

Feasibility Study and Business Plan for a Biodiesel Production Plant Based in Anchorage, Alaska

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and

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August 15, 2006

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Statement of Work

The Alaska Conservation Foundation has awarded a grant to AkPIRG, in collaboration with Ben May of Biofuels Alaska. The grant was given in order to complete a business plan that will show the profit margin for a biodiesel business in Alaska. This will include medium-term plans to expand the amount of waste oil collected. In addition, investigation is warranted into the much larger feedstock potential from millions of gallons of fish oil disposed of in Alaskan waters by fish canneries.

Specific actions include:

- Writing a business plan.
- Gathering solid quotes of costs from materials providers, production plant manufacturers, storage tank manufacturers, warehouse landlords, delivery costs, insurance agents, permitting agencies within the city, and membership in the trade organization, National Biodiesel Board, that guarantees quality fuel to consumers.
- Contacting a select few fleet owners to gauge interest in a biodiesel blend fuel.
- Ongoing review of the business plan and feasibility study with the University of Alaska Small Business Development Center.
- Disseminating the information through presentations, newsletters and websites.

Mission Statement

Biofuels Alaska's mission is to provide useful products from disposed commodities. A triple bottom line will be achieved through attention to business profitability, improved ecological stewardship, and fair treatment of individuals involved in the production and use of our products. Waste fryer grease converted into a clean burning replacement for diesel (biodiesel) will be the first recycling process. Expansion into the procurement of fish oil as a larger feedstock for biodiesel is the second project.

Description of Proposed Business

Biofuels Alaska's goal is to use a waste product and process it into an Alaskan-made economical and clean fuel. The feedstock used in the chemical process will come from waste vegetable oil (WVO) collected from restaurants by Alaska Pet and Garden—a division of Alaska Mill and Feed. 140,000 gallons of WVO will be processed in a containerized and resell-able production plant using turnkey technology provided by an established manufacturer. (See the schematic diagram in the Appendices Section.) The fuel will meet ASTM and EPA guidelines for road fuel and will qualify for tax incentives from the federal government of \$0.50 per gallon. It will be sold to fleets and government agencies that are interested in using biodiesel for economic, maintenance, political, and environmental reasons. The initial focus will be on processing fuel, so deliveries of inputs and outputs will be contracted with trucking companies. The initial customers targeted will be fleets with their own fueling stations and individuals with the capacity to buy barrels or totes of fuel.

Introduction to Biodiesel

The product made from the transesterification of vegetable oils is called biodiesel or methyl ester. Although some media attention has been paid to using straight vegetable oils in diesel motors, biodiesel is a different product. The process removes and breaks larger and more viscous glycerol ester molecules that do not combust well in modern diesel engines. Biodiesel in the 21st century has moved out of experimental and niche markets and into the mainstream. It can be used in any diesel vehicle in pure form or blended in any proportion with regular petrodiesel. In 2001 the American Society for Testing and Materials (ASTM) created the new standard, #6751, for biodiesel paving the way for car manufacturers to have consistent biodiesel to test in their diesel engines.

The Environmental Protection Agency has also helped with standardizing biodiesel for on-road use. Tier I and Tier II tests by the EPA established biodiesel standards as a clean alternative to diesel. It has become attractive to public transportation providers who are concerned about exposing adults and children to toxins and carcinogens (More on the advantages of biodiesel in Marketing). Here are the results of the EPA's compilation of studies on emission reductions from using biodiesel as a fuel:

Total Unburned Hydrocarbons	-67%
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Carbon Monoxide	-48%
Particulate Matter	-47%
Nox	+10%
Sulfates	-100%
PAH (Potential Carcinogens)	-80%
nPAH (Potential Carcinogens)	-90%
Ozone potential of speciated HC	-50%

Other advantages of biodiesel include:

- High flash point at 260° F compared to 125°F for petrodiesel making biodiesel safer to transport and use.
- Toxicity of less than 1/10th that of table salt. A person can ingest their body weight in biodiesel and survive (not recommended).
- Biodegradable at the same rate as dextrose (a sugar)—95 % degraded after 4 weeks. This is four times faster than petrodiesel.
- Listed as not containing any hazardous materials on safety data sheets.

All these benefits make biodiesel a desirable product that reduces greenhouse gases, has an image of ecological stewardship, and is ideal for use in pristine areas such as national parks, backcountry lodges, and marine settings. It is also advantageous in enclosed areas such as mines, building, or ships.

Market for Biodiesel--USA

Biodiesel production and consumption in the United States has increased literally exponentially since the year 2000. Thirty new plants were built, and commercial production tripled to 75 million gallons just in 2005. Expected production in 2006 is between 150 and 225 million gallons. In addition, Western Europe produces about 300 million gallons annually. Examples of biodiesel acceptance show that it is moving out of its niche as an experimental fuel and into the mainstream market. Sysco, the largest private trucking firm in the USA, is fueling its trucks with 5% biodiesel. Minnesota and Washington States have mandated that all diesel sold in the state will be at least a 2% biodiesel mixture. San Francisco uses a 20% mixture in its entire fleet. On the engine manufacturer side, the Chrysler Group announced it will honor its warranty for 5% mixture in its diesel Liberty and Cherokees. These vehicles roll off the line with a biodiesel blend in their tanks. Volkswagen has authorized the use of 5% biodiesel in all its cars. New Holland has signed off of a 20% blend in any of its engines. The consortium of US engine manufactures (OEM) is currently testing the viability of a 20% blend in their diesel vehicles. Funding is in place for this research and results are expected at the end of 2006. This is paving the way for increased consumer confidence in their engines' ability to utilize biodiesel. On the fuel side of the equation, standards have been set for biodiesel by the American Society for Testing and Materials (ASTM). Any fuel sold for highway use must comply with these standards for EPA and DOT

approval. This has allowed engine manufactures to have a standardized fuel to test against and allowed consumers to have a fuel they can trust.

Market for Biodiesel--Alaska

Currently no commercial biodiesel production exists in Alaska. Alaska Pet and Garden collects, filters, and dewateres 15,000 to 20,000 gallons per month of waste vegetable oil (WVO) from restaurants in Anchorage, Palmer, and Wasilla. This amount is being increased by a municipality of Anchorage campaign to bring more restaurants into compliance with city ordinances for fryer grease. Last year, the oil was shipped to Seattle for use in animal feed. With publicity new buyers were found in Alaska. Emerald Services Alaska is taking the majority of the WVO and is selling it as a burner fuel for heating asphalt for road construction. This is viable only during the 5-6 month road construction season. A smaller amount is being sold to Fairbanks for the manufacture of biodiesel, although this buyer is not currently willing to disclose anything about the business.

Mark Goodman has managed the collection, purification, and sale of 175,000 to 200,000 gallons of the WVO for Alaska Pet and Garden. He has indicated that with a viable biodiesel production company in Anchorage he would be willing to negotiate a cooperative agreement for exclusive sale of 75% of the supply. This results in a potential initial supply of 131,000 to 150,000 gallons per year.

In 2002, the total transportation and non transportation use of No. 2 diesel in Alaska was 420 million gallons. With this ratio of more than 2500 to 1, biodiesel is not in competition with petrodiesel and will have its price set by the price of diesel. Prior to the recent inflation of petrodiesel to nearly \$3.00 per gallon, biodiesel had gathered a higher price because of its benefits. Currently biodiesel is selling at about the price of petrodiesel. This will be the target of initial sales in Alaska in order to garner market share.

Commercial biodiesel typically has not been marketed at the retail pump. It is advantageous to market to fleets because of the larger volume consumed, because a retail site does not need to be invested in, and because greater quality control and education is possible with fleet managers. Dedicated and educated individual consumers typically

customer throughout the entire year. With a reliable feedstock supply from Alaska Pet and Garden approximately 140,000 gallons of WVO will be made available annually.

Marketing

Biodiesel can currently be sold at the same price or slightly less than petroleum diesel. Consequently, the main resistance to buying biodiesel is fear of engine damage due to previous misinformation or mistrials involving off-spec fuels. Educating materials will need to be provided to show that biodiesel has moved from experimental to a mainstream renewable fuel with multiple benefits which include:

- **Lower Price**—Currently, biodiesel could be sold for slightly less than petrodiesel.
- **Better lubricity**—ASTM spec biodiesel actually increases the longevity of engines and reduces maintenance costs.
- **Ecological Stewardship**—Reduced emissions, reduced green house gases, non-toxic, safe for kids and pristine environments.
- **Patriotic for the Nation**—Greater fuel independence. Meaning less need for becoming involved in world conflicts, and less of our soldiers in harms way.
- **Image**—The public relations benefit can be an important asset to a company.
- **Tax incentives**—Additional tax incentives are in place for companies and government agencies that use alternative fuels.

Considerable interest has been generated about this clean and less expensive fuel. I have been approached by two TV reporters simply because I'm interested in doing a business making biodiesel. This interest will be an asset during the opening of the business and will provide increased marketing and exposure.

Process Technology Description

The following process is based on BioKing's BK-38000 automated and containerized plant. BioKing was selected because of price, and availability of key components (free fatty acid neutralizer, glycerine byproduct and biodiesel boiler, and magnesol water free purification). The plant operates as follows. Also see schematic in the appendix B.

1. Filtered and dewatered WVO is stored at above 50 degrees Fahrenheit
2. Free fatty acids (typical in WVO) are processed in the neutralizer
3. Transesterification with a NaOH or KOH, methanol, and the WVO takes place in reactor(s).
4. Dirty Biodiesel and Glycerine are stored in a small buffer tank until they can be separated by a centrifuge.
5. Glycerin, mixed with biodiesel, is burned as a heat source for the processing plant.
6. Dirty Biodiesel is run through the centrifuge to extract remaining soaps, glycerin, and lye. This can be done with water or with Magnesol, a drying agent

7. Biodiesel is then stored at above 50 degrees Fahrenheit until blended with petroleum diesel, or used as pure biodiesel.

Insurance and Contingencies

Insurance for a light industrial production plant has been estimated at \$10,000 per year for this business.

In the case of a business failure, various components are resell-able. The containerized production plant can be resold and reused by another regional biodiesel producer. Tanks used for storage will have been used for non-hazardous chemicals and will be resell-able. In fact, as the business expands, older individual components can be sold to increase profits.

Location of Business

Sites for lease in the Anchorage Municipality have been sought. Since the processing plant is containerized this allows more flexibility with the facilities that are leased. Optimum property would be a small amount of warehouse space (less than 1000 square feet with a significant amount (3-4000 square feet) of parking lot/pad around it. The warehouse can house the tanks that need to be kept warm and the tanks for methanol can be kept more safely outside. Initial inquiries have been made to the city regarding permitting. Since biodiesel production is a new process and product for the municipality they were not able to give clear guidelines about the zoning and permitting needed for production. Consequently, permitting will need to be completed or reasonable assurances made by the city that permitting will be allowed before investing or construction can begin. Favorable factors for permitting include the current Begich administration at City Hall being amenable to “green” projects in the city, and BioKing making a processor that does not produce waste water.

Management and Personnel

The BK-38000 production plants can be used to make 3,000,000 gallons per year if run 24 hours per day 330 days per year. They are automated and run by a PC computer. More conservatively, production will probably be halved by the need to neutralize free fatty acid at the beginning of the processing. This means that the plant could produce at least 1,000,000 gallons per year if run 24 hours per day. So, one person will be adequate to process the current volume of feedstock available in Southcentral Alaska (140,000 gallons) if the plant runs approximately 8 days a month. Consequently, the owner could also be the operator and this person’s time can also be free for other tasks. This would include marketing, organizing deliveries, billing, finding and developing other sources of feedstock, fine-tuning the process to minimize cost and increase quality control, and selling to individual consumers at the site. These activities can also be done at times while the operator is monitoring the biodiesel production. Part-time help will be sought after a few months of operation to allow for redundancy in trained personnel who can perform the basic operations of the plant. This will allow vacation, sick, and training time to be taken by the owner/operator. The current plan for

recruiting a worker is to seek a paid intern from the environmental science departments at UAA and APU.

Application of Investments

Investments will be put towards the production plant, tanks, and initial purchases of materials and ingredients such as WVO and methanol. Since commitments from buyers will have been garnered prior to the investment and construction of the plant, income will be generated from the first batch of biodiesel and continuing investment will be minimal.

Capitol Costs Include:

• BK-38000 production plant	\$ 280,000
• Delivery	\$ 5,000
• Four 5000 gallon insulated tanks	\$ 25,000
• Two 1000 gallon tanks	\$ 2,000
• Two 100 gallon biodiesel tanks for generator and boiler	\$ 1,000
• One 1000 gallon Tote for Delivery	\$ 1,000
• Diesel Truck	\$ 20,000
• Diesel Generator	\$ 15,000
• Pumps	\$ 2,000
• Piping	\$ 2,000
• Computer	\$ 1,000
• Office Furniture	\$ 1,000
• Remodeling Cost	\$ 3,000
• Miscellaneous	\$ 20,000
Total	\$ 378,000

Initial Fixed Costs Include:

• Lease and Deposits	\$ 6,000
• Insurance	\$ 3,000
• Permitting with Municipality	\$ 4,000
• National Biodiesel Board Certificate	\$ 5,000
Total	\$ 18,000

Initial Working Capitol For 2 Months of Wages and Supplies:

• Wages	\$ 14,000
• Supplies	\$ 27,100
• Cash On Hand	\$ 3,000
• Promotions	\$ 1,000
Total	\$ 45,100

Total Investment	\$441,100
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Conclusion

According to research conducted in the spring and summer of 2006 with a \$441,000 investment, a commodity price for WVO of \$0.65 cents per gallon, a continuing tax incentive of \$0.50 per gallon, and a price of \$2.80 per gallon, profitability is projected to be \$0.55 per gallon.

Further information can be found at biodiesel.org or through contacting Ben May at benjammin@acsalaska.net.