
Biodiesel Plant Startup Guide

Prepared for:

Green Harvest Biofuels

June 11, 2009



Product Descriptions and Specifications



A Bioremediation Company

USFuelTech Aiken, SC 29803

1-803-642-2209

sales@usfueltechinc.com

WWW.USFuelTechinc.com

Introduction

This document describes a Biodiesel production plant with a capacity to produce 2,000,000 Gallons of Biodiesel per year (2MGPY) by direct transesterification of feedstock oils.

Biodiesel manufactured will meet all European and USA quality standards: EN14214 US ASTM 6751 as long as the Feedstocks are properly prepared, and the plant is run using the materials and processes set forth by USFuelTech.

USFuelTech builds three core plants built on nameplate hourly throughput.

R125
R250i
R500i
R2000i

Each core unit is fully scalable by being integrated with any other sized unit the Company manufacturers to achieve the client's desired yearly production of Biodiesel.

Typical plant building requirements

The client will secure an appropriate site for the processing equipment. Minimum sizes are indicated below. Any such site should be prepared in accordance with local requirements and regulations concerning explosive environments (for those areas which will house processing equipment and storage of Biodiesel, methanol and methoxide).

Proposed building dimensions:

As a minimum, the completed production site should include a production floor with approximately 200 square feet for every 500,000 gallons of B100 produced annually.

The production facility should also include the following features:

- Office with chemistry testing area
- Tanks for Feedstocks, Finished B100, Methanol and waste Glycerol
- Electrical work per USFuelTech specifications for the Biodiesel equipment
- Heating and air conditioning
- Water and Sewer hookups
- Parking area
- Fencing, telephone and a broadband internet connection
- Asphalt or hard track road

-
- Additionally, some local building codes may require a sprinkler system or other fire suppression system to be installed in the main production area.

Berms

A berm is simply some kind of containment wall that surrounds all of your processing equipment, as well as your storage tanks. The berm must be strong enough to hold the oil without leaking or bursting in the event a tank ruptures or leaks.

The Processor can have its own berm (or spill proof containment wall) capable of containing a spillage of approx. 265 Gallons. USFuelTech has great experience in meeting these standards in Biodiesel production facility requirements and would be happy to provide advice on a consultancy basis or contract to build the facility should this be required.

Power requirements

The equipment listed in this document will require approximately 30KwH of power to operate. Operation by steam, or other hot waters, may also be a viable power source for the equipment depending up that particular installation.

Waste disposal requirements

One of the major advantages of the proposed process in this document is the complete absence of the need to treat or dispose of contaminated water. The only waste is the disposal of Bioresin which is used in the Ion Exchange units.

After the resin has reached its useful life span, the Bioresin can be disposed of as ordinary non-toxic waste, and also may sometimes be recycled by being returned to the manufacturer.

Access requirements

During the design of the site, adequate consideration must be given to the need to accommodate transport vehicle access. Production in the quantities planned will require careful planning of goods in, and goods out requirements.

There will be a need to cater to both large and small tanker trucks, and delivery vehicles of many different sizes.

Rail access may allow the plant owner's to acquire feedstock from distant locations in bulk - saving considerable amounts on over the road (OTR) transport costs - and also be able to ship B100 amounts that are larger than can be accommodated by standard OTR tanker trucks.

Material storage requirements

Storage Tanks

Oil, Glycerin and Biodiesel can be stored in single or double skinned tanks, plastic (HDPE) or metal. Methanol should be kept in tanks specifically approved for this solvent, typically stainless steel, in accordance with local regulations.

In many cases, the Methanol tank will be located outside the plant.

Base catalysts must be stored in a suitable area and kept anhydrous (water free) at all times.

Storage for all the raw materials

In order to have a constant supply of materials on hand to produce Biodiesel, you will need to have 5 days of materials available for processing and storage.

The chart below outlines storage capacities needed to accomplish this reserve for a 4 million gallon per year Biodiesel plant.

Raw Material	5 Days
Feedstock (Waste Oils)	40,000 gallons
Methanol	20,000 Gallons
Catalyst (Liquid)	2,000 Gallons*
Finished Product	
Biodiesel	40,000 gallons
Methanol	20,000 gallons
Waste Glycerol	10,000 gallons

*Liquid catalyst comes in *Totes* and does not require separate tanks.

Plumbing and pipe work

It is most important that the pipe work feeding the processors and the tanks is adequately sized and meets all requirements for its operating environment.

Pretreatment of Feedstocks

In order to produce a viable and efficient conversion process, the Free Fatty Acid (FFA) levels of the feedstock - either waste vegetable oils (WVO's) or virgin oils - the FFA's must be at 3% or lower for the transesterification process to properly work.

If a higher FFA amount is mixed with the Methanol and catalyst, and fed to the reactor, it will produce unwieldy amount of soaps, salts and glycerin that will not be able to be separated and cleared from the reacted fuel rendering that batch of fuel totally useless.

This system will use a glycerin flocculation system to separate the FFA from the waste oil. Glycerin is added on top of the WVO as it settles it brings out the FFA and water to the bottom of a cone shaped tank. The Glycerin/FFA is then pumped off to be used as boiler fuel or animal feed. The resulting WVO should be less than 2% FFA.

There are many techniques to reduce the FFA levels, starting with the plant operator buying a much more expensive feedstock lower in FFA's. Other conventional methods using Sulphuric Acid, or other Acid Stripping techniques are used by USFuelTech as they produce the greatest result for the least cost per gallon.

Using this technology, which costs about \$0.30 per gallon of fuel in materials, also uses less Methanol in the overall process therefore reducing the costs for the plant operator to manufacture fuel.

Plant performance

The plant is designed to produce EN14214 (ASTM 6751) grade Biodiesel subject to use of the recommended feedstock quality and process procedures.

Technology

All equipment is completely manufactured in the United States to the highest industrial standards.

What are the benefits of adopting the USFuelTech approach?

Price

Our plant can pay back investment within one or two years, whereas alternatives deliver payback over 5 or even 10 years.

Quality and Modularity

All components are made of high quality materials that help to meet EN14214 (ASTM 6751) standards.

Modularity and flexibility in production means that you can produce up to 500 Gallons per batch, and in the future add additional processors to produce 500 Gallons per yearly batch or add larger processors (our largest produces 2,000 gallons per hour) to grow over time as you need.

No other manufacturer can offer this. Each processor is a plant in itself. That means lower service and maintenance costs and, vitally, you don't have to completely stop production during repair or maintenance.

Washing

No water purification technology is needed, and no specialized waste management is required, keeping equipment prices down as well. We will use, a Bioresin, which we see as the most effective and efficient method of washing Biodiesel as a polishing step. It will quickly remove any contaminants from Biodiesel and leave the Biodiesel extremely clear.

Final Biodiesel polishing

Our Biodiesel polishing units remove even the smallest particulates by filtering the Biodiesel down to 1 micron.

Support

We offer complete support for a successful installation of all Biodiesel equipment. Our service engineers will be available throughout the initial Biodiesel plant installation and commissioning period to insure a smooth transition of all components and systems during the initial production startup period.

System Pricing

Price exclude all electrical switchgear and cabling other than the control panels for the supplied equipment, all additional sockets, cabling etc must be sourced and installed by the client.

Local, state and Federal permits required to operate a Biodiesel production facility are the full responsibility of the buyer. USFuelTech does offer, at an additional price, a full package of permitting engineering services to assure full compliance with all laws.

Price also excludes all taxes and applicable local levies of any kind. Delivery times will be confirmed at time of order. A typical manufacturing schedule for the equipment itemized above is approximately 12 weeks from receipt of cleared funds for deposit.

Commissioning and certification of plant operators

- The customer should ensure that they are compliant with local planning regulations, environmental requirements and health and safety requirements.
- The customer must ensure that a suitable smooth and level site is ready for installation and that a 3 phase 220V (USA), 380-Volt, 415-Volt or 440-Volt + Neutral + Earth/grounding point electrical supply is available for the power requirements of all the equipment. The transfer pumps, and polishing unit pump operate off single-phase supply. The power supply with sockets must be available where the unit is to be operated i.e. it is not USFuelTech's responsibility to fit junction boxes or extensions.
-
- Production should be calculated on a maximum of 20 hours per day.

*Ex Works is defined as: "The seller fulfills his obligation to deliver when he has made the goods available at his premises (i.e. works, factory, warehouse, etc.) to the buyer. In particular, he is not responsible for loading the goods on the vehicle provided by the buyer or for clearing the goods for export, unless otherwise agreed. The buyer bears all costs and risks involved in taking the goods from the seller's premises to the desired destination."

Warranty

The Biodiesel processors manufactured by USFuelTech have a warranty period of 1 year against defective materials and workmanship. Items included with the processor and its ancillary equipment but not manufactured by USFuelTech (such as heater elements, pumps, gauges etc) have a 1 year warranty as well.

Service and Maintenance:

USFuelTech provides a service and maintenance contract that includes annual service and a call out facility for processor repair and maintenance. This is provided at an annual cost of 10% of the capital cost for the equipment covered.

Service means: Providing our customers with a tailored maintenance regime ensuring optimum product performance, whilst ensuring that legislative obligations are met. In the event of equipment malfunction, service means a fast and efficient callout and repair process.

We provide a service and maintenance regime for all USFuelTech processors and their associated controls and ancillaries.

Why preventative maintenance?

No matter how well equipment has been designed, manufactured, installed and commissioned, the possibility for failure cannot be ignored.

Programmed preventative maintenance can extend the life of an item, and reduce the likelihood of downtime. Such a program also may permit the equipment to be updated in line with the latest technological advances and standards.

For equipment handling highly combustible materials and producing quality Biodiesel such as USFuelTech processors, the operator or owner is normally required by law to provide a suitable system of maintenance to maintain the system in an efficient state, in efficient working order and in good repair.

Regulations may not specify a maximum time interval for maintenance, but US-FuelTech recommends annual maintenance of processing equipment.

What additional services are offered?

USFuelTech offers a range of services which may be tailored to meet your exact requirements:

Besides the opportunity to check that the system is performing as designed, this will allow for any further training of local personnel that may be necessary. If this visit falls within the warranty period, any defective parts are replaced free of charge.

- Emergency callout.
- Spares support.
- Repair and refurbishment.
- Advice on regulatory compliance and certification for USFuelTech clients.