The Coupling of Two Processes to Create Algae Biofuel

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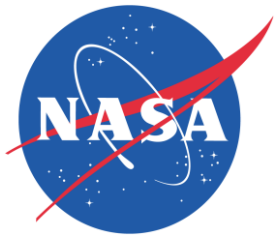
University of Arizona



Improvements to the environment

- One solution to two environmental problems:
  - Reduces greenhouse gas emissions
  - Offers a viable alternative fuel
    - Does not utilize corn feedstock needed for human dietary consumption
    - Cleaner fuel than petroleum/gasoline
    - Does not require deforestation like biofuel from wood biomass
  - Solves the water consumption issue
    - Power plant process water must be treated prior to disposal

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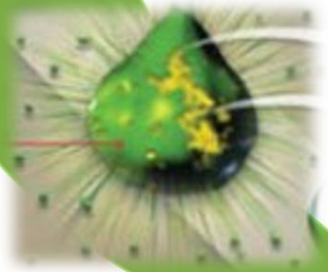
Biodiesel Production

Cultivation

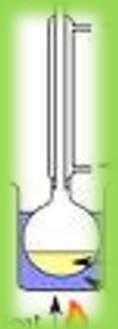
Harvesting



Biomass processing

Lipid Extraction

Transesterification Reaction



Analysis by GC-MS/FID

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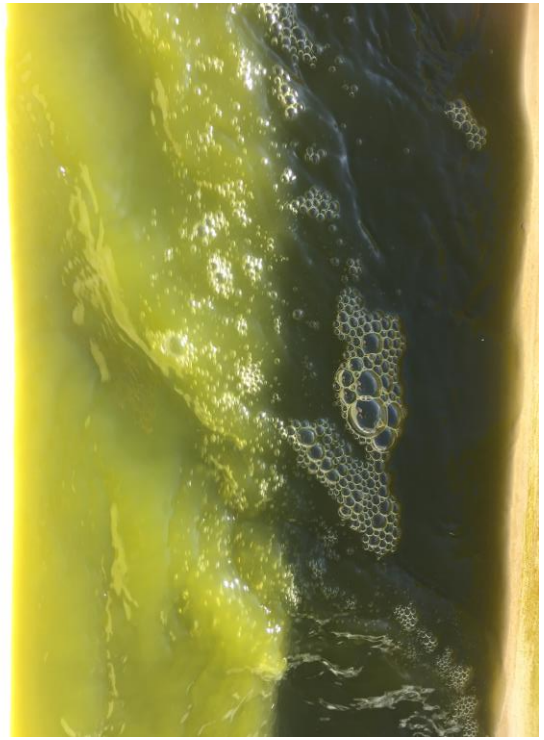
Process 1: Mitigation of CO2

- The algae recycle the CO2 normally emitted into the atmosphere (flue gas), and feeds on it to create biomass
- The lipids created by the algae are valuable for a efficient burning biodiesel
- The CO2 also controls the pH of the algae's growth environment



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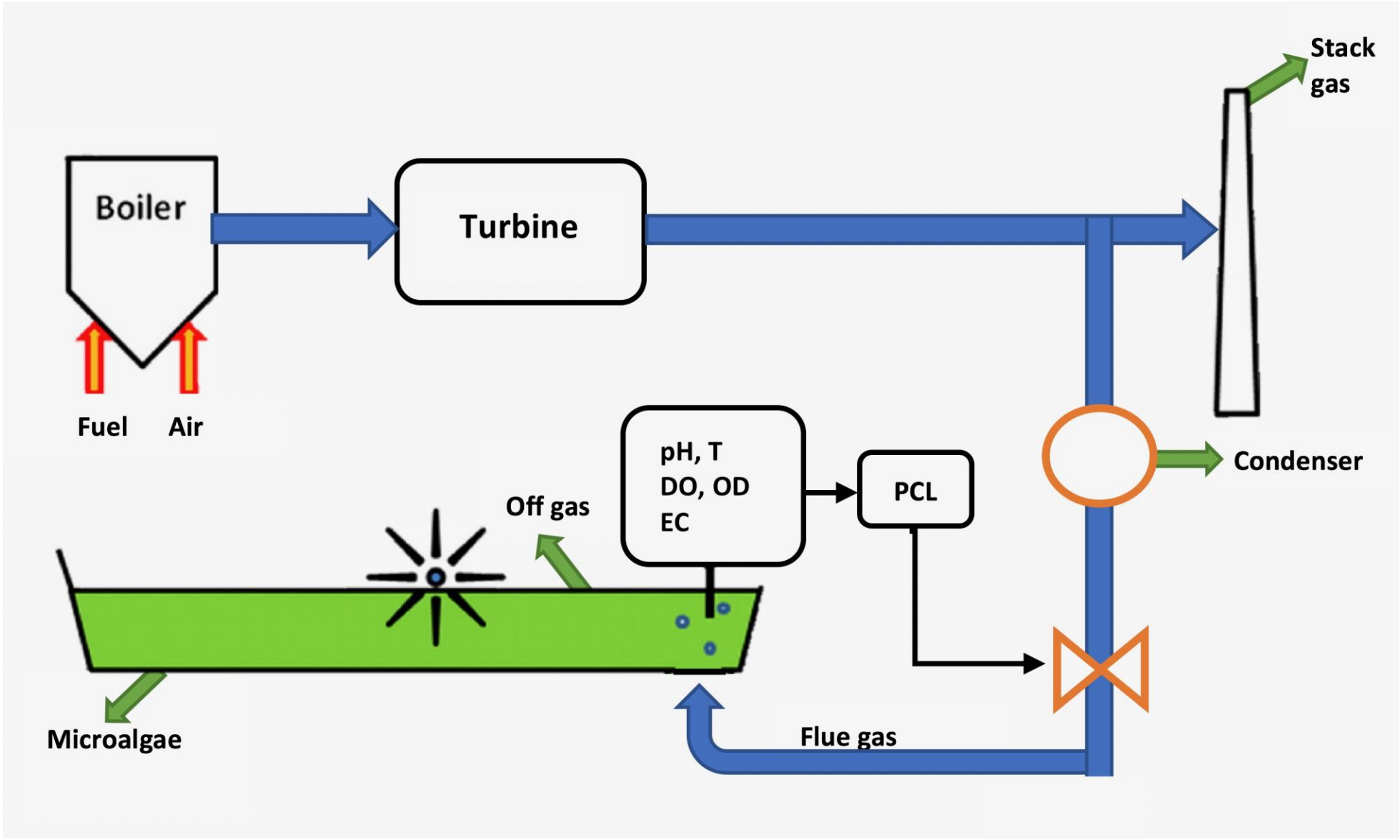

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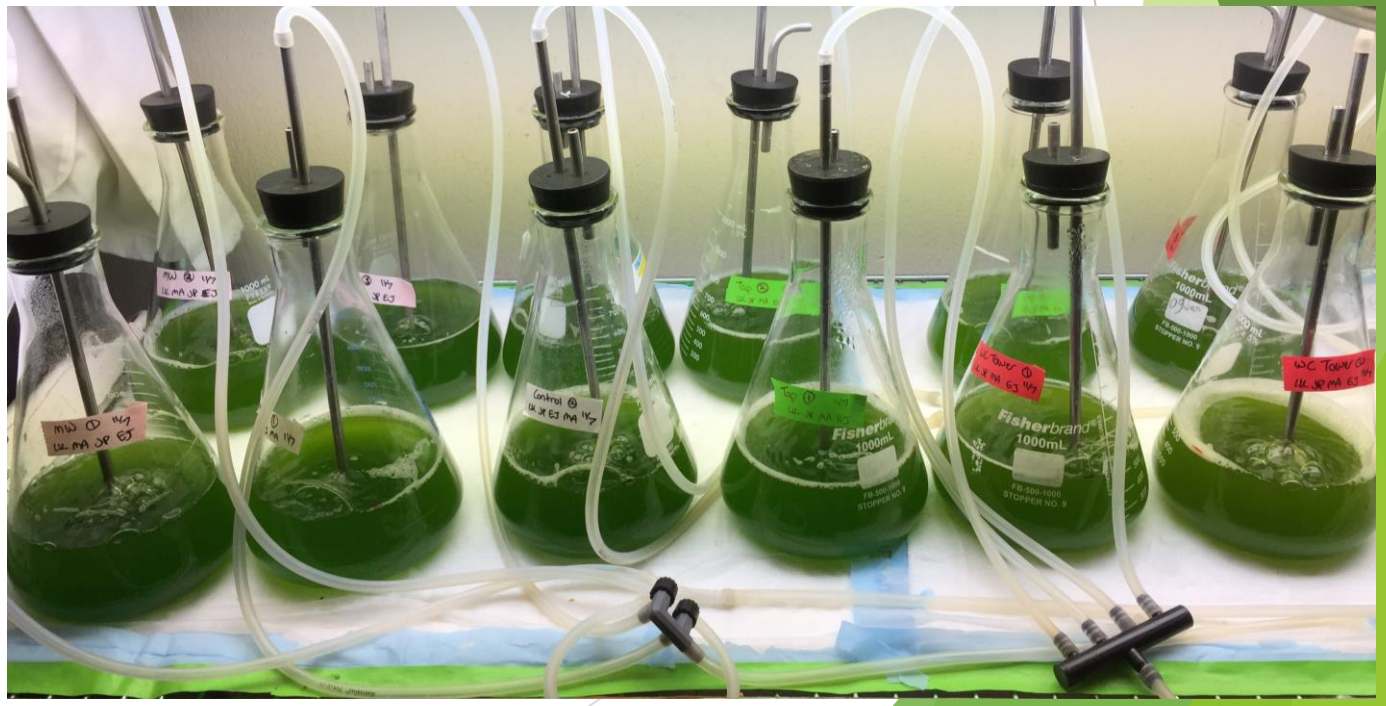
Process 2: Utilizing power plant wastewater

- Another use for algae is to treat wastewater
- Objective: analyze the growth rate of algae in different types of water
- Samples taken from sites around the power plant:
  - Cooling Tower water
  - Makeup/recycle water
  - Tap water
  - Control (Distilled Water)



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Overall System

Water Cooling Tower

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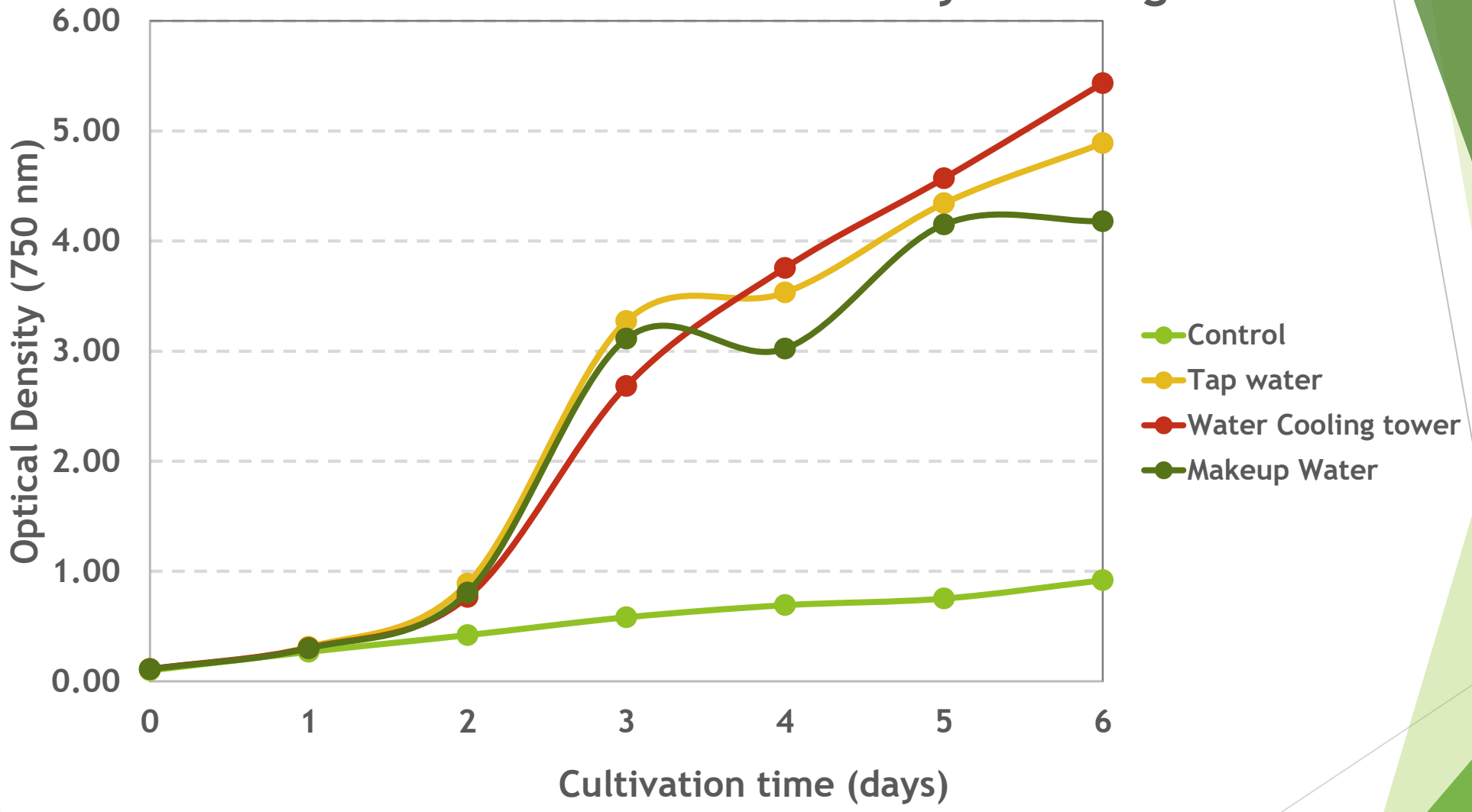
Process Water Treatment by Microalgae



- Cooling Tower Water produced the best growth rate results

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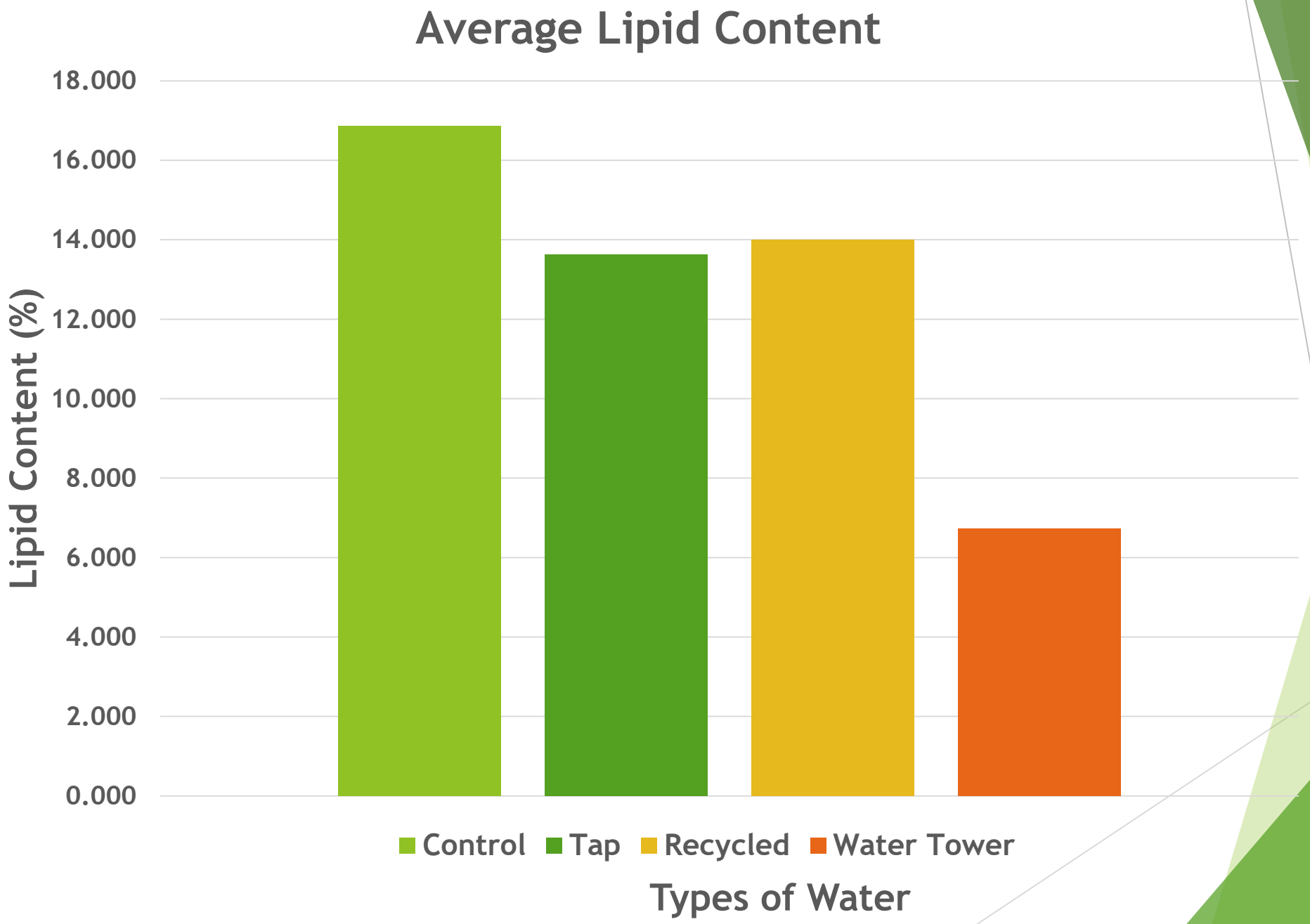

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Conclusion and Future Prospects

- Cooling Tower Water produced the best growth rate
- The control produced the highest lipid content
- Next step would be to take it out of the lab and pilot scale the experiment
- Future research: water analysis
- Other possible uses:
  - Space operations
  - Utilized in other types of power plants
  - Fuel for jets, cars, and other transportation vehicles
  - Inks
  - Livestock feed

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Thank You

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NASA