

GREEN Corp.



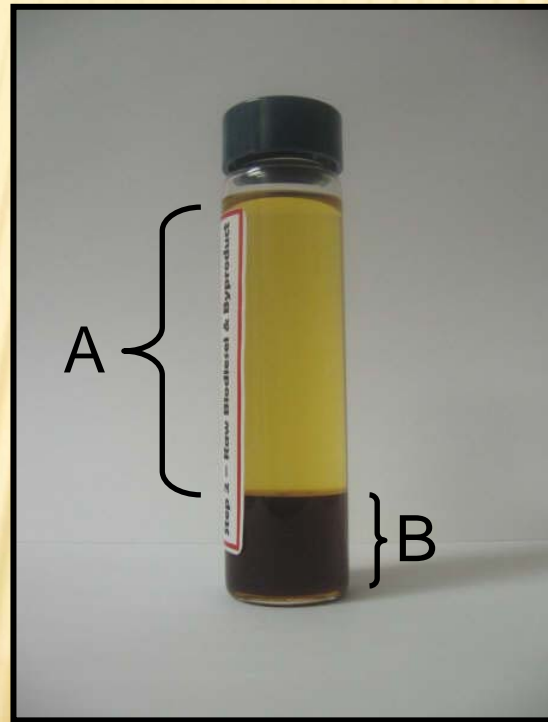
Pioneering Small-Scale Energy Solutions

THE BIODIESEL REACTION

1) *Vegetable Oil + catalyst*

2) *Raw Biodiesel (A) and Crude Byproduct (B)*

3) *Purified Biodiesel*





WINTER USAGE LESS THAN B100 IN CANADA



INDUSTRY PROBLEMS WITH SMALL SCALE

- ✘ No control of methanol vapors
- ✘ Not safe—methanol is dangerous
- ✘ Difficult to control quality of fuel—ASTM standards
- ✘ Artisanal washing of biodiesel is done with water/mild acid—lengthy (5 days)
- ✘ Hard to work by untrained chemists



GREENSTAR TECHNOLOGIES

- × Greenstar 200, Greenstar 1000
- × Intellectual property
- × Safety safeguards
- × Fuel quality standards and monitoring
- × Training operators
- × Costs of operations
- × Carbon credits



	Research	Patents	Trademarks	Corporate
2004	Market research			Forest BioProducts formed
2005	Benchtop experiments (transesterification , washing; Road tests; 1 prototype			
2006	2 prototypes; road tests of biodiesel	CA 2,553,879 on devise:	Frankentank, Stick it to the Man Concepts	
2007	3 prototypes; road tests of biodiesel	CA 2,553,879 filed on PCT as PCT/CA2007/001 875 CA 2,596,578 on safety enclosure	Greenstar 200	SITTM Technologies SITTM Holdings
2007	Design and begin testing components of 1000 L Hazardous area classification	CA filing on design (in progress)	Greenstar 1000	Green Corp
2008	CSA certification Commissioning	CA filing Automation technologies	Democratization of Energy	

GREENSTAR TECHNOLOGIES

	Greenstar 200	Greenstar 1000
Production capacity	200 L batches	1000 L batches
User interface	Manual	<u>Automated</u>
Feedstocks	All types	All types
Biodiesel wash method	Magnasol	Magnasol
Glycerin separation	Gravity, phase separation	<u>Liquid/liquid condensers</u>
Feedstock tolerance	<5 % Free fatty acids	<5% Free fatty acids
Methanol removal	Vacuum distillation	<u>Flash evaporation</u>
Power consumption	20 amps	100 amps
Weight	1000 lbs	9,500 lbs
Transport	Skid handles	double axle--optional
Spill containment	Yes	Yes
Electrical components	Explosion proof	Explosion proof
Explosion containment	None	<u>Yes</u>

OUR VISION

- ✘ To provide affordable, safe (explosion, health) and reliable tools (ASTM) for fuel independence:
 - + Individuals
 - + Companies
 - + Cooperatives
 - + Nations
- ✘ To support the creation of decentralized, locally-owned and controlled fuel production networks
- ✘ To contribute to climate change, rural development policies and priorities of communities, regions, nations.



GREENSTAR 200

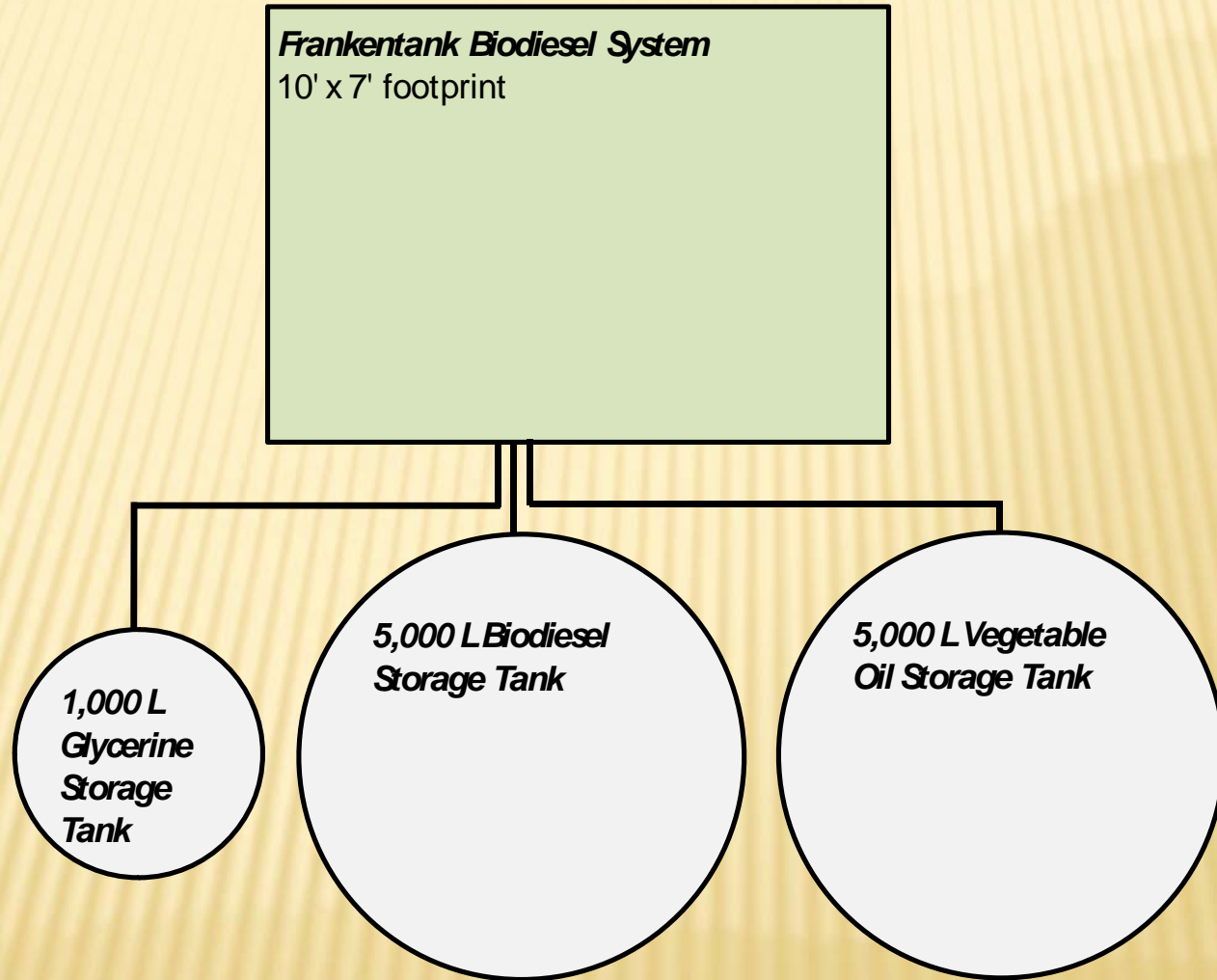


GREEN Corp.

GREENSTAR 1000



FOOTPRINT – GREENSTAR 1000



EVOLUTION IN BIODIESEL TECHNOLOGIES

EVOLUTION



GREENSTAR 1000-SAFETY SAFEGUARDS

- + Zone classified
- + Dry chemical fire suppression system
- + UL listed 2 hr fire-rated wall construction
- + Mechanical ventilation
- + Combustible gas detection system (200 ppm)
- + Safety interlocked and airtight doors
- + 1000 L spill containment sump
- + Roof-mounted explosion relief panels



ASTM 6751 STANDARDS

Property	ASTM Method	Limits	Units
Flash Point	D93	130 min.	Degrees C
Water & Sediment	D2709	0.050 max.	% volume
Kinematic Viscosity, 40°C	D445	1.9 – 6.0	mm ² /s
Sulfated Ash	D874	0.020 max.	% mass
Sulfur, S 15 Grade	D5453	15 max.	Ppm
Copper Strip Corrosion	D130	No. 3 max.	
Cetane	D613	47 min.	
Cloud Point	D2500	Report	Degrees C
Carbon Residue	D4530	0.050 max.	% mass
Acid Number	D664	0.50 max.	mg KOH/g
Free Glycerine	D6584	0.020 max.	% mass
Total Glycerine	D6584	0.240 max.	% mass
Phosphorus Content	D4951	0.001 max.	% mass
Distillation Temperature	D1160	360 max.	Degrees C
Sodium/Potassium	UOP 391	5 max, combined	ppm



ASTM INDICATORS

Property	Indicator Of	Possible Field Problems
Flash Point	Unreacted alcohol	Fire risk during handling and storage
Water & Sediment	Workmanship, production quality	Poor engine performance, fuel filter plugging
Kinematic Viscosity, 40°C	Adulterants, oxidation	Poor engine performance, plugged fuel filters or fuel system
Sulfated Ash	Presence of abrasive solids, unremoved catalyst	Injector, fuel pump, piston and ring wear, filter plugging, engine
Sulfur, S 15 Grade	High sulfur feedstock, adulterant	Engine wear, increased emissions
Copper Strip Corrosion	Unreacted acids	Corrosion of copper, brass and bronze fuel system parts
Cetane Number	Ignition quality	Poor engine performance, engine knock
Cloud Point	Crystal formation	Fuel filter plugging, lack of cold weather operability
Carbon Residue	Carbon deposition, adulteration	Excessive smoking, increased particulates
Acid Number	Unreacted acids, oxidized fuel	Corrosion, plugged filters
Free & Total Glycerine	Unreacted or partially reacted oil or fat	Injector deposits, plugged filters
Phosphorus Content	Contaminated feedstock	Damaged or malfunctioning catalytic converters
Distillation Temperature	Impurities of adulteration	Poor engine performance
Sodium/Potassium	Processing problems, improper chemistry	Filter plugging and engine deposits

GREEN CORP MEASURES FOR ASTM 6751

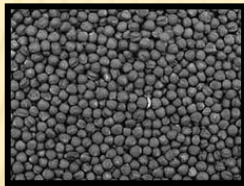
- + Titration of feedstock
- + Methanol used 2x [3 M]
- + 2 step production protocol
- + Glycerin removal through liquid/liquid condenser
- + Water/methanol removal through flash evaporation
- + Cleaning with magnasol
- + Finishing biodiesel to 1 micron absolute

ASSESSING ASTM COMPLIANCE



POWERING THE PEACE

SEED



- Production Cost - \$433 per ha
- Yield – 3.75 tonnes per ha (2000-2004)
- Oil Content – 45%



- Extraction Efficiency – 60%
- Throughput – 150 kg per hour

MEAL



- 2,740 kg per ha
- Animal feed

OIL



- 1,100 L per ha
- Biodiesel feedstock

Peace Country Scenario

Production Cost (\$/ha)	\$433
Avoided Cost - Meal (\$/ha)	\$382
Net Production Cost (\$/ha)	\$50
Canola Oil - Volume (L/ha)	1,100
Canola Oil - Cost (\$/L)	\$0.05

Production data courtesy of Gerard Aldridge, P.Ag. and Nick Underwood P.Ag, C.C.A.

THE FRANKENTANK™ & THE PEACE

	Canola Oil	WVO
<i>Feedstock</i>		
Volume (L)	250	250
% FFA	0%	5%
% MIU	0%	1%
<i>Reactants</i>		
Triglycerides (kg)	220	207
Methanol (L) ^a	50	47
<i>Catalyst</i>		
KOH (kg)	1.4	3.6
<i>Products</i>		
Biodiesel (L) ^b	245	235
Glycerol (L)	22	21
Excess methanol (L) ^c	19	18
Soap (L) ^d	0	13
Total byproduct (L)	36	48

a - methanol is added at 18% w/w of triglyceride

b - 95% conversion of fat to biodiesel

c - 25% of XS in raw biodiesel; 75% in byproduct

d - 100% conversion of fatty acids to soaps

	Canola Oil		WVO	
	Amount	Cost	Amount	Cost
<i>Feedstock (L, \$/L)</i>	250	\$0.05	250	\$0.00
Total (\$)	\$11		\$0	
<i>Methanol (L, \$/L)^{a,b}</i>	50	\$0.92	47	\$0.92
Total (\$)	\$46		\$43	
<i>Potassium Hydroxide (kg, \$/kg)</i>	1.4	\$2.70	3.6	\$2.70
Total (\$)	\$4		\$10	
<i>Cleaning Powder (kg, \$/kg)</i>	1.0	\$2.50	1.0	\$2.50
Total (\$)	\$3		\$3	
<i>Filter Bags (ea, \$/ea)</i>	2	\$4.00	2	\$4.00
Total (\$)	\$8		\$8	
<i>Electricity (kWh, \$/kWh)</i>	16	\$0.06	16	\$0.06
Total (\$)	\$1		\$1	
TOTAL (\$)	\$73		\$64	
TOTAL (\$/L)	\$0.30		\$0.27	

a - methanol is bought at \$1.25 per L

b - 70% of excess methanol is recovered

SMALL-SCALE BIODIESEL TECHNOLOGIES

Producer	Model Name	Materials	Unit Cost (\$)	Batch Time (hr)	Hands On Time (hr)	Batch Size (L)	Annual Output (Continuous, L)	Unit Cost (\$/L)
B100 Supply	The Ester Machine	Steel	\$7,480	8	2 *	960	1,051,000	\$0.01
BioDiesel Gear	Model 30	Plastic	\$2,750	8	1	90	99,000	\$0.03
	Model 60	Plastic	\$3,025	8	1	200	219,000	\$0.01
	Model 110	Plastic	\$4,620	8	1	350	383,000	\$0.01
BioDiesel Solutions	FuelMeister II Domestic	Plastic	\$3,295	12	0.5	160	117,000	\$0.03
	FuelMeister II International	Plastic	\$3,625	12	0.5	160	117,000	\$0.03
DIY Processor Kits	Complete Processor Kit	Plastic	\$2,525	72	3	220	27,000	\$0.09
	Double Complete	Plastic	\$3,794	72	3	480	58,000	\$0.07
Real Goods	AGR BioHome 150	Plastic	\$5,496	48	1.5	280	51,000	\$0.11
	AGR BioPro 190	Steel	\$8,495	48	0.5	240	44,000	\$0.19
Home BioDiesel Kits	The Freedom Fueler	Plastic	\$3,295	48	1	150	27,000	\$0.12

- None are patent-protected
- None have ESA/CSA or equivalent safety certification

CONCLUSIONS

- The price of distillate fuels will continue to rise
- Biodiesel is an eco-friendly, economically viable and seamless substitute for regular diesel
- Biodiesel is gaining credibility in the marketplace
- On-farm biodiesel production from oilseeds makes sense
- Small-scale biodiesel processors enable users to realize significant savings on fuel and

Stick It TO The Man