Low Cost Photobioreactor for Algae Cultivation

This technology demonstrates the potential of using waste CO₂ and heat from coal-fired power plants to cultivate algae, which can then be processed into value-added products like biofuels and other bioproducts.

Key Elements

- **Low Cost** - Semi-rigid, thin-wall material strikes balance between cost and strength
- **Modular** - Eliminates major scale-up issues, can customize based on project requirements
- **Scalable** - Can range in size from 7.5-10,000 liters; can be used as seed and/or process reactors
- **Integrated** - Cultivation, harvesting, and measurement and control all incorporated
- **CO₂ input** - Liquid driven venturi method avoids high cost and complexity associated with gas compression
Material Characteristics

- Inexpensive
- Recyclable
- Commercially Available

Comparison of PBR Material Costs
(normalized for equal volume tube assemblies)

<table>
<thead>
<tr>
<th>Material</th>
<th>Height (feet)</th>
<th>$/ft</th>
<th>$/tube</th>
<th>$/Fitting</th>
<th>Sub $</th>
<th>Total $</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLASS</td>
<td>4&quot;</td>
<td>12.5</td>
<td>3.3</td>
<td>41.25</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>6&quot;</td>
<td>6</td>
<td>5.3</td>
<td>31.8</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>PVC</td>
<td>4&quot;</td>
<td>12.5</td>
<td>7.1</td>
<td>88.75</td>
<td>5</td>
<td>10</td>
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<tr>
<td></td>
<td>6&quot;</td>
<td>6</td>
<td>10.75</td>
<td>64.5</td>
<td>10</td>
<td>20</td>
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<tr>
<td>PET</td>
<td>5&quot;</td>
<td>8</td>
<td>0.90</td>
<td>7.17</td>
<td>5</td>
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</tbody>
</table>

Benefits of photobioreactors compared to open ponds

- Higher areal productivity
- Closed system limits contamination
- Higher CO₂ utilization efficiency

Adjustable measurement probe portfolio

- Dissolved CO₂ - Reaction input
- Dissolved O₂ - Reaction product
- pH - Maintain process control
- Gas Phase CO₂ - Monitor equilibrium
- Photosynthetically active radiation - Reaction input

Contact

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