

A Biodiesel Processor Feasibility study at the University of California, Davis

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Presentation Outline

1. Project Background
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3. Results and Discussion
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 - b. Sensitivity Results
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1. Project Background

Problem Statement:

- Perform a neutral feasibility study for the Springboard Biodiesel processors, and determine the financial and environmental benefits for an oil to biodiesel converter on the campus of UC Davis

Client:

- Company: Springboard Biodiesel
- Contact: Matthew Roberts, President of SpringBoard Biodiesel
- Product: Springboard Biodiesel Biopro 190

2. Methodology

Considerations

- UC Davis currently gets cooking oil filtered and reused for cooking
- later recycled and turned into biodiesel by filter

Constraints

- Incentives to use biodiesel on campus

Assumptions:

- Used cooking oil disposed by UC Davis
- 12,000 lbs/year → 8 lb/gal → 1500 gallons

Analysis

Objective: cost/benefit + return in investment, sensitivity, emission reduction calculation

Subjective: market analysis

Product Overview: 100 gal capacity

Can be scaled down by ½

Oil (100 Gallons)
Free (up to 1500 gal)

Methanol (20 gal)
\$22.6

Sulfuric Acid (1.6 cups)
\$ 9.85

Catalyst

10.4 lbs NaOH (**\$20.80**) or
7.7 lbs KOH (**\$20.02**)

Fresh Standing Water (90 gal)
\$ 0.35



27 kWh/run
\$2.03/run

Can be scaled down by ½

Maintenance: \$410.44 /year
Just using free oil: \$20.69/run

Biodiesel (100 gal)
Saving 150-300\$

Glycerol (10 gal)
\$1.40

\$97.74 for 1 100 gal run
\$99.77 for 2 50 gal runs

Cost Benefit Analysis

Biopro 190: \$12,225

Biopro 360: \$16,995

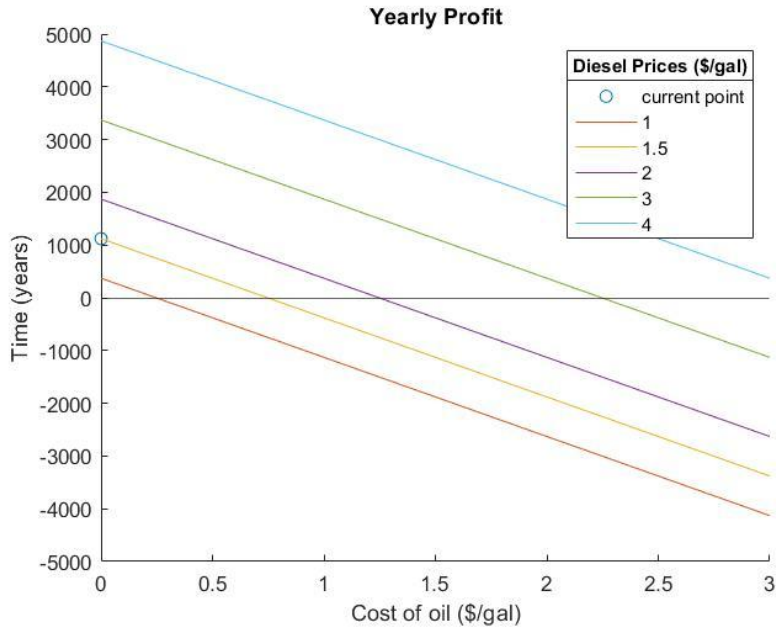
Cost per 100 gal ~\$100

Diesel Costs: \$1.5-\$3/gal

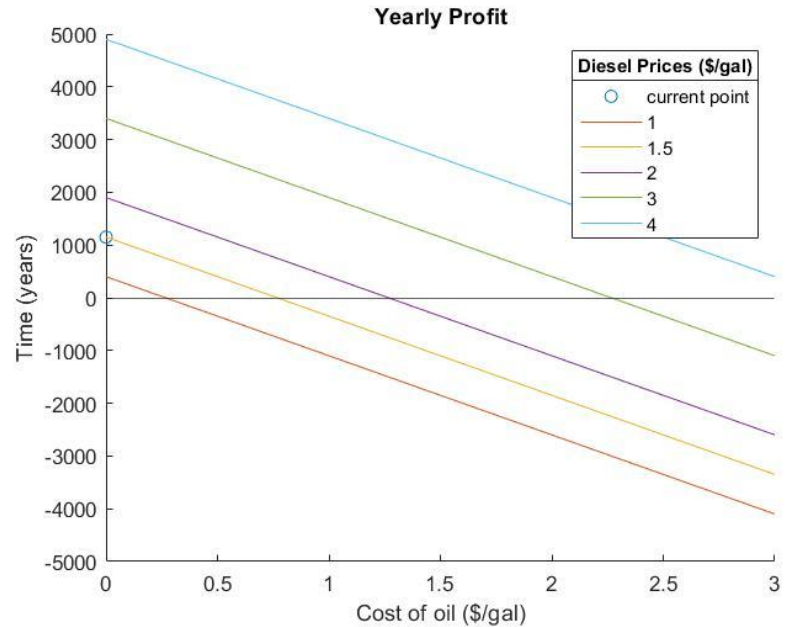
Profit per run: \$50 - \$200

Input / Output	Quantity	Cost (\$ / run)
Oil	100 gal	0
Methanol	20 gal	22.6
Sulfuric Acid	1.6 cups	9.85
NaOH	10.4 lbs	20.80
KOH	7.7 lbs	20.02
Water	90 gal	.35
Electricity	27kWh	2.03
Glycerol Disposal	10 gal	1.4
Maintenance	Yearly Cost	= 410.44/ runs = 20.69

Sensitivity Analysis



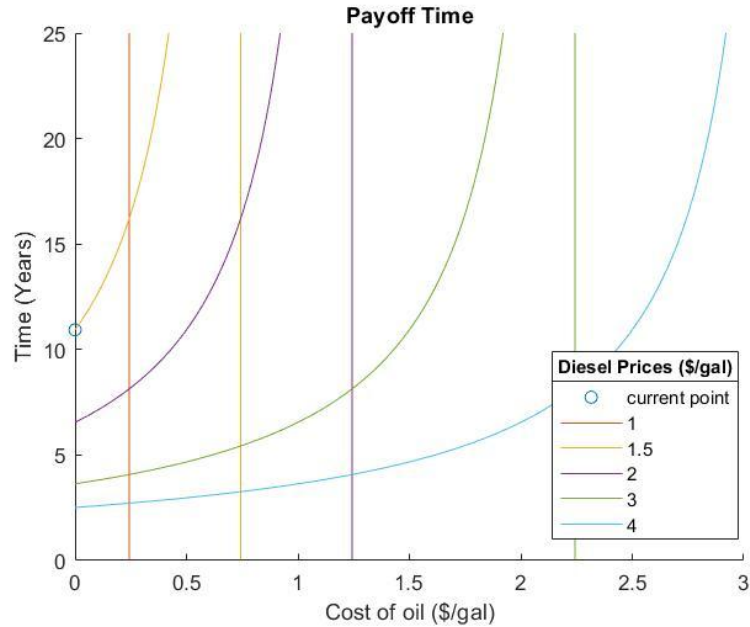
30 runs BioPro 190



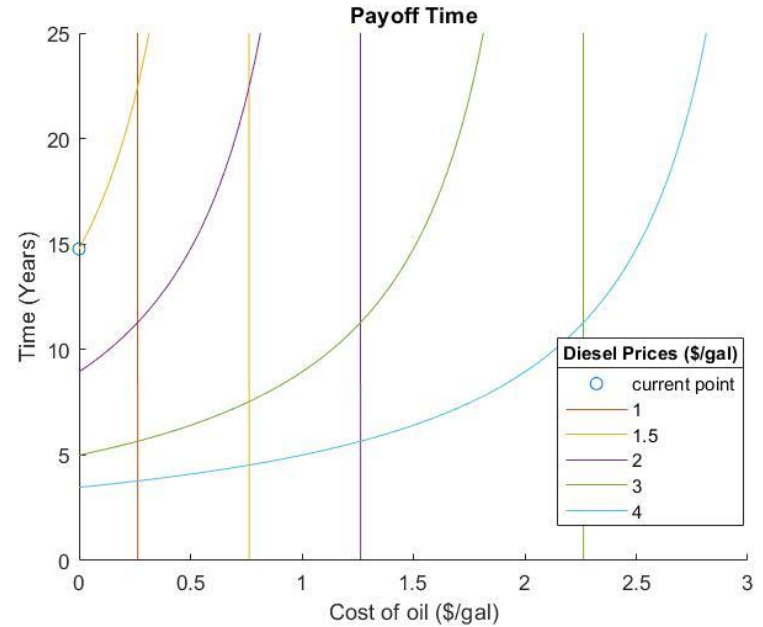
15 runs BioPro 360

Expected lifespan
is 20 years

Sensitivity Analysis



30 runs BioPro 190



15 runs BioPro 360

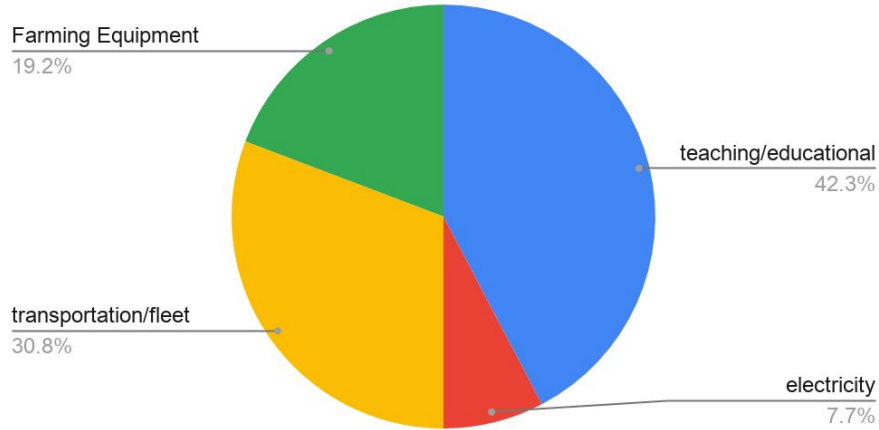
Competitors

Company	Product	Cost	Gallons	Time	Safety	Ease of use	Preparation time	\$/gallon
Springboard Biodiesel	BioPro 190	\$12,250	50	48 hours	CE Mark	Automated system	30 minutes	1.06
Biodiesel Kit Store	40 Gallon Processor	\$3,895	40	7-10 hours	Safety First Kit	Not Automated*	30 minutes	--
US Freedom Biofuels	BD65	\$12,152.80	65	48 hours	--	Not Automated	15 minutes	0.9



***Built in mist washing system. Easily wash your biodiesel.**

Case study Result



Total number of users studied: 23 out of 150

User Size: 10-22000 people

Most popular: Biopro 190

Gallon produced: 100-1000 gallon/month

Similar Case: Truman State University, Culinary Institute of CA- St. Helena

Insights: farm and school with irregular equipment most successful

Emission Analysis

Biodiesel provides a lifecycle reduction in greenhouse gas emissions of 76.4% relative to average petroleum diesel.

Emission Type/Biodiesel reduction	B100
carbon monoxide	-48%
unburned hydrocarbon	-67%
particulates	-47%
sulfates	-100%
ozone Specialized HC	-50%

	B100	Diesel 1 gallon	biodiesel 1 gallon	annual reduction 1500 gallons
carbon monoxide	-48%	22.2 lb	11.544 lb	15984 lb

Final Recommendation

BioPro 190

- Quick Return on Investment
 - if diesel is usually purchased at 3\$ (payoff time ~5 yrs)
 - Diesel users are willing to maintain system
- Biodiesel from Free Dining Commons Oil < Russel Ranch Uses
 - Growth of program, decrease payback time

Source of Uncertainty and Next Step

- Explore UC wide options to implement biodiesel
- Find use of biodiesel on campus
 - User should be interested in maintaining the system
 - Continue communication with Russel Ranch and Student Farm
- Quality of biodiesel competitors/springboard would need testing
- Life cycle analysis of the biodiesel production
- Competitors and incentives can vary depending on year and school
 - Dining services on board
 - This year's free oil will be lower due to lower use of dining facilities on campus
 - Reliable source elsewhere

The End

Questions

Bibliography

<http://www.springboardbiodiesel.com/>

Ayre , James. “Formula E Uses Recharging Generators That Run On Glycerine.” *CleanTechnica*, 4 Nov. 2016.

[1] Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel, US Environmental Protection Agency, EPA420-F-05-001, Feb 2005.

[2] Environmental Protection Agency, Renewable Fuel Standards Program Regulatory Impact Analysis, released in February 2010

(http://www.extension.org/pages/Used_and_Waste_Oil_and_Grease_for_Biodiesel).

Government Incentives on Biodiesel

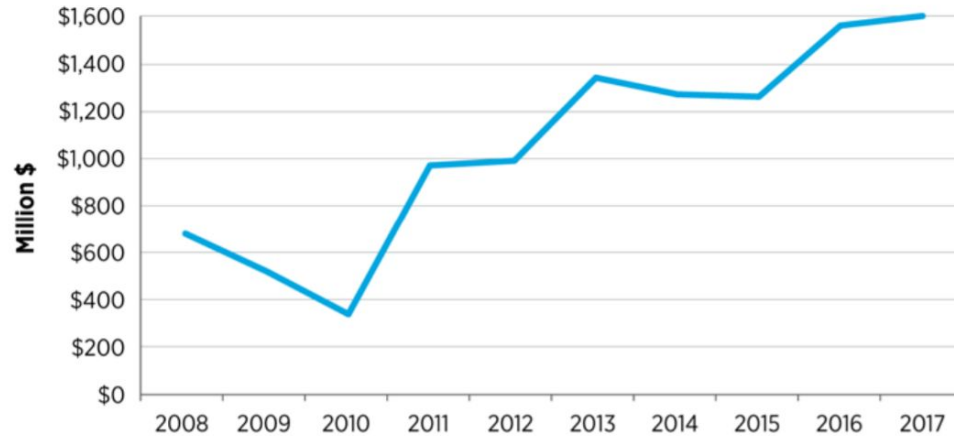


Figure 25. Estimated federal investment in the biodiesel tax credit

Sources: EIA 2018a, Table 10.4; AFDC 2018d. Calculated by multiplying biodiesel production by tax incentive of \$1.00/gallon.

Client

Company: Springboard Biodiesel

Contact: Matthew Roberts, President of SpringBoard Biodiesel

Product: Springboard Biodiesel Biopro 190 & 380

Matts' Goals:

- Expansion of product within all UC's
- Receive a neutral study explaining benefits of technology



3. Research Finding and Outcomes-Case Study

Users:

- 99 schools (USA, Saudi Arabia, Costa Rica, Pakistan)
- 3 Hospitality resorts, 3 casino, 3 restaurant groups
- Farms, Co-ops, remote island and fire station
- User size range from 30 people to 10000 people

Usage:

- Educational- lab
- Transportation and fuel

Goal

- Create comprehensive analysis and audit of the use of Springboard products to better inform future users