



Biorenewable Insights: Algae Technology

Algae Technology is one in a series of reports published as part of NexantECA's 2023 Biorenewable Insights program.

Overview

Algae is consumed as food, used as fertilizer, used in wastewater treatment process or converted into biofuels via thermochemical/ biochemical reactions. They are also rich sources of bioactive components including proteins, polysaccharides, essential fatty acids, which have found application in food, pharmaceuticals and cosmetic industry.

Algae is touted as a panacea for global warming, in that it is a potential source of fuel that actively fixes carbon. This has the potential to produce carbon-neutral or carbon-negative fuels. As such, it has been explored as a sustainable source of biofuel, given its high lipid content that can be converted into biodiesel and polysaccharides that can be converted to biogas or bioethanol.

This BI report provides an overview of the production pathways, growth mechanisms, culturing systems, harvesting and extraction techniques. The following issues are also addressed in this report:

- Technology overview
- Status of technology developers
- Comparison of the different technology routes and process economics comparison
- Carbon intensity impact
- Capacity analysis
- Commercial applications of algae

Technologies

There are many approaches to the production of algae for oils, and the extraction of those oils. The process begins with selecting the appropriate algae strain for intended use. Following that would be algae cultivation which can be take place in fresh water, seawater or even wastewater in an open or closed system. Key areas covered include:

- Algae growth mechanisms
- Culturing systems
- Harvesting and product extraction

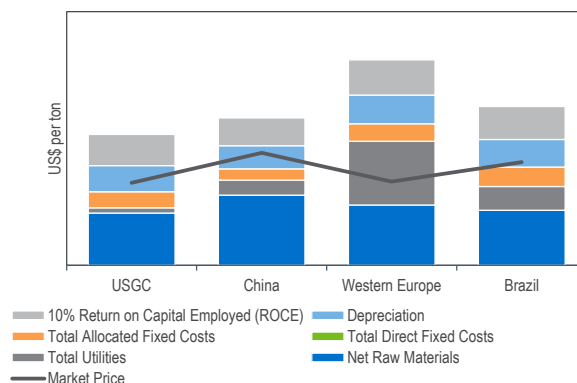
Strain Selection	Cyanobacteria	Microalgae	
Cultivation	Open/ Closed Terrestrial Systems	Open/ Closed Offshore Systems	
	Fresh Water	Sea Water	Wastewater
	Autotrophic	Mixotrophic	Heterotrophic
Harvesting	Filtration		Gravity Settling
	Centrifugation		Filter Pressing
Extraction	Mechanical		Chemical

Process Economics

Detailed cost of production estimates for algae production via open pond, photobioreactor (PBR) and heterotroph routes are presented.

Algae products such as algae oil, ethanol and diesel are also included.

Regional comparison includes USGC, China, Western Europe and Brazil.



Commercial Impact

Algae-based fuel currently face challenges in terms of cost competitiveness compared to traditional oil and gas.

NexantECA believes that the competitiveness of algae biofuel will depend not only on the costs of production relative to alternatives but also on difficult-to-predict factors such as "green premium" pricing, the price of credits and other policy compliance instruments, and the regional presence of a carbon price.



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The BI program (sister program to the world renowned TECH program, formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging technologies of interest to the renewable energy and chemical industries.

BI's comprehensive studies include detailed technology analyses, process economics, as well as capacity analysis and impacts on conventional industry. Reports typically cover:

- Trends in technology
- Strategic/business overviews and/or developer profiles
- Process Technology:
- Chemistry
- Process flow diagrams and descriptions of established/conventional, new and emerging processes
- Process economics – comparative costs of production estimates for different technologies across various geographic regions
- Capacity tables of plants and analysis of announced capacities
- Regulatory and environmental issues where relevant

Subscription Options

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- Cost of production tables in spreadsheet format (as requested)
- Consultation time with the project team

An annual subscription to BI includes 10 reports published in a given program year. Reports can also be purchased on an individual basis, including reports from previous program years.

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

NexantECA serves its clients from over 10 offices located throughout the Americas, Europe, the Middle East, Africa, and Asia.

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