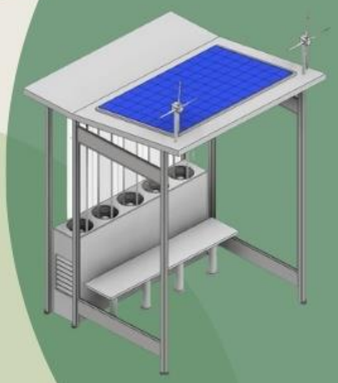
ACRP University Design Competition for Addressing Airport Needs

A Microalgae Photobioreactor for Improving Air Quality Around Airports

Airport Air Pollution

The transportation sector generates the largest share of greenhouse gas emissions at 28% in 2021 (EPA, 2024).

Our Photobioreactor



Five air-lift column photobioreactors that purify the air while also serving as a transit shelter for arriving and departing passengers located near the pick-up and drop-off areas of the airport terminal. This design can absorb approximately 81 g of carbon dioxide per day, whereas a tree can only absorb about 27 g of carbon dioxide per day (Bernet, 2023).

Role of Microalgae

Microalgae have a CO2 fixation efficiency that is 10-50 times better than that of terrestrial plants and an ability to effectively utilize the Nitrogen & Sulfur containing pollutants that threaten human health (Zhou et al., 2017).

Impact on Human Health

Global aviation emissions contribute to approximately 16,000 premature deaths every year (Yim et al., 2015).

Sustainability of Microalgae Cultivation

Microalgae biomass can be used in the production of “food, animal and aquaculture feed products, cosmetics, nutraceuticals, pharmaceuticals, fertilizers, bioactive substances, and biofuels (Zhou et al., 2017).”

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