

# Plant to Power

2009-2011

## Plan of Action

1. Design and Construct a Bioreactor
  - a. Safe and Secure Model for Classroom and Expo Use
    - i. Purchase Tanks, pumps, containment skid, hoses, SS fittings and valves, heating elements, steel framing, washing nozzles, safety equipment, testing kits, etc.
2. Purchase and Design a Display Trailer
  - a. Enclosed trailer to haul Bioreactor to Classrooms, Fairs, and Expos
  - b. Graphic Message and Logo Design on Outside of Trailer to promote Biofuels
3. Construct a Recycle Center @ Farm Bureau
  - a. Concrete Pad
  - b. Stainless Steel Storage Tanks
    - i. For Used Oil
    - ii. For Glycerin
    - iii. For Biodiesel
  - c. Storage Containers for paper, glass, and plastic
  - d. Enclosed Climate Controlled Building
  - e. Pumps and hoses for easy transfer
4. Purchase and Re-build a Single Cylinder Diesel Engine
  - a. Utilize biodiesel to;
    - i. Run Generator
      1. Operate pumps and air compressor
      2. Provide electricity for exhibits and displays
    - ii. Operate ice cream freezers
5. Build a Twin 5-gallon Ice Cream Freezer
  - a. Ran from Biodiesel Engine
  - b. Utilize at Fairs, Events, and Expos for Agriculture and Biofuel Promotion
  - c. Fundraiser for local clubs and organizations
6. Purchase a Used Diesel Truck
  - a. Utilize Biodiesel Fuel
  - b. Haul Bioreactor and Trailer
  - c. Graphics to promote biofuel
7. Design and build condenser
  - a. Column
  - b. Ice bucket/pump
  - c. Collection

## 8. Glycerin Utilization

- a. Soap
  - i. Formulation
  - ii. Marketing & sales
- b. Fire Logs
  - i. Compressed Fire logs from sawdust and glycerin
  - ii. Formulation
  - iii. Marketing and Sales

## 9. Marketing & PR of Biodiesel

- a. Brochures
- b. Name & logo
- c. Curriculum outreach
  - i. Labs
    - 1. Equipment lists
    - 2. Chemicals
    - 3. Safety & Disposal
  - ii. Lecture
  - iii. Assessments
    - 1. Quizzes
    - 2. Exam

## 10. Gas Chromatography

- a. Gas cylinders
- b. Regulators and copper tubing
- c. Biodiesel columns
- d. Injectors & septum
- e. Standards
  - i. Biodiesel
  - ii. Glycerin
  - iii. MeOH
  - iv. Water
- f. Write software

## 11. Display

- a. Sample bottles
- b. Formula displayed
- c. Pictures
- d. Lights, colors
- e. Signs, posters

## 12. Display tables

- a. Make-Your-Own-Biodiesel
- b. Fliers and brochures
- c. Posters & pictures

- d. Research results
- e. Soap sales

### 13. Build or Purchase a Soybean Press

- a. Convert Raw Soybeans to Oil
- b. Use Virgin Soybean Oil to Make Biodiesel
- c. Utilize Byproduct (Soybean Meal) in Animal Feeds
  - i. Develop Marketing Plan for Soybean Meal
  - ii. Test Nutrient Value of Meal

### 14. Biodiesel In The Classroom Workshops

- a. Workshops for Teachers, Consumers, Businesses, etc.

Sample Program:

Reactor Design & Construction: Hardware store accessible, No technical expertise, 100 ft<sup>2</sup> footprint

Lecture Highlights: Terminology & Chemistry, Chemicals, Equipment & Safety, Processing Techniques, Storage, Biodiesel Uses & Glycerin Uses, Research, Funding & References

Laboratory Handouts & Activities: 1. Titration– Tests oil quality, 2. Dr. Pepper– Prepares a 1L test batch of biodiesel, 3. Glycerin & Water– Separates glycerin from biodiesel and water-washes biodiesel, 4. 3-27– Tests completion of reaction, 5. Molecular Sieve Retention– Tests holding capacity of molecular sieve with respect to water and methanol, 6. Distillation– Separates methanol from glycerin for recycling, 7. Liquid Hand Soap– Prepares soap from glycerin co-product

Curriculum Conferences

Dates: February 26-27, 2010 (Session A), March 25-26, 2010 (Session B), April 29-30, 2010 (Session C)

Schedule: Thursday 4:30pm-8:30pm?, Friday 9am-3pm?

Details: Limit of 20 participants per session, \$100 per participant (Curriculum, Food, Materials, Lab equipment/chemicals, Facility fees, Checks payable to "Plant To Power", Snacks/drinks provided Thursday evening, Continental breakfast & snacks provided Saturday (lunch is on your own)).

Student Written & Tested Assessments: Lecture Quizzes, Lab Quiz, Unit Exam