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P057

REMOVAL OF NITROGEN AND ORGANIC MATTER IN SWINE WASTEWATER BY USING MEMBRANE BIOREACTOR OF PILOT PLANT SCALE

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In this study, it was analyzed that removal efficiency by using membrane bioreactor of pilot plant scale about nitrogen and organic matter. Sample was acheived at a farmhouse in Kuungkido in Korea. Pilot plant was consisted of anoxic-oxic unit. Submerged membrane bioreactor was in oxic unit. Module type of membrane was hollow fiber. Samples ere obtained once a week during six months. The characteristices of influent were analysed such as following things: pH= 7-7.3, Alkalinity (mg/as CaCo3)= 7200-8200, MLSS(mg/1)=22000-23000, T-N(mg/L)= 5000-5400, NH4+-N(mg/L)= 2400-2500, No3-N(mg/L)= 1000-1250. Characteristics of effluent were analyzed such as following things: pH= 7-7.3, Alkalinity (mg/as CaCo3)= 7200-8200, MLSS(mg/1)=20-28, MLVSS(mg/L)= 5-16, BOD(mg/L)=2900-3800, COD(mg/L)= 4100-4600, NH4+-N(mg/L)= 750-780, No3-N(mg/L)= 230-250. The removal efficiency of each factor was as follows: COD(mg/L)= 84-86%, BOD=83-86%, T-N=80-83%, NH4+-N=78-82%, NO3(mg/L)= 78-80%. As system has been stabilized, efficiency of each factor was elevated gradually. According to change of operating condition, optimum condition was derived.

P058

TREATMENT OF DOMESTIC SEWAGE BY A METAL MEMBRANE BIOREACTOR

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A submerged flat metal membrane bioreactor (MBR) was used to treat synthetic domestic sewage in this study. The sandwich membrane module was consisted of 3 polymethyl methacrylate supporting sheets and 2 stainless membranes (Hitachi Metal Co., ltd.), with a 0.4 μm nominal pore size and an effective filtration area of 0.24 m2.

The experiment was continued for 270 days and ran under two modes as an aerobic membrane bioreactor (AMBR) and an anoxic/aerobic membrane bioreactor (A/O-MBR) at the permeate flux of 0.4-1m/day. Polyvinyl alcohol (PVA) particles were added to the aeration tank with volume ratio of 10% at the last A/O-MBR stage. Air scouring, back flushing with the permeate fluid or 0.1% NaOCl solution and periodical operations were used to alleviate membrane fouling. Mixed liquor suspended solids (MLSS) concentration, sludge particle size distribution, extracellular polymeric substance (EPS), soluble and colloidal COD were also investigated to analyze the membrane fouling mechanisms and influencing factors under different operation modes. The results showed that: 1) The mean COD and TN removal efficiencies achieved 95% and 33% under AMBR mode, and those were 88% and 72% under A/O-MBR mode, respectively. The removal of TN under AMBR mode could be explained by the microorganism multiplication and the aerobic denitrification mechanism at high MLSS concentration.

The high COD (more than 50 mg/L) in supernatant and the low COD (less than 15 mg/L) in effluent indicated the intercepting effect of metal membranes. 2) The system ran stably for 115 days at permeate flux near 1m/day without changing the membrane under AMBR mode, but the membrane filterability decreased gradually under A/O-MBR mode, and the addition of PVA even worsened the membrane filterability on the contrary. 3) Normally the dominant membrane fouling mechanism under AMBR mode was cake formation and the membrane filterability was restored more than 70% by NaClO back flushing or simple sponge scrubbing. However the pore blocking became obvious when MLSS was more than 20,000mg/L. Under A/O-MBR mode, the dominant was pore blocking and the membrane filterability could not be restored effectively. Off-line washing was performed frequently and the permeate flux was minified to 0.5m/day lastly. 4) Pore blocking under AMBR mode was due to the accumulation of SMP and mineral, but that under A/O-MBR was mainly resulted from the microorganism cells break and the occurrence of homologous magnitude particles to membrane pore size. It was proved by the decreasing of MLSS, the crescent colloidal COD in supernatant, the diminishing average particle size and EPS concentration.

Keywords: Metal membrane; aerobic membrane bioreactor (AMBR); anoxic/aerobic membrane bioreactor (A/O-MBR); polyvinyl alcohol (PVA); membrane fouling