The structure of our plant is divided into three parts:

1. Carbon absorption infrastructure for capturing carbon that algae consume to grow up.
2. Upstream consists of a series of reactors scaled to produce enough concentration of algae to produce subsequent extraction in the sea bag bioreactors.
3. Downstream that consist of separate biomass from algae oils and then, through a process of transesterification, to obtain biofuel.

The project undertaken in this report corresponds to a vision of the future of renewable energy and more specifically to the production of biofuels. The idea we start with is a biodiesel production plant with the capacity to meet 10% of demand for the biodiesel Catalonia planned for the coming years. The biodiesel will be produced from algae because its production capacity is much higher than other crop species used in the production of biodiesel like corn.

The objective of the current work would be to produce 10% of the use of biodiesel in 2015 will be of 741 KT, 15% of the total diesel fuel today. The biofuel Catalonia planned for the coming years. The idea we start with is a biodiesel production from algae plant.

**EXECUTIVE SUMMARY**

The summary of the whole project concludes that its viability with the actual situation is not possible since the price obtained for our product highly exceeds the current market price of the fuel without government subventions. As mentioned on the Market of the product section, the annual output of our plant was 17 KTon/year (13 batches). We could not achieve the stated goal, reaching only 23.4% of the desired production.

**EXECUTIVE SUMMARY**

<table>
<thead>
<tr>
<th>Total Capital Investment</th>
<th>$571,536,370</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Investment Charged to Project</td>
<td>$611,545,915</td>
</tr>
<tr>
<td>Operating Cost</td>
<td>$167,535,997</td>
</tr>
<tr>
<td>Production Rate</td>
<td>23,077,985.86 kg/yr</td>
</tr>
<tr>
<td>Unit Production Cost</td>
<td>$9.34/kg</td>
</tr>
<tr>
<td>Total Revenues</td>
<td>$236,399,220</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>19.13%</td>
</tr>
<tr>
<td>Return On Investment</td>
<td>29.0%</td>
</tr>
<tr>
<td>Payback Time</td>
<td>11.33 years</td>
</tr>
<tr>
<td>IR (After Taxes)</td>
<td>$70.7</td>
</tr>
<tr>
<td>NPV (at 7.0% discount)</td>
<td>$496,546,000</td>
</tr>
</tbody>
</table>

**CAPITAL COST ESTIMATION**

SuperPro Designer was used as the basis of the process does not fit with the plant model that we have designed. For this reason the calculation has been made manually using the program economical statistic parameters. [3]

**MARKET OF THE PRODUCT**

The Catalán Institute of Energy, Department of Labor and the Industry of the Government of Catalonia expect that the use of biodiesel in 2015 will be of 741 KTN, 15% of the total diesel fuel today. The biofuel Catalonia planned for the coming years. The idea we start with is a biodiesel production from algae plant.

**OPERATING COST ESTIMATION**

The cost estimation discussed in the previous section is valuable for economists, engineers and microbiologists because they are concerned with the long-run industry sustainability. Nevertheless, potential investors may be more concerned with the profitability of their investment. Profitability is typically measured by such indicators [4] as payback period, net present value (NPV) and internal rate of return (IRR) extracted from the Cash Flow of the project [5]. This section will analyze the profitability of the biofuel production plant, providing insights to potential investors who might be interested in this technology.

**PROFITABILITY ANALYSIS**

**FINANCING - PROCESS SUMMARY**

<table>
<thead>
<tr>
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**FUEL TODAY**

The refining model of extensive fractionation in order to extract value from every last drop of the barrel of oil must be adapted and adopted for biofuel refinement [1]. Oil currently benefits from a relatively low raw material price (an advantage that is slowly being eroded), but oil-derived products also benefit from highly efficient, integrated processes that minimize capital and operating costs. Unless biofuelseries adopt the same approach of extensive fractionation and effective process integration, they will fail to achieve competitive operation.

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The Catalán Institute of Energy, Department of Labor and the Industry of the Government of Catalonia expect that the use of biodiesel in 2015 will be of 741 KTN, 15% of total diesel distributed in Catalonia [2]. Our aim would be to produce 10% of the use of biodiesel in 2015 will be of 741 KT, 15% of the total diesel fuel today. The biofuel Catalonia planned for the coming years. The idea we start with is a biodiesel production from algae plant.

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