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Design and Evaluation of Carbon Capture Unit by Algae

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Abstract: *World Climate Change Concern has grown with rising emission levels of CO_2 due to industrialisation, deforestation, over-reliance on fossil fuels. Among several investigated methods for biocarbon capture, microalgae use is an environmentally friendly and low cost technique. One of the main advantages of microalgae over land plants is their higher photosynthetic efficiency. This enables microalgae to assimilate CO_2 at rates greater than those of terrestrial plants while also producing valuable biomass of interest for biofuels and pharmaceuticals.*

As such, the objective of this work is to concentrate on developing a modular device for carbon dioxide sequestration through microalgae culture including the unit design, the mathematical model of the algae photobioreactor and functional simulation of the system with confirmation of steady-state performance

With rising levels of atmospheric carbon dioxide (CO_2) in the contemporary world, there exist a dire need for novel sustainable means of capturing carbon in the atmosphere to curtail climate change. This work examines whether a carbon capture unit can be configured based on algae which, as a natural CO_2 sponge, can potentially return the required energy and substrate. Because of their high efficiency in conversion of CO_2 into biomass, algae are also a potential alternative to traditional carbon capture and storage (CCS) processes.

This project concerns designing a compact bioreactor specifically adapted to enhance algae growth, CO_2 trapping and biomass production. The study covers initial algae species selection, bioreactor design and optimization as well as different operational and environmental conditions like light, CO_2 concentration and nutrient concentrations. KPIs, such as rates of CO_2 absorption, biomass yield, and system energy consumption.

Keywords: *Climate Change*

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