An Innovative Concept for Degassing and Absorption in Photobioreactor

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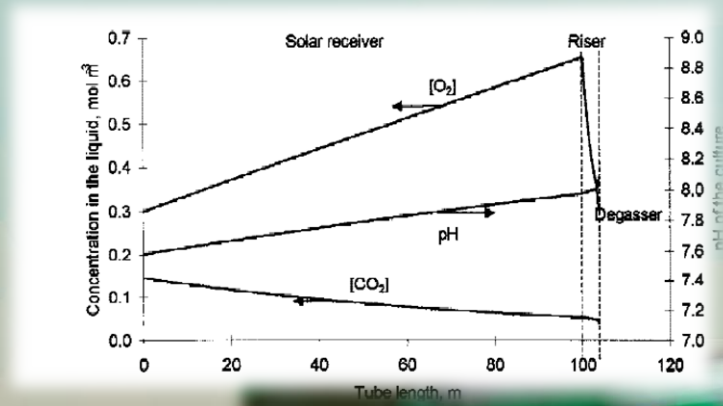
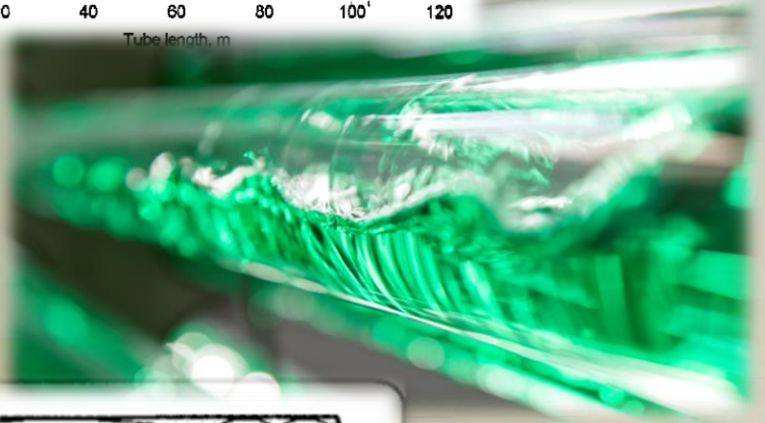
3 Scale up Limits

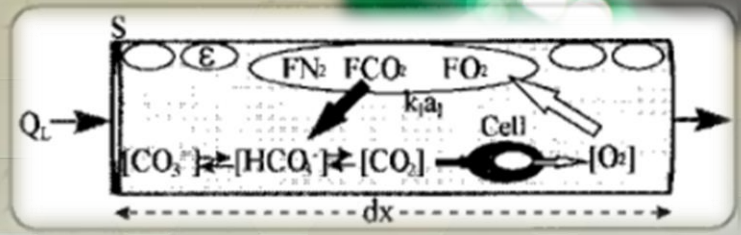
1. Limited Maximum Lenght of the S olar Collector due to oxygen bu ildup in liquid phase.

2. Large Geometry for the degassing vessel due to limited driving force (~10 mg/l)

3. Carbon dioxide loss with pH control in the solar collector or degassing vessel







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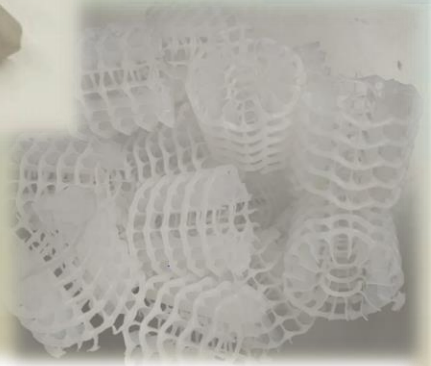
Prediction of dissolved oxygen and carbon dioxide concentration profiles in tubular photobioreactors for microalgal culture
F. Camacho Rubio,F. G. Acién Fernández,J. A. Sánchez Pérez,F. García Camacho,E. Molina Grima

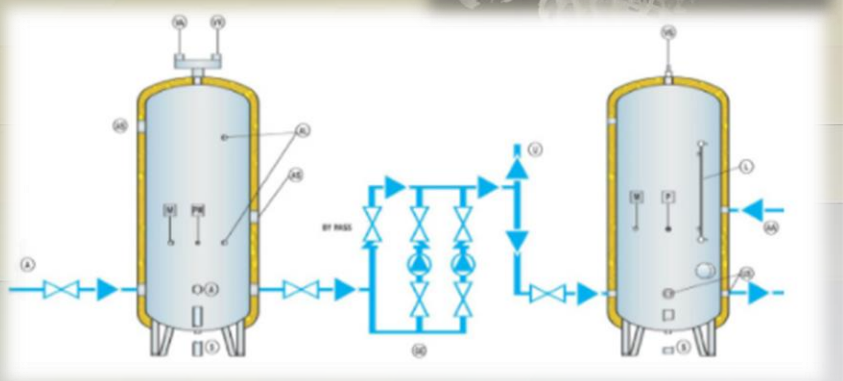
Our Solutions

1. Solar Collector elongated thanks to a b ubble free gas-liquid extraction me mbrane supported realized with PTF E 3D printed.

2. Optimization of the degassing process with dynamc pressure control, higher gas-liquid surface thanks to tower p acking coated elements.

3. Dedicated vessel for pH control with CO2 recirculation and dynamic pressure control.





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Membrane-Supported Liquid-Liquid Extraction
Wolfgang Riedl doi.org/10.1002/cben.202000032

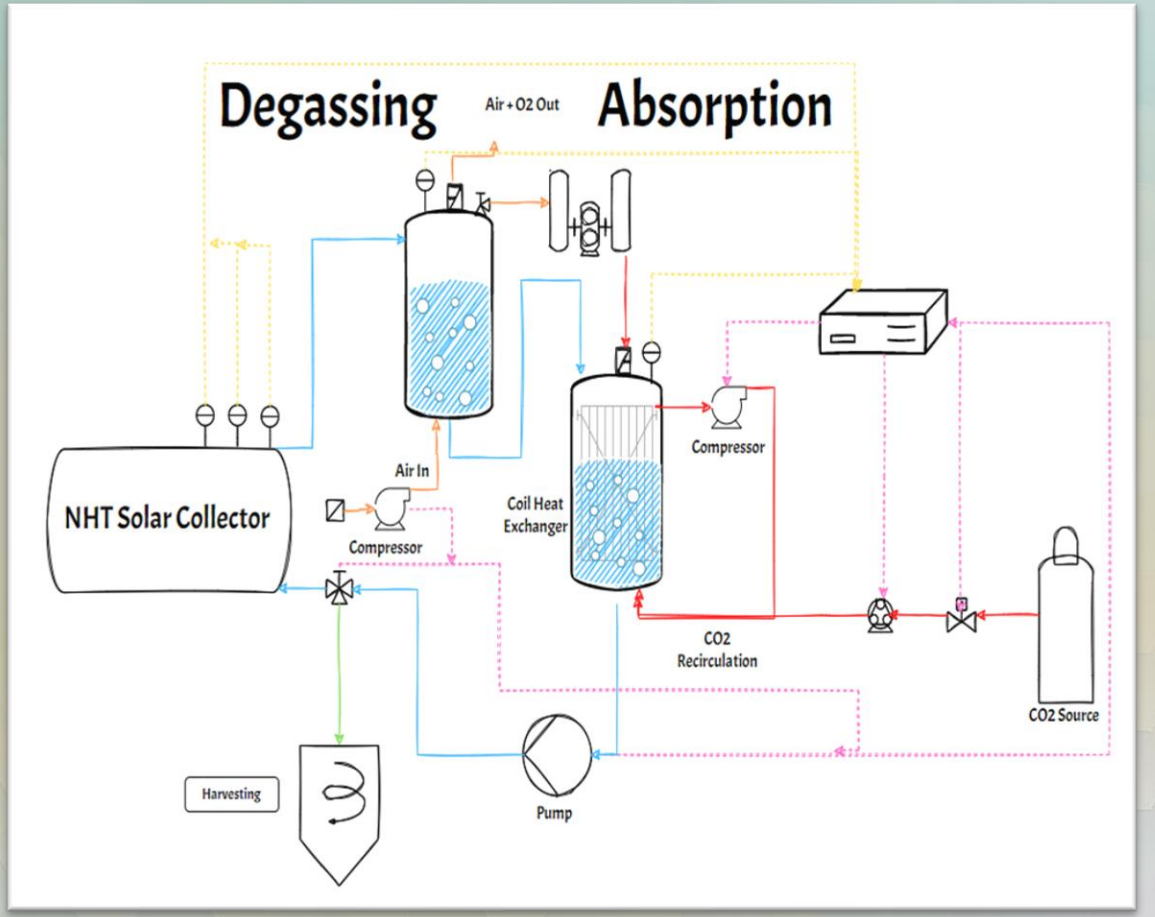
Design and Simulation

Separate the two processes into t wo different units.

Full CO2 recirculation with 0% Carbon Dioxide losses.

Pressure Variation in function of t he DO.

Highly Adaptability to different scenarios (YCO2, XO2, pH, Flow).



Test Result

High volumetric mass-transfer coefficient in both processes:

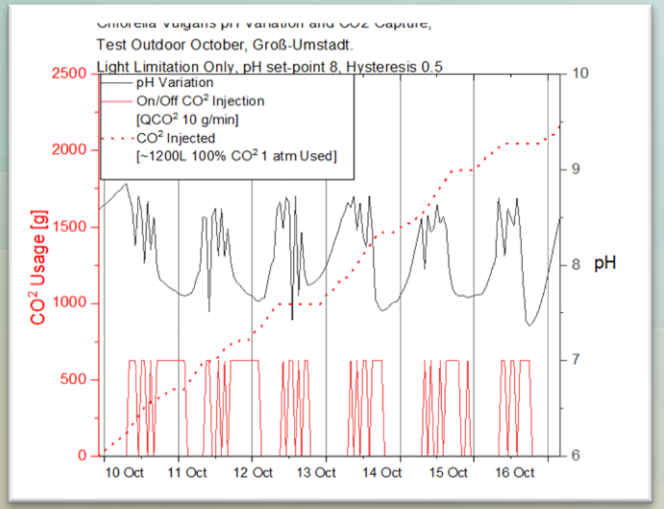
K_La_{O2} = 26.1 h^{-1} @ ε = 0.001185

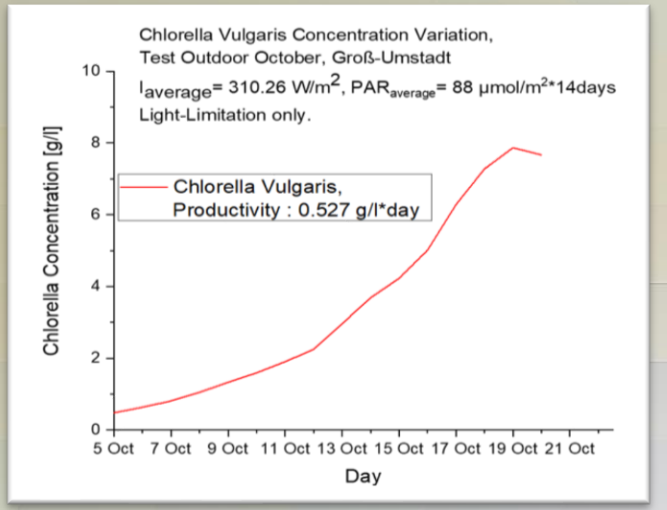
K_La_{CO2} = 28.05 h^{-1} @ ε = 0.000891

High Productivity obtained even in batch mode.

High Hysteresis allowed (high pH variation).

Only 2.1 kg CO2 used to control the reactor for 6 days.





Future Development and Scale Up

- Application of the complete system in a larger scale tubular photobioreactor with estimated s olar collector length up to 1200m.
- Governmental Founded project for Carbon Di oxide from Biogas production Plant usage.
- New test with gas-liquid and liquid-liquid e xtraction with enhanced hollow membrane.

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Thank You

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