A Look at Post-combustion Flue Gas CO_2 Capture for Sustainable Algae Production

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Abstract. Making up approximately 80% of the United States greenhouse gas (GHG) emissions, carbon dioxide is the primary GHG emitted through anthropogenic activities. Fossil fuel derived electricity generation—specifically coal combustion— is one of the dominating sources of this ubiquitous pollutant. Orlando Utilities Commission (OUC) strives to reduce its carbon footprint by investing in technologies to capture CO_2 from their flue gas. Captured CO_2 may then be used to stimulate large-scale algae production. In their third year partnering with the University of Florida, OUC has tasked a group of students to research the feasibility of using absorption methodologies for carbon capture and algae production.

Over the course of 8 months, an interdisciplinary team of engineering students from the University of Florida investigated two different scenarios for feeding captured CO_2 to algae. After chemical absorption, the CO_2 can be delivered to algae via two methods: (1) adding CO_2 - rich solvent directly to algae ponds or (2) by stripping CO_2 gas from the solvent and adding pure CO_2 gas to ponds. The first scenario was evaluated utilizing a gas absorption prototype that was designed and built at the University of Florida Chemical Engineering Department and which used potassium carbonate as the operating solvent. Potassium carbonate was used as a transport mechanism to deliver the CO_2 to the algae. Algae toxicity testing was performed using a spirulina culture to determine the effects of loading the CO_2 rich potassium carbonate into the culture Also, preliminary studies suggest that CO_2 remained captured in the solvent long enough to transport and distribute to algae ponds. The second scenario required simulating the absorption of more efficient solvents for CO_2 capture within the software ASPEN Plus at larger flow scales. Amine based compounds simulated in ASPEN were found to achieve absorption efficiencies up to 90%. As this scenario considered CO_2 stripping from the solvent, it is assumed that the CO_2 fed to algae is pure and nontoxic.

2019 Algal Biomass Summit Budget
Mary Rosenthal Student Travel Grant Application
Applicant Name: Madelyn Wilson
University: University of Florida

Professor: Dr. Sindia Rivera-Jiménez

Airfare	$0
Lodging (ABS Hotel x3 Nights)	$643.50
ABS Registration	$795
Total	**$1,438.50**