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There are many varieties of seeds and nuts that can produce oils for food, nutraceuticals, skincare products, aromatherapies, fuels and industrial lubricants. This publication describes the basic processes involved in oil processing including seed cleaning, extraction, clarification, packaging and storage. Sources for more information and equipment are included in the **References** and **Resources** sections at the end of the publication.



Photo courtesy Sustainable Systems, LLC

Safflower oil.

Introduction

Farmers and small business owners are asking if it is possible and profitable to add value to their seeds and nuts by extracting the oil. This is not an easy question to answer because there are so many variables, some of which are noted in the following sections of this publication.

Culinary oils include olive, sesame, safflower, sunflower, grape seed, canola, apricot kernel, coconut, hazelnut, peanut, pumpkin and walnut oils. Advertisements for these culinary oils tout their health benefits and unique flavors. Some of these

plant-derived oils can be used to make soap, body and hair oils, detergents and paints. Some can also be used to make industrial lubricants. A wide range of oilseeds and other oil-producing plants are high-quality feedstocks for biodiesel. Oilseed processing expands the use of crops such as sunflowers and brings value to grape seeds, which are usually waste products.

Most oil processing in the United States is done on a large industrial scale. Small-scale oil extraction is more commonplace in other parts of the world. As a result, many of the useful resource materials and much of the appropriate-scale machinery come from other countries. However, interest in small- to intermediate-scale oilseed processing on the part of farmers and others in the United States grew dramatically in the past five years. This publication describes the basic processes of oilseed production, with extensive sources for additional information and equipment.

Getting started

Culinary oil businessman and consultant E. Peter Matthies, now living in Germany, suggests that you ask yourself the following questions before starting oil processing:

- Why do I want to start oil processing?
- Will it be a hobby or a new economic enterprise?
- How big will the operation be?
- How many different products will be made, including both oil and the press

cake left after the oil is pressed out of the raw seeds or nuts?

- Do I want to target mass markets or specialty markets?
- What geographical area do I want to cover?

The first question is important because it affects the answers to all the other questions. It even affects how you read this publication. If you crush oilseeds for biodiesel or straight vegetable oil fuel production, you need to pay special attention to several specific processing steps.

For culinary oils, there are several more processing steps and technologies to consider and possibly add to your plan. You may forego some of the more complex, costly steps for exclusively personal-use cooking oil or biofuel.

Later in this publication, Matthies describes how he got into this new oil business after retiring from the petroleum business.

Basic processing steps

Seed cleaning

Preparation of the raw material often includes removing husks or seed coats from the seeds and separating the seeds from the chaff. There are a wide variety of small- to intermediate-scale approaches to and technologies for effective seed cleaning. Approaches range from using various sizes of hardware cloth screens in tandem (Clothier) to using a compact fanning mill such as the Clipper Office Tester and a spiral separator for small farms (Small Scale Grain and Pulse Production forum, 2008). See the **Resources** section for examples, types and sources of equipment.

Seed preparation and conditioning

For successful pressing, the seed must be:

- **Clean.** Fine dust in the seed may clog the oil press hardware. Chaff left in the seed will absorb some of the oil and keep it from getting squeezed out of the expeller. Sand in the seed will wear out the press. Stones damage the oil press screw or piston.
- **Dry.** Moist seed leads to low yields and clogs the screw or cage, a part of the press. Moist seed may also get moldy, as mold spores are present in all crops. A rule of thumb is that the moisture content of the seed should be close to 10 percent. The number varies considerably for specific oilseeds. For example, rapeseed should be dried to a 7-percent moisture content, camelina to about 6 percent and sunflower to 8.5 percent. Safflower needs only to be dried to 11 percent and soybean is safe for storage and processing at 12 percent (Alam, 2007).

There are at least two methods of testing seed moisture levels. Hand-held moisture testers allow the user to simply place the seed in the tester, turn it on and select the type of seed to test. The tester provides an instant readout. These testers cost from \$400 to \$700. Brand names include DICKEY-johns mini GAC, the Grintec HE-50 and GE Sensing's Pro-timeter Grainmaster.

Here is a lower-tech, low-cost way of moisture testing: Weigh a sample of seed, and then heat the sample in an oven at 300 degrees Fahrenheit for one hour. Reweigh the sample. The weight lost in the oven is equal to the moisture content of the original sample. Calculate the percentage by dividing the weight lost by the original weight and multiplying the result by 100.

Even dry seed can quickly get damp by being in contact with damp earth. Once the seed is dried and bagged, it must be carefully stored to keep it from absorbing moisture.

- **Warm.** Warm seed will yield the most oil for the least effort. The optimum heat range for oil extraction is from 100 to 160 degrees. There are several ways to

This canola seed will need very little cleaning before crushing.



Photo by Holly Hill, NCAT

preheat the seed in advance of extraction. For very small batches, heating the seed in an oven or double boiler works, as does concentrated sunlight in a solar food dryer or some other solar collector. For larger batches, a heating element in a hopper located between the seed storage facility and the oilseed press works well.

Extraction by cold pressing

Oil can be extracted mechanically with a ram press, an expeller or even a wooden mortar and pestle, a traditional method that originated in India. Presses range from small, hand-driven models that an individual can build to power-driven commercial presses. The ram press uses a piston inside a cage to crush the seed and force out the oil (Herz, 1997).

Expellers have a rotating screw inside a horizontal cylinder that is capped at one end. The screw forces the seeds or nuts through the cylinder with gradually increasing pressure.

The seed is heated by friction and electric heaters or a combination of the two. Once the cap is removed, the oil escapes from the cylinder through small holes or slots and the press cake, or meal, emerges from the end of the cylinder. Both the pressure and temperature can be adjusted for different kinds of feedstock.

There are two distinct expeller press designs — a single cylinder press that expels the press cake out in pellet form and a traditional cage-style screw press that expels the meal out in large flakes.

Oil expellers

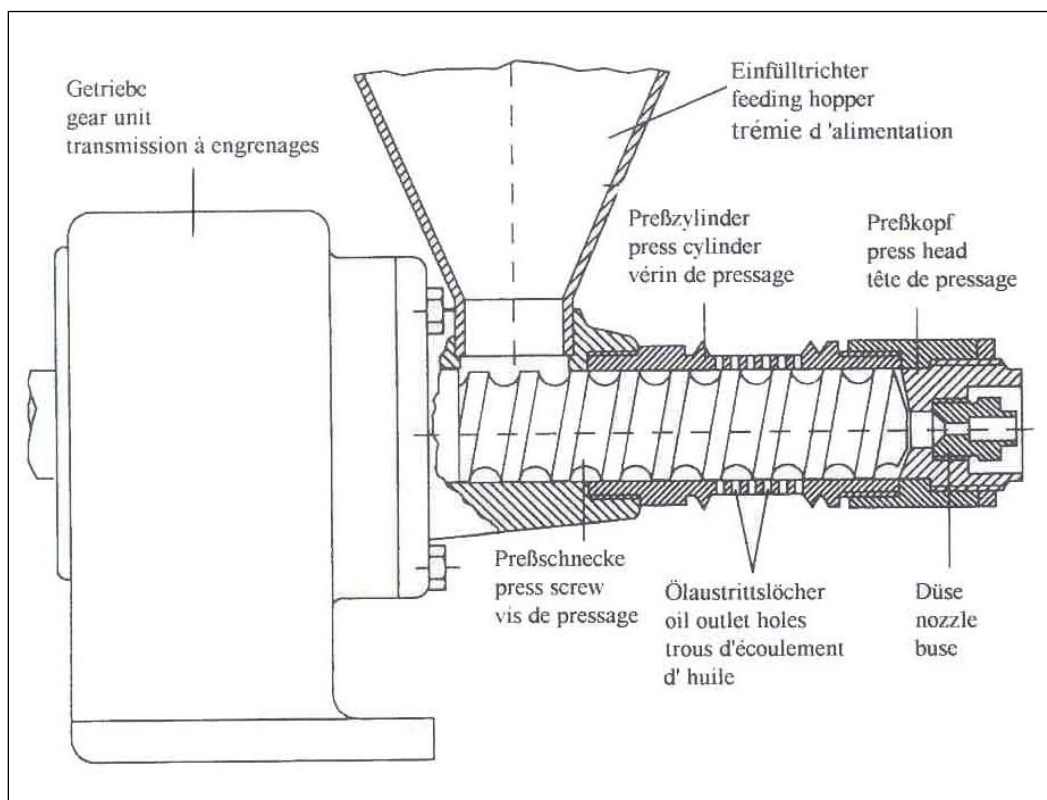
There are many manufacturers of single-cylinder presses. Most presses are sold in European countries and designed primarily for rapeseed, or canola. For

example, the Täby Press is a screw press manufactured in Sweden. It is similar to the Komet Oil Expeller described below. Various models are available for cold pressing rapeseed, linseed, flaxseed, sunflower seed, sesame seed, peanut, groundnut, mustard seed, poppy seed, cotton seed, jojoba and more. All of the Täby line of screw presses are distributed in the United States by Magic Mill International. See the **Resources** section for more information.

Komet Vegetable Oil Expellers are manufactured by IBG Monforts in Germany. The company's range of products covers small hand-operated machines as well as industrial machines. According to product literature, Komet oil expellers feature a special cold pressing system with a single conveying screw to squeeze the oils from various oil-bearing seeds.

The machines operate on a gentle mechanical press principle that does not involve mixing and tearing the seeds. Virtually all oil-bearing seeds, nuts and kernels can be pressed with standard equipment and without adjusting the screws or oil outlet holes.

Figure 1. Sectional view of a Komet (single cylinder) oil expeller.



Some advantages and disadvantages of each type of press are:

Single cylinder:

Advantages:

- Simple to use and adjust for multiple feedstocks
- Designed for continuous use
- Easier to unplug if it gets backed up, which happens occasionally
- Works quite well out of the box.

Disadvantages:

- Not for use for large, industrial-scale presses due to the very large pressure generated on the press head
- Expensive

Cage style:

Advantages:

- Less expensive for small and large electric-driven presses
- The expeller of choice for larger capacities of more than 3 tons per day

Disadvantages:

- Difficult to adjust for different sizes of seeds
- Needs more constant monitoring

Note: Reports from farmers who bought certain imported Chinese models included lower than expected quality and considerable setup time. They may need new parts or motor upgrades to function properly.

If you want to process larger amounts of oilseed crops, a 3-ton to 10-ton per day cage press may be what you want. You can also link multiple cylinder presses in tandem to perform the same function. Another option is the Instapro press, which is a semi-industrial-scale press available in the 20-ton per day capacity.

Both cylinder and cage presses have significant electrical requirements. Any press with a capacity over 3 tons per day will likely require three-phase power and smaller presses require 220-volt power.

Choosing the correct size of press for what you intend to do is very important. For example, Montana farmers' experiences led to the conclusion that 1-ton per day presses



This 1-ton press was too small and slow for what its owner planned for it.

are too small for what is needed to produce biodiesel or straight vegetable oil fuel on an average Montana grain farm.

Solvent extraction of oil

Oils can also be extracted with solvents, but solvent extraction is a complex and costly operation. Solvent extraction isn't suited for small-scale processing because of high capital and operating costs, risks due to fire and explosions from solvents, and the sheer complexity. Management of solvents such as hexane is a problem as well (Principles of Oil Extraction).

Clarification

Clarification removes contaminants such as fine pulp, water and resins. You can clarify oil by allowing it to sit undisturbed for a few days and then removing the upper layer. If the oil needs further clarification, filter the oil through a fine filter cloth. Finally, you can heat the oil to drive off traces of water and destroy any bacteria. Very clean oil is important in all uses, including biodiesel.

Degumming

Degumming is the process of removing the phospholipids from the oil. Many people advise that you allow the resulting oil to settle out the gums, or hydratables, over a period of one to two weeks. However, you need more chemical processing to make high-quality culinary oil or biodiesel feedstock.

The chemistry of degumming for biodiesel production

Degumming is a critically important process for oilseed processors who use their oil in a high-quality biodiesel or in straight vegetable oil fuel. These gums are similar to normal triglycerides; however, one gum chain is a phosphorus molecule. Most of the gums are hydratable with water, meaning that either a normal settling or a water wash followed by settling will get gums out. Some of the gums are non-hydratable, so the oil must be mixed with phosphoric or citric acid to cause the non-hydratable gums to swell up and come out of solution.

The amount of non-hydratable gums formed, as well as the acid content of the oil, will often depend on the oil extraction temperature. Within a certain temperature range, lipases, the enzymes that consume fats and oils, are active during oil extraction. These lipases can cause the free fatty acid (FFA) content or the amount of non-hydratable gums to increase. Higher gum levels and FFA levels are not good for biodiesel production.

Getting the non-hydratable gums out may or may not be critical, depending on the application. For instance, most of the hydratable gums will come out in the glycerin phase in biodiesel production, but the non-hydratable gums that are left over will cause the producer to miss on the American Society of Testing and Materials (ASTM) phosphorus specification for their B100, or 100-percent biodiesel.

Refining, bleaching and deodorizing

The vegetable oil produced and processed to this point does not need refining, bleaching or deodorizing as long as the natural taste, smell and color are acceptable to the user. However, getting the oil to commercial food grade may be an important step in oilseed processing if your market demands it. For example, restaurants require oils that have a relatively high smoke temperature and may or may not want the taste of the natural oil. Getting the oil to food grade will add value and can make small-scale biodiesel from oilseeds more feasible for those who intend to use the oil in a manner similar to the full-cycle farming story at right.

The RBD process gets oil to commercial grade specifications.

The RBD process includes:

- **Refining.** Refining usually consists of two steps. The first step is degumming, which is described above. The second step is neutralization, in which the free fatty acids (FFAs) in the crude oil are caustic-stripped with sodium hydroxide (NaOH) in an aqueous solution. The resulting soap stock is settled, filtered or centrifuged out (Van Gerpen et al., 2006).
- **Bleaching.** In this step, the oil is mixed with certain types of bleaching clays to absorb colors and some other contaminants such as soap, trace metals and sulfur compounds.
- **Deodorizing.** This is a distillation process that occurs at high temperatures and low pressure (Van Gerpen et al., 2006). The oil is put under a vacuum and heated with steam to remove any leftover taste or odors and FFAs. Deodorizing can also be achieved by treatment with activated charcoal (Pilgeram, 2008).

RBD is not always beneficial to nutrition. Crude oil contains more vitamin E, trace elements, phytosterols and more. The trade-off is that crude oil is healthier but less stable (Pilgeram, 2008).

Oil packaging and storage

Use clean, dry containers to package and store oils. Sealed glass or plastic bottles are adequate for small quantities. Colored containers in a dark box help increase shelf life. Steel or plastic tanks work well for large

Full-cycle farming?

Everdale Organic Farm in Ontario, along with Piedmont Biofuels from North Carolina, came up with a novel way to use the same batch of oil for food and fuel. For example, a farmer could “rent the oil” by harvesting his canola, processing the oil seeds to food-grade standards and “renting” the oil to a restaurant for a price lower than the restaurant typically pays for their oil. After using the oil, the restaurant returns the oil to the farmer for conversion to biodiesel. This way there is no competition between food and fuel and the economics work out favorably for small-scale biodiesel production from oilseed crops.



Photo courtesy Montana State University.

Camelina seed is very small compared to other oilseeds.

quantities. The shelf life of oil is usually six to 12 months if it is properly packaged and kept away from heat and sunlight (Fellows and Hampton, 1992).

Keeping air away from oil is perhaps the most important step to prevent rancidity. Completely fill whatever

size container you chose so there is no air space and then cap the container tightly (Van Gerpen, 2008).

Shelf life of oil may vary depending on the type of oil as well as the storage conditions. For example, flax and grape seed have a shorter shelf life than canola or sunflower due to the large amount of polyunsaturates present.

If the stored vegetable oil does not reach sustained temperatures of 100° F or more, its vital components will be preserved. Therefore, vegetable oil is excellently suited for natural nutrition. As long as the oil is stored in a dark, *cool* place, it will have a long shelf life.

Oilseed by-products: Meal and hulls

Soy hulls and sunflower shells removed before pressing are used as animal feed. Soy hulls are used as a replacement for corn or winter hay.

Seed meal is a valuable by-product of pressing oilseeds. Sesame seed cake is valuable as a human food. Sunflower seed cake is not suitable for people, but it makes a good addition to chicken, pig or cattle feed. It is quite high in crude protein, but contains very few carbohydrates. It should be used as a feed additive, not a feed by itself.

Canola, soy and safflower meal are also used as animal feed supplements. At the time of this writing, extensive camelina animal feeding trials are being conducted. *Table 1* shows the nutrient levels of various oilseed meals.

Just as with oilseeds, proper storage of seed cake is extremely important. Moldy seed cake is a twofold problem. First, moldy seed cake does not taste good to animals. Animals may not be willing to eat moldy feed. Worse, some kinds of mold make mycotoxins such as aflatoxin. These poisons can make people and animals sick. Some of the

What's in the meal?

Be clear on oil content of the oilseed and the cake. Crushing the whole seed rather than dehulling it before pressing increases the fiber levels. All of the numbers describing the various oilseeds on the next page are the oil, or fat, content of the meal. The words fat and oil are interchangeable.

Keep in mind that any variability in an oilseed crusher's efficiency and effectiveness in removing the oil will affect factors such as feed ration recommendations and shelf life. For example, canola seed is about 40 percent oil, based on methods that extract virtually all the oil, usually solvent extraction. However, if cold pressing canola gets only 70 percent of that 40 percent, the amount of oil left in the cake is more than what a processor that removes 85 percent of the oil would leave.

Meals of the oilseeds in the brassica family contain glucosinolates, which are organic compounds that function as natural pesticides and give brassicas their bitter taste. Glucosinolates have anti-nutritional qualities that block absorption of some nutrients. Mustard meal has very high levels of these compounds. Camelina and canola have much lower levels, making them far more suitable for feeding.

Soybeans contain trypsin inhibitors that need to be deactivated by cooking before animals can derive the full value of the protein in the meal (Van Gerpen, 2008). There is a large body of literature on what meals are best suited for ruminant or monogastrics like swine and poultry animals. See the **Resources** section for a sample of those sources.

Table 1. Nutrient composition of various oilseed meals resulting from solvent or mechanical extraction*Source – Biodiesel benefits for Cattle Producers: Feeding Byproducts of Biodiesel Production, 2008, Greg Lardy.*

Dry matter basis									
	DM, %	CP, %	Fat, %	TDN, %	NEm, Mcal/lb	NEg, Mcal/lb	ADF, %	Ca, %	P, %
Camelina meal, mechanical extraction	91.5	36.5	14.1	88.6	.97	.64	19.2	.38	.77
Canola meal, mechanical extraction	90	41	7.4	76	.8	.52	16	.6	.94
Canola meal, mechanical extraction, On-farm press	92.6	36.9	14.1	88	1.09	.77	NG	.6	1.02
Canola meal, solvent extraction	90	43.6	1.2	69	.73	.45	18	.67	1
Mustard meal, mechanical extraction	93	34.5	5.5	73	.76	.48	NG	NG	NG
Safflower meal, mechanical extraction	91.9	23.5	7.2	56.1	.55	.25	NG	.26	.66
Safflower meal, solvent extraction	92	25.4	1.1	57	.55	.29	41	.37	.81
Soybean meal, mechanical extraction	90.7	46.7	5.2	84.9	.94	.62	NG	.31	.65
Soybean meal, solvent extraction	89	49	1.2	84	.94	.64	NG	.33	.71
Sunflower meal, mechanical extraction, On-farm press	93.1	23.6	19	90.5	1.13	.8	NG	.43	.79
Sunflower meal, solvent extraction	90	38.9	1	64	.65	.35	28	.39	1.06

Abbreviations: DM = dry matter; TDN = total digestible nutrients; NEm = net energy for maintenance; NEg = net energy for gain; CP = crude protein; ADF = acid detergent fiber; Ca = calcium; P = phosphorus; NG = not given.

poisons from moldy seed will end up in the oil, but most remain in the seed cake. The toxins can also get into the meat, eggs and especially the milk of the animals that eat the cake.

Rancidity is another shelf-life issue for oilseed cake. Shelf life of meal is most affected by the content of unsaturated fatty acids and the content of antioxidants such as vitamin E and derivatives. Unsaturated fatty acids, such as omega-3s, decrease the shelf life. Antioxidants increase shelf life. Storage, temperature, humidity, moisture content and seed type are also important factors to consider. For example, camelina and flax both have high concentrations of omega-3 fatty acids. However, camelina meal contains higher concentrations of vitamin E and subsequently has a longer shelf life than flax meal. Canola oil contains less unsaturated fat than camelina oil. Subsequently, canola meal is more stable (Pilgeram, 2008).

Adding value adds costs

Although value-added processing can be a way to increase a farmer's share of the farm product dollar, adding value doesn't come free. At each step, one is adding more work, buying additional equipment and supplies and using more energy. Information needs increase. Wholesaling or retailing culinary oil will require nutritional labeling. And depending upon the situation, liability insurance may become a must.

A key point to remember is that adding value to any foods by processing increases safety risks due to the increased handling. Therefore, rules and regulations are established by each state to protect public health. In addition, the Food and Drug Administration regulates products going out of state. Anyone considering processed foods as a value-added business should contact their state health department before proceeding.

One (bio)oilman's story

E. Peter Matthies has been involved with pressing oil from seeds and nuts for more than 15 years. The following is from a communication Matthias sent to one of the authors of this publication and serves to illustrate one man's experience with oilseed production.

"Upon my retirement I started to ranch (and) raise cattle in western Colorado. A professor at Colorado State University suggested that I plant alfalfa and rotate it with canola rather than other small grains. With a press, I would get some oil and the by-product (press cake) would also have economic value.

When I found the special cold press equipment in Germany, I purchased a couple of presses and got started. I learned from the equipment company representatives about other oils from hazelnuts, peanuts, walnuts, macadamia nuts, sesame, sunflower, hemp, Saw palmetto and others and started to make oils. I also tried some very special oils, like coffee oil and oil from dried orange peels. I went to some of the big shows and met marketing and distributing people. I furnished them with samples and received substantial orders. I shipped anywhere from 1-gallon containers to 55-gallon drums. A local cattle feed lot sent their truck twice a month to pick up any press cake that I didn't use for my own horses and cattle.

Slowly my name became known by word-of-mouth. People sent me different seeds or nuts to test for oil content and for the taste and value of such oils. Through a Web page I attracted universities and other companies.

Some people who bought the special Komet presses from me concentrated on special markets, such as hemp seed oil

in Canada or grape seed oils from wineries or certain immigrant groups who like special oils they were used to from their home country.

Later I became known for the special quality of the truly cold pressed oil (less than 90 degrees) and I was asked to test various varieties of certain products, such as grape seed oil from different grapes, like an oil "a la merlot" or "a la pinot noir." I produced oil on contract for several companies until they had established their own markets, at which point they acquired their own production plants.

Small-scale operators, who consider oils as a sideline, might be able to sell to local shops and restaurants. Health spas are always in need of special oils. Make sure you have a good name for your product and present the oils in appealing containers.

In regard to pricing, find out what other people charge and see if you can live with that. Or concentrate on high price markets like certified organic stores or Kosher (markets). Prices for the same oil are different in different parts of the country. Can you be competitive at those rates? Can you sell just under those rates and still be economical? Certified organic and Kosher (products) cost extra for inspection in addition to the installation and operation of the plant. Is the market large enough to pay for the higher costs?

I believe there is no sure-fire way (to sell oils) in all parts of the country. But one thing is necessary wherever you are: You've got to go out and toot your horn!"
(Matthies, 2004)

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Resources

Oilseed crushers

(Neither NCAT nor the authors of this publication endorse any of the products listed here. It is intended as a sample, not a comprehensive list of equipment suppliers.)

Cropland Biodiesel Oilseed Press

Cropland Biodiesel sells three models of screw presses with the option to buy the press itself or the press and motor together for an additional cost. Catering to the farming community, Cropland Biodiesel has customized units with a Thermostatically Controlled Heated Press, giving the ability to dial in the exact temperature necessary to expel the highest amounts of oil from the seed crop.

CLB-100

Capacity: 1 ton per 24 hours

CLB-300

Capacity: 3 ton per 24 hours

CLB-500

Capacity: 5 ton per 24 hours

Contact:

Doug Fluit

Cropland Biodiesel

2003 Pangborn Rd.

Lynden, WA, 98264

(360) 815-7061

hunter@croplandbiodiesel.com

www.croplandbiodiesel.com

Kern Kraft Oilseed Press

The German Kern Kraft oilseed presses range from ¼ ton per day to 4 ton per day capacity. Circle Energy in Wisconsin distributes German Kern Kraft oilseed presses and filters as well as Evolution biodiesel processors. Jon Becker-Schickel is a Circle Energy representative located in Thermopolis, Wyo. For prices and further information, contact:

M. Jon Becker-Schickel

1531A Owl Creek Road

Thermopolis, WY 82443

(307) 867-2233

(563) 581-0048 cell

www.circle-energy.com

Biopress Series Oilseed Press

Biopress200

Capacity: 5 ton per 24 hours

Biopress400

Capacity: 10 ton per 24 hours

Biopress oilseed press distributors

BioFuel Canada Ltd.

280 Midpark Way S.E.

Calgary, Alberta Canada

T2X 1J6

(403) 255-4820

www.biofuelcanada.ca

CentralBioDiesel

8208 NW 6th St.

Coral Springs, FL 33071

(954) 889-7BIO (7246)

sales@centralbiodieselhttp.com

www.centralbiodieselhttp.com

Mammoth Oilseed Press

These presses are the cold press type producing both useable oil for diesel engines (after proper filtering or processing) and a valuable by-product, feed cake for animals. They are a screw-press-type unit and typically can produce a gallon of oil from a 5-gallon bucket of canola.

Mammoth MSP-2T

Capacity: 2 ton per 24 hours

MSRP: n/a

Mammoth MSP-4T

Capacity: 4 ton per 24 hours

MSRP: \$3,995

Mammoth MSP-6T

Capacity: 6 ton per 24 hours

MSRP: \$4,495

Mammoth MSP-10T

Capacity: 10 ton per 24 hours

MSRP: \$9,950

Mammoth Oilseed Press distributors:

Trimline Design Centre Inc.

6772-99 Street

Edmonton, Alberta Canada

T6E 5B8

(780) 466-9034

(780) 466-9031 fax

info@trimlinedesigncentre.com

Woodleaf Biodiesel Innovations

Vaughn Ruth

6340 Woodleaf Road

Woodleaf, NC 27054

(704) 278-2256

info@woodleafbiodiesel.com

www.woodleafbiodiesel.com

Hybren Oilseed Press

The Danish Hybren press is specifically intended for small seeds such as canola and mustard and has a capacity of 1/2 ton per day and retails for about \$3,500. www.hybren.dk

Hybren Oilseed Press distributors:

Sustainable Village

1080 Oakdale Place

Boulder, CO 80304

(303) 998-1323 or (888) 317-1600

(303) 449-1348

info@sustainablevillage.com

www.sustainablevillage.com

NBT Building Products Ltd.

Unit 9000 Suite 305

190 Trans Canada Highway NE

Salmon Arm, BC, Canada V1E 1S3

(250) 833-0275

(866) 835-1031 fax

info@plantdrive.ca

www.plantdrive.ca

Rosedowns Mini Oilseed Press

The Mini Press Range has been designed to cover the needs of both the smaller specialty oil processor and a pilot plant operation. The presses have been designed for cold pressing most oilseeds without pre-treatment. Contact for prices.

Mini 40

Capacity: 1 ton per day

Mini 100

Capacity: 3 tons per day

Mini 200

Capacity: 5 tons per day

Mini 500

Capacity: 10 tons per day

De Smet Rosedowns
Cannon St, Hull
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www.rosedowns.co.uk

US contact:
Jenkins Centrifuge Company
1123 Swift
North Kansas City, MO 64116
(800) 635 1431
RJenkins@jenkinscentrifuge.com
www.JenkinsCentrifuge.com

Other Oilseed Press manufacturers

IBG Monforts Oekotec
An der Waldesruh 23
41238 Mönchengladbach
Germany
+49 (0) 2166 8682 90
+49 (0) 2166 8682 44 fax
oekotec@ibs-monforts.de

E. Peter Matthies
20 Marshall St.
d-52066 Aachen
Germany
+49 241 160 7122
+49 241 160 7123 fax
fruitoil@hotmail.com
(Matthies serves as a U.S. sales contact for Komet presses)

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60 Okner Pkwy.
Livingston, NJ 07039-1604
(973) 535-9200
Manufacturer of standard and custom ultra-sanitary crushers for hops, seed and oilseed crushing applications.

Pulva Corp.
P.O. Box 427
Saxonburg, PA 16056-0427
(724) 898-3000
www.pulva.com
Pulva Corporation produces crushers. You can send them a 5-gallon pail of seeds and they will crush them for a free test trial. See their Web site for more information.

The French Oil Mill Machinery, Inc.
1035 W. Greene St.
P.O. Box 920
Piqua, OH 45356-0920
(937) 773-3420
The French Oil Mill Machinery manufactures oilseed crushers on a small and large scale.

ATTRA has an eight-page document that shows schematic drawings and photos of hand-powered oilseed presses, along with very small-scale electric powered presses. Call 800-346-9140 and request the "Small Scale Oilseed Presses" document.

Other equipment manufacturers and suppliers

BAR N.A., INC.
309 W. Hensley Road
Champaign, IL 61826-7200
(217) 398-0000, ext.222
(217) 398-0002 fax
This company produces small-scale planting and harvesting threshing machines. The company also makes processing equipment for soy milk, dairy analogs, tofu, mechanical extraction of processing equipment for vegetable oils, infant foods, low-cost foods, filling, packaging and labeling and snack TVP.

Seedburo Equipment Company
1022 W. Jackson Blvd.
Chicago, IL 60607
(312) 738-3700
(800) 284-5779
(312) 738-5329 fax
sales@seedburo.com

ALMACO
P. O. Box 296
99 M Avenue
Nevada, IA 50201
(515) 382-3506
(515) 382-2973 fax
sales@almaco.com

Huntsman, Inc
2362 Warren Ave.
Twin Falls, ID 83301
(208) 733-2214
(877) 733-2214
(208) 733-2240 fax
mail@huntsmaninc.com

Huntsman, Inc. supplies used and reconditioned food-processing equipment, including seed cleaners and packaging.

Food Processing Machinery & Supplies Association
1451 Dolley Madison Drive, Suite 200
McLean, VA 22101
(703) 761-2600
(703) 684-1080 fax
info@fpsa.org

FPM&SA is a nonprofit trade association founded in 1885 to provide a business link between food and beverage processors and suppliers. The association is made up of several hundred industry members. It can provide information about sources of all kinds of equipment and supplies. Processfood.com is the association's electronic marketplace.

Small-to-mid-scale seed cleaners

A.T. Ferrell Company
www.atferrell.com/aboutClipper.asp
This company manufactures clipper fanning mills.

Oilseed production and processing

Schumacher, Joel. Small Scale Oilseed Processing. Briefing Number 88. May 2007. Montana State University Extension Service.
www.ampc.montana.edu/briefings/briefing88.pdf

Grubinger, Vern. Final Report: On-farm Oilseed Biodiesel Production. May 2007. University of Vermont Extension Service.

How to Process Oilseeds on a Small Scale.
www.howtopedia.org/en/How_to_Process_Oilseed_on_a_Small_Scale

Food Protein R & D Center
Cater-Mattil Hall 373 Olsen Blvd.
2476 Texas A&M University
College Station, TX 77843-2476
(979) 845-2741
(979) 845-2744 fax
marwaha@tamu.edu

The mission of the Oilseeds Processing Program is to conduct basic and applied research to help add value to oilseeds and to serve as a technical resource to the oilseeds processing industry.

The Oilseeds Processing Program has experience with essentially all row-crop oilseeds as well as a number of industrial crops. Row crop expertise includes familiar edible oilseeds such as soybeans, cottonseed, corn germ, canola, peanuts, sunflower seed, safflower seed and flax seed. Industrial crop expertise includes castor seed, rape seed, crambe, jojoba and others in various stages of commercialization. Specific services include practical short courses and customized training.

Oilseed meal and animal feeding

Pilgeram, Alice. Camelina Sativa, A Montana Omega-3 and Fuel Crop
www.hort.purdue.edu/newcrop/ncnu07/pdfs/pilgeram129-131.pdf

Specifications on Sunflower Meal. Meal/Whole seed Feeding of Sunflower. National Sunflower Association.
www.sunflowernsa.com/wholeseed

Canola Meal Feed Guide. Canola Council of Canada.
www.canolacouncil.org/canola/canola-meal.aspx

Animal Feed Resources Information System — Canola Oil
www.fao.org/ag/aga/agap/frg/afris/Data/724.HTM

Saskatchewan Canola Development Commission
www.saskcanola.com/canola/meal.html

Lardy, Greg. Biodiesel Benefits for Cattle Producers: Feeding Byproducts of Biodiesel Production. 2008. Western Organizations of Resource Councils, Billings, MT. 28 p.
www.worc.org

Publications from organizations

Several private, nonprofit organizations involved with development work around the world have publications that provide information on technologies appropriate for smaller-scale farms and businesses. Publications

related to small-scale oilseed processing are followed by contact information for the organizations that distribute them.

Now Build This – The Sunflower Seed Huller and Oil Press.

Digitized print of original article by Cox, Jeff. 1979. The sunflower seed huller and oil press. *Organic Gardening*. Rodale Press. April. 13 p.

www.green-trust.org/2000/biofuel/sunfloweroil.htm.

Enterprise Works Worldwide (EWW)
1825 Connecticut Avenue NW, Suite 630
Washington, DC 20005
(202) 293-4600
(202) 293-5698 fax
info@enterpriseworks.org

Herz, Jonathan. 1995. How to Use Your Ram Press. EWW.

Herz, Jonathan. 1997. Using and Maintaining the Ram Press. EWW. 42 p.

Herz, Jonathan. 1995. Construction of the CAMARTEC BP-30 Press: A Workshop Manual. EWW. The EWW manual describes feed rations for commercial broiler chickens, cows and pigs that include sunflower seed cake.

Practical Action Publishing [formerly known as the Intermediate Technology Development Group (ITDG)]
To subscribe to Waterlines or Enterprise Development and Microfinance, contact:

Subscription Manager
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Colchester, Essex, CO28HP, U.K.
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<http://practicalactionpublishing.org>

To order a book, call:
+44 (0)1926 634501 (9 am to 5 pm, Monday to Friday, U.K. time)
+44 (0)1926 634502 fax
www.developmentbookshop.com

Anon. No date. Principles of Oil Extraction. Practical Action Publishing. 11 p. (316K PDF)

Anon. No date. Food Processing Building Design. Practical Action Publishing. 3 p. (60K PDF)

Potts, K.H., and K. Machell. 1993. The Manual Screw Press for Small-scale Oil Extraction. Practical Action Publishing. 72 p.

This book describes a small-scale process of oil extraction for use in rural areas, as well as ways to market and distribute the oilcake.

Anon. 1993. Oil Processing. Practical Action Publishing. 48 p.

This book is aimed at volunteers training for food processing projects and their trainers, and for the non-specialist already involved in projects and seeking specific information on technology choice. Contents cover raw materials from which oil can be extracted, methods of oil extraction and processing, descriptions of types of improved technologies, case studies, a checklist of questions to ask when planning a project or enterprise, facts and figures on a range of pre-processing and extraction equipment, references, further reading and contacts.

Kessler, Nathan. No date. Understanding Solvent Extraction of Vegetable Oils. VITA. 12 p.

This technical brief outlines the procedures and equipment required to extract vegetable oil using solvents.

PACT Publications
1200 18th Street, NW
Washington, DC 20036
(202) 466-5666
books@pacthg.org

ECHO
17391 Durrance Rd.
N. Ft. Myers, FL 33917
(239) 543-3246
(239) 543-5317 fax
echo@echonet.org
<http://echobooks.org>

Educational Concerns for Hunger Organization is a nonprofit Christian organization dedicated to the fight against world hunger. ECHO's Web site provides access to resources and services for small farm tropical agriculture from around the globe. ECHO's most popular publications are online and include several about oilseed crops. A for-sale publication is The Manual Screw Press for Small-Scale Oil Extraction.

Web sites

Tiny Tech UDYOG
www.oil-refinery.com/

Armfield Limited
www.armfield.co.uk/

Palm Oil Processing
www.fao.org/DOCREP/005/Y4355E/y4355e04.htm

The Sunflower Seed Huller and Oil Press
http://journeytoforever.org/biofuel_library/oilpress.html

Minor Oil Crops – Individual Monographs
www.fao.org/docrep/x5043e/x5043e00.htm

Specialty Olive Oil Production
www.sfc.ucdavis.edu/pubs/SFNews/archive/94111.htm



Camelina grows in a Montana field.

Notes

Oilseed Processing for Small-Scale Producers

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This publication is available on the Web at:

www.attra.ncat.org/attra-pub/oilseed.html

or

www.attra.ncat.org/attra-pub/PDF/oilseed.pdf

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