



Ian M. Lawson
Director, Business Development

Head Office:
845 North Main Street
Miamisburg, OH 45432
(937) 308-1230

ilawson@JatroRenewables.com

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Mr. Michael Sticklen,
Mr. Matt Phillips
Flint Hills Resources
Des Moines, IA
Phone: (515) 817-2992
email: mike.sticklen@fhr.com

Subject: Cost Estimates for – Supercritical Biodiesel Plants – 15, 30 and 50mmgy

Dear Mr. Sticklen,

Thank you for the opportunity of assisting Flint Hills Resources (FHR) by providing a range of biodiesel processing plant cost estimates.

QUALIFICATIONS

Jatro Renewables (Jatro) has its headquarters in Miamisburg, Ohio (a Dayton suburb). The company began as a biodiesel producer in 2004. By 2009 it turned to building and re-engineering biodiesel (BD) plants as its primary focus. A total of 19 plants were subsequently built or completely re-engineered.

In 2013 the company began developing a core patent, licensed from others, and brought it into commercial use by late 2015.¹ One plant is running at Annawan, Illinois and owned by CHS, Inc. Another similar plant is currently under construction in central California owned by Calgren Energy, a 60MMgy ethanol plant. The project cost was partially subsidized by a multi-million-dollar grant for the use of innovative technology from the California Energy Commission.

For more information on *Jatro Renewables, Inc.* please visit our website at: www.JatroRenewables.com

BACKGROUND

We understand FHR is contemplating building additional biodiesel plant manufacturing capabilities and has requested information about *Jatro Renewables* Supercritical Biodiesel technology and pricing.

This document provides the details for the scope of activity, labor costs and equipment costs for each stage of the entire process – from the initial permitting and conditional use approvals through final commissioning of the plant including EPA and CARB approvals.

1. *The development was no small achievement as none pre-existed and took 18 months of research.*

It should be understood that FHR will manage the construction of the proposed plant including paying for all equipment and parts directly to vendors. This arrangement includes covering all labor. The project estimate includes every cost and contingency. We provide a spreadsheet of costs for 100s of items which we update periodically on a competitive basis (*sample page in Appendix B*).

I. SCOPE OF WORK

The scope of work begins with the effort to prepare permit applications for submittal to the local appropriate government agencies for the biodiesel manufacturing equipment, including a separate permit for the methanol storage tank. Our effort will also include follow-up with agency staff to help ensure timely processing of applications.

Once a clear path exists for the “critical” approvals, we will begin designing the BD plant given the facts on the ground (for instance, is the project a greenfield or is it co-located where we take into consideration leveraging existing assets such as energy, stranded heat, access to a beer well etc.).

II. PLANT OVERVIEW

Volume (<i>nameplate</i>)	15mmgy	30mmgy	50mmgy
Operation	7/24, 350 days	7/24, 350 days	7/24, 350 days
Process	Continuous	Continuous	Continuous
Automatic/Manual	Automatic	Automatic	Automatic
Feedstocks	All EPA and LCFS approved of any FFA and in any combination		
Final products	ASTM 6751 biodiesel, clear and distilled. Glycerin, >95% pure		
Shifts/Hours	2x12 ²	2x12 ²	2x12 ²
Personnel – Operators/Shift	1	2	2
Utility/Shift	2	3	4
Chemist/Shift	1	1	1
Bookkeeper (<i>day shift only</i>)	1	1	1
Total Man-Hours/Shift/Month	3,530	4,942	5,648

III. PLANT CONSTRUCTION

(a) Permitting

From FHR, we will collect and review the data on the proposed equipment and location/facility. This information will be the basis for consultations with a local engineering company who have experience with permitting for chemical plants. The critical permits will be addressed first to insure the project can move ahead at the location and with the plant-size selected.

2. Or, 3 shifts per day at 8 hours each.

These key permits include a local city or county Conditional Use Permit (CUP) and permission from local air resources board (if applicable).

Usually, these can be ascertained within a few days by providing parameters on such items as Annual Emissions Load (in tons) of toxic air contaminants; quantities of water discharge and condition; and, any soil contamination potential.

Once it's clear the plant can be built at the proposed location, a draft permit application package will be submitted to FHR for review and comment. Following incorporation of comments, final application document(s) will be provided to FHR for signature and submittal to the various agencies. Payment must be shown on an FHR account.

After application submittal, we will follow up to answer questions and negotiate the permit conditions with the various entities. We will work closely with their staff to process the permits. We will also review the Permits to Construct to ensure correctness.

(b) Engineering & Licensing

The following describes the process to design the actual plant either co-located or as a greenfield:

1. Designing the facility includes all the biodiesel processing equipment, storage and ancillary tank placement and pipeline layout
2. Liaising with FHR's civil engineering firm to design plant building structure (if required)
3. Managing the project with FHRs' plant manager on mechanical, electrical and automation issues
4. Soliciting one or more quotes for all equipment (*as seen in Appendix B spreadsheet sample*)
5. Developing the PFDs, Simulation data (ChemCad), P&IDs and 3D renderings (if requested)
6. Providing facility-specific Operation Manuals (if more detail required Jatro can provide at additional cost)
7. One-time licensing fee (no residuals) for use of Supercritical technology patents.

(c) Plant Design Parameters – 15mmgy³

The plant design is based on the following criteria:

Ground Space

- 12,000 to 15,000 sq. ft.
- A building is NOT required to house the System Process other than a metal roof over the multi-floor steel structure

3. Criteria for 30 and 50mmgy plants proportionately larger, details upon request, but estimated cost herein.

Storage Tanks	15,000 to 20,000 sq. ft. including secondary containment
Building	<ul style="list-style-type: none"> • 4,000 sq. ft., 25 ft. ceilings – for Boiler room w/roof penetrations; • Electrical switch-gear/panels; Control room; Chemical lab (w/vacuum hood etc.); • Bathrooms; Employee lockers/Changing room; Break room etc.
Building Sprinklers	0.2 to 0.4 gpm
Energy	2,000 AMPS, 3-Phase, 480 volts
Natural Gas (Boiler Load)	35mmBTUs/hour – max. boiler load (this number will be refined after final P&IDs)
Water	100 gpm for non-process use. All water used recycled.

(d) Plant Process Equipment

Feedstock Treatment	Includes homogenizer and filtration w/DE
<i>Super</i>[®] Process	<ul style="list-style-type: none"> • Accepts feedstock FFAs to 100% • Accepts multiple feedstock types blended in prior step • Water used and recycled • No catalyst is required (yields glycerin 95 to 97% pure) • ASME certified equipment
Distillation	Methanol is distilled and excess recycled to Methanol tank
Vacuum	High efficiency system
Pumps	Explosion proof pump and motors (Class 1, Div. 2)
Heat Exchangers	Multiple. Some are stainless steel, others are MS, All are ASME certified
Distillation⁴	<p>Biodiesel is distilled to a clear (as water) solution</p> <ul style="list-style-type: none"> • Stainless steel (SS304) • Column with receiver/disposal mechanism for residue • Condensers • High efficiency vacuum system • High heat pumps, piping and seals • Temporary storage tank • Automated, hands-free

4. Please see Appendix A for overview on the Advantages of Clear Biodiesel (vs. having the color of its feedstock).

Storage Tanks

Total storage 450,000 gallons

- Feedstock oil storage – 4 days
- Methanol & Recycled Methanol – 12 days
- Glycerin – 14 days
- Biodiesel – 4 days
- Other – Coalescers and other small tanks/receivers

Electrical & Automation

- All are Class 1, Div 2 instrumentation.
- Electrical and Automation panels – indoor
All automation points will be tied into a single control center.
The controls are multiple screens and the relevant information systems will be built in to track the inventory, dispensed volumes etc.
- Automation based off the Siemens or Delta V platform (FHR's preference), Panels, HMIs, PLCs and Wiring
- Electric pumps and motors
- Instrumentation (valves, indicators, flow meters)
- Programming
- Automation software, Computer hardware

Piping & Fabrication

Design and labor to install all piping of various sizes depending on the size of the facility includes bends/Ts/Valves/Gauges, level indicators, flow meters etc. (*for total cost see item #3 on Page 7*).

Other Equipment

- Centrifuges/Decanters
- Oil and Biodiesel filtration systems including VLF (to reduce feedstock to <0.1% MIU)
- Thermal boiler (35mmBTU/hr – Natural gas)
- Cooling tower
- Air compressor
- Water treatment recycle system
- Numerous Pumps/Motors/Starters, Flow Meters
- Various process tanks
- Partial chemistry lab to test 6 main ASTM parameters.

Existing Building (if used)

As noted, a building is not required for the Super[®] Process. However, if a building is used it must have:

- Lighting
- HVAC
- Main electrical drops
- Tank pads
- Loading station containment walls
- Roof related items
- Permitting issues due to changes in building design
- Insulation and heat tracing
- Grounding of all process equipment.

Warranties

All moveable parts such as Boiler, Cooling Tower, chiller, pumps, motors, centrifuges, valves, actuators, PLCs will be passed along from the manufacturer. Typically from 60 days to 5 years.

Process Guarantee

Quality ASTM⁵ 6751-15, Volume 30 GPM or 150 MTD – input and yield >96% (cleaner feedstock results in higher yield).

Completion

12 to 15 months from Agreement signing date.

IV. PROJECT COST ESTIMATE

1. The estimates below are based on projects designed and built by *Jatro Renewables*. If additional items are introduced during construction, they must be approved by the FHR first.
2. Prices of equipment listed include delivery to project site
3. Due to fluctuating price of steel, prices are only good for 30 days from Agreement signing date
4. All items include applicable estimates of federal and state taxes
5. We have built into prices of imported items (from Germany, Italy etc.) with a 5% contingency as a buffer against import taxes, fluctuations in the value of the dollar and so forth
6. We conduct weekly meetings of the project team to update progress and set agendas and so forth. The project is tracked by Microsoft Project and is updated in real time to identify and track critical tasks
7. Price estimates include the cost of all labor
8. Jatro will provide FHR a spreadsheet of all items in each category below (*see sample attached*)
9. Entire estimate assumes FHR will manage construction but with close oversight by Jatro.

(a) Estimate Breakdown— 15mmgy Plant

1. <i>Super</i> [™] and Ancillary Process Equipment	\$5,170,000
2. Storage tanks and Transportation, including installation and accessories (vents, etc.)	821,000
3. Fabrication materials and labor including parts of any existing structure	1,835,000
4. Other equipment (details below)	2,787,000
5. Electrical and Automation	1,630,000
6. Engineering and one-time Royalty/License	3,680,000
7. Contingency	800,000
Sub Total:	\$16,723,000
8. Insulation and heat tracing (equipment/tanks)	450,000
9. Miscellaneous (Rental/Shipping, etc.)	225,000
10. Permit process/OSHA/Regulatory docs.	50,000
11. Building/Structure/Utilities and Land/Development	3,000,000
12. Startup and Training (10 weeks):	350,000
Grand Total	\$20,798,000
Cost per nameplate gallon	\$1.37

(b) Estimate - 30mmgy Plant

The following estimates are extrapolated from the 15mmgy base cost estimate. However, if FHR prefers to build a larger plant a separate detailed estimate will be provided including a spreadsheet of all equipment, parts, engineering, labor and license costs.

Grand Total	\$33,277,000
Cost per nameplate gallon	\$1.11

(c) Estimate - 50mmgy Plant

The following estimates are extrapolated from the 15mmgy base cost estimate. However, if FHR prefers to build a larger plant a separate estimate will be provided with the same detail as above including a complete spreadsheet of all equipment, parts, engineering and license costs.

Grand Total	\$48,529,000
Cost per nameplate gallon	\$0.97

Note: Additional training at start-up (we allow three weeks specifically) or any engineering tasks outside the scope of the project (as described in the final Agreement) we charge \$175/hour plus 50% of expenses for per diem costs, travel time and travel cost per person with a minimum of 16 hours. We can typically provide up to three personnel per location. Off-site monitoring service is also available, and the cost depends on the amount of time required.

(d) Payment Terms

- | | |
|---|---|
| Jatro Engineering and Technology Fee | 10 installments with a 5% retention until conformance to Process Guarantees is shown. |
| Jatro Provided Equipment | <ul style="list-style-type: none">• 50% payment upon signing of contract for Jatro equipment• 45% before the shipment of Jatro equipment with load-out certificate• 5% after completion of installation, testing, training, and certification EPA (and LCFS if applicable) BEFORE production. |

(d) Summary

The total cost of the project includes the estimated costs for the land, building/structure, building modifications/improvements, insulation, grounding, pump pads, storage containment walls, and any outside additions such as laying of the road or a rail line. It also, includes the total all in project costs for the Process Equipment, including Storage tanks and Labor.

FHR
March 23, 2018
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With our prior experience in implementing the projects in various states in the U.S (MI, OH, NE, IL, NY, PA, MD, WI, and CA) as well as outside the U.S, we can provide guidance on the engineering, and permitting issues from EPA and other local regulatory bodies on both process equipment and electrical/automation instrumentation.

Please feel free to call or email with any questions.

Regards,

Ian M. Lawson
Director Business Development

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APPENDIX – A

To Distill or Not Distill

Advantages of Clear Solution:

1. Product homogeneity - whatever the feedstock, the product will always look the same. Biodiesel will look colorless (color of water -with a very faint tinge in some instances). Tremendous marketability.
2. Superior quality for Biodiesel for both Virgin and Animal feedstock. Exceeds most critical ASTM standards by a huge margin.
3. Effective against high Sulfur feedstocks such as Tallow, YG, Chicken Fat, Animal Fat renderings. Will reduce 60 ppm Sulfur to less than 10 ppm.
4. Stand out in the market for providing superior product compared to others. Margins will be higher as you don't have to add additives.
5. All distilled product meets Cold Soak Filtration test.

Disadvantages of Clear Solution:

1. Slightly higher cost of energy
2. 1 to 3% loss of the product as a column bottom. This product can be used as heating oil or as a boiler fuel depending on quality requirements.
3. Oxidation Stability additive to be added (cost about \$0.015/gallon of biodiesel)

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APPENDIX – B

Sample of Breakdown of Project Pricing

	A	B	C	D	E	F
86	20	Cooling Tower	PACK Unit	\$155,000.00	\$10,000.00	\$50,000.00
87	30	Air Compressor	PACK Unit	\$16,234.99	\$1,000.00	\$2,000.00
88	MAT	Material		\$1,912,500.00	\$82,000.00	\$275,000.00
89		Piping, Valves & Fittings (include. all supports, frames, racks etc)	Piping	\$812,500.00	\$50,000.00	\$100,000.00
90		Electrical Wiring, Trays & Accessories (250I/O @ \$5/feet for 200ft per I/O)	Cable	\$250,000.00	\$15,000.00	\$25,000.00
91		Insulation & Heat Tracing (\$15/feet Estimate. 10K Feet of piping)	Insulation	\$150,000.00	\$10,000.00	\$50,000.00
92		Instruments & I/O Panels (based on 250 I/O count)	Instruments	\$350,000.00	\$2,000.00	\$50,000.00
93		Motor Control Center (bucket style, ProfIBUS. 30 Points)	MCC	\$250,000.00	\$5,000.00	\$50,000.00
94	LABOR	Labor		\$1,610,000.00	\$5,000.00	\$400,000.00
95		Fabrication (\$80/Hr for 10# Emp. working 10Hr/d, 5d/wk for 16wk)include fabrication, installation, rigging,	Labor	\$640,000.00	\$0.00	\$200,000.00
96		Electrical Labor (\$80/Hr for 4# Emp. working 10Hr/d, 5d/wk for 16wk)include electrical, grounding, termin	Labor	\$260,000.00	\$0.00	\$50,000.00
97		Insulation & Heat Tracing Labor (\$80/Hr for 4# Emp. working 10Hr/d, 5d/wk for 16wk)include heat tracing	Labor	\$260,000.00	\$0.00	\$50,000.00
98		Staging equipment onsite and storage	Labor	\$150,000.00	\$0.00	\$25,000.00
99		Rental Equipment (Crane, Forklift, Telescope Lift etc)	Labor	\$150,000.00	\$5,000.00	\$25,000.00
100		Automation (Programing, Graphics, FAT)	Labor	\$150,000.00	\$0.00	\$50,000.00
101	LAB	Laboratory		\$179,500.00	\$5,900.00	\$26,925.00
111		Jatro Engg, Startup, etc		\$3,275,832.44	\$0.00	\$70,000.00
119	CIVIL	Civil EPC		\$2,650,000.00	\$125,000.00	\$397,500.00
124	TURNKEY/OTHER	Turnkey implementation and outside consultants		\$1,245,000.00	\$0.00	\$80,000.00
125		Environmental plus SPCC (Consultant)	Eng.Fee	\$50,000.00	\$0.00	\$18,000.00
126		HAZOP/PHA Moderator (Consultant)	Eng.Fee	\$50,000.00	\$0.00	\$15,000.00
127		EPA Eng. Review (Consultant)	Eng.Fee	\$25,000.00	\$0.00	\$5,000.00
128		Turnkey - includes full-time on-site manager	Turnkey Fee	\$1,120,000.00	\$0.00	\$42,000.00