

Abstract of Main Thesis

Title of Thesis

Membrane Fouling Mitigation in Advanced Membrane Bioreactor

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Abstract on the Content of the Applicant's Thesis

Membrane fouling is still considered as the most serious problem in membrane bioreactor (MBR) although this process has been used in all over the world for wastewater treatment and water reclamation and reuse. Development of advanced types of MBR has been also widely studied to expand the performance and function of MBR. This thesis shows that the fouling risk is decreased by applying existing treatment process such as coagulation and adsorption to MBR and its operational conditions are also investigated. The background and purpose of the study is described in Chapter 1. Chapter 2 is a literature review on membrane fouling and its mitigation especially contemporary studies on application of coagulation and adsorption to MBR. In Chapter 3 it is clarified that simultaneous addition of iron coagulant and polysilicate as a coagulant aid effectively reduces membrane fouling risk by MBR laboratory experiences using the coagulant or mixtures of the coagulant and the coagulant aid. A commercial polysilicate-iron (PSI) also exhibits to reduce membrane fouling risk and enhance MBR performance. Moreover such reduction is caused by coagulation of extracellular polymers (especially protein). In Chapter 4 series of experiments of MBR are carried out where charcoal made from excess sludge was added to the reactor. The experiment results clarify that the charcoal addition reduces extracellular polymers (especially carbohydrate) resulting in mitigation of membrane fouling risk. A recycle system is proposed that consists of addition of the charcoal to MBR, charcoal production using the MBR excess sludge, its utilization such as deodorization and addition again. The conclusions obtained in the study and future problems in researches on membrane fouling and advanced MBR are mentioned in Chapter 5.