Removal of Nutrients from Sewage Using Algal Photo-Bioreactor

Authors : Purnendu Bose, Jyoti Kainthola

Abstract : Due to recent advances in illumination technology, artificially illuminated algal-bacterial photo bioreactors are now a potentially feasible option for simultaneous and comprehensive organic carbon and nutrients removal from secondary treated domestic sewage. The experiments described herein were designed to determine the extent of nutrient uptake in photo bioreactors through algal assimilation. Accordingly, quasi steady state data on algal photo bioreactor performance was obtained under 20 different conditions. Results indicated that irrespective of influent N and P levels, algal biomass recycling resulted in superior performance of algal photo bioreactors in terms of both N and P removals. Further, both N and P removals were positively related to the growth of algal biomass in the reactor. Conditions in the reactor favouring greater algal growth also resulted in greater N and P removals. N and P removals were adversely impacted in reactors with low algal concentrations due to the inability of the algae to grow fast enough under the conditions provided. Increasing algal concentrations in reactors over a certain threshold value through higher algal biomass recycling was also not fruitful, since algal growth slowed under such conditions due to reduced light availability due to algal 'self-shading'. It was concluded that N removals greater than 80% at high influent N concentrations is not possible with the present reactor configuration. Greater than 80% N removals may however be possible in similar reactors if higher light intensity is provided. High P removal is possible only if the influent N: P ratio in the reactor is aligned closely with the algal stoichiometric requirements for P.

1

Keywords : nutrients, algae, photo, bioreactor

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020