

Business Plan OrangeX Greens



OrangeX

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Outlines:

1. OrangeX LLC as Engineering Manufacturing & AI firm
2. OrangeX Biofuels (Green Manufacturing)
3. Market Need & Critical Market Analysis
4. Technology for the entire Project
5. Funding Chart & Financial Plan Summary
6. Operational, Management & Marketing Plan Summary

1. OrangeX LLC as Engineering Manufacturing & AI firm:

OrangeX LLC is an Engineering Manufacturing & AI firm. OrangeX LLC is an Engineering design, manufacturing and Artificial Intelligence firm which produces Biofuels, and creates novel and innovative Biofuels driven Engineering automobiles named **FormulaX Trucks** and innovative AI Generative social media engine named ChatMap. **FormulaX Trucks** utilize **hybrid fuels sources** as a **mix of renewable biodiesel sources and conventional fuel (oil & gas) sources** **to create the most efficient, cost-effective, and environmentally green automobiles possible.** Technological innovation for biofuels is concept, design, development, and manufacturing of the Novel Photobioreactor Design for producing biodiesel feedstock from algae. ChatMap utilizes user-based GIS live news feed from News sources from the internet and would help create **new social trends** as **live data creation tool** and then create **reward based social media for users,** rewarded through live debates and live audience voting on such debates, whose data is fueled through its unique AI Generative algorithms.

Logo of OrangeX LLC:



Figure 1: Logo of OrangeX LLC

The Four Triangles mean Power, Law, Science and Wealth. It also represents incredible stability and upwards momentum. It also represents Pyramids of Egypt which are a symbol of power and money, and it also represents Dollars on the USA Bills.

2. OrangeX Biofuels (Green Manufacturing):



Technological innovation for biofuels is concept, design, development, and manufacturing of the Novel Photobioreactor Design for producing biodiesel feedstock from algae. OrangeX Biofuels technology manufacture & produce a specific blend of Biodiesel for a wide range of Biodiesel blends powered applications.

Official Color of Biofuels:

The Official Color of this platform will **Green (##008000)**; matching Green Revolution). **Green is a secondary color.**

Motto, Legacy, Vision and Logo of OrangeX Greens Development Company (OGDC):

The motto of OrangeX is **Survive, Profitability and Sustainable Expansion!** Vision of OrangeX LLC, USA is to create the next world of Manufacturing in the 21st century by ushing the limits of Manufacturing Innovation and advancing human civilization!



Figure 1: OrangeX Greens Development Company (OGDC)

3. Market Need & Critical Market Analysis:

The problem which we are trying to solve here is that Oil and Gas are going to be exhausted in less than 25 years, and obviously Oil and Gas companies are having trouble figuring out that how to make a smooth, profitable and easy transition from Oil and Gas to Renewables or Biofuels, so inevitably that is going to happen; now, since the major profits of this are from the Automobiles industry so the Automobiles industry as of now is not adapting to support Renewables effectively since Solar and Wind are not effective solutions, as we cannot just make everything electric, since, all the major Engine companies and Automobiles never want that thing to happen, otherwise, how would Oil and Gas sell; that is why figuring out which can be the World's First Commercial Automobile that works on Biofuel Engine, primarily designed for that; and how can this new car company make shift from Oil and Gas to Biofuels most effectively, since, both Solar, Wind (sources of Electric Power) will not be able to compete effectively within the Global Oil and Gas



Market; and Oil and Gas companies will keep jacking up the prices and that us hurting them and that is hurting Renewables Sector as well, so a Joint Venture in this area might prove to be the most fruitful one; and since, the major economic impact of Oil and Gas has been on Automotive Industry so we know that Biofuels Driven Automobiles are the future, Most Economical and Best Alternatives available! Thumps up to a Sustainable and Greener Future for the world and for our next generations! So, the problem statement clearly tells how Market Need of Biofuels is favor by Shifting Market Dynamics in direction of Biofuel driven Automobiles.

“A strategy of skipping biofuels and electrifying everything means choosing to use massive quantities of fossil fuels that emit the most toxic and carbon intensive emissions,” says Graham Noyes, executive director of the Sacramento-based Low Carbon Fuels Coalition. At the same time, U.S. and European agricultural interests and investors are pouring serious money into biofuels that go into cars and trucks running on liquid fuels.

Since, Elon wants all non-renewable fuel to be dead, so he can take it all over with Solar works of his, but the logic is simple; I can convince all petrodollars to come and invest in my Renewables and that would make World Governments attract more to my plans of making Renewables the new oil of the World! And that would defeat Elon Musk, since, he does not have the moral authority of Renewables as he himself is fueling his renewable revolution through non-renewable generated electricity for his Tesla vehicles! And I will make such a business plan, where it will be an easy transition process for Oil Kings of the World, to come and join me in this battle to make Renewables the new oil of the World! It is all dependent upon Market Needs and Market Needs change all the time!



Figure 2: SPEL's Biofuels Idea from Waste Cooking Oil (Technology was all complete)

Market Need of Biofuels versus Oil and Gas:

The main idea of our product is to produce diesel from natural sources like algae. Diesel is being extracted from crude oil so far. But our idea is somewhat different from conventional ideas to obtain energy sources i.e., diesel to gain power like to run turbines, automobiles, and other power consuming devices. Our product is more friendly to the environment, and it is more economical for our users. It provides us with more economical benefits than diesel obtained from crude oil. It would be 10 to 15% cheaper than crude oil diesel.

Nowadays algae are mostly utilized for biodiesel production due to their high lipid content. However, algae also have high carbohydrate content that cannot be ignored. Thus, they can be utilized for bioethanol production directly or with the remains which are obtained after oil extraction. Hence, **both biodiesel and bioethanol can be produced from algae crops and since in algae, there is no crop food competition and also maximum yield hence this is the best method available.**



Figure 3: Why Algal Biodiesel is better than Diesel.

Now the world is preferring to use alternative sources of energy like biofuel because the conventional sources are increasing rapidly. So, our target is to produce more efficient fuel which would serve as a substitute for diesel. the name of this substitute is **bio diesel**. it is also called algae fuel. **Algae fuel** or **Algal biofuel** is an alternative to fossil fuel that uses algae as its source of natural deposits. As bio diesel is obtained from plants i.e., algae so it **does not produce pollution in the environment** like diesel oil. algae **absorb CO_2** from environment so its fuel is more friendly and favorable to the environment because **CO_2** is harmful.

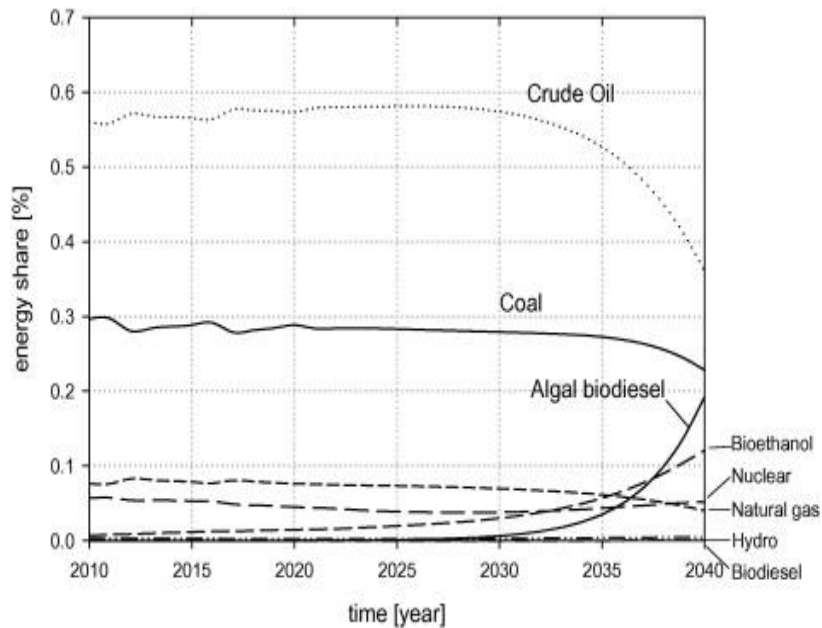


Figure 4: Crude Oil going down while Renewables Going Up (Year 2030)

Bio diesel is more friendly to the environment due to its source as well as its procedure of production. It is produced totally by natural process. We cultivate green algae in ponds which are built in a cultivation land in many acres. During the production of algae, it absorbs natural light from sun and absorb CO_2 from the environment. after the algae is produced it is cultivated and oil is extracted from it through machinery. After it this oil is sent to an oil refinery from where the pure diesel is obtained. in the whole process we produce less environmental pollution than the diesel obtained from crude oil.

Market Need of Biofuels in Global Market:

Demand for renewable fuels is growing rapidly, and by 2020 the global market for biodiesel is projected to be about 35 million t/a. Within **6 to 7 years** demand for renewable fuels will be spurred by mandated usage levels and new legislation under development in the field worldwide. So, the international market of biodiesel will expand in the coming years to come which sets the milestones for our future. Targets set for mandated bio-content include:

- The new EU directive on renewable energy has set a target of 10% to be achieved by 2025.
- National legislation in Finland, which has targeted 20% content by 2022, and
- Legislation in the US, which will require 20% content by 2022.

Another report from **Pike Research** predicts the global bio-fuels market will double over the next decade, from **\$82.7 billion in 2011 to \$185.3 billion** in 2021. Even with this rapid growth, however, significant hurdles remain and could prevent the industry from meeting government mandates.

Chart 1.1 Biofuels Production by Region, World Markets: 2011-2021

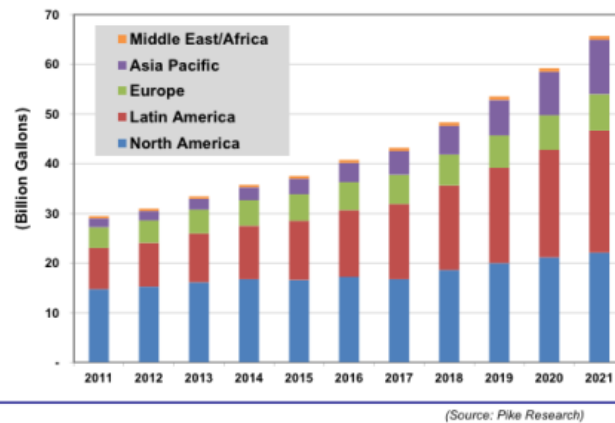


Figure 5: Biofuels Production by Region

These are big markets, and we want to target our consumers in these areas (after **6 to 7 years**). From now to before **2025** the market need of alternative sources of energy will increase to a very higher limit and this opportunity defines our international marketing plans scheme.

Chart 1.2 Biofuels Demand by Region, World Markets: 2011-2021

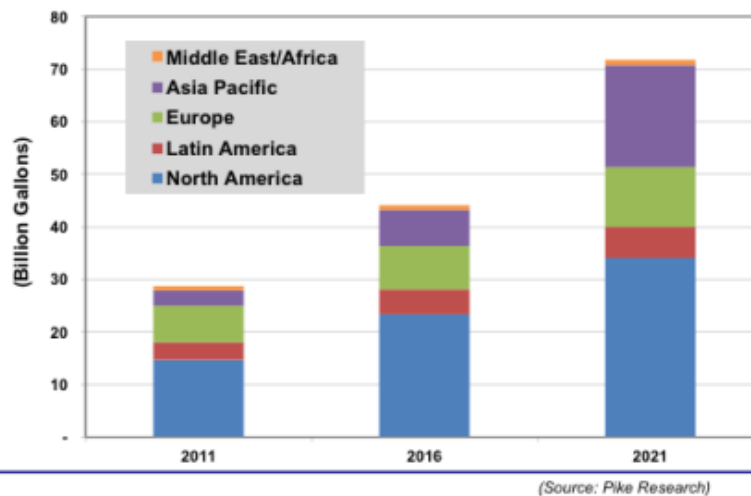


Figure 6: Biofuels Demand/Market Need by Region

In addition to mandated usage levels set for biofuels, also global economic developments, and the growth in the demand for petroleum products also play a part in shaping bio-fuel demand, as mandated usage levels are based on the overall consumption of road traffic fuels in many countries. Demand for renewable fuels has grown steadily in recent years as a result of rising bio-mandated content levels and growing demand for fossil diesel. **Global biodiesel demand in 2012 totaled 21.8 million tons (21 million tons).**

This increased competition represents an opportunity for **OrangeX Biofuels, USA** as it will reinforce the benefits offered by premium-quality renewable diesel in the eyes of both customers and legislators.



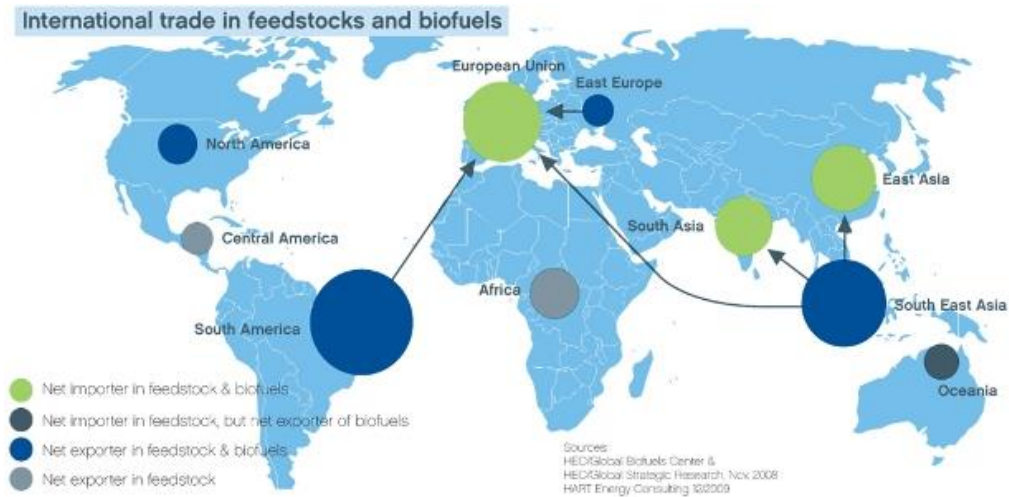


Figure 7: International Trade in Biofuels

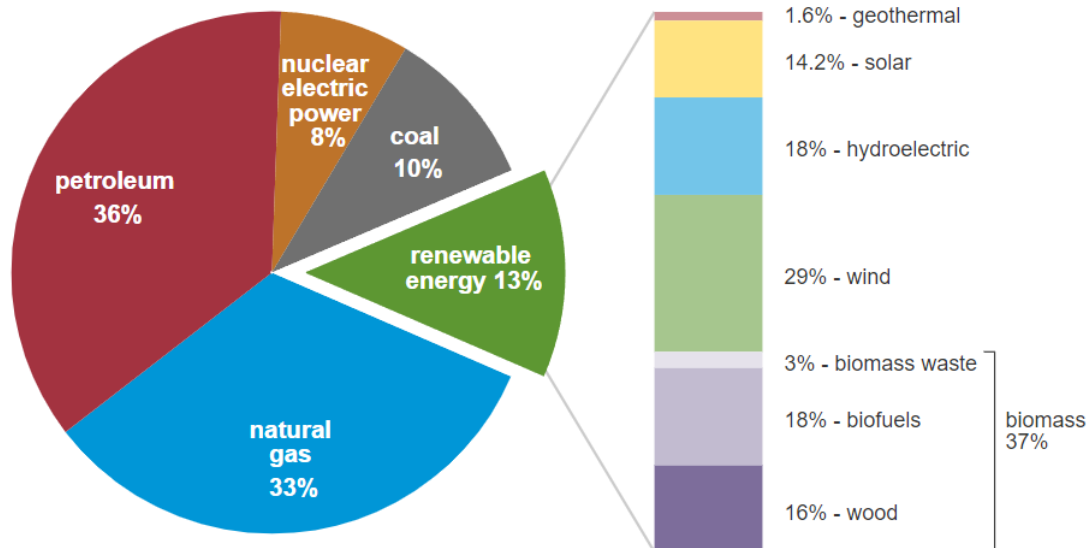
Post-Oil and Gas Boom By 2030:

When Oil and Gas production peaks in Year 2030; then by that time, Oil and Gas production will start going down; weakening monopoly of the Oil and Gas companies on Oil and Gas companies in the Global Arena, however energy demand will keep increasing.

U.S. primary energy consumption by energy source, 2022

total = 100.41 quadrillion
British thermal units (Btu)

total = 13.18 quadrillion Btu



Data source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2023, preliminary data

Note: Sum of components may not equal 100% because of independent rounding.

Figure 2: USA Primary Energy Consumption

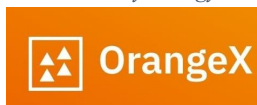


Figure 1 clearly proves Energy Consumption patterns of USA and increasing Market Need of Renewables as a Substitute for Oil and Gas/Fossil Fuels.

Critical Long Term Market Analysis:

What is going to be the impact of Biofuels Industry as fuel Source on Automobiles primarily and how can Oil and Gas companies get involved in helping Renewable Expand.

“Global Electric Vehicle Market is valued at USD 193.55 Billion in 2022 while Global oil and gas market stands at \$6,819.04 billion in 2022; it is just 2.83% of that market; that is why rather than competing with Oil and Gas Companies, coming up with Renewable Fueled Engines for a mix of Renewable Fuel and Petrol/Diesel is the right move; that would further increase the business of Oil and Gas companies and that would be enough to fuel a Renewable Energy future led by OrangeX LLC, USA! Chemical Engineering and Petroleum Jobs could easily be shifted to Jobs in Renewable Sector in the future! And since, Oil and Gas will never be enough by 2035, so Renewables will win huge deals in the coming future!”

The length of time soil can be used for algae production depends on a variety of factors, such as the type of soil, the nutrients available, and the management practices used. In general, soil can be used for algae production for several years, as long as it is properly maintained, and nutrients are replenished as needed.

However, it is important to note that using soil for algae production can also lead to the buildup of contaminants and pathogens, which can affect the growth and health of the algae. Therefore, it is recommended to regularly test the soil for contaminants and pathogens and to take appropriate measures to manage any issues that arise.

As for an expiry date for soil, there is no set expiration date for soil as it is a natural resource. However, soil can become depleted of nutrients over time, and if not properly managed, it can become contaminated or compacted, which can impact its suitability for algae production. Therefore, it is important to regularly monitor and maintain the soil to ensure optimal conditions for algae growth. If properly managed, it can go over 100 years in production as well. Agricultural land can be used for hundreds of years if it is managed sustainably and not subjected to intensive and unsustainable practices that degrade the soil quality. **Many agricultural lands have been used for centuries without being depleted or rendered unsuitable for crop production.**

In Pakistan, out of the total area of **79.6 million hectares**, **22.1 million hectares** are cultivated; the rest of the territory is comprised of culturable waste, densely populated forests, and rangelands. So, around 75% Agricultural land area of Pakistan is available for Agricultural purposes. Hence, this **Biodiesel production from algae** is a very feasible project in Pakistan. **100,000 Acres of Algae cultivation** are required to meet per year diesel demand in Pakistan which is a total of **3.83 Million Metric Tons!** (If Diesel imports were cut down to zero) So, even **25,000 Acres is enough for the project in Pakistan!** For USA, it is around **200 Million Metric Tons, so that means x50 of Pakistan or around 5 Million Acres of Land!** Pakistan needed **200,000 tons** of Diesel in Pakistan during year 2023, even **5500 acres of land** is enough! 26,800 acres land of billions allotted at throwaway price in Sindh Pakistan in 2015; 6,70,00,000 PKR; so, the price of 25,000



Acres Agricultural land (2500 PKR per acre) is just 6.7 Crores PKR in Pakistan! Wow, man, even I could have bought that! And that would give me if Biodiesel Plants were all over the facility, like a staggering 1.28 Million Metric Tons, so this looks a good project overall!

On average, algae can produce up to **100 times more oil per unit area** than rapeseed, depending on the strain of algae and the cultivation method used. This means that algae can potentially produce significantly higher yields of biodiesel per unit area than rapeseed oil. Through this single project, if done successfully, in Pakistan alone, OrangeX LLC, USA can create **100,000+ jobs** in Pakistan and Pakistan can serve as very favorable country for progressing Renewables Future in the world!

Biodiesel is a green fuel, how is it better than oil and how it's combustion is not bad for economy?

Biodiesel is considered a green fuel because it is made from renewable resources such as vegetable oils, animal fats, and algae. Unlike fossil fuels such as oil, which are non-renewable and will eventually run out, biodiesel can be produced sustainably and can potentially provide a long-term solution to our energy needs.

Biodiesel is also considered to be a cleaner-burning fuel than conventional diesel fuel. When biodiesel is burned, it produces fewer emissions of pollutants such as carbon monoxide, particulate matter, and sulfur dioxide. This can help to improve air quality, reduce greenhouse gas emissions, and mitigate the negative impacts of transportation on public health and the environment.

In terms of the economy, the use of biodiesel can have several potential benefits. For example, biodiesel production can create jobs in agriculture, manufacturing, and transportation sectors, which can help to stimulate economic growth and development. Additionally, because biodiesel can be produced locally from renewable resources, it can help to reduce reliance on imported fossil fuels and enhance energy security.

However, it is important to note that there are also some potential drawbacks to the use of biodiesel, including higher production costs and the need for additional infrastructure to support its use. Additionally, the combustion of biodiesel can still produce some emissions, and the overall environmental impact of biodiesel production and use will depend on a variety of factors, including the specific feedstocks and production methods used.

Overall, while biodiesel is not a perfect solution to our energy needs, it does offer several potential benefits over conventional oil-based fuels, including reduced emissions and enhanced energy security, which can help to support a more sustainable and resilient economy in the long term.

Human foods are also biofuels (through first principles and not analogy):

Just as humans eat, digest and get energy from food, so do vehicles eat, digest and get energy from biofuels; and also source of Biofuels and food is similar. Prove it through references. And why Biofuels are best for humans versus Petroleum Products.



The concept that human foods and biofuels for vehicles share similarities in terms of energy generation is an interesting analogy. To support this analogy, we can draw connections between the sources of biofuels and food, the processes involved in their utilization, and discuss why biofuels might be considered more beneficial than petroleum products for humans. However, it's important to note that while there are similarities, there are also significant differences between the two, particularly in terms of efficiency and environmental impact.

Similarities between Human Foods and Biofuels:

1. **Energy Sources:** Both human foods and biofuels are derived from organic matter, which contains stored energy. Human foods primarily come from plants and animals, which store energy in the form of carbohydrates, fats, and proteins. Biofuels, on the other hand, are derived from organic materials such as crops, algae, and even waste products, which can be converted into energy-rich fuels.
2. **Digestion and Conversion:** In humans, the digestive system breaks down food into simpler molecules, and these are converted into energy through various metabolic processes. Similarly, biofuels are created through processes like fermentation or chemical conversion, where the complex organic molecules are broken down into simpler compounds that release energy when burned or processed in engines.
3. **Energy Release:** When humans consume food, the energy stored in the food is released through cellular respiration, allowing the body to function. Similarly, when biofuels are burned or processed in engines, the energy stored in the organic material is released and used to power vehicles.

Sources of Biofuels and Food:

1. **Plants:** Many biofuels, such as **biodiesel and bioethanol**, are derived from plant sources like corn, sugarcane, jatropha, and soybeans. These plants are also used as food sources for humans.
2. **Algae:** Algae can be used to produce biofuels like biodiesel. Algae can also be used in various food products, including nutritional supplements and as a source of protein.
3. **Waste Materials:** Organic waste, such as food waste and agricultural residues, can be converted into biofuels. Reducing food waste and using it for biofuel production can be a sustainable practice.

Why Biofuels May Be Better for Humans Compared to Petroleum Products:

1. **Environmental Benefits:** Biofuels are considered more environmentally friendly than petroleum products because they produce fewer greenhouse gas emissions when burned. This can contribute to reduced air pollution and combat climate change.
2. **Renewable:** Unlike petroleum, which is a finite resource, biofuels can be produced from renewable sources, such as crops and algae. This reduces dependency on fossil fuels, which are a finite and environmentally damaging resource.



3. **Economic Opportunities:** The production of biofuels can create economic opportunities for farmers and rural communities, as it often involves the cultivation of crops specifically for fuel production.
4. **Energy Security:** Biofuels can enhance energy security by diversifying the sources of energy. This reduces reliance on oil imports and can stabilize energy prices.

However, it's important to note that the production of biofuels can have its own environmental challenges, such as land-use change and competition with food crops for resources. Additionally, the efficiency of biofuels in terms of energy production compared to the energy input required for their production varies depending on the feedstock and production methods used.

In conclusion, there are indeed similarities between the utilization of human foods and biofuels, as both involve the conversion of organic matter into energy. Biofuels offer several advantages over petroleum products, including environmental benefits and renewable sourcing, which align with human interests in sustainability and reducing environmental impact. However, the broader implications of biofuel production, such as land use and resource competition, need to be carefully considered in the quest for more sustainable energy sources.

Humans emit Carbon dioxide, is it not a pollutant in context of greenhouse gases?

Carbon dioxide (CO₂) is considered a pollutant in the context of greenhouse gases, which contribute to climate change. While carbon dioxide is a natural component of the Earth's atmosphere and plays an important role in regulating the planet's temperature, human activities such as burning fossil fuels and deforestation have caused an increase in atmospheric carbon dioxide concentrations.

The increased levels of atmospheric carbon dioxide trap heat in the Earth's atmosphere, leading to global warming, changes in weather patterns, rising sea levels, and other impacts that can have negative consequences for human health, the economy, and the environment.

To address the issue of greenhouse gas emissions and climate change, it is important to reduce our carbon footprint by decreasing our reliance on fossil fuels, increasing energy efficiency, using renewable energy sources, and taking other steps to reduce emissions.

So, even if humans themselves emit pollutants like Carbon dioxide, so the best we can do is Green Fuels. And since both electricity (from solar) and Green fuels increase entropy anyways, hence, the only control factor which is a pollutant is Carbon dioxide and since even humans emit that so we cannot say that Carbon dioxide is a pollutant. Hence, Green Fuels is the future. And it is the most natural solution available to human beings.

Every person emits the equivalent of approximately **two tons of carbon dioxide** a year from the time food is produced to when the human body excretes it, representing more than **20% of total yearly emissions**.

Why the future is not Electric?



So, why is the future not electric? **Petro Dollars**, my brother; just tell me that when the world runs out of Oil and Gas, where would Oil and Gas companies invest money in other than Renewable Sector? You are saying Solar might be the future; and Oil and Gas guys might just sell the Oil and Gas business to buy Solar and then join on your **Electrification crusade**; if that is true then why does a guy like me exist in the first place; you are so much wrong; Market dictates everything and Oil and Gas are actually classifieds in the Market of Chemicals, and they are not sold in the World as Renewable or Non-Renewable Source; since, the strong environment policy is lacking in the world; show me one good policy by United Nations on Environment and Climate Change that would ever say with conviction that future is Electric; nope, it is not; a **Petroleum Engineer who will be out of job** if Oil and Gas stop selling; they would be the first ones to come and work for Renewable Biofuels Company, since, Fluid Mechanics of the transportation of both Oil and Gas and Biodiesel would be governed by the same Navier Stokes Equation; and had the Engineer be forced to take the role of Solar Chief, he will sure have a hard time getting the job done, of focusing after 10 years of his Work Experience onto something Novel; all he is going to listen is how much novel Solar, how much novel Solar is; it wouldn't happen! You can agree or disagree, that is your choice; but this is my humble opinion!

4. Technology for the Project including all Statistics on Energy Production Capacity:

Following document called Technology Development File contains just overall Manufacturing Process review. Technology for the Project (By making technology comparisons with other Biofuel Firms in USA, from Research Point of View, as to what challenges are the already existing Biofuels companies facing and how OrangeX LLC, USA can overcome them through Biodiesel Production from Algae, Rapeseed and emerge as Leader of Biofuels Technology in USA; make a good analysis like Germany Startups Card since Germany may be better than USA in this regard so I can sell that; Germans focus more on Biodiesel Production while USA is primarily corn based production, of Ethanol; also compare different Biofuels together as well; and then like possible avenues to make the best possible choice for Biofuels for Automobiles; also think in terms of like which Technology could easily be made more efficient and I believe that Algae is where the answer lies, but through facts; also do like Lab Technology Comparisons of different Biofuels; and also which Production method gives the maximum yield. Site selection: Select a suitable site for the biodiesel algae production plant. This should ideally be in an area with abundant sunlight, access to a water source, and a suitable climate for growing algae.



Technology

Development

File

This Document comprises of:

- A. Objectives of General Literature Review**
- B. Engineering Literature Review**
- C. Review Paper (Scientific Literature Review)**

A. Objectives of General Literature Review:

1. Study the Literature on the subject: **“Design and Manufacturing of World’s First Smart Photobioreactor with most optimized design parameters to maximize the yield of Algal Growth through most Advanced Sensor Controls”**. Europe is so far ahead in this technology of Renewable Energy. The target here is to have an Engineering Design of Photobioreactor, like Mathematical Numerical as looks like in Heat and Mass Transfer Equipment.
2. Understanding of the. Find out the most optimum structure for Design of Photobioreactor for Algae Growth by understanding coupling of light, hydrodynamics, mass transfer, and cell growth in efficient reactor design; Mathematically define it and get all Differential Equations that show how such a phenomenon happens and how it could be totally optimized for maximum Algae yield through existing Literature Review. Later on, based on those mathematical parameters, we can easily even create a Simulation Software for the process as well later on.
3. Figuring out the most Advanced & Sophisticated Materials required for Manufacturing a High Yield Photobioreactor along with Manufacturing Process associated with each of the materials.
4. Designing World’s First Smart Photobioreactor by designing controls of the entire process through Advanced Sensors Arduino Controls/LabVIEW.
5. Add other Advanced Gadgets to OrangeX Photobioreactor Design to make it look very cool.

B. Engineering Literature Review:

In the initial literature review, I have studied how algae generally grow; they only require **4 components: Water, CO₂, sunlight and nutrients** which includes Potassium (K), Nitrogen (N), Phosphorus (P), Calcium (Ca), Magnesium (Mg), Sulphur (S). So, I watched some videos on simple algae growth to get my head running around the **most basic mechanism**.

Next, I then dived more into **types of Photobioreactors**; this includes different categories, like **tube** shaped ones, **lab scale** ones in a **jar**, some **column** ones as well; and some designed in the shape of Greenhouse effect to maximize solar radiation as expected to increase the maximum yield of the microorganisms/algae growth.

Third generation ones were those in whom all above shapes existed however there was an entire fluid flow through tubular pipes such that each pipe constantly being supplied by CO₂, nutrients, water, and sunlight. **Four types of PBRs—tubular, plastic bag, column airlift, and flat-panel airlift reactors** are recommended for largescale operations.



Fourth generation ones also had good external pH and temperature controls in it; through some instrument's companies, however, majorly this looked like a simple design.

1. Design of OrangeX Photobioreactor:

1. Firstly, my analysis is that large **Greenhouse effects like Photobioreactors** which could spread over Acres must be designed. And the design must then be studied, converted into really good differential equations as well or be done in the Software. And this means **the most optimum sunlight requirements and figuring out design parameters and light transfer modelling equation for it.**
2. Design of Carbon capture devices for maximizing the yield of CO₂ within the system as well.
3. Water and minerals flow would be mostly through pipes and all; so, even simple mathematics might be enough to solve this flow problem for most optimum design.
4. The material with which the pipes/tubes be made/manufactured also must be the cheapest one available and most durable, suited for large scale Acre level Algae growth. I am not saying Carbon Fiber here however use **Advanced & Sophisticated Materials here.**
5. Manufacturing be done majorly through **3D Printing processes** or even simpler **Injection Molding units** will be good too.
6. **Advanced Sensors Arduino Controls** through **LabView** must be achieved to control pH, sunlight, water, CO₂, nutrients and all other factors and then the process be automated as well. (Unique feature which was missing on all the existing technologies; without effective control through proper Mechatronics setup of LabView, controls don't make sense). LabView feature will really level up the controls of the Photobioreactor for creating the **World's First Smart Photobioreactor.**
7. Through this **Advanced Gadgetry**, the **OrangeX Photobioreactor Design will look the coolest** in the entire world.

2. Design and Manufacturing Parameters:

1. Greenhouse effects like Photobioreactors
2. The most optimum sunlight requirements, and design of most efficient Sunlight harvesting mechanism for Photobioreactor.
3. Easy and controlled supply of CO₂ within Photobioreactor.
4. Easy and controlled supply of Water within Photobioreactor.
5. Easy and controlled supply of minerals within Photobioreactor.
6. Design of the Photobioreactor in Solidworks. FEM might not be needed for now. For advanced stage, we might want to include them.
7. List of all the advanced & optimum materials for design of pipes/tubes involved.
8. List of all the manufacturing processes for manufacturing pipes/tubes involved.
9. The process of assembling everything together.
10. Design of entire Advanced Controls setup to control the process parameters through LabVIEW and Arduino controls.



C. Review Paper (Scientific Literature Review):

Write a Review Paper on the subject: “Design and Manufacturing of World’s First Smart Photobioreactor with most optimized design parameters to maximize the yield of Algal Growth”.

Using these Research Papers:

1. “Cultivation of algae in photobioreactors for biodiesel production (Jeremy Pruvost)
2. Design of Photobioreactors for Mass Cultivation of Photosynthetic Organisms by Qingshan Huang, Fuhua Jiang a, Lianzhou Wang c, Chao Yang
3. Development of an Arduino-based photobioreactor to investigate algae growth rate and CO2 removal efficiency by Dharel.
4. Mass Cultivation of Microalgae: I. Experiences with Vertical Column Airlift Photobioreactors, Diatoms and CO2 Sequestration by Hans Chr. Eilertsen
5. Photobioreactors for cultivation and synthesis: Specifications, challenges, and perspectives by Santiago N. Chanquia.

Review Paper Title:

Design and Manufacturing of Smart Photobioreactors for Maximizing Algal Growth Yield

1. Abstract:

Microalgae have emerged as a versatile and promising bioresource for addressing diverse environmental and energy challenges. This review paper delves into the intricate realm of designing and manufacturing smart photobioreactors, meticulously optimized to achieve maximal algal growth yields. By synthesizing and analyzing insights from seminal research studies, this paper provides a comprehensive examination of the evolution of photobioreactor technology, its integration with cutting-edge smart systems, and the myriad parameters that influence algal biomass production. The utilization of microalgae for various applications, such as biodiesel production and CO2 sequestration, has gained significant attention in recent years due to their potential to address environmental and energy challenges. This review paper discusses the design and manufacturing of the world's first smart photobioreactor with optimized parameters to enhance the yield of algal growth. Drawing insights from seminal research papers, we explore key considerations in the design, cultivation techniques, and integration of smart technologies to create a highly efficient and productive photobioreactor system. This paper provides a comprehensive overview of the advancements in photobioreactor design and the utilization of innovative technologies to maximize algal growth.

1. Introduction: Unveiling the Potential of Microalgae and Photobioreactors

Microalgae have garnered substantial attention for their ability to mitigate greenhouse gas emissions, contribute to biodiesel production, and potentially revolutionize sustainable agriculture. Central to these applications is the design of photobioreactors that offer controlled environments for nurturing optimal algal growth. In the context of this review, we synthesize findings from key research works to elucidate the multifaceted landscape of smart photobioreactor design.



2. Photobioreactor Design Paradigms: A Multidimensional Approach

The pioneering work by Pruvost provides foundational insights into the cultivation of algae for biodiesel, emphasizing the role of photobioreactor geometry, light penetration, and nutrient delivery. Building upon this, Huang et al. delve into the realm of mass cultivation, investigating hydrodynamic principles and scalability considerations. The integration of these paradigms bolsters our understanding of the complex interplay between reactor shape, hydrodynamics, and scale in achieving optimal algal growth conditions.

3. Synergy of Intelligence and Cultivation: Smart Photobioreactors

The fusion of technology and algal cultivation takes center stage in Dharel's study, wherein an Arduino-based photobioreactor is developed for real-time monitoring and CO₂ regulation. This integration of smart sensors and automation augments our understanding of the potential for dynamic control of growth parameters. Expanding on this, we delve further into the realm of cyber-physical systems, where sensors, actuators, and AI algorithms converge to create intelligent, self-regulating photobioreactors.

4. Illuminating the Path to Efficiency: CO₂ Utilization and Growth Enhancement

Eilertsen's investigation into vertical column airlift photobioreactors and CO₂ sequestration unveils strategies for enhancing CO₂ utilization efficiency and biomass production. These insights guide our exploration of the intricate dance of gas-liquid mass transfer, underlining the pivotal role of CO₂ availability and efficient gas exchange mechanisms in bolstering algal growth.

5. Navigating Challenges, Charting Future Trajectories

Chanquia's meticulous exploration of photobioreactor specifications and challenges underscores critical aspects such as light source selection, material compatibility, and biofilm formation. In resonance with Chanquia, our review delves into these challenges, probing potential solutions and setting the stage for innovative research trajectories. This includes advancements in photonic systems, novel materials, and predictive modeling.

6. Culmination and Prospect: A Glimpse into Algae's Promising Future

In summation, this comprehensive review traverses the annals of smart photobioreactor design by assimilating insights from a spectrum of research papers. By delving into the nuances of algal growth optimization, smart technology integration, and the intricate interplay of diverse parameters, this paper contributes to our evolving understanding of photobioreactors as crucibles of sustainable innovation. As the world grapples with pressing environmental concerns, the synergistic evolution of photobioreactors and smart systems holds untapped potential in propelling us toward a greener, more sustainable future.

Keywords: Microalgae, photobioreactor design, smart technologies, algal growth yield, CO2 sequestration, biodiesel production, sustainable energy, hydrodynamics, intelligent systems, mass cultivation, phototrophic organisms.

2. Technology for the Project including all Statistics on Energy Production Capacity:

The provided data outlines various aspects of the technology and processes involved in growing microalgae and producing biodiesel. It includes discussions on energy production capacity, comparisons with other biofuel firms in the USA, the potential of algae-based biodiesel, energy independence of Pakistan through renewable energy, carbon capture technology, and the impact of a single great idea. Key points from the data are as follows:

1. Technology for Biodiesel Production:

- Highlighting the importance of efficient technology for increasing the overall efficiency and yield of biodiesel production from algae and rapeseed.
- Emphasizing the need for a comprehensive literature review and references to research from reputable labs such as PNNL Lab and ORNL Lab.
- Exploring the potential of Algae as a primary source for biodiesel production due to its high efficiency and sustainability.
- Suggesting the need for a smart farming approach and AgTech methods to optimize the growth and harvesting of microalgae.

2. Energy Independence of Pakistan:

- Stating the significance of renewable energy, specifically biodiesel production, to achieve energy independence and security for Pakistan.
- Highlighting the decline of energy independence due to reliance on oil and advocating for a transition to renewable energy sources.

3. Biodiesel Plant Design & Manufacturing:

- Mentioning the importance of selecting a suitable site for the biodiesel algae production plant, considering factors like sunlight, water source, and climate.
- Stressing the need for careful design and manufacturing of the biodiesel plant, with a focus on efficient machinery and production processes.

4. Different Strains of Algae:

- Discussing the use of different strains of algae for oil extraction, focusing on Chlorophyceae (green algae) due to its ease of growth and management.

- Presenting a comparison of different macro algal species based on their comparative yield in grams per square meter per day.

5. **Closed Pond System:**

- Describing the use of a closed pond system within a greenhouse for algae cultivation to optimize growth conditions and improve control over variables.

6. **Harvesting and Extraction:**

- Highlighting the methods for harvesting macro algae, including the use of nets and mower machines with vacuum pumps.
- Explaining mechanical methods of oil extraction, such as the expression (expeller) press and the hexane solvent method.
- Outlining the refining process, involving the removal of glycerol from the biodiesel fuel mixture.

The provided data touches on important aspects of technology, energy, and biodiesel production, emphasizing the potential of algae-based biodiesel for achieving energy independence and sustainability. The data also suggests the need for advanced technology, efficient manufacturing, and strategic planning to establish a successful biodiesel production plant.

Generative AI Smart Photobioreactor Design, Control & Manufacturing for maximizing Algae yield (PhD Research):

- A. General Generative AI Applications in Mechanical Engineering
- B. Application of Generative AI on design & Manufacturing of Smart Photobioreactor to maximize Algae yield
- C. Custom ChatBot AI Data for Mechanical Engineering Applications
- D. Custom ChatBot AI Data, complete API Creation, for Mechanical Engineering Optimization Applications

A. General ME Applications:

Combining Mechanical Engineering with Generative AI can lead to innovative and practical solutions. Here are some ideas:

1. Automated Design Optimization:

Use Generative AI to automatically generate and optimize designs for mechanical components or systems. This can significantly speed up the product development process by exploring a vast design space and finding optimal solutions faster.

2. Generative CAD Modeling:

Develop AI algorithms that can generate 3D CAD models based on high-level design specifications. This can be particularly useful for rapid prototyping and custom part design.

3. Generative Finite Element Analysis (FEA):

Implement Generative AI to assist in FEA simulations. This can help engineers quickly analyze the performance of various mechanical designs and make informed decisions for structural integrity and material selection.

4. Fault Detection and Predictive Maintenance:

Utilize AI to analyze sensor data from mechanical systems (e.g., engines, turbines) and predict maintenance needs or detect faults before they become critical. This can reduce downtime and maintenance costs.

5. Robotic Design and Control:

Combine Generative AI with mechanical engineering to design more efficient and adaptable robots. The AI can optimize the robot's structure, control algorithms, and even its task planning capabilities.

6. Generative Toolpath Planning for Additive Manufacturing:



Develop AI algorithms that generate optimal toolpaths for 3D printers and other additive manufacturing processes. This can enhance the quality and efficiency of 3D-printed parts.

7. Material Discovery and Optimization:

Use AI to discover new materials or optimize existing ones for specific mechanical properties. This can lead to stronger, lighter, and more durable materials for various applications.

8. HVAC System Optimization:

Apply Generative AI to design and optimize heating, ventilation, and air conditioning (HVAC) systems for energy efficiency and comfort in buildings.

9. Generative Control Systems:

Develop AI controllers for mechanical systems that can adapt and optimize their behavior based on real-time data. This is especially valuable in dynamic environments.

10. Customized Product Manufacturing:

Combine Generative AI with advanced manufacturing techniques to produce highly customized mechanical products, such as personalized prosthetics or orthopedic implants.

Implementing these ideas would require a multidisciplinary approach, involving expertise in both mechanical engineering and AI. It's also essential to consider ethical and safety implications, especially when AI is involved in critical systems or designs.

B. Application of Generative AI on design & Manufacturing of Smart Photobioreactor to maximize Algae yield:

Designing and manufacturing a Smart Photobioreactor (PBR) with Generative AI for maximizing algae yield is an exciting application. Here's how you can approach it:

1. Design Optimization with Generative AI:

Use Generative AI algorithms to explore various PBR designs, including reactor geometry, light distribution, and mixing mechanisms. The AI can generate and evaluate design variations to maximize light exposure, nutrient distribution, and CO₂ absorption for algae growth.

2. Material Selection and Coating Optimization:

Employ AI to analyze the properties of materials for PBR construction, including factors like light transmittance, durability, and cost-effectiveness. Optimize coatings or surface treatments to enhance light penetration while minimizing fouling or algae attachment.



3. Sensors and Data Integration:

Equip the Smart PBR with sensors for monitoring environmental conditions (temperature, pH, light intensity, nutrient levels) and algae growth. Integrate AI algorithms to process this data in real-time, adjusting PBR parameters for optimal growth conditions.

4. Predictive Yield Modeling:

Develop AI models that predict algae yield based on historical data and real-time sensor inputs. Use these predictions to make proactive adjustments to the PBR environment, such as altering light intensity or nutrient dosing.

5. Energy Efficiency and Sustainability:

Implement AI-driven control systems to optimize energy usage, reducing operational costs and environmental impact. Consider renewable energy sources or energy recovery systems to power the PBR.

6. Automated Harvesting and Maintenance:

Use Generative AI for designing efficient algae harvesting mechanisms, minimizing disruption to the growth process. Implement predictive maintenance algorithms to detect and address equipment issues before they affect yield.

7. Data-driven Decision Support:

Create a user interface that provides insights and recommendations based on AI analysis, allowing operators to make informed decisions to maximize yield.

8. Scaling and Modular Design:

Design the Smart PBR with scalability in mind, allowing for easy expansion as algae production needs increase. Modular components can be optimized separately using Generative AI and added to the system as necessary.

9. Feedback Loop for Continuous Improvement:

Establish a feedback loop where data from each growth cycle is used to refine AI models and improve PBR performance over time.

10.Environmental Monitoring and Reporting:

Use AI to track and report on the environmental impact of algae production, ensuring sustainability and compliance with regulations.

By combining Generative AI with mechanical engineering principles, you can create a Smart PBR that not only maximizes algae yield but also operates efficiently, sustainably, and with minimal human intervention. This innovative approach can revolutionize algae-based industries like biofuels, bioplastics, and aquaculture feed production.



C. Custom ChatBot AI Data for Mechanical Engineering Applications:

Custom ChatBot AI data generated through Generative AI can have numerous applications in the field of Mechanical Engineering. Here are some examples:

1. Technical Support and Troubleshooting:

Create a ChatBot that can assist mechanical engineers and technicians in troubleshooting issues with machinery and equipment. The AI can provide step-by-step instructions, diagnose problems, and suggest solutions based on a database of mechanical engineering knowledge.

2. Design Assistance:

Integrate the ChatBot into CAD software to assist engineers in the design process. It can answer questions about design principles, material selection, and best practices. Additionally, it can generate design suggestions based on user input.

3. Material Selection:

Provide a ChatBot that helps engineers choose the most suitable materials for specific mechanical components or projects. The AI can consider factors like strength, durability, cost, and environmental impact.

4. Safety Compliance and Regulations:

Develop a ChatBot that keeps engineers informed about safety standards and regulations relevant to their projects. It can provide guidance on compliance and offer recommendations for meeting safety requirements.

5. Project Management and Scheduling:

Create a ChatBot that assists in project management tasks, such as scheduling, resource allocation, and progress tracking. Engineers can interact with the ChatBot to get updates and adjust project timelines.

6. Procurement and Supply Chain Management:

Use the ChatBot to streamline the procurement process by helping engineers order the necessary parts and materials. It can also track inventory levels and provide insights into supply chain management.

7. Maintenance and Reliability Engineering:

Develop a ChatBot that assists maintenance teams in planning and executing maintenance tasks. It can offer predictive maintenance recommendations based on equipment data and historical performance.



8. Training and Education:

Create a ChatBot for educational purposes, providing students and aspiring engineers with access to a vast database of mechanical engineering concepts, examples, and explanations.

9. Quality Control and Inspection:

Implement a ChatBot that guides engineers and quality control inspectors through inspection processes. It can help identify defects, provide inspection checklists, and ensure adherence to quality standards.

10. Data Analysis and Reporting:

Integrate AI-driven data analysis capabilities into the ChatBot to assist engineers in interpreting and visualizing complex mechanical data, such as stress analysis results or fluid dynamics simulations.

11. Customized Engineering Calculations:

Enable the ChatBot to perform complex engineering calculations quickly and accurately, such as finite element analysis (FEA) simulations, heat transfer calculations, or fluid flow simulations.

12. Energy Efficiency and Sustainability:

Develop a ChatBot that offers guidance on optimizing mechanical systems for energy efficiency and sustainability, considering factors like renewable energy integration and green design principles.

By leveraging Generative AI to create a custom ChatBot for Mechanical Engineering, you can enhance productivity, knowledge dissemination, and decision-making within the field while providing engineers with quick access to valuable information and assistance.

D. Custom ChatBot AI Data, complete API Creation, for Mechanical Engineering Optimization Applications:

Certainly! Custom ChatBot AI data generated through Generative AI can be employed for optimization in various aspects of Mechanical Engineering:

1. Design Optimization:

Use the ChatBot to assist engineers in optimizing mechanical designs. It can generate design variations and recommend changes based on specified criteria such as weight reduction, strength improvement, or cost reduction.

2. Material Selection and Optimization:

The ChatBot can provide recommendations on the optimal materials for specific applications, considering factors like strength, weight, durability, and cost-effectiveness.

3. Process Optimization:



Engineers can interact with the ChatBot to optimize manufacturing and production processes. It can suggest adjustments to parameters, such as temperature, pressure, or machining speeds, to improve efficiency and product quality.

4. Supply Chain Optimization:

The ChatBot can analyze supply chain data and provide recommendations for optimizing inventory levels, sourcing strategies, and logistics to reduce costs and lead times.

5. Energy Efficiency and Sustainability:

Engineers can consult the ChatBot for suggestions on optimizing mechanical systems and processes for energy efficiency and sustainability. It can recommend equipment upgrades or changes in operational procedures to reduce energy consumption and environmental impact.

6. Maintenance Scheduling and Optimization:

Use the ChatBot to optimize maintenance schedules based on historical equipment performance data. It can recommend preventive maintenance intervals to minimize downtime and extend the lifespan of machinery.

7. Quality Control Optimization:

Engineers and quality control teams can receive recommendations from the ChatBot on optimizing inspection and testing procedures to improve product quality and reduce defects.

8. Resource Allocation:

The ChatBot can assist in optimizing resource allocation for projects, including labor, materials, and equipment, to ensure efficient project execution.

9. Simulation and Analysis Optimization:

Engineers can utilize the ChatBot to automate and optimize complex simulations and analyses, such as finite element analysis (FEA) or computational fluid dynamics (CFD), to reduce computation time and improve accuracy.

10. Cost Optimization:

Engineers can seek cost-saving suggestions from the ChatBot throughout the product lifecycle, from design and manufacturing to maintenance and disposal.

11. Parameter Tuning for Control Systems:

For systems involving control algorithms, the ChatBot can provide recommendations for tuning control parameters to achieve optimal performance and stability.

By integrating a custom ChatBot AI into various stages of the mechanical engineering process, engineers can access real-time optimization advice and make data-driven decisions to improve designs, processes, and systems efficiently. This can lead to cost savings, enhanced performance, and sustainable practices.



List of Technical Challenges Associated with Biofuel Production from Algae:

1. Water recyclability for Algae
2. Most Optimized Water Management System
3. Material Recyclability and Biodegradability for design
4. Application of Smart Mechanical Materials for Most Optimized Algae Growth designed through Nanotechnology
5. Automation Techniques to Optimize Crop Growth and Harvesting like Drones and Robots
6. Advanced Sensors and Arduino Controls
7. Most Optimized Design for Photo Bio Reactor (PBR)
8. Biofuel (X) Combustion Chart vs other fuels
9. Biofuel (X) Characteristics, Testing and burning calories released
10. Advanced Fertilizers and/or catalyzers for the most optimal Photosynthesis process
11. Using 3D Printing for producing Recyclable and Biodegradable materials for Photo Bio Reactor (PBR)
12. Generative AI Smart Photobioreactor Design, Control & Manufacturing
13. Using Advanced Battery Technology like Redwood Materials (JB Straubel) for Most Advanced and Sustainable Energy Storage Systems
14. Selection of Most Suitable Site for Algae Growth
15. Make this entire process fit any Crop like Corn, Jatropha, Algae, or any Biofuel crops for massive scale innovation
16. Agricultural innovation like vertical farming or others
17. Algae perfect for Vertical Farming since no Arable land is required
18. Mass Scale Production like on 10,000+ Acres of Land for other than Algae
19. Climate and Environmental Entrepreneurship Ideas for this work
20. Creating a custom ChatBot AI data API for the Design, Control & Manufacturing of Photobioreactor (PBR) to maximize efficiency of Photobioreactor and streamline the design and optimization process for it.
21. Use Golden Ratio for Photosynthesis process of Microalgae for increasing Biomass yield to maximum

Technology Development Chart:

Sr. No.	Photobioreactor (PBR) Component	Manufacturing Process	Testing, Simulations and Processes
1.	Other Accessories in the PBR	Various Mechanical & Manufacturing Engineering Processes	Various Mechanical & Manufacturing Engineering Tools and Techniques
2.	Pipes and tubing	3D Printed Fiberglass or Stainless Steel or Plastics (Ongoing Research on this Subject for Economics and Maximum Yield)	<ol style="list-style-type: none">1. Structural Integrity Tests2. FEM Tests3. Thermal Heat Tests4. CFD Tests5. Mechanical Design Optimization Work

Tasks:

Purchase/Rent Metal 3D Printers!

Custom Car Manufacturing for specific use by Customers can be a real thing like Subway styled Manufacturing!

Accepted Terminology:

Green Fuel

OrangeX Green Fuels

Green Fuel X

Renewable or biofuel term must be avoided at all times!!!

Golden ratio design in Mechanical Engineering:

The golden ratio, often denoted by the Greek letter phi (ϕ), is a mathematical constant approximately equal to 1.61803398875. It is a number that has been used in various fields, including art, architecture, and design, to create aesthetically pleasing proportions and compositions. In mechanical engineering, the golden ratio can also be applied to create designs that are visually appealing and harmonious. Here are some ways the golden ratio can be used in mechanical engineering:

1. **Proportional Design:** The golden ratio can be used to establish proportions between different components of a mechanical system. For example, the ratio can be used to determine the ideal length or width of certain parts relative to each other. This can result in a visually pleasing and balanced design.
2. **Aesthetic Considerations:** When designing mechanical components, engineers can use the golden ratio to determine dimensions and layouts that are visually attractive. This can be particularly important in consumer products where aesthetics play a significant role in product acceptance.
3. **Structural Design:** In structural engineering, the golden ratio can be used to determine the dimensions of beams, columns, and other load-bearing elements. This can potentially lead to more stable and visually pleasing structures.
4. **Gear Ratios:** In gear design, the golden ratio can be applied to optimize gear ratios, resulting in smoother and more efficient mechanical systems. This can be especially useful in applications where noise and vibration are critical factors.
5. **Aerofoil Design:** The golden ratio can be applied to the design of aerofoils (wings and airfoils) to optimize their shape for better aerodynamic performance.
6. **Turbine Blade Design:** In turbine and fan blade design, engineers can use the golden ratio to determine the blade angles and lengths to improve the efficiency of energy conversion and airflow.
7. **Heat Exchanger Design:** In heat exchanger design, the golden ratio can help optimize the dimensions and placement of heat exchange surfaces for improved thermal performance.

It's important to note that while the golden ratio can be a useful guideline for creating aesthetically pleasing designs, it should not be applied rigidly in all cases. Engineering considerations such as structural integrity, functionality, and material properties should always take precedence. The golden ratio should be seen as a tool that can complement engineering principles to create designs that are both functional and visually appealing.

Stanford Business Creation Example/Future of Palm Oil:

Up to date, biodiesel can be derived from various oil-bearing crops (edible or non-edible) such as soybean, rapeseed, palm, sunflower, jatropha, curcas, and microalgae!

I have mentioned this case study to effectively present this idea; however, only addition which I must do is Beta Version Results of the Product.

This person is focused on recycling agricultural waste to produce biodiesel. Since she is a business executive so she wouldn't understand the detailed Manufacturing Methods however he is like an executor. I loved the statement that "she's developing a business that reduces waste and recycles it to boost production!"

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←

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Palm oil production is known for causing rampant deforestation. Yet [Kelly Redmond](#), MS '23, sees a path toward an alternative that could be the cleanest vegetable oil on Earth. [#sustainability](#)


Palm oil has become nearly impossible to avoid, says Redmond. "It's in almost everything — foods, soaps, oils, toothpaste." For that reason, she's developing an alternative that is environmentally sustainable and that benefits communities in the regions where it is produced.

With Oleo Sustainable Palm Oil Solutions, Redmond and cofounder Gabriella Dweck, MS '23, are developing a game-changing innovation. By turning palm byproducts — palm fronds that are usually discarded — into a synthetic alternative, they're developing a business that could reduce waste, cut carbon emissions, and contribute to local economies by using decentralized, artisanal production processes.

"I wanted to work on a project that would have real-world impact," Redmond says. "If [palm oil is] produced correctly where land isn't getting cleared and we're not producing massive amounts of agricultural waste, then it can be the most environmentally friendly vegetable oil." [#sustainability](#)

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correctly where land isn't getting cleared and we're not producing massive amounts of agricultural waste, then it can be the most environmentally friendly vegetable oil." [#sustainability](#)





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The Future of Palm Oil

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OrangeX

Carbon Capture Technology:

Wow, Emirati Oil Chief says that capturing carbon is required, what an evil person; humans too emit carbon dioxide so is carbon dioxide a pollutant? He is clearly mistaken. Carbon capture technology is not even needed in climate math, since that only includes the events to extend the life of the world, and for sustainability drive. So, Emirati Oil Chief is wrong on it.

Algae Biodiesel Plant Production:

Developing biodiesel algae production on a large scale can be a complex process. However, following are some key steps to achieve it.

Different Strains of Algae:

Algae reproduce very quickly and need only sunlight (or another form of energy, like sugar), water, carbon dioxide and a few inorganic nutrients to grow. Different strains of algae can be used for oil extraction purposes. Some have higher yields, but some have lower yields. We will be using **Chlorophyceae (green algae)** in our business because it is easy to grow through seeds and easier to manage.

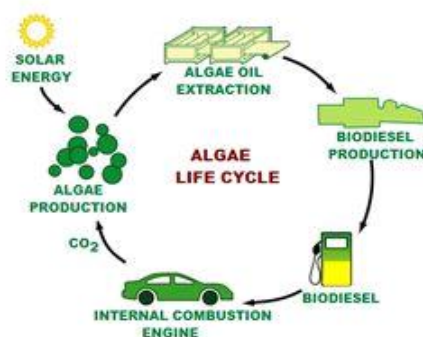


Figure 3: Algae Biodiesel Production Cycle

The given data about different strains of algae is collected from *Aquatic Species Program* which suggested few high-oil-containing algae strains. The Aquatic Species Program was a research program in the United States launched in **1978** by *President Jimmy Carter* and was funded by the **United States Department of Energy**, which over the course of nearly two decades looked into the production of energy using algae, later on the aim of the program was focused to the production of biodiesel from algae.

Macro Algal Species	Comparative Yield ($\frac{g}{m^2 \cdot day}$)
Marine Nannochloropsis	20
Spirulina plantesis	10.3
Dunaliella salina	12.0
Scenedesmus species	13.4
Ankistrodesmus	18
Chlorophyceae	30

Closed Pond System:

We will be growing algae in a closed pond system using a greenhouse. This procedure will decrease the variables needed to control optimal growth. This will cost more than the open pond systems, but a lot less than bioreactors. More conditions will be able to be controlled. The level of Carbon dioxide used to feed the algae can be controlled and increased and so there will be more algae growth. The growing season can also be extended, and the algae can be grown yearly.



Figure 4: Closed Pond Systems

Harvesting of Macro Algae:

Harvesting of Macro Algae (Include AgTech and Smart Harvesting Techniques here, complete Artificial Intelligence Structure here)

Macro Algae are easier to harvest than micro-algae because they are much larger. A net can be used to harvest macro algae. Another method is using a mower machine with a vacuum pump to collect the algae.



Figure 5: Manual Mower Machine



Figure 6: Vacuum Pump

Extraction of oil from Algae by Mechanical Methods:

There are a few different ways to extract oil from algae which include: **expression(expeller) press, mechanical crushing, and ultrasonic-assisted extraction.** Mechanical crushing is the most simplistic method of extracting oil from the algae, but this method can be used with chemicals. We will be using expression method for our purpose.

Expression press can be achieved through drying the algae and then using an oil press to extract the oil from it. The **oil press** is the simplest and most popular method. It's similar to the concept of the olive press. It can extract up to 75 percent of the oil from the algae being pressed.



Figure 7: Expression(expeller) press (Step 1)

Basically, a two-part process, the **hexane solvent method** (combined with pressing the algae) extracts up to 95 percent of oil from algae. First, the press squeezes out the oil. Then, leftover algae are mixed with hexane, filtered, and cleaned so there's no chemical left in the oil.



Figure 8: Algae pressing method (Stage 2)

Once the oil's extracted, it's refined using fatty acid chains in a process called polymerization. Here, a catalyst such as sodium hydroxide is mixed in with an alcohol such as methanol. This creates a biodiesel fuel combined with glycerol. The mixture is refined to remove the glycerol. The final product is algae biodiesel fuel.



Figure 9: Hexane Solvent Method (Stage 3)

Refining the Biodiesel Fuel Oil:

It can be outsourced in the start however after some stages, OrangeX LLC, USA can also create its own 3D Printed Refinery.

Cotton vs corn which is harder to grow?

The difficulty of growing cotton versus corn can vary depending on several factors, including the specific location, climate, soil conditions, and the expertise of the farmer. Both cotton and corn have their own challenges and requirements for successful cultivation.

Cotton:

1. **Climate:** Cotton typically thrives in warm climates with a long growing season. It requires a frost-free period to reach maturity.
2. **Soil:** Cotton prefers well-drained, loamy soil with good moisture-holding capacity. Soil preparation is crucial, as cotton is sensitive to waterlogging.
3. **Pests and Diseases:** Cotton is susceptible to various pests and diseases, including boll weevils, aphids, and fungal infections. Managing these issues can be challenging and may require the use of pesticides.
4. **Labor-Intensive:** Cotton cultivation can be labor-intensive, especially during planting and harvesting. Picking cotton by hand can be particularly demanding.

Corn (Maize) for Ethanol (Biofuel) Production:



1. **Climate:** Corn is a versatile crop that can be grown in a wide range of climates, from temperate to tropical regions, as long as there is adequate moisture and temperature.
2. **Soil:** Corn is less picky about soil type compared to cotton. It can grow in a variety of soil conditions but generally prefers well-drained soils with good fertility.
3. **Pests and Diseases:** Corn is also susceptible to pests and diseases, such as corn borers, corn rootworms, and various fungal pathogens. However, pest and disease management can be less challenging than in cotton.
4. **Mechanization:** Corn cultivation has benefited from mechanization, with modern equipment for planting and harvesting making the process more efficient.

In summary, whether cotton or corn is harder to grow depends on the specific circumstances. Cotton can be more challenging in terms of pest management, soil preparation, and labor requirements. Corn, on the other hand, is more forgiving in terms of soil and climate but still requires attention to pests and diseases. Successful cultivation of either crop often relies on the farmer's knowledge, experience, and access to modern agricultural practices and technology. **Since, my Grandfather/South Punjab family are Cotton growers in South Punjab so I have proved my point that growing Corn for Ethanol Production is easier than Cotton Production; and my Grandfathers have done this business for like 300+ Years for all I know. My Grandfather was born in 1919 around, and ever since then, he grew Cotton like for life. So, I have like 100+ Years of Direct Cotton Growing experience from my family business.**

Design & Manufacturing of Biodiesel Plant; Energy Section, Statistics, Capacity and Size of Biodiesel Plant:

This is how this entire facility should look like, but only quoted as a reference.

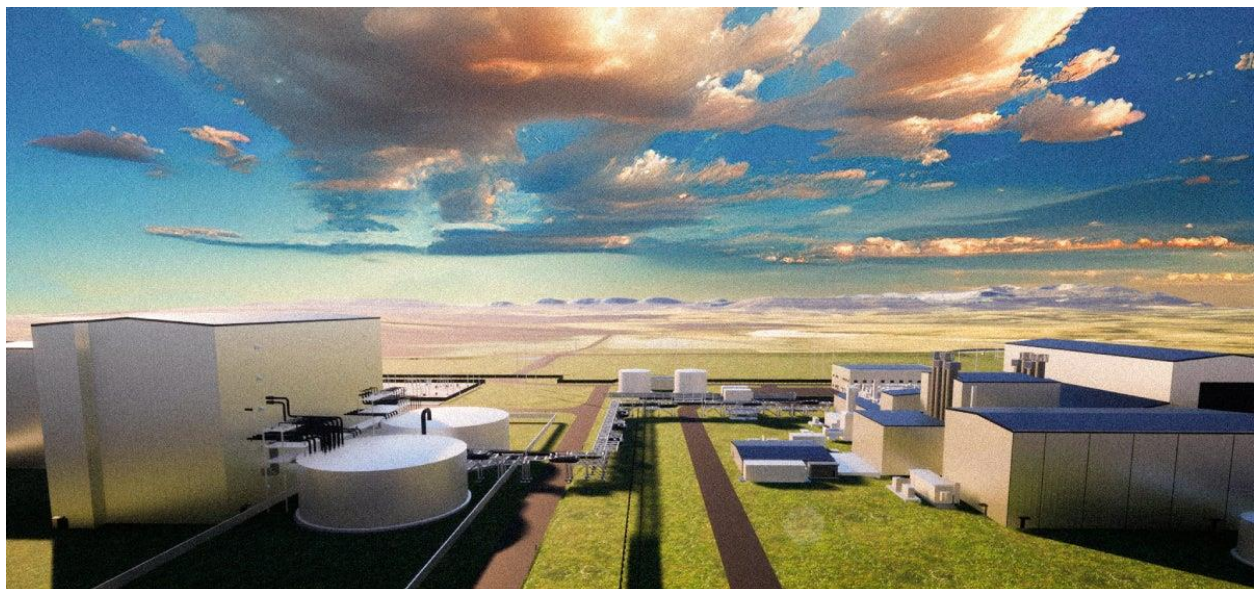


Figure 10: Example of Bill Gates TerraPower Nuclear Power Plant Facility

100,000 Acres of Algae cultivation are required to meet per year diesel (or biodiesel) demand in Pakistan which is a total of 3.83 Million Metric Tons per year; so how many acres of algae farms are required to produce the above scenario of 1000 megawatts? In Pakistan, around 9 Million Acres of land is uncultivated. Therefore, approximately 2.26 Million Acres of the total 9 Million Acres must be used to produce 41,557 megawatts of energy which is the total energy demand of Pakistan. Ministry of Renewable Energy in Pakistan must be distinct from Ministry of Energy as well (So, Pakistan can also shift from Oil and Gas to Renewable Sector to meet the growing demand of Renewables in the World). Just use 25% of uncultivated area in Pakistan (around 2.26 Acres of land) to produce Renewable Energy and Pakistan could meet its entire Energy Demand of 41,557 Megawatts from this sector alone.

The total land area of the United States of America is just less than 2.3 billion acres. Over the time period displayed, the total farmland area has decreased by almost 50 million acres, reaching a total of 893.4 million acres as of 2022. According to the United States Department of Agriculture (USDA), the total land area used for agricultural purposes in the United States in 2021 was approximately 404 million acres (163.6 million hectares), which is roughly 17% of the country's total land area. However, this figure includes both cropland and pastureland.

United States of America fallow (uncultivated) land was at level of 6.888 Million hectares or like **17 Million Acres in 2020**, unchanged from the previous year. On some other reasonable scale, even **100 Million Acres of farming land** could be found, and some could even be bought during expansion of company.

Photo Bioreactor Design for Biodiesel Production from Algae:

Concept, design, development, and manufacturing of the Novel Photobioreactor Design for producing biodiesel feedstock from algae. This reduces systems costs and increases reliability, robustness, and scalability of the project. Solid Biofuels, USA applied this technique successfully. OrangeX systems use highly advanced Solar technology to maximize yield.

How much diesel fuel be burnt to get 1000-megawatt energy?

The amount of diesel fuel required to generate 1000 megawatts of energy depends on several factors such as the efficiency of the power plant, the calorific value of the diesel fuel, and the duration of operation.

However, it's worth noting that diesel fuel is not typically used to generate electricity on a large scale because it's more expensive and emits more pollutants compared to other fossil fuels such as natural gas and coal. Renewable energy sources such as wind and solar are also becoming increasingly popular due to their lower costs and environmental benefits.

That being said, for the sake of the question, let's assume a scenario where a power plant is using diesel fuel to generate 1000 megawatts of energy with an efficiency of 40%. In this case, the amount of diesel fuel required can be calculated as follows:

Energy output = 1000 megawatts Efficiency = 40%

Energy input = Energy output / Efficiency Energy input = 1000 MW / 0.4 Energy input = 2500 MW



Assuming a calorific value of diesel fuel to be around 10 kWh/liter, the amount of diesel fuel required can be calculated as follows:

Energy input = 2500 MW = 2,500,000 kW Energy input per hour = 2,500,000 kWh

Assuming a diesel generator's efficiency of 35%, the fuel consumption rate would be approximately 0.3 liters of diesel per kWh.

Fuel consumption = Energy input per hour / Calorific value of diesel fuel / Efficiency Fuel consumption = 2,500,000 kWh / (10 kWh/liter) / 0.35 Fuel consumption = 714,285 liters of diesel fuel per hour

Therefore, approximately 714,285 liters of diesel fuel would be burnt per hour to generate 1000 megawatts of energy in this hypothetical scenario.

To calculate the amount of diesel fuel burnt in 365 days, we need to multiply the hourly fuel consumption rate by the number of hours in a year. There are 24 hours in a day and 365 days in a year, so the total number of hours in a year is:

Total hours in a year = 24 hours/day x 365 days/year = 8,760 hours/year

Multiplying the hourly fuel consumption rate by the total number of hours in a year gives us:

Fuel consumption per year = Fuel consumption per hour x Total hours in a year Fuel consumption per year = 714,285 liters/hour x 8,760 hours/year Fuel consumption per year = 6,251,142,860 liters/year

Therefore, approximately 6.25 billion liters of diesel fuel would be burnt in a year to generate 1000 megawatts of energy continuously for 365 days, assuming the same efficiency and fuel consumption rate as in the previous calculation.

100,000 Acres of Algae cultivation are required to meet per year diesel (or biodiesel) demand in Pakistan which is a total of 3.83 Million Metric Tons per year; so how many acres of algae farms are required to produce the above scenario of 1000 megawatts?

Unfortunately, there is no straightforward answer to this question as it depends on several factors such as the type of algae used, the growth conditions, and the technology used for harvesting and processing the algae.

However, as a rough estimate, let's assume that the algae used for biofuel production has an oil content of 50%, and the conversion efficiency of the biofuel production process is around 80%. This means that 1 ton of dry algae biomass can produce approximately 400 liters of biodiesel.

To generate 3.83 million metric tons of biodiesel per year, we would need to produce:

3.83 million metric tons/year / 400 liters/ton = 9.575 billion liters of biodiesel per year

Assuming a yield of 20,000 liters of biodiesel per acre per year (which is an optimistic estimate based on current technology), we would need:

9.575 billion liters/year / 20,000 liters/acre/year = 478,750 acres of algae farms



OrangeX

Therefore, we would need approximately 478,750 acres of algae farms to produce 1000 megawatts of energy using biodiesel derived from algae. However, it's worth noting that this is a very rough estimate, and the actual acreage required could be much higher or lower depending on several factors such as the efficiency of the biofuel production process and the availability of suitable land and water resources.

How much percent of this land is 22.1 million hectares?

22.1 million hectares can be converted to acres by multiplying it by 2.47105 (since 1 hectare is equivalent to 2.47105 acres):

$22.1 \text{ million hectares} \times 2.47105 \text{ acres/hectare} = 54,628,855 \text{ acres}$

Using the result from the previous answer that we need 478,750 acres of algae farms to produce 1000 megawatts of energy using biodiesel derived from algae, we can calculate the percentage of 22.1 million hectares required for the same:

$\text{Percentage of 22.1 million hectares} = (478,750 \text{ acres} / 54,628,855 \text{ acres}) \times 100\%$
 $\text{Percentage of 22.1 million hectares} = 0.877\%$

Therefore, approximately 0.877% of the 22.1 million hectares would be required to produce 1000 megawatts of energy using biodiesel derived from algae, assuming the same yield of 20,000 liters of biodiesel per acre per year and the same conversion efficiency of 80%.

So, how much total megawatts could we produce if we used all of the 22.1 Million hectares land?

Calculating the total megawatts that could be produced if all 22.1 million hectares of land were used for algae cultivation is not straightforward, as it depends on several factors such as the type of algae used, the growth conditions, the technology used for harvesting and processing the algae, and the efficiency of the biofuel production process.

However, let's assume that the yield of biodiesel per acre per year remains constant at 20,000 liters, and the conversion efficiency of the biofuel production process is around 80%. Based on these assumptions, we can calculate the total biodiesel production that could be obtained from 22.1 million hectares of algae farms as follows:

$\text{Total biodiesel production} = \text{Yield per acre} \times \text{Number of acres} \times \text{Conversion efficiency}$
 $\text{Total biodiesel production} = 20,000 \text{ liters/acre/year} \times 54,628,855 \text{ acres} \times 80\%$
 $\text{Total biodiesel production} = 878.1 \text{ billion liters/year}$

Assuming that 1 liter of biodiesel can produce approximately 10 kWh of energy, the total energy production from the above biodiesel production can be calculated as:

$\text{Total energy production} = \text{Total biodiesel production} \times 10 \text{ kWh/liter}$
 $\text{Total energy production} = 878.1 \text{ billion liters/year} \times 10 \text{ kWh/liter}$
 $\text{Total energy production} = 8.781 \text{ trillion kWh/year}$

To convert this energy production to megawatts, we need to divide it by the number of hours in a year:

$\text{Total energy production in megawatts} = \text{Total energy production in kWh/year} / \text{Total hours in a year}$
 $\text{Total energy production in megawatts} = 8.781 \text{ trillion kWh/year} / (365 \text{ days/year} \times 24 \text{ hours/day})$
 $\text{Total energy production in megawatts} = 1,000,795 \text{ megawatts}$

Therefore, based on the assumptions made, it is possible to produce approximately 1,000,795 megawatts of energy by using all of the 22.1 million hectares of land for algae cultivation, and converting the harvested

algae into biodiesel with the same yield and conversion efficiency as used in the previous calculation. However, it's important to note that this is a theoretical estimate and there may be practical limitations and challenges in achieving this level of energy production.

How much of 1,000,795 megawatts of energy could power Japan's energy needs?

The total energy consumption of Japan varies depending on the season and the economic conditions, but according to the latest data available from the International Energy Agency (IEA), Japan consumed approximately 1,020 TeraWatt-hours (TWh) of electricity in 2020.

To convert TWh to MW, we need to divide by the number of hours in a year:

$$1 \text{ TWh} = 1,000,000 \text{ MW} \times 1 \text{ hour} \times 1 \text{ year} / 8760 \text{ hours} \quad 1 \text{ TWh} = 114.08 \text{ MW}$$

Therefore, Japan's electricity consumption in 2020 was approximately:

$$1,020 \text{ TWh/year} \times 114.08 \text{ MW/TWh} = 116,531 \text{ MW}$$

Comparing this to the theoretical estimate of 1,000,795 MW of energy that could be produced from the 22.1 million hectares of algae farms, it appears that the energy produced would be more than enough to power Japan's energy needs. However, it's important to note that this is a theoretical estimate based on several assumptions and practical limitations such as land availability, cost, and infrastructure, which would need to be overcome to achieve such a level of energy production.

Convert to percentage?

To convert the energy produced by the algae farms to a percentage of Japan's electricity consumption, we can use the following formula:

$$\text{Percentage} = (\text{Energy produced} / \text{Japan's electricity consumption}) \times 100$$

Substituting the values, we get:

$$\text{Percentage} = (1,000,795 \text{ MW} / 116,531 \text{ MW}) \times 100 \quad \text{Percentage} = 860.25\%$$

Therefore, the energy produced from the 22.1 million hectares of algae farms could potentially exceed Japan's electricity consumption by over 860%. However, as mentioned earlier, this is a theoretical estimate based on several assumptions and practical limitations would need to be addressed to achieve such a level of energy production.

And that for USA's energy needs?

The total energy consumption of the United States varies depending on the season and the economic conditions, but according to the latest data available from the U.S. Energy Information Administration (EIA), the United States consumed approximately 100.2 quadrillion British thermal units (BTUs) of energy in 2020.

To convert BTUs to MW, we need to use a conversion factor of 0.29307107 MW/BTU:

$$1 \text{ BTU} = 0.29307107 \text{ MW}$$

Therefore, the energy consumption of the United States in 2020 was approximately:

$$100.2 \text{ quadrillion BTUs} \times 0.29307107 \text{ MW/BTU} = 29.36 \text{ million MW}$$



Comparing this to the theoretical estimate of 1,000,795 MW of energy that could be produced from the 22.1 million hectares of algae farms, it appears that the energy produced would only account for a small fraction of the United States' energy needs.

To convert the energy produced by the algae farms to a percentage of the United States' energy consumption, we can use the same formula as before:

$$\text{Percentage} = (\text{Energy produced} / \text{United States' energy consumption}) \times 100$$

Substituting the values, we get:

$$\text{Percentage} = (1,000,795 \text{ MW} / 29.36 \text{ million MW}) \times 100 \text{ Percentage} = 3.41\%$$

Therefore, the energy produced from the 22.1 million hectares of algae farms could potentially account for approximately 3.41% of the United States' energy consumption. However, it's important to note that this is a theoretical estimate based on several assumptions, and practical limitations such as land availability, cost, and infrastructure would need to be considered to achieve such a level of energy production.

How much renewables share of energy is in USA? Only biofuels?

According to the U.S. Energy Information Administration (EIA), renewable energy accounted for approximately 12.4% of the total primary energy consumption in the United States in 2020. This includes various sources of renewable energy, such as wind, solar, hydroelectric, geothermal, and biomass.

Biofuels, which are typically produced from crops such as corn and soybeans, are a type of renewable energy source that is commonly used for transportation fuel. In 2020, biofuels accounted for about 5% of the total primary energy consumption in the United States, according to the EIA.

It's worth noting that the share of renewable energy in the United States' total energy consumption has been steadily increasing in recent years due to policy incentives, declining costs, and technological advancements in renewable energy technologies.

Can vertical farming in algae production for biodiesel beat solar?

Vertical farming of algae for biodiesel has the potential to be more efficient than solar power in terms of land use and energy input, but it also faces several challenges that could limit its overall efficiency.

Vertical farming of algae involves growing algae in vertical structures, which can maximize the use of available land and sunlight while minimizing the need for water and fertilizers. Compared to traditional algae cultivation methods, vertical farming can also reduce the amount of space needed for cultivation and increase the yield of algae per unit of land.

However, vertical farming of algae also requires energy input for lighting, aeration, and circulation, which can be significant. The energy input for vertical farming can also vary depending on the specific technology used, the scale of production, and the location.

In terms of overall efficiency, it's difficult to compare vertical farming of algae to solar power directly because they have different uses and applications. While vertical farming of algae can be used for biodiesel production, solar power is primarily used for generating electricity. However, both technologies have the potential to play an important role in transitioning to a more sustainable energy system.

In summary, vertical farming of algae has the potential to be more efficient than traditional algae cultivation methods and could be competitive with solar power in some circumstances. However, it's important to consider

the specific technologies used, the scale of production, and the location when comparing the overall efficiency of different energy sources.

As an example, a study published in the Journal of Cleaner Production estimated that a vertical farm system using a hydroponic technology could produce between 1.5 and 7.5 kg/m² of lettuce per year, depending on the specific system design and management. Based on these estimates, a 1-hectare (10,000 m²) land farm could potentially support between 15 and 75 vertical farm units for lettuce production.

On average, pure biodiesel (B100) may provide around 3-5% lower mileage compared to conventional diesel. This means that if a vehicle typically achieves 40 miles per gallon (mpg) with diesel fuel, it may achieve around 38-39 mpg with pure biodiesel. So, kind of the same mileage.

In the United States, the average fuel efficiency for diesel cars is around 30-40 miles per gallon (mpg).

Assuming an average of 1,000 miles driven per month and a fuel efficiency of 35 mpg, you would require approximately 28.57 gallons of diesel per month (1000 miles / 35 mpg = 28.57 gallons).

Arduino Photobioreactor & Controls of the Photobioreactor:

Development of an Arduino-based photobioreactor to investigate algae growth rate and CO₂ removal efficiency. LabView software can be used in this case successfully to design Mechatronics way to control the pH of Algae Growth culture. Hence, through sensors all of Photobioreactor could be controlled, like it's temperature, pH, water levels and any other Live Data Control as required and also control responses available in case the pH be maintained, temperature be maintained and hence an entire control system could be designed over it through Arduino One successfully.

Arduino Photobioreactor Controls & MEMS:

Development of Arduino based MEMS sensors for the Photobioreactor will lead to Chip like revolution for Controls of Photobioreactor and in coming times, the Chip business will easily create enough momentum to take over TSMC.

5. Funding & Revenues of OrangeX Biofuels LLC Project/Startup:

A thorough cost analysis to identify the costs involved in producing biodiesel algae in Pakistan is done. This includes the cost of land, machinery, taxes, refining, and profits earned. Around **33 Million PKR is investment cost for the Project in first 3 years** and by Year 4, all of Capital Investment is returned and hence the project becomes self-sustainable in revenue after achieving



breakeven. However, to further cut down costs and achieve further savings, **automatic farms and smart farming technologies must be employed in the future and overall process must be optimized. Joint Ventures can also happen to make capital costs come easy. And leasing and credits systems could be introduced in American models to suit for American Market. The breakeven could be lowered like to paying just 1 Million PKR per year so that salaries of the employees are not affected.**

Biofuels Business Plan also applies to Ethanol from Corn Production and Biodiesel Production from Jatropha Plant or Rapeseed Oil from Rapeseed Plant:

Just add to the Biofuels Business Plan that the same plan applies to Ethanol from Corn Production, Biodiesel Production from Jatropha plant, and Ethanol Production from Corn and also to other Biofuels Crops as well; and then latest AgTech Solutions like Best Seed for Maximum Yield like the Seed on which Genetic Engineering has been done, then Optimization Methods, Drones Harvesting Techniques and Automation Techniques and Artificial Intelligence techniques all play a key role to increase Production of Said Biofuels Crops to Millions of Metric Tons per year. Biofuels fit the Agricultural Category and hence Biofuels are regarded in the Crops Category and every Innovation which is applied in Crops Category is also applied in Biofuels Category. And leasing methods create a financial solution to even own 1 Million Acres with ease. And hence make the business profitable even though the land is not brought but leased like House in USA. Now, when we link this Natural Production to Biofuels Specific Automobiles, that is where the Renewable Dollars are. And they would replace the Oil and Gas Business. And obviously Biofuels Power Plants would succeed Oil and Gas Power Plants. And power of Renewables is that a company can do business over it for more than 100+ years. That is why Bill Gates was also buying some farms as well; and I think the State of Wyoming, USA might be a Golden Opportunity for Production of Biofuels because of easy Regulations and everything. And easy land availability. However, cost dynamics might be slightly different from Pakistan, but I am sure majorly things might not be very different.

Financial Plan:

Capital Cost/Investment required for this project (Year 1) = **Rs. 14,352,000**

Capital Cost/Investment required for this project (Year 2) = **Rs. 6,516,000**

Capital Cost/Investment required for this project (Year 3) = **Rs. 13,032,000**

Breakdown of Initial investment

Cost of **4 Acre** land for the cultivation of algae (PKR 1 Lac per Acre = **Rs. 400,000**

(Approximately)

Cost of construction of 4 ponds = **Rs. 2,300,000** (Subject to variation)

Operating Cost of Biodiesel Plant per year:

The operating cost of algal ponds per year = **Rs. 600,000/-**

Total Cost before Refining and Taxes = PKR 3,300,000



Breakdown of the cost of construction (Rs. 2,300,000 Breakdown)

- Cost of brick lining on sides and on the bed of the pond = **Rs. 150,000**
- Cost of labor = **Rs. 100,000**
- Cost of building materials like cement, aggregate etc. and other charges= **Rs. 150,000**

Cost of machinery installed for cultivating, harvesting and drying algae = **Rs. 1,000,000**

Cost of Algae and other chemicals required = **Rs. 300,000**

Miscellaneous = **Rs. 100,000**

This is how we will be using the initial investment to start the first phase of our plan.

After the setup of the Biodiesel Plant, Operating Cost of Biodiesel Plant per year:

The operating cost of algal ponds per year = **Rs. 600,000/-**

Now, algae cultivated will be harvested and oil will be extracted from them as efficiently as possible. Under favorable conditions, we will be getting 10,000 **gallons or 37,850 liters** of biodiesel per acre per year.

In case of **4 acres**, it will be almost **151,400litres** of biodiesel per year.

Rs. 3,300,000/- per year divided by **151,400 liters** of biodiesel = **Rs. 22** per liter cost before refining and taxes.

The oil obtained after harvesting and extractions has impurities, and it will be sent to an oil refinery to separate biodiesel from the mixture.

Cost of refining one liter of impure biodiesel = **Rs.60 (per liter)**

Profit per liter of biodiesel will be **Rs. 50**.

Summed up price of the algal biodiesel (excluding G.S.T and petroleum levy) = **Rs. 22+Rs. 60+Rs.50**
= Rs. 132

Taxes per liter = PKR 13 per liter

Summed up price of algal biodiesel including Government taxes (**PKR 15 per liter**) = **Rs. 145**

This is the final price of our algal biodiesel, that is we will be selling biodiesel in the country at the rate of **Rs. 145/liter**.



Now, provided that we sell all our produced biodiesel, the profit is **Rs. 50/liter**.

Profit in one year = **Rs. 50/liter * 151,400litres/year = Rs. 7,570,000/year per 4 Acres**

PART 1

Important Assumptions:

We are making following assumptions for our business model.

Assumption	Basis
The cost of setting up the ponds and the extraction plant = Rs. 3,300,000 (Price for 4 Acre Ponds Construction)	We contacted different contractors, workshops and labors and found out their rates and approximated them.
The yield of biodiesel from algae is almost 40,000 gallons (per year for 4 Acres).	We read the research of different organizations currently working on the algal-biodiesel project and approximated it.
We approximated the working cost of the algal biodiesel to be Rs. 22 per liter.	We approximated it by checking the current labor cost, electricity cost and materials cost without refining and taxes.

Year 1 is construction of 4 Ponds Only (Initial Expenditures are Capital Cost)

Capital Cost/Investment required for this project (Year 1) = **Rs. 14,352,000**

Year 2 is construction of 8 Ponds Only

Capital Cost/Investment required for this project (Year 2) = **Rs. 6,516,000**

Year 3 is construction of 16 Ponds Only

Capital Cost/Investment required for this project (Year 3) = **Rs. 13,032,000**

Year 4 is only Operations of 16 Ponds Only

Year 5 is only Operations of 16 Ponds Only

PART 2

Algal Biodiesel					
OPERATING BUDGET					
PROFIT AND LOSS ACCOUNT					
	Year 1	Year 2	Year 3	Year 4	Year 5



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	Rs	Rs	Rs	Rs	Rs
Cost					
Pond Construction Cost	2,300,000	2,300,000	4,600,000	-	-
Land Cost	400,000	400,000	800,000	-	-
Operational Cost	600,000	1,200,000	2,400,000	2,400,000	2,400,000
Refining Cost	9,084,000	18,680,000	37,360,000	37,360,000	37,360,000
Taxes	1,968,000	3,936,000	7,872,000	7,872,000	7,872,000
Total Expenditures	14,352,000	26,516,000	53,032,000	47,632,000	47,632,000
Total Capital Cost Invested	14,352,000	6,516,000	13,032,000	0	0
Revenue	21,953,000	43,906,000	87,812,000	87,812,000	87,812,000
Net Profit	7,601,000	17,390,000	34,780,000	40,180,000	30,280,000
Cash in Hand after Completed Year	21,953,000	43,906,000	87,812,000	87,812,000	87,812,000
Profit retained in business (Investments for next years)	20,000,000	40,000,000	47,632,000	47,632,000	47,632,000
Profit Earned	1,953,000	3,906,000	40,180,000	40,180,000	40,180,000
Breakeven (Paid)	-	-	-	33,900,000 Paid Back	-
Profit after Breakeven Paid	-	-	-	6,280,000	40,180,000

*Just dividing it by 12 gives the company's cashflows separately (this chart is enough for any OrangeX Startup)

Leasing Model:

Now, an average American spends about between **\$150 to \$200** on fuel alone per month.

An average American spends about **\$487 per month** on Car Leasing alone.

The average car lease payment in Q2 2022 was **\$540 per month**, and the average lease term is 36 months.

Now, the total would be somewhere around **\$687 per month**. So, I think the cars totally designed for this task, might, actually be a great idea in this direction, since Leasing will force more of users to buy Biofuels Driven Vehicles.

And no doubt such Vehicles will really defeat Tesla since Biofuels is sustainable energy and sellable technology which people think is as cool as Oil and Gas.

"Biodiesels are more expensive than Diesel; so how will it compete against Diesel?"

"Biodiesels are more expensive than Diesel; so how will it compete against Diesel?"



(Shawn Kung)

"I think the answer lies in the Leasing Model; I think that maybe people would be more interested in like learning that the total time of lease on the Biodiesel Manufacturing will automatically reduce the overall cost of the product; since, if Biodiesel is being sold in 2023, so Oil is also being sold now, however, by 2123, Biodiesel will eventually be selling in the World! And that is how futuristic thinking will bring down the prices and need of Oil for Automobiles automatically! The solution lies in the prices, and it lies in the Leasing Model! Biodiesel has the future however Oil does not have any future, and I learnt that in Business Projects, Venture Capitalists think more about the future gains! Next, every person will be interested in investing in Green Future for coming Generations, and also this will rapidly take OrangeX LLC, USA's Biofuels IPO to a staggering \$100 Billion, since, everyone knows that Oil demand is going to reduce in the future and they would be looking at a CEO like Elon Musk who talks about Sustainable Energy and Biofuels exactly solve that; so when the need of the future will be presented to Americans, they would readily accept it!"

(Dr. Engr. Hassan Irtza Chaudhry)

"Overall excellent answer! Because even if it is expensive, people will still buy it if they believe that the product has quality and in the longer run, has future! And ever-expanding business of Biofuels Driven Vehicles in USA will decrease the overall prices successfully, since the need of it will grow globally!"

(Shawn Kung)

"And I mean Photobioreactors in this case, which we might build for Prototype in the start will not just be simple tube that carries water and then algae grow into it when light is incident upon it and some nutrients are cycled through it; nope, it is going to be a highly efficient design to increase the maximum yield of algae mass growth at cheapest prices!"

(Dr. Engr. Hassan Irtza Chaudhry)

"You are right; because Americans love Tech Entrepreneurs like these ones, who turn their dreams into reality, and they eat thoughts, so they are eating the thought of Green Revolution successfully! And man, on International Scale, through a person of your background and skills, Green Revolution and Sustainable Energy future will be accepted by everyone in the entire world! It is really like a dream come true!"

(Shawn Kung)

6. Operational, Management & Marketing Plan Summary (Daily basis operations):

Marketing & Sales of the Product:

We will only be targeting specific customers". Our main customers will be the biodiesel customers. We will attract them to buy our biodiesel by using different tactics. Our value proposition includes



"free delivery to shop, free engine maintenance, environment friendliness of product and other points." "Free delivery to shops" carries great importance for our customers. A tesla like Supercharging Network like Scenario all across USA. Spark Charge like startups can get this job done effectively.



Figure 11: Tesla Like Supercharging Network all across USA

In initial service time of our company, we will be focusing upon shopkeepers keeping diesel generators. A percentage of our company's profits plus investments will be utilized to expand the business and network, thus the customers.



Figure 12: Comparison Table of Biodiesel vs Diesel

Social Media Marketing of Company/Product to get like 1000 to 1 Million Followers on Social Media Networks:

Stage 1: Inorganic Social Media Marketing:

First, through OrangeX LLC, USA LinkedIn page do In-organic Marketing on LinkedIn to get anywhere between 1000 followers, 2000 followers to 5000 followers for \$49 to \$99 to \$189. It



takes around 10 to 15 days to make it happen after the payment. And use the same approach to increase Followers on all other Social Media Platforms.

Stage 2: Organic Social Media Marketing:

Now, do Organic Marketing on Social Media on LinkedIn and increase Followers (Basically, it happens when you first have like 1000 followers or 5000 followers, so, when Target Audience of Millions of people will see it; like \$100 LinkedIn campaign will reach at least 1 Million people, and so forth; now, since if the content produced is really good and likes are shown on the page, then there is a very high probability of other people liking the Company page as well. Through this, the company develops this Authority that people will like company posts. And then it is all genuine work.

So, even \$150-\$200 budget is enough for LinkedIn and similar one on YouTube, Facebook, and Twitter, so like just \$1000 is enough for this task on all Social Media Platforms.

Stage 3: Using all Social Media Tactics to win big:

Then, use the Real Content Appeal and all other Social Media Tactics to win big in this game. And create a Solid Digital Presence for successful digital business.

The lesson is that Tesla has 12 Million Followers on LinkedIn and even 57,000 employees on LinkedIn; however, is it not so that just 880 people liked the post; and there were only 107 reposts; so, that is why managing Social Media Presence on LinkedIn is very easy. Just an Organic Audience of 1000 people (which I have earned in these last 10 years) is actually enough for entire lifetime so to speak and next stage is this one.

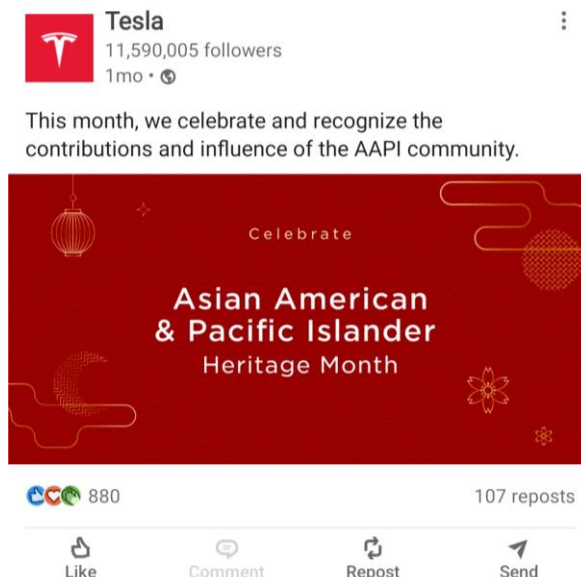


Figure 13: Example of Social Media Marketing

Management Plan Summary & Company Structure:



1. Executives - 11
2. Production Manager - 10
3. Engineers Team - 100
4. R&D Team - 40
5. Sales Team - 40
6. Accounts Team - 40
7. HR Team - 30
8. Marketing Team - 30

Total Employees = 300

36 Crores PKR per year be the profit for 1 lac PKR salary per month! (300 employees)

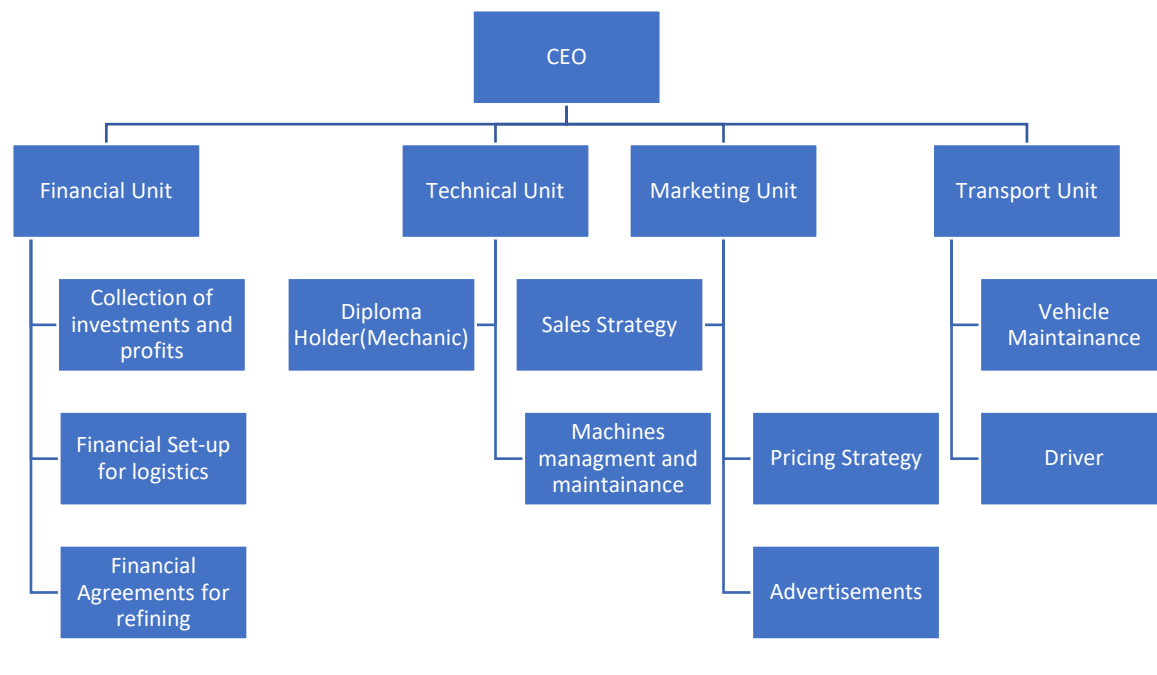


Figure 14: Organogram of Company Officials

Brains and R&D: (These are Direction/Brain Engineers)

1. Artificial intelligence for smart farming
2. Optimization jobs to increase productivity.
3. Farming Simulation jobs to increase productivity. (Smart farming solutions)
4. Autopiloting jobs to increase productivity.
5. AgTech Solutions
6. Vertical farming solutions.
7. Idea cell (Innovation cell)
8. Chemical Processing Jobs
9. Material Selection Jobs
10. Manufacturing Jobs
11. Fuel Treatment Jobs

12. Refining Jobs
13. Lab testing (results and selection) jobs
14. Biotechnology R&D Jobs (Using Viruses and Bacteria to increase growth of Algae)

Biofuels Business Plan – Backing, Employees and Support Structure:

#Previous Startups before OrangeX LLC, USA which I created/Founded have till date Employed 500 to 700 Employees directly while at least 2000 Employees indirectly.

#Add to Management Plan Summary to make it look very much Professional; and also that Jobs Structure at OrangeX LLC, USA is very much organized, and also would use H1-B Card to attract as many Foreign Talent as it can; and also that Pressure of high intensity work at Orange might press on nerves of Employees very much; also that Pressure of Green Cards and Strong Career at OrangeX LLC, USA and Work Sponsorships from OrangeX LLC, USA might not come very easy.

#Starting in 2013 till today, I have broken up around 10,000+ Jobs and added them to the Breadbasket of OrangeX LLC, USA, this is how Great Companies and Startups are made, Step by Step and team by team and year by year; without the slow Evolution which I have started in 2012, no Great Company/Startup could be created.

In technical side, there should be **Execution Engineers (Design Engineers, Manufacturing Engineers, and Maintenance Engineers)**. Make it so that Detailed Design and Detailed Manufacturing, be a job for hired Engineers at the firm. As founder, I just have to make a mid-phase plan, where I should I have a map of what are the possible options for making it happen, and the final shape of the Biodiesel Plant would come out as a result of 100 brains thinking it through. For Pakistan, look for all possible options like Joint Ventures approach as well to use as a tactic to increase the overall economy of the project.

Operational Plan Summary:

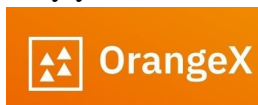
Our day will start with our office. In the first place, we will be checking whether the pre-requisites for our day's plan are prepared or not. Algae matures in less than 10 days under good supervision. The mature algae will then be harvested and dried. It will then be stored in godowns.



Figure 15: Daily Inspection

Patenting and Registration Process for Biofuel X in USA:

1. OrangeX will sell Biofuel X in USA by year 2025-2026.



2. Most important licenses are Biofuel X License from USA Federal Government.
3. For hardcore Engineering, do Joint Venture with a big Engineering Firm in USA who already has Professional Engineer (PE) licenses in USA and work with them, give them a share of the ownership of the Product. Distribution and Sales License would also be managed by partner JV firm in USA.
4. Lab Samples of Biofuel X are required for submission where all of Chemical tests are conducted on Biofuel X.
5. Biofuel X patent in USA!
6. Under Research License of OrangeX LLC, USA; Research Work under Engineering from Social Media Management is legal as task of OrangeX LLC, USA is to manage Social Media Causes for Green Engineering Work in USA!

Team for Biofuels Production:

1. 40 Employees in the start are enough (however the way how I run the team may be very different from the inexperienced people and there is no alternative to the experience which I have, sorry Musk)
2. Hence my ideas cannot be copied (Only I myself can do them and then make them profitable too)

Biodiesel Blends for Chemical Composition of Biofuel X:

The passage discusses various aspects of biodiesel blends, focusing on B5 (up to 5% biodiesel), B20 (6% to 20% biodiesel), and B100 (pure biodiesel). Till, B20 are low level blends and till B100 are high level blends. It explains that low-level blends like B5 are ASTM-approved for safe use in diesel engines without separate labeling. B20 is highlighted as a common blend with a balance of cost, emissions, and compatibility. The text mentions that B20 meets quality standards, and many engines can use it without modifications, although users should consult warranty statements.

Engines running on B20 show similar performance to those using petroleum diesel, with minimal differences in fuel consumption. Biodiesel offers greenhouse gas emissions benefits, and the extent of this benefit correlates with the blend level. B100 and high-level blends have less regulatory support and are less commonly used due to pricing and potential issues like clogging filters, impacting engine warranties, gel formation in cold temperatures, and storage challenges. B100 requires special handling and may increase nitrogen oxide emissions.

The passage also advises users to ensure that biodiesel meets ASTM D6751 standards, with different grades (No.1-B and No.2-B) based on application needs. It concludes by suggesting tools to find biodiesel fueling stations and understanding biodiesel costs using the Alternative Fuel Price Report.

Biodiesel Benefits and Considerations:

Biodiesel is a domestically produced, renewable alternative to petroleum diesel that enhances energy security, air quality, and safety. The United States' transition to becoming a net petroleum exporter in 2020 underscores the importance of reducing petroleum consumption, with biodiesel



playing a role in achieving this goal. The transportation sector, constituting 30% of total U.S. energy needs, significantly benefits from biodiesel, reducing costs and strengthening national security.

Biodiesel, particularly from soybeans, boasts a positive energy balance, providing 4.56 units of energy for every unit of fossil energy consumed. Its usage in engines, including those meeting 2010 emissions standards, contributes to comparable air quality benefits alongside traditional diesel. Life cycle analyses reveal a 74% reduction in carbon dioxide emissions with B100 compared to petroleum diesel.

Engine operation sees improvements with biodiesel, enhancing fuel lubricity and raising the cetane number. This address concerns reduced lubricity resulting from federal regulations on sulfur content in diesel fuel. Recommendations from engine original equipment manufacturers should guide optimal biodiesel blends, with 2% biodiesel generally sufficient for adequate lubricity.

In terms of safety, pure biodiesel is less damaging than petroleum diesel if spilled and is safer to handle due to its higher flashpoint. The flashpoint of biodiesel exceeds 130°C, making it less combustible than petroleum diesel. For detailed guidance on handling, storing, and transporting biodiesel, reference the Biodiesel Handling and Use Guide.

Current Biofuels vs other fuels prices in USA:

National Average Price Between July 1 and July 15, 2023	
Fuel	Price
Biodiesel (B20)	\$3.77/gallon
Biodiesel (B99-B100)	\$4.53/gallon
Ethanol (E85)	\$2.95/gallon
Natural Gas (CNG)	\$2.86/GGE
Liquefied Natural Gas	\$3.79/DGE
Propane	\$3.25/gallon
Gasoline	\$3.59/gallon
Diesel	\$3.88/gallon

Figure 16: Fuel Prices comparison