

Effect of Environmental Factors on Photoreactivation of Microorganisms under Indoor Conditions

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Abstract : Ultraviolet (UV) disinfection causes damage to the DNA or RNA of microorganisms, but many microorganisms can repair this damage after exposure to near-UV or visible wavelengths (310–480 nm) by a mechanism called photoreactivation. Photoreactivation is gaining more attention because it can reduce the efficiency of UV disinfection of wastewater several hours after treatment. The focus of many photoreactivation research activities on the single species has caused a considerable lack in knowledge about complex natural communities of microorganisms and their response to UV treatment. In this research, photoreactivation experiments were carried out on the influent of the UV disinfection unit at a municipal wastewater treatment plant (WWTP) in Edmonton, Alberta after exposure to a Medium-Pressure (MP) UV lamp system to evaluate the effect of environmental factors on photoreactivation of microorganisms in the actual municipal wastewater. The effect of reactivation fluence, temperature, and river water on photoreactivation of total coliforms was examined under indoor conditions. The results showed that higher effective reactivation fluence values (up to 20 J/cm²) and higher temperatures (up to 25 °C) increased the photoreactivation of total coliforms. However, increasing the percentage of river in the mixtures of the effluent and river water decreased the photoreactivation of the mixtures. The results of this research can help the municipal wastewater treatment industry to examine the environmental effects of discharging their effluents into receiving waters.

Keywords : photoreactivation, reactivation fluence, river water, temperature, ultraviolet disinfection, wastewater effluent

Conference Title : ICEUSE 2016 : International Conference on Environmental and Urban Systems Engineering

Conference Location : Montreal, Canada

Conference Dates : May 16-17, 2016