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COMPLEMENTING YOUR BASIC PROCESSING MACHINES

Bill Gregg

The basic cleaning operations performed by basic processing machines generally do the bulk of the processor's work in changing field-run seed into a high-quality product ready for planting. However, they will not always remove all undesirable seed, and capacity may not be as high as desired. The progressive processor is always looking for ways to improve his efficiency.

Consideration should always be given to whether a particular crop or weed seed should be removed in the field or in the cleaning plant. It is poor management to grow seed in weed patches, make no effort to clean them up, and then expect the processor to separate everything from the crop seed. Every processor should have a field man who knows processing, weed and insect control, and fertilizers. The field man can work with growers—help them select clean fields and keep them clean.

Special-purpose machines can sometimes increase processing efficiency, or remove a contaminant, and make their use not only practical but necessary. These machines can be divided into two categories: machines which improve the condition of your seed before actual processing; and, machines which will make a specific separation, based on specific seed differences. These machines, properly used, will complement the operation of basic cleaners to produce a higher quality product in a more efficient operation.

The first such machine, the scalper, is actually a precleaner. It is intended to "scalp off the top", to make a rough removal of sticks, straw, and other inert from a seed lot before it is cleaned or stored. In my opinion, every dryer or processor of seed should have and use a scalper. Reduced drying costs, less elevator plugging, and faster processing of scalped seed will pay for a scalper in a short time.

A wide range of types and sizes of scalpers are available. Screen scalpers range from a single "airless" screen to multiple-screen scalpers with 1 or more air separations. There are reel screen scalpers ranging from huge receiving scalpers to the reel on disk-cylinder separators. Some scalpers include an aspiration, while others use only an air separation.

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For maximum effectiveness, the scalper should be used as soon as the seed come in. For example, a high-capacity scalper can scalp wheat, oats, peas, peanuts, etc., before they go into storage. This will often reduce the storage space needed. Scalping to remove high-moisture trash will enhance drying and storage of freshly-harvested seed. Scalping before the seed are cleaned will usually put the seed in better condition for processing, increasing the capacity of cleaners and the precision of separations. A processing line scalper should be mounted at the first point in the line. It will reduce the bulk of material going into your cleaners. This prevents elevator and feed-hopper plugging, reduces the bulk of material that must be removed, and allows you to make closer separations.

The Huller-Scarifier was designed for a specific job - to remove hulls from seeds and to scarify hard seed coats. This is usually accomplished on a production scale by some means of rubbing the seed against an abrasive surface, although heat, irradiation, and acid can also be used to scarify seed. When seed are scarified mechanically, the scarifier should follow the air-screen machine, or be further down the cleaning process. After all foreign material has been removed, more uniform scarification can be done. This allows all seeds to be scarified properly, with a minimum of seed damage.

The amount of hulling necessary depends, of course, on the seed being cleaned. Seed may be hulled to increase seed weight, and to make processing and planting easier. Hulling may change the physical characteristics of your seed enough to make possible the separation of a weed seed that could not be removed from unhulled seed.

In some installations, the huller is located between a scalper and the air-screen machine when all seed must be hulled. If only a portion of the seed require hulling, the huller is located so that it can be fed from the cleaner that separates hulled from unhulled seed. Hulled seed are fed from the huller back into the cleaning line.

The scarifier-huller is a useful machine in processing clovers, lespedeza, alfalfa, and some grasses. As a huller, it improves the efficiency and uniformity of processing and planting. As a scarifier, it gives more uniform field stands of crops that contain hard seed.

The scalper and the scarifier-huller put the seed in condition for easier handling. Some machines that actually separate seeds are the spiral, the draper, and the vibrator. These separate seeds by differences in their ability to roll or slide under different conditions.

The spiral separator is a very simple machine with no motor and no moving parts. It consists of a vertical arrangement of sheet metal spirals set at a certain pitch. It resembles an open screw conveyor standing on end.

The seed mixture is fed onto the inner spiral from a hopper at the top of the machine. As seed travel down this inclined inner flight, the round seed gain
momentum and roll at a much faster speed. They soon roll over the edge of the inner flights and fall into the outer flight. They are discharged from a separate spout.

Less round seed tend to slide or move more slowly. They remain on the inner flights and discharge through a different spout. Some spirals have several separate flights which all have separate discharge spouts.

The spiral is simple, inexpensive, light and requires little floor space. Its only adjustment is the rate of feed. However, its capacity is limited, and it has a narrow range of separations. As a "separating and upgrading" machine, it is used after the seed have been cleaned down to a single contaminant. Such separations as vetch and dogfennel from wheat, and splits from soybeans can be made on the spiral.

Many spirals were used in the past, particularly in small grain areas. New chemical herbicides have greatly reduced the need for spirals. Also, other machines such as the disk-cylinder and the precision grader will make many of the same separations, and offer more flexibility and higher capacity.

The draper makes a similar separation, but offers more flexibility. It consists of an inclined draper belt which moves toward the high end. When the seed mixture is fed onto the center of the draper, the rounder seed roll or slide and fall off the lower end. Flat seed come to rest on the draper belt, and are carried off the upper end. Slope and speed of the belt can be changed to gain wider separating power. Different draper belts can be used to separate seed that vary in ability to slide. A smooth belt surface will allow smoother seed to slide downhill. Drapers may have from 1 to 4 separate draper belts.

The vibrator separator uses an entirely different motion to make a roughly similar separation. It consists of a tilted deck mounted on an electromagnetic vibrator. This gives the deck a high-frequency, "live-action" vibration, similar to the vibration of a tuning fork. A rheostat control varies the vibration. When a seed mixture is fed onto the tilted vibrating deck, no seed is able to sit completely still. Rougher or flatter seed will be able to gain some footing, and "creep" across the deck toward the high side. More rounded or smoother seed are not stable enough to move up the deck; the vibration causes them to move down toward the lower end of the deck.

Deck tilt and rheostat vibration control can be combined to produce very close separations. For example, pigweed and hulled Johnsonsgrass can be removed from alfalfa with the vibrator. This machine has, however, disadvantages which severely limit its use. The deck surface must be kept small. Larger decks introduce false vibrations which destroy the separation. As a result, capacity is very low. The cost of the machine is high, and it is hardly economical to use them in batteries. The vibrator has been used largely in experimental work.
Decks stacked several high over a single vibrator perform well, but capacity is still low. Seedsmen will be able to solve many difficult separation problems if a high capacity machine is ever developed to separate seeds by imparting this type of motion to them.

Aspirators and pneumatic separators separate seed according to differences in their terminal velocities. Terminal velocity is the air velocity that will suspend a seed if it is placed in a rising air column. When an air column is adjusted to a given terminal velocity and mixed seed are dropped into it, all seed with terminal velocities less than the air velocities will be lifted. Seed with terminal velocities greater than the air velocity will fall down through the air column. Seed characteristics such as shape, surface texture, and specific gravity all affect a seed's air resistance and its terminal velocity.

Both aspirators and pneumatic separators employ this principle, but in slightly different ways. The aspirator has a fan at the exhaust end of the separating air column. This creates a vacuum or negative pressure in the separating column. The pneumatic separator has a fan at the air intake, which creates a positive pressure, greater than atmospheric pressure, in the separating column.

The positive-pressure pneumatic separator operates much like a laboratory seed blower. A seed mixture is dropped into a vertical air column. The air is adjusted, by a lever at the fan intake, to blow the lighter seed fraction up into a discharge pan and out a spout. The heavier crop seed fall down through the air column until they reach a sloping screen placed across the air column. They then slide off this screen to the heavy seed discharge spout.

In the aspirator, the exhaust fan draws air through a falling curtain of seed. Heavy seed fall through the air column, while lighter seed are lifted to separate discharges. The air chamber in some aspirators has a moveable side. This allows the air velocity to be decreased as it moves up the column. As the air velocity decreases, it will drop below the terminal velocity of some of the lifted seed. They will drop out of the air column into intermediate discharge spouts. With this feature, a seed mixture can be fractionated into heavy, light, and one or more intermediate fractions. This is the "fractionating" aspirator.

Several different aspirators and pneumatic separators are available, and will produce excellent results when properly used. Aspiration improves scalping; combined with reel or flat screens, an air separation will remove dust and other fine material along with larger trash.

These separators will remove lightweight and immature or broken crop seed, and weed seed whose terminal velocities are different from that of the crop seed. They have proven very useful to upgrade seed by removing specific contaminants. For these separations, aspirators or pneumatic separators are located in the final phases of the cleaning process.
The successful processor realizes that seed processing is more a science than an art. He examines his seed, and notes differences in the seeds' physical properties. Two kinds of seed that differ in degree of roundness or smoothness may be a job for a spiral or draper. If the seed appear to differ in the characteristics that cause air resistance, an aspirator or pneumatic separator may be able to separate them.

Low capacity, elevator or feed hopper plugging, heavy rates of trash removal by a separator, may show a need for a good scalper. If hulls or hard seed are a problem, don't risk trying to remove them with a combine - use a huller-scarifier which can be closely controlled.