

Impact of Monoethanolamine (MEA) on the Removal of Organic and Nitrogen in an Activated Sludge System

N.N.H Ismail¹, A.N.F Akhma¹, M.A. Razali¹ and M.A.H.M. Fauzi¹.

¹ Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 31750 Tronoh, Perak
nur_16002421@utp.edu.my

Abstract. MEA is an organic compound utilized in industrial plants for the removals of sour gases from liquid hydrocarbons. However, MEA interferes with the removal of organic and nitrogen process, occurred in the activated sludge system, causes effluent BOD, COD, TSS, ammonia and nitrate to increase. Hence, the study on the impact of MEA on the removal of organic and nitrogen compounds in the activated sludge system were pursued. The objectives include, to determine the impact of MEA on the removal of organic nitrogen compounds, as well as to identify the loading of MEA which is inhibitory to the microbes in the removal of organic nitrogen compounds, by varying the addition of MEA concentrations into the raw influent. A bench scale studies were conducted, where two trains were set up. Both trains comprise of reactors with an aeration tank and a clarifier, provided with sludge recycle system, with the purpose of treating the wastewater generated by refineries. Train 1 operated at conventional activated sludge mode and extended activated sludge mode, while Train 2 operated at only extended aeration activated sludge mode. The influent and effluents gathered from both trains were analyzed in accordance to APHA Methods. Sampling parameters were conducted three times a week and measured in triplicates, for all sampling points. During Acclimatization Phase 1, a dilution of 1:6 were made to the raw influent, while full strength testing was conducted during Acclimatization Phase 2. The addition of MEA at various concentration of 50 mg/L, 100 mg/L, 500 mg/L and 1000 mg/L, was made to the raw influent once the wastewater has acclimatized. The results show that the addition of 1000 mg/L MEA increased influent COD concentration to an average of 1774 mg/L. Average COD removed/mg mlvss.day stabilized even after the addition of 100 mg/L MEA, at an average of 35.22 mg COD removed/mg mlvss.day and 14.62 mg COD removed/mg mlvss.day, for reactor A1T1 and A1T2, respectively. Influent TBOD and influent NBOD stabilized with the addition of MEA to an average of 302.0 mg/L and 26.96 mg/L. MLSS and MLVSS concentrations in reactor A1T1, A2T1 and A1T2 stabilized throughout the study, with MLSS/MLVSS ratio of 0.78, 0.83 and 0.84, respectively. Nitrification rate slightly increased for reactor A2T1 with the addition of 500 mg/L, at an average of 0.007823 mg Ammonia removed/mg mlvss.day, while in reactor A1T1 and A1T2, nitrification rate dropped to 0.001827 mg Ammonia removed/mg mlvss.day and 0.003476 mg Ammonia removed/mg mlvss.day, respectively. Influent Total Phosphorus and Nitrate-Nitrogen stabilized with the addition of MEA at an average of 9.28 mg/L and 5.65 mg/L. Overall, effluent COD, BOD, TSS, Nitrate Nitrogen, Total Phosphorus, TKN and Total Alkalinity concentrations met respective standard discharged limits.

Keywords: MEA, organic removals, nitrogen removals, activated sludge system.