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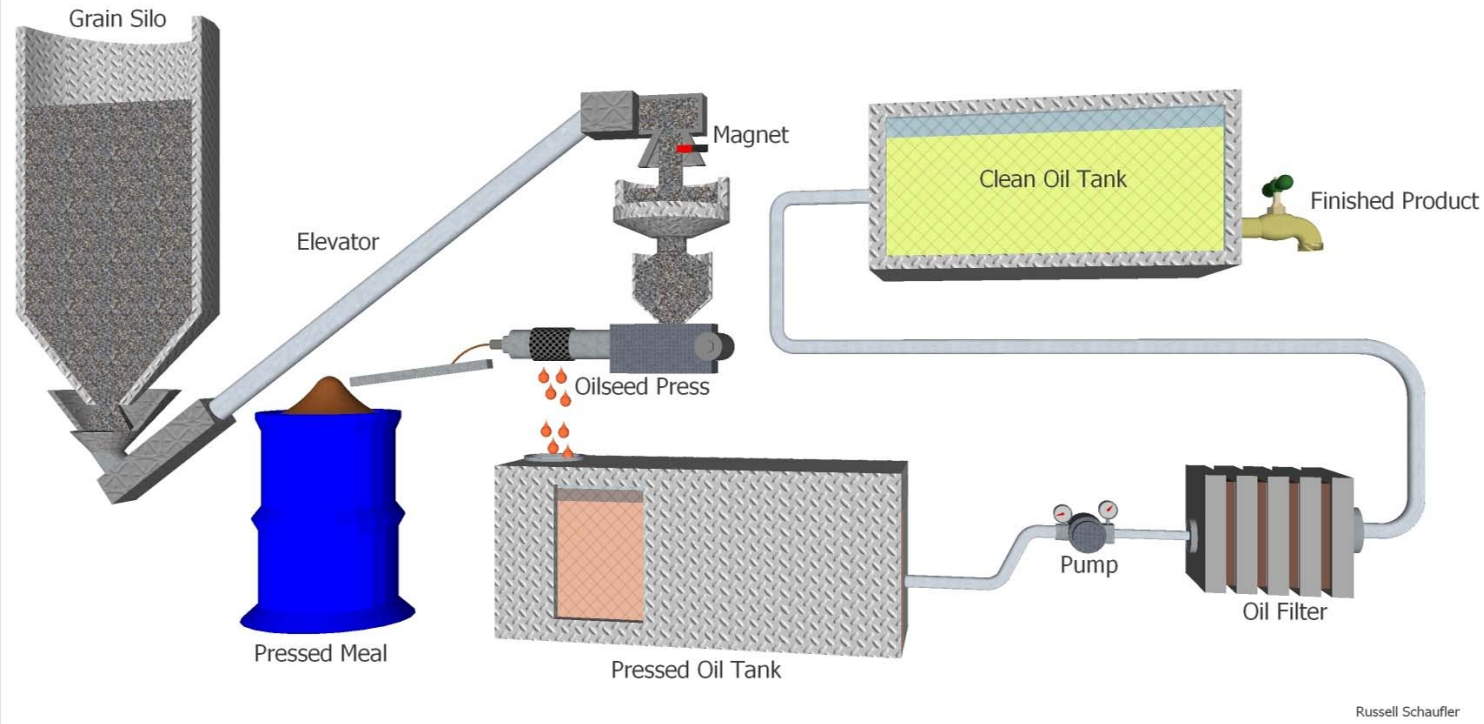
Oilseed Fact Sheet: Overview of Small-scale Oilseed Processing



Introduction

Small-scale oilseed involves many steps. Despite being simpler than the commercial equivalent, there are a number of important steps that must be taken to make the system effective. From the grain silo, where the seed is stored, to the finished product, this factsheet covers the process that the small-scale producer may employ when processing oil from oilseed.

Grain Silo

After being harvested and cleaned, the seed to be used for processing is placed in the grain silo, where it is stored. Grain silos are kept under specific conditions for storage, such as certain humidity levels; these vary from seed to seed. Since the oilseed press, crucial to the operation, can run 24 hours a day, 7 days a week, the storage unit can be used to store seed for many days of oilseed processing.

Auger

When the seed is needed for processing, it must be moved to the expeller press for oil extraction. The majority of the oilseed processing procedure uses gravity as the feeding system. The elevator is one process where this is not done. The auger, or elevator, is essentially a screw inside a tube, which spins and pulls the seed from the bottom of the silo upwards to be fed into the press. A belt conveyor also may be used to convey the seed.

At the top of the elevator, positioned above the press, the auger releases the seed downward above the press. As the seed leaves the auger, a magnet inside the discharge collects ferrous metal debris from the seed (Figure 1). Examples of this debris are screws that have fallen loose in the machinery, metal filings from the elevator itself, and other metal shards which have escaped the seed cleaning process.

From the auger, the seed falls into a cone that contains a high-low switch. These switches sense when the funnel is full or empty beyond a certain point, and turns the elevator on and off when necessary to keep the cone full. In this way, the seed feeding into the press does not need to be monitored, as the switch will prevent the feeding

Penn State Extension

Oilseed Fact Sheet: Overview of Small-scale Oilseed Processing

Figure 1: Ferrous metal debris collected by the magnet in the nozzle.

system from overflowing. A third "overflow" switch should be used as a safety switch in case the high level switch fails.

Oilseed Press

From the funnel containing the high-low switch, the seed is fed into the hopper on the expeller press (Figure 2). The press is a crucial part of the system, as it extracts the oil from the seed. An expeller press is composed of several components. From the hopper, the seed is fed into the barrel, in which a screw slowly turns. The screw pulls the seed forward, where it is crushed, squeezing the oil back into the barrel, where it is released from a series of small holes to be collected. The crushed seed is compacted and extruded through the press head, where it can be collected.

The extruded pulp, known as meal, can be used for a variety of different functions. Meal is commonly used as feed for cattle, as it is high in protein. It can also be used as pellets in stoves, which burn the meal at high temperature for heating both homes and other buildings. The meal can also be used as fertilizer.

Due to its oil content, meal must be used fairly soon after it is collected; the oil in the meal will go rancid over time. The expeller press does not remove all of the oil from the meal; the amount which can be extracted depends on the press settings. Expeller presses usually have adjustable tip diameters and a variable speed drive.

Pressed Oil Tank

The oil which is pressed in the expeller press comes out in a steady drip or stream, and is collected for further processing. Depending on the operation in question, this container could be as simple as a jug, a 55-gallon drum, or as complex as an oil tank designed for oil storage.

The most effective system collects the oil in a sealed tank. In this case, the oil going from the press to the tank should be covered to prevent outside contaminants from entering the oil.

The tank should be built from a smooth material which will resist corrosion by the oil. Stainless steel and food-grade plastics are the most common materials. Materials such as copper and aluminum are not desired.

The oil that has been extracted at this

Figure 2: Small expeller press for extracting oil from seed.

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point will contain small bits of debris that escaped the press, called the foots. Foots are suspended in the oil, and must be removed. Different methods are used for removal of the foot. The first involves settling the oil in the tank, allowing the foots to fall to the bottom of the tank, at which point the cleaner oil is moved on.

Some processing systems use a second method. In this case the oil is stirred in the tank, keeping the foots suspended. The foots are then completely removed in the next process. Either way is effective. Often a combination of the two is used.

The Pump

In order to enter the final stages, the oil must be moved from the oil storage tank to the filter, which will finish cleaning the oil. The diaphragm pump is the most effective pump design for this process (Figure 3). Diaphragm pumps work in the same way as the human heart, moving the oil through a series of chambers through valves.

Other pumps which are commonly used are screw-type pumps, which create the flow using a slowly turning screw. Centrifugal pumps are not effective, as the oil moving to the filter must be kept at a constant pressure. Pumps of all types are either electrically operated, or powered via compressed air.

Figure 3: A small diaphragm pump.

Filter

The pump from the previous step delivers the oil from the oil storage tank into the filter, the next component in the process. There are a number of different types of filters, but one common design is the filter press.

The pump pushes the oil through a pressurized filter made of a cloth mesh. The filtering agent is usually diatomaceous earth, a fine powder consisting of ground up diatoms. To place the agent into the filter, the diatomaceous earth is mixed with clean oil and pumped through the filter press, depositing the agent on the meshes. The oil to be filtered is pushed through, capturing any foots inside the filter press in the form of cakes.

The filter press must be regularly cleaned out when full. The cakes must be removed. The clothes do not need to be cleaned with every filtering.

Clean Oil Tank

Once filtered, the clean oil is pumped into a clean oil tank. This tank is similar to the pressed oil tank, except it is now only a storage unit. It must be sealed, like the pressed oil tank, to preserve the oil inside. Even when cleaned, the oil contains oxidants which will cause the oil to go rancid after a period of time in exposure to air. For this reason, it is best kept sealed away from oxygen.

Oilseed Fact Sheet: Overview of Small-scale Oilseed Processing

In some cases, an inert gas such as nitrogen is pumped into the tank, to replace the oxygen and keep the oil fresh. In other instances, keeping a vacuum in the tank performs the same function.

The oil at this point is ready to be packaged as the final product, or moved on for further processing. Most small-scale processors will bottle the oil at this point.

Summary

The oilseed processing system is a complex and carefully managed procedure. From the storage of the seed, to the extraction of the oil and further cleaning and storage, it is important to maintain and understand the system. This factsheet detailed the process from fresh seed to the final cleaned oil.

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