# Mobile Oil Press and Biodiesel Processor

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## INTRODUCTION

The Central Utah Biodiesel project was established in 2005 as a multidisciplinary partnership with USU Extension, Snow College, and local farmers and citizens. Support for the project has come from a number of farmers, citizens, government agencies, and industry. The goal was to provide an energy hedge or renewable alternative for agriculture and rural economies. Applied research, education, and demonstration activities have been conducted to establish agronomic practices and production benchmarks, fuel conversion processes, the economic opportunities of biodiesel and other value added products and by products, and to identify other synergistic opportunities.

## SEEDS TO FUEL

The equipment in this trailer, a seed press and reactor tanks; can produce diesel fuel from seeds grown in Central Utah (Figure 1). Seeds include: sunflower, safflower, canola, and camelina.

**Figure 1.** Mobile (trailer mounted) research and demonstration biodiesel processer and oil seed press. This equipment is currently available to farmers for on-farm fuel production. Funds were provided by UDAF and NRCS.

## SEEDS TO OIL AND SEED MEAL

The seed press uses a screw mechanism to squeeze the oil from the seed. The oil is pushed between the edges of metal plates surrounding the turning screw and flows by gravity into a container. The solid portions of the seed are pushed out of the end of the machine and down a separate shoot (Figure 2). The oil content of sunflower, safflower, canola, and camelina ranges from approximately 33 to 40 percent. Using seeds with a 35 percent oil content would require 22 pounds of seed to produce a gallon of vegetable oil and would also yield 14 pounds of meal that can be feed to livestock.

**Figure 2.** Oil seed screw press separating oil (left) and seed meal or cake (right) from camelina seed. Press is belt driven by a 5hp 220v motor.

## BIODIESEL BASICS

Biodiesel fuel is produced by treating a biological fat, in this case vegetable oil or waste cooking oil, with an alcohol, methanol. The reaction, readily accomplished in a kitchen using household containers or the equipment demonstrated below, can be scaled to any level of production. The biodiesel is fully functional as fuel in modern diesel engines. The reaction also produces glycerin, useful for cosmetics, fertilizer, dust control, or other household and industrial applications.

## PROCESSING VEGETABLE OIL TO BIODIESEL

Vegetable oil, virgin or waste cooking should be water free and filtered or settled to remove particles. Oil, up to 50 gallons with this processor, is then added to the first reactor tank and heated to 125°F by pumping the oil through the adjacent heater (Figure 3). Methanol and lye (the catalyst) are then mixed in a separate container to make a methoxide solution (Figure 4). Methanol is added in the proportion of 1 gallon of methanol to 5 gallons of oil. The amount of catalyst varies by the titration of the feedstock oil but is usually 5-7 grams per gallon. The methoxide solution is then injected into the heated oil and the reaction runs for approximately 8 hours (Figure 4). The resulting reaction yields biodiesel on top and glycerin on the bottom in approximately the same ratio as oil to methanol. An example is shown in Figure 5a. The glycerin is drained out the bottom and the biodiesel is transferred to the second tank for washing (Figure 5b). In the second tank water is sprayed on top of the biodiesel to remove any impurities and the water and impurities settle to the bottom (Figure 5c). The water is then drained off of the bottom and biodiesel air dried, filtered, and pumped into a fuel storage tank. The equipment shown can process 50 gallons of oil from start to finish in 48 hours. If both tanks are working simultaneously the equipment could produce a 50 gallon batch in 24 hours.

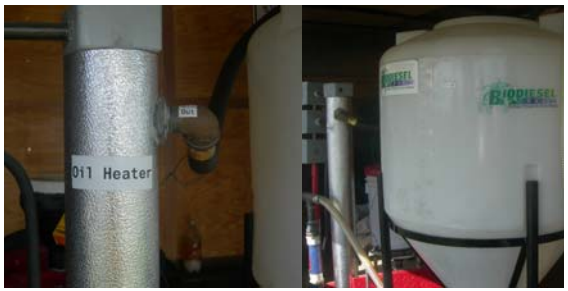
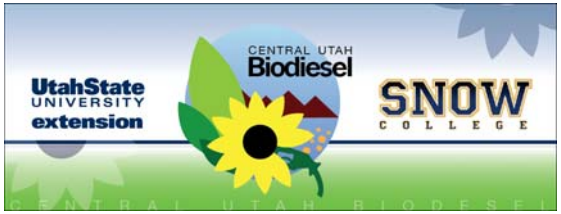



**Figure 3.** Two pictures of the biodiesel processor with the first reaction tank and electric recirculating oil heater



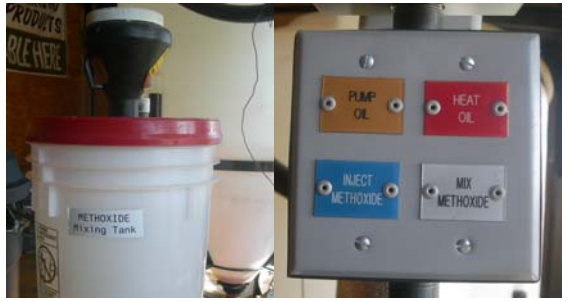




**Figure 4.** Methoxide mixing tank (left) where methanol and lye are combined before injecting into hot oil. Biodiesel processor control panel (right).

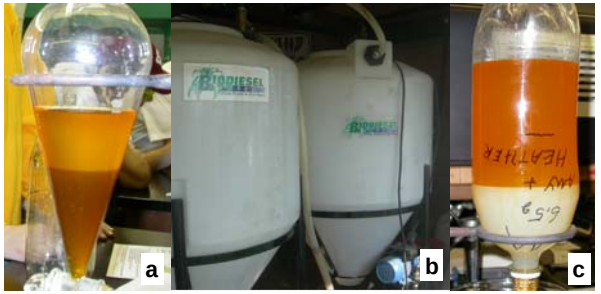



**Figure 5a,b,&c. a**, An example of biodiesel on top and glycerin below in a separatory funnel; **b,** the reaction tank (left) and the washing tank (right) of the biodiesel processor; **c**,washed biodiesel on top and wash water below in a plastic bottle.

## CONCLUSIONS

This summary has been presented by the Central Utah Biodiesel Project and is focused on processing oil seeds into biodiesel. Research based information is available on growing sunflower, safflower, canola, and camelina, their agronomic benefits and additional value added products and seed meal as livestock feed including value added high Omega 3 meal is available at the USU Extension Offices in Richfield (435) 893-0470 and Ephraim (435) 283-7582 or online at http://extension.usu.edu/sevier/

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