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Optimization of Removing Organic Matter and Nutrient using Advanced Oxidation Processes and On-line Monitoring systems

Seung Joo Lim*

Research Division for Industry & Environment, Korea Atomic Energy Research Institute, 29 Geumgu, Jeongeup, Jeollabuk-do, 56212 Republic of Korea

Tons of wastes, of which most refractory organics are anthropogenic, have been generated since the industrial revolution. Although activated sludge process and its modified processes have been usually used for the treatment of municipal wastewater since over 100 years, these processes generated the tremendous excessive biomass. For industrial wastes, the treatment process design of each waste is highly dependent upon the waste source. The process is determined by waste characteristics such as organic and nutrient loading as well as the biodegradability of waste. When the influent consists of the high concentration of refractory organic matter, it is necessary that the treatment process be lessen the persistence of organic matter first. Several investigators showed that the excellent performance for the reduction of refractory organic matter using physicochemical, thermal and Advanced Oxidation Processes (AOPs) including ozone, ozone/UV, ozone/H_2O_2 and electron beam/gamma irradiation. In addition, AOPs are used for very effective disinfection processes. When pathogens are exposed to hydroxyl radicals, nucleic acids suffer from fatal damages by the attack of hydroxyl radicals. It is possible that the optimization of removing organic matter and nutrient in the wastes using the pretreatment of AOPs and the following on-line monitoring system. Several investigators suggest on-line monitoring systems with the use of simple parameters such as electric conductivity, pH, oxidation reduction potential and the concentration of dissolved oxygen in full scale municipal/industrial wastewater treatment plants. The changes of many anions and cations usually occur during the phosphorus release and uptake in biological nutrient removal processes. When organic nitrogen is oxidized to nitrate, oxidation reduction potential increases. But the pH decreases in nitrification processes. Electric conductivity is shown very differently from wastewater to wastewater. For the case of biological phosphorus removal, volatile fatty acids, phosphate and cations such as potassium and magnesium are involved in luxury uptake. Specifically, electric conductivity is a function of many ionic species involved the phosphorus release and uptake in biological nutrient removal processes. Many research concluded that electric conductivity is not correlated to organic matter removal, but to phosphorus removal. With the change of electric conductivity, it is possible to understand between denitrification and phosphorus release in an anaerobic digester. The feasibility of simple parameters such as electric conductivity, pH, oxidation reduction potential and the concentration of dissolved oxygen is important information to adjust the anaerobic/aerobic cycle, resulting in optimizing parameters in full scale municipal/industrial wastewater treatment plants.

***Corresponding author:** Seung Joo Lim, Research Division for Industry & Environment, Korea Atomic Energy Research Institute, 29 Geumgu, Jeongeup, Jeollabuk-do, 56212 Republic of Korea, Tel: +82-63-570-3357, Fax: +82-63-570-3362; E-mail: seungjoolim@gmail.com

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