d). No significant difference was observed on the removal of sulfamethazine, sulfamethoxazole and ciprofloxacin between different HRTs, but the decrease in HRT resulted in greatly decreased removal rate of tetracyclines. About 94.0% of tetracycline, 93.2% of oxytetracycline and 78.6% of chlortetracycline were removed at HRT of 12 ~ 8 days, while the corresponding removal rate was decreased to 47.6 %, 61.8 % and 40.5 %, respectively, as the HRT was shortened to 2.7 days. The above results suggested that the performance of a MBR be mainly influenced by HRT and the resultant ammonia loading rate. HRT of 3 - 4 d may be enough for efficient removal of COD and ammonium from DPW, but insufficient for effective removal of antibiotics.

*Key words:* antibiotics, digested piggery wastewater, heavy metals, membrane bioreactor (MBR), nitrification rate

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