

COMBINED ANAMMOX-CONSTRUCTED WETLAND PILOT PLANT AT GDAŃSK WWTP

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Abstract

Deammonification has been widely applied at wastewater treatment plants (WWTPs) as a cost effective process to treat sidestreams with high nitrogen load. Applying the deammonification process in the mainstream, however, still presents a challenge. Major barriers in this application include low temperature, low ammonia concentration and high COD/N ratio. This report presents the results of pilot testing mainstream deammonification concept that was conducted at the Wschód WWTP in Gdańsk (Poland). The examined process configuration included primary, secondary and tertiary treatment steps. The physical-chemical primary treatment consisted of two stage flocculation tank and primary sedimentation tank. The secondary treatment incorporated integrated fixed-film activated sludge (IFAS) reactor, equipped with mixer and fine bubble air diffuser, and coupled with the secondary sedimentation tank. The IFAS reactor was inoculated with anammox bacteria immobilized on AnoxKaldnes K5 plastic carriers from the Sjölanda WWTP in Malmö and suspended growth activated sludge from the Wschód WWTP in Gdańsk. Removal efficiency of organic compounds and nutrients were observed after each step of the wastewater treatment process. The effect of C/N ratio and temperature variations on nitrogen removal were investigated, with particular attention to the efficiency and resilience to low temperature of deammonification. The results of this study revealed very high efficiency of the tested pilot system. The measured average total nitrogen removal efficiency was 77% and 96% at process temperature 13.5°C and 30°C, respectively.

Keywords: Mainstream anammox; deammonification; autotrophic nitrogen removal; nitrification; wastewater treatment.