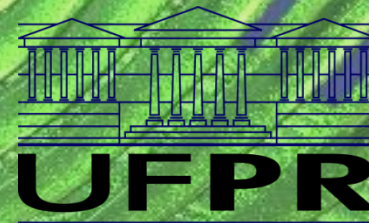




International Team 11

# Design and Development of a Gas Coupling Unit for Trigeneration and Algae Photobioreactor Systems





# Systems Coupling



Exhaust Gasses



# Why???



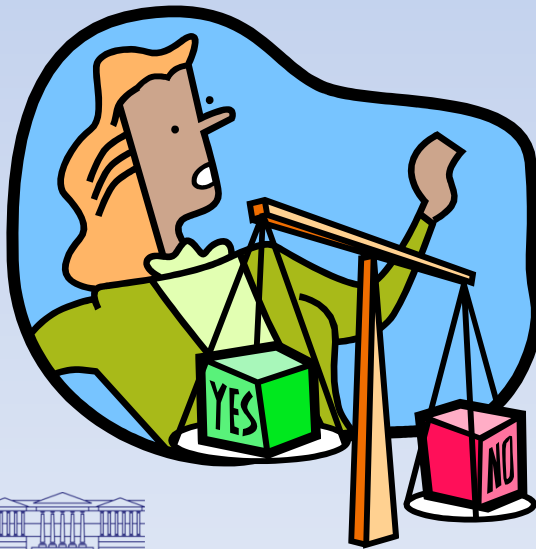
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- Consume the CO<sub>2</sub> produced during the combustion;
- Use the exhausts gases to increase the algae growth;
- May produce Biodiesel by the algae fat;
- Sustainability;



# Selection Criteria

- Each criterion will be weighted, each concept will be scored in each criterion
- Highest weighted score is selected
- Closer evaluation may be needed if more than one concept stands out



- **Adaptability** – Can be used with different trigeneration /photobioreactor applications
- **Scalability** – Applicable to larger or smaller systems
- **Power Requirements**– Must not draw too much electrical power from generator
- **Durability** – Expected lifespan, resistance to fouling or corrosion
- **Reliability** – Consistency of operation and/or steady-state condition
- **Cost** – Efficient budget use
- **Controllability** – Precision control of nutrient delivery
- **Capture Effectiveness** – Portion of exhaust gases sequestered / maximum capacity





# Concepts 1, 2 & 5

A pump is required to overcome the water pressure and initiate bubbling in the bioreactors



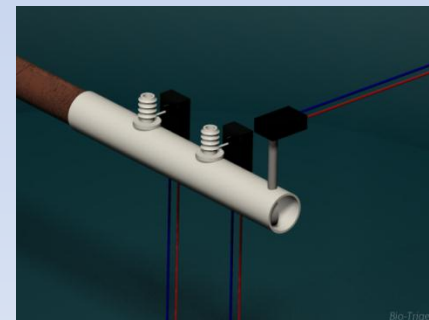
These designs cannot work without modifications



# Conclusions

The modified concept has the following advantages:

- Cheap to manufacture
- Relatively easy to maintain
- Easily replaceable parts
- Corrosion resistance
- Low power draw
- High controllability
- Easily scalable
- Robust / adaptable

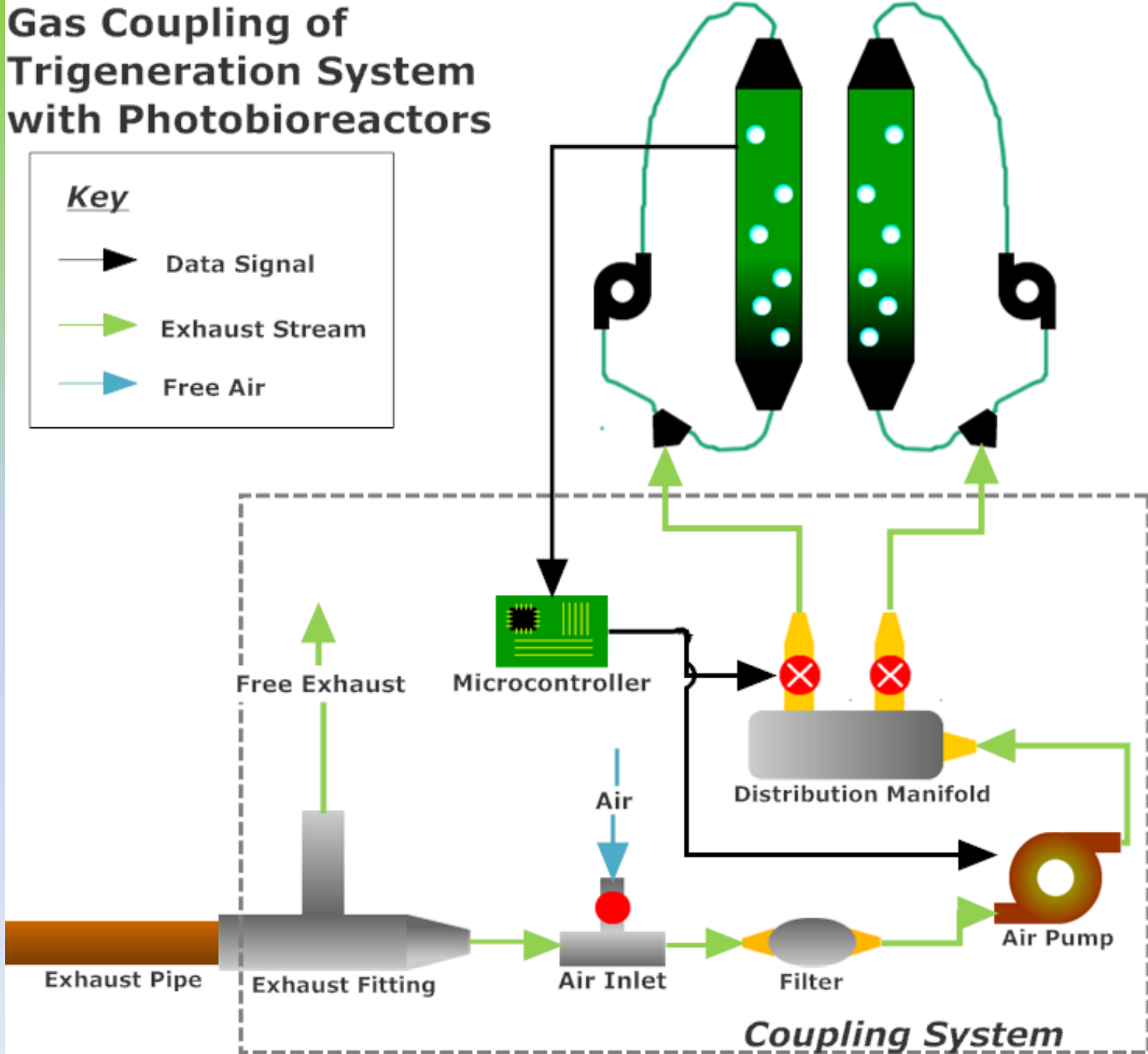




# Gas Coupling of Trigeneration System with Photobioreactors

## Key

- ▶ Data Signal
- ▶ Exhaust Stream
- ▶ Free Air





# What has been completed since the last presentation

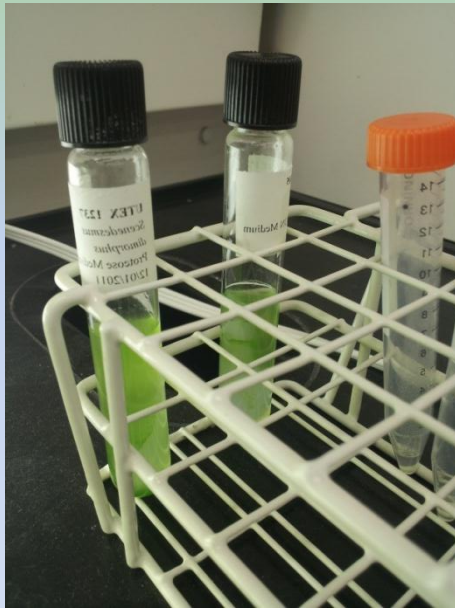
- Pump re-selection
  - HP-20 → GP-40
  - Higher Flow Rate
  - Standardized Inlet & Outlet
- Obtained badges in order to work in CAPS building
- New Algae selected
  - Chlorella sp. & Scenedesmus → Chlorella Vulgaris & Scenedesmus
  - Easier to grow
  - More resilient



# What has been completed since the last presentation

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- Inoculated old algae again
- New bioreactors unpacked



# What has been completed since the last presentation

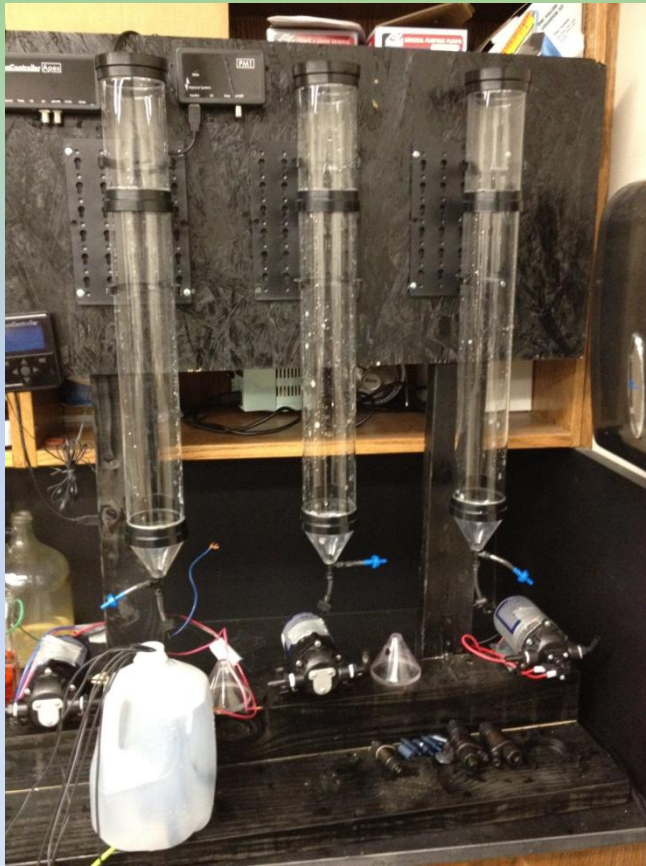
- Used Iodine to neutralize the old cultures in order to appropriately dispose them





# What has been completed since the last presentation

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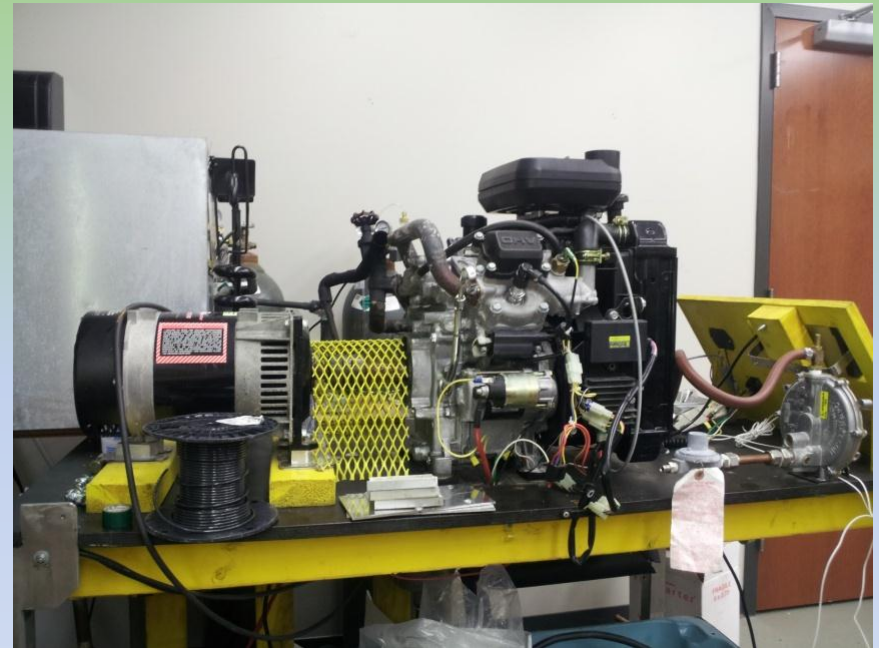


- Old bioreactors cleaned
- Replaced the tubing
- Keep the pH sensors in the water



# Next Tasks

- Run the Trigereneration System
- Check the exhaust gases temperature during the test



# Next Tasks

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- Test pH sensors
- Order / Purchase Parts
- Inoculate new Algae strain
- Order strain specific food

