

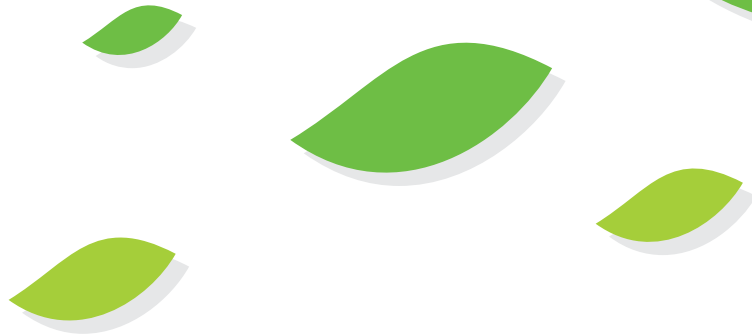


“ENGINEERING is the art of making something USELESS useful and making something USEFUL even more useful.”

Adeel Anwar
Founder & CEO



BIO-ECONOMY CONSULTANCY
HELPING CREATE A GREENER WORLD

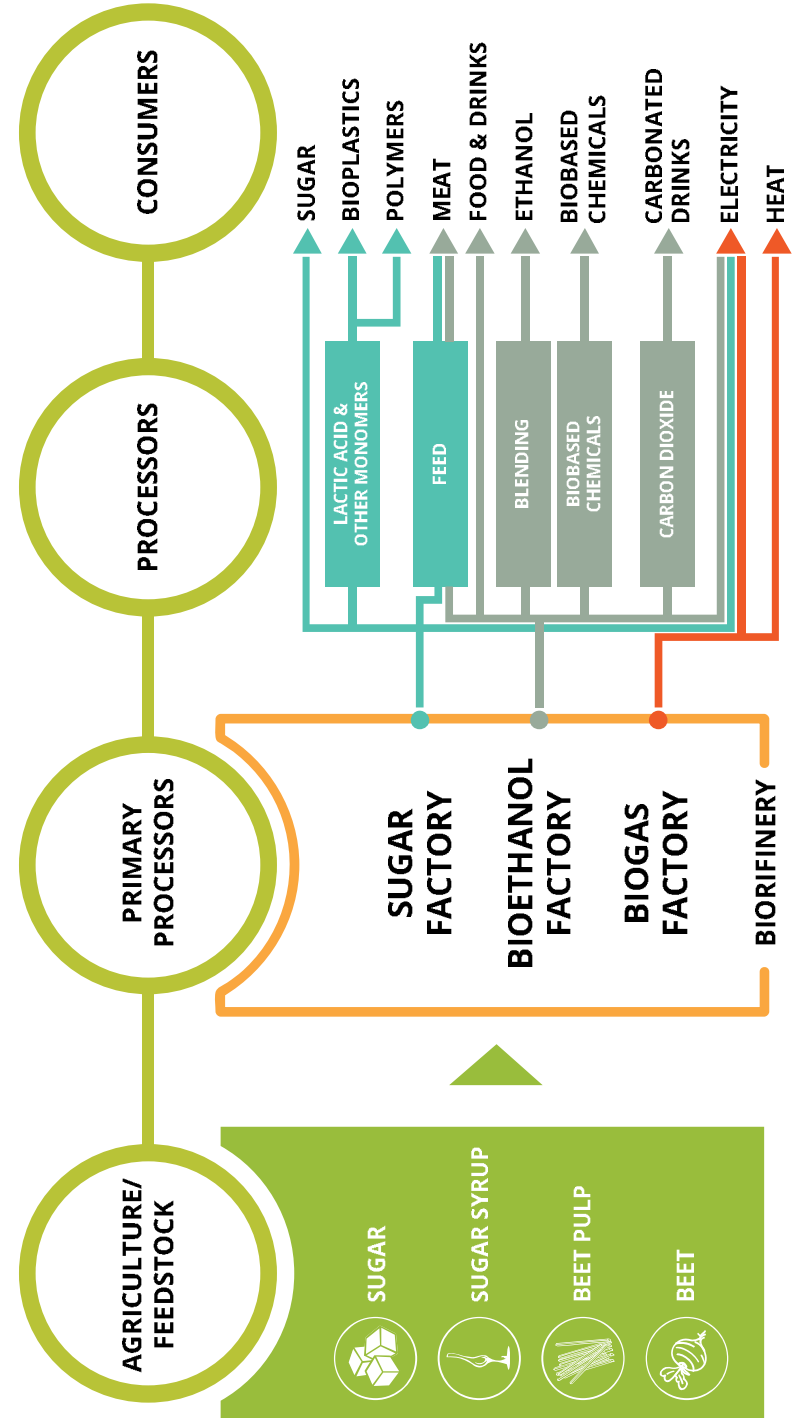
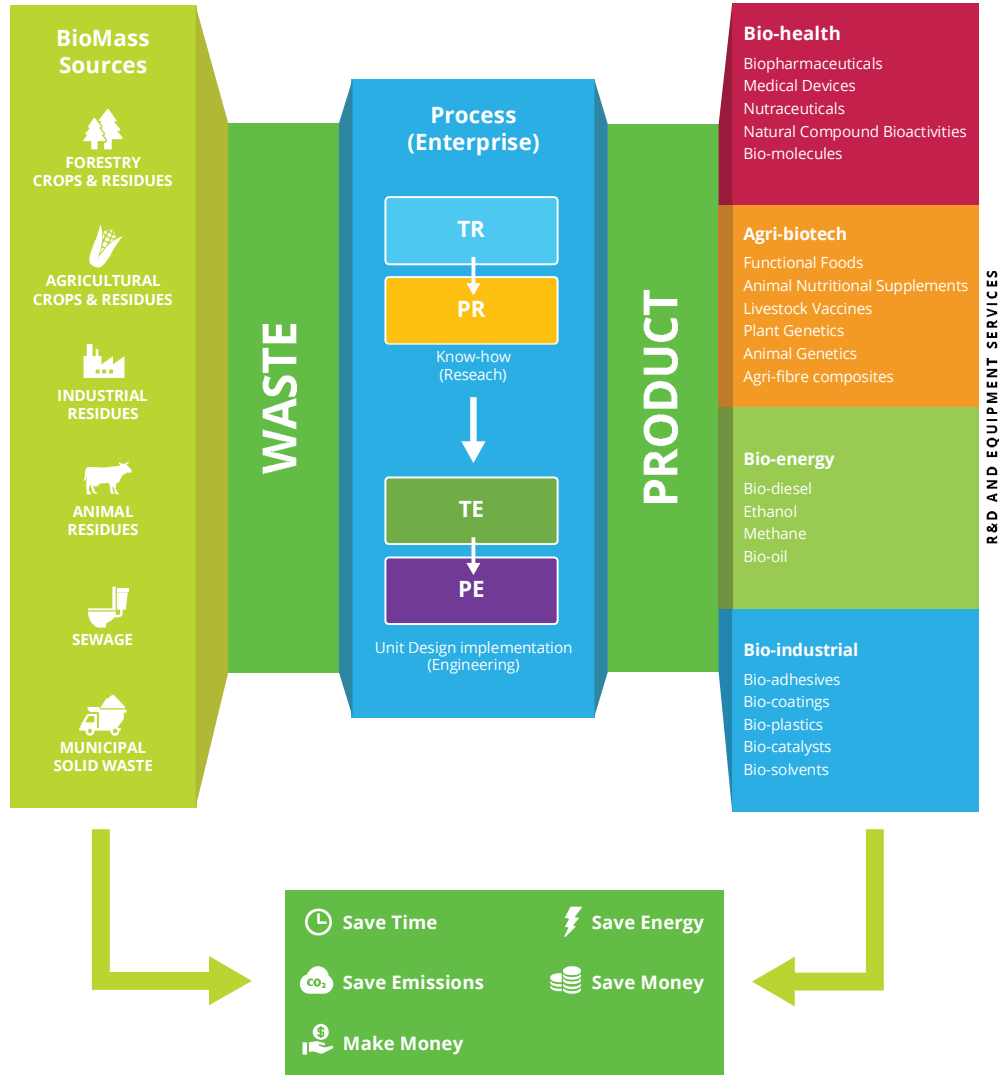


BIO-ECONOMY CONSULTANCY
www.bio-economy-consult.com



The concept of a bio-economy revolves around utilising bio based sources to generate energy, fuel and a variety of value adding products.

Depending on the desired end use, a plethora of products can be produced using a number of processes from various bio sources.



EXAMPLE - SUGAR BEET IN THE BIOECONOMY VALUE CHAIN

SERVICES

At the Bio-Economy Consultancy we have developed a systematic approach to help you bring your bio dream to life.

Four distinct steps have been outlined with typical challenges each service endeavours to address.



Theoretical Research

- What solutions are there for my bio source according to literature?
- What technologies and processes are required?
- What is the sustainability analysis?
- How much would it cost?



Practical Research

- Could you demonstrate the concept on a lab scale using my sample?
- Could you tell me what my bio source is composed of?
- Could you determine the physical properties of my product?
- Could you generate reaction data so we can use it for our simulation?



Theoretical Engineering

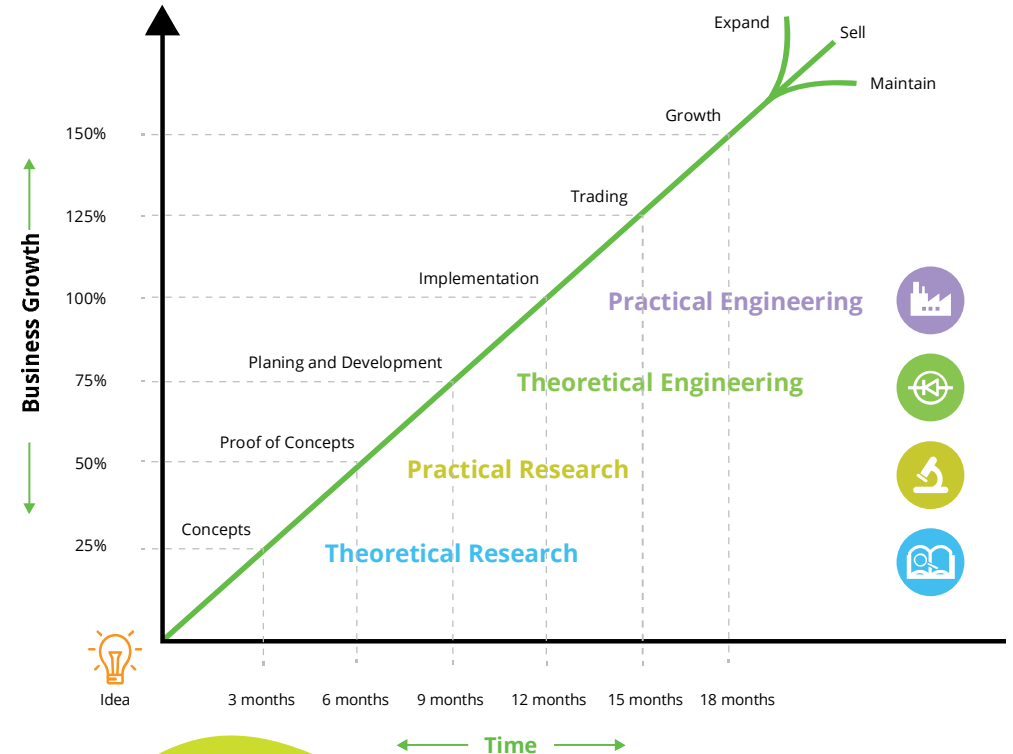
- Could you design my unit or process and show me what it looks like?
- Could you carry out a simulation of how the unit or process will operate?
- Could you produce the plant layout?



Practical Engineering

- Could you build our unit or process?

Depending upon how much you already know you can choose one or more services to progress with your journey.



Idea

3 months

6 months

9 months

12 months

15 months

18 months

Time

The BC Method®

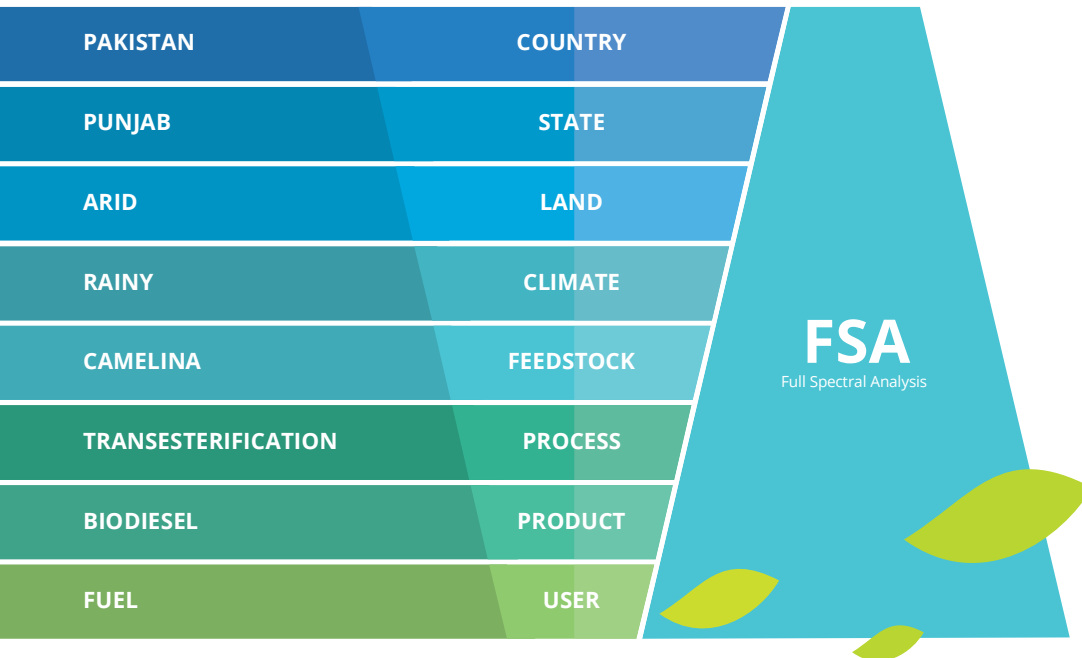
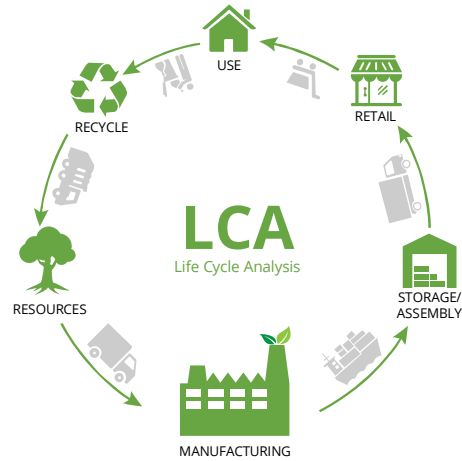


Researchers show the way. Engineers make it happen.

Only strong theory can lay the foundations for realising great ideas.

This service involves generating a:

- Literature Review (including SWOT and PESTEL analysis)
- Detailed Technology Report
- Bio-economy Roadmap for a community or country
- Life Cycle Analysis (LCA)
- Full Spectral Analysis (FSA)
- Sustainable Supply Chain Solutions



Theory and ideas are useless unless proven in practice.

This service involves conducting:

- Lab Based Experimentation
- DChemical Analysis (GC-MS, FTIR)
- Physical Analysis (DSC, TGA)



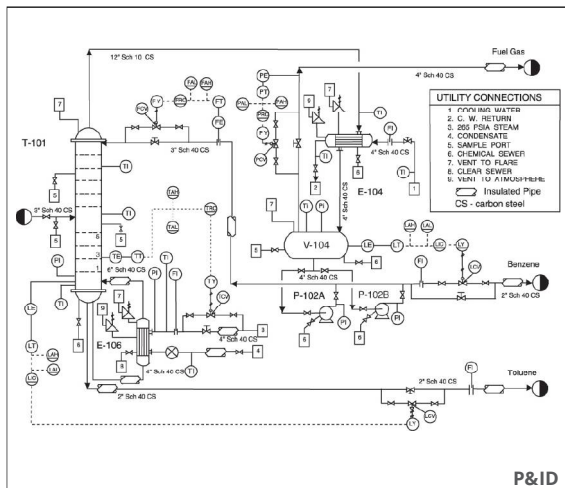
Having completed the research, the pieces of the puzzle must be put together and tested computationally.

This service involves producing a:

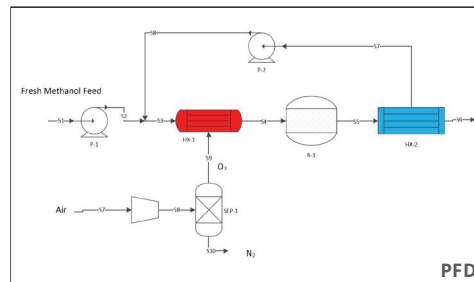
- Process Design
- Process Flow Diagram (PFD)
- Process and Instrumentation Design (P&ID)
- Process Modelling and Simulation (Aspen HYSYS and PROII)
- Auto CAD (Unit or Plant Design)



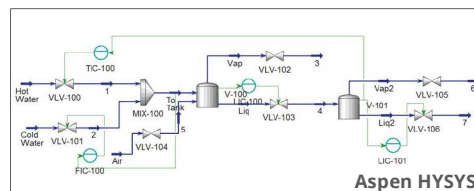
AUTOCAD



P&ID



PFD



Aspen HYSYS

With everything tested and proven, why not bring it to life?

This service involves commissioning bio projects such as:

- Farm Waste to Energy
 - Anaerobic Digester (Biomass)
 - Biogas (Fuel or Electricity) and Bio fertiliser
- Farm Waste to Fuel
 - Trans-esterification (Waste Oils)
 - Biodiesel
- Bio-Refinery
 - Thermochemical Conversion (Biomass)
 - Biofuel (Bio Ethanol)
 - Power (Heat/Electricity)
 - Biomaterial (Bio chemicals)

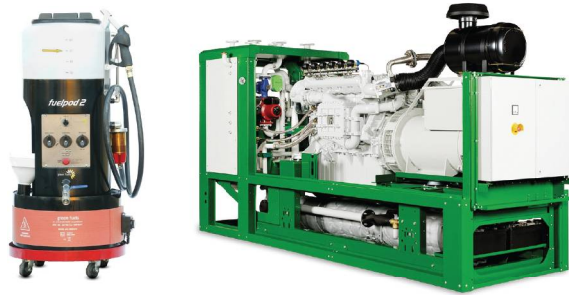


SOLUTIONS

We aim to offer bio solutions at every scale to add value to your bio sources.

Small (De-centralised):

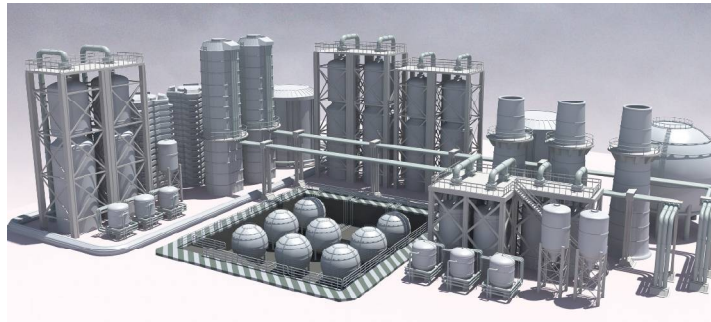
- Commercial
- Domestic



Bio-fuel Pods and Combined Heat-Power (CHP) Generators

Medium (Local):

- Country
- Cities



Bio-refinery Plant

Large (Centralised):

- Global
- National



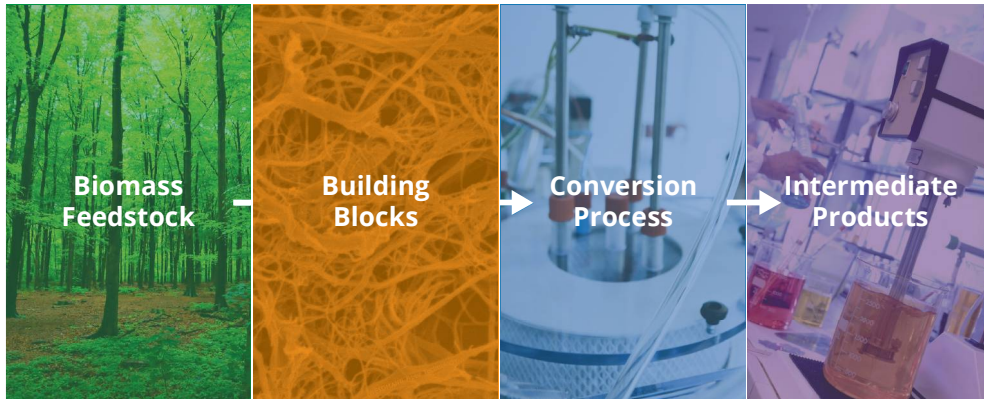
Integrated Seawater Energy and Agriculture System

With an annual economic turnover of over 2 trillion euros in just Europe and encapsulating 20% of the overall global employment, the bio-economy movement offers one of the most fascinating investment opportunities.



BIO-INDUSTRY LEADERS

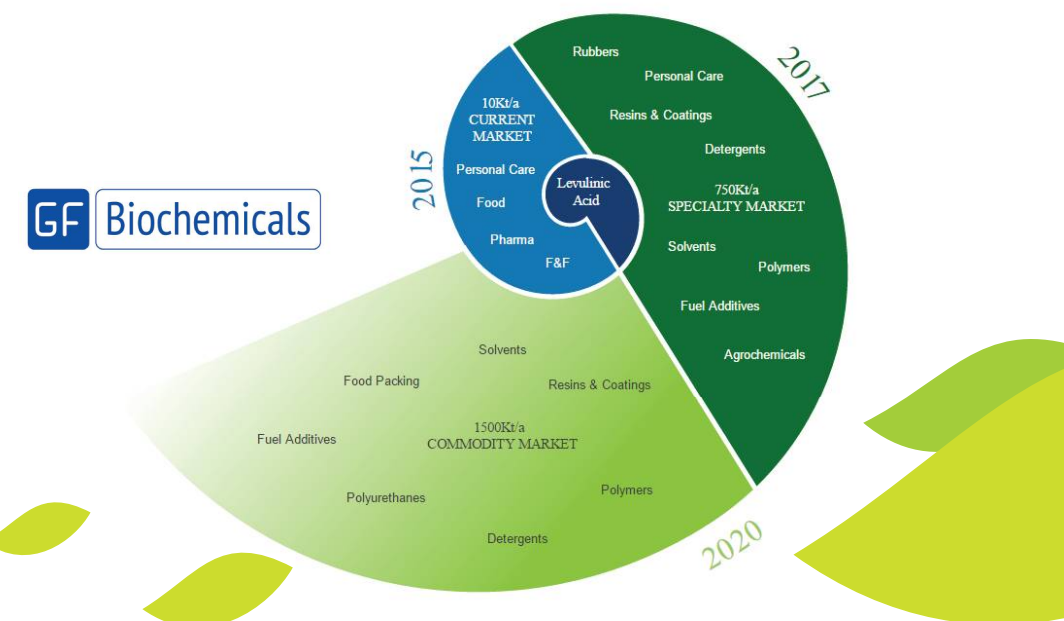
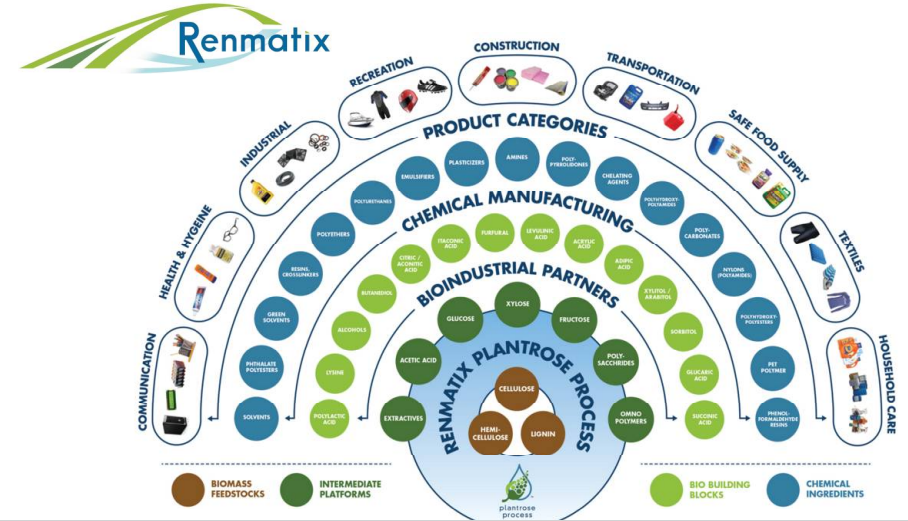
The step by step processes used by bio industry leaders have been highlighted below followed by a number of exciting case studies already underway.



Trees	Starch	Enzymatic Fermentation	Butadiene
Grasses	Cellulose	Gas/Liquis Fermentation	Pentanes, pentene
Agricultural Crops	Lignin	Acid Hydrolysis / Fermentation	BTX
Agricultural Residues	Other Carbohydrates	Gasification	Phenolics
Animal Wastes	Lipids	Combustion	Organicacids
Municipal Solid Waste		Co-firing	Furfural
			Resorcinol
			Levulinic acid
			Levoglucosan
			Peracetic acid
			Tetrahydrofuran
			Anthraquinone
			Sorbitol

CASE STUDIES

Manufacturing chemicals and products from fossil fuels will soon become a distant memory thanks to pioneering endeavours from the likes of Renmatix and GF Biochemicals to convert cellulosic feedstock into a host of bio intermediaries and products.



CASE STUDIES



BETARENEWABLES

Beta Renewables is a leader in the field of advanced biofuels and biochemical compounds at competitive costs. It was established at the end of 2011 as a joint venture between Biochemtex, a company of the Mossi Ghisolfi Group and the U.S. fund TPG (Texas Pacific Group) with a total investment of 250 million Euro (350 million dollars). At the end of 2012, Novozymes – world leader in the enzymes industry – became a shareholder of Beta Renewables, with the acquisition of 10 percent of the shares, amounting to 90 million Euro. Beta Renewables owns the PROESA™ technology, applied to the field of biofuels and chemical intermediates. Beta Renewables manages the plant in Crescentino (VC), the first commercial facility in the world for the production of second-generation ethanol. Beta Renewables, where needed, also offers Clients support in establishing supply chains and identifying the best feedstock solutions, according to the local characteristics of the Projects being developed.



Together with area farmers, DuPont is making cellulosic ethanol commercialization a reality with its biorefinery in Nevada, Iowa. Situated in a prime agricultural location, the cellulosic ethanol plant in Nevada, Iowa will be among the first commercial-scale cellulosic biorefineries in the world. The plant will convert corn stover (corn cobs, leaves and stalks) to 30 million gallons of fuel-grade ethanol annually.

- DuPont is collaborating with more than 500 local farmers to gather, store and deliver 375,000 dry tons of corn stover each year.
- Stover will be harvested from 190,000 acres of farmland within 30 miles of the plant.
- Proximity to Iowa State University and DuPont Pioneer research locations enables further research, collaboration and innovation.
- The plant's fully integrated end-to-end production system will be available to license globally.

DuPont is devoted to working with producers to create value across the biomass supply chain. Our vision is to provide sustainable solutions to the evolving advanced biofuels market, while creating new opportunities for rural America.



Oleco's vision is '100% resource recovery for the food industry' and their story began more than 30 years ago when used cooking oil was collected and used in animal feed. When this was banned due to tighter regulations, a huge amount of used cooking oil ended up in landfill or was illegally poured into the country's drains. As a solution they looked at other ways to recover the value from this precious resource, so they started on a journey to collect both used cooking oil and food waste and convert them into renewable energy instead of merely throwing it away.

From there, they have spent the last decade expanding to offer a national service from 14 depots across the UK and have grown and improved their oil supply and organic waste collection services. Today they are one of the UK's largest distributors of cooking oils to the catering trade and have created innovative collection systems and designed their own bespoke vehicles specialised for the collection of used cooking oil and food waste. They now serve 50,000 customer sites across the UK and lead the way in developing their conversion technologies to ensure they extract the maximum benefit from the valuable resources they collect.



The world's first research facility aimed at finding a way to grow food as well as biofuels using desert land irrigated with seawater has exists in Abu Dhabi. The facility is based at Masdar City and will be operated by Masdar Institute of Science and Technology, with funding coming from the Sustainable Bioenergy Research Consortium – a group whose goal is to cut the aviation industry's carbon emissions. Group members include Masdar Institute, Etihad Airways, the plane maker Boeing, GE Aviation, engineering company Honeywell, French aircraft engine maker Safran and Abu Dhabi refining company Takreer.

The UAE imports about 90 per cent of its food, but it is hoped that by promoting aquaculture using seawater, the country could grow more of its own fish and shellfish. Aquaculture has been a fast-growing global food market, increasing by about 6 per cent each year, but there have been concerns about the environmental damage that can be caused by nutrient-rich effluent discharged by the fish stocks.

The research hub will use coastal seawater to raise fish and shrimp for food and then use the nutrient-rich wastewater as fertiliser for plants rich in oils that can be harvested for aviation biofuel. These salt-tolerant plants, the halophytes, thrive in arid, desert conditions and do not require fresh water or arable land to grow. Any remaining wastewater then passes through a cultivated mangrove, which naturally filters more of the nutrients before it is discharged into the sea. The trial for the technology is being run on a small scale, but if it proves to be viable, a 200-hectare demonstration site is planned.



Argent specialise in the supply of high grade, sustainable diesel for fleet operators, delivering to over 100 UK depots from Kent to Dundee. They aim to provide the best economic value to their customers and, with a range of greenhouse gas savings from their products, they can also provide best environmental value.

All the bio-component of their diesel is made in the UK from waste fats and oils. This ensures it is the most sustainable available and they deliberately exclude any raw materials that could also be used for food or feed. Argent has two manufacturing facilities for waste-based biodiesel and following a recent £75million investment, the production capacity will be 145 million litres per year.

CRODA

Croda create, make and sell speciality chemicals that deliver real benefits to a range of diverse products including health and beauty, engine lubricants, plastics and many more.

Their business is split into three core market sectors: Personal Care, Life Sciences (Crop Care and Health Care) and Performance Technologies (Coatings and Polymers, Geo Technologies, Home Care, Lubricants and Polymer Additives). They also have an Industrial Chemicals business area. In all areas of their business they focus on developing and delivering innovative ingredients sustainably. They have 18 manufacturing sites and offices in over 30 countries.

NESTE OIL

Every day, Neste does more with less. As they continue to pioneer the oil industry, they keep on rethinking conventional models. They make the most of existing resources and search out new, low-carbon feedstocks from materials like waste and residues. They are already the world's largest producer of renewable diesel and are seeing interesting growth opportunities also outside the fuel market. Their renewable products are produced at the Porvoo, Rotterdam, and Singapore refineries, while diverse crude oil-based oil products are produced in Finland.