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How to Get the Most from Your Seed Cleaner

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Preparing Seed for Cleaning

Many older seedsmen will remember that the purity of seed coming from the old time threshing operations was such that it was almost good enough to bag and tag without further cleaning.

On the other hand, seeds harvested with modern combines may contain as much as 60 to 70% foreign material — consisting of trash, weed seeds, stems, leaves and freshly killed insects. Much of this material may be green, making the seeds difficult to handle and dangerous to store until this foreign matter has been removed. Therefore, in many seed cleaning plants today the first machine used is a scalper. The scalper removes the bulk of the foreign material so the seeds can be mechanically handled and safely stored until the cleaning operation can be finished. Scalper machines may consist of simple reels to remove the long straws, or they may incorporate a flat screen to separate the long straws and the green material. They may also be a combination of top screens or bottom screens necessary to handle the kind of seed coming in. These machines are built with a fan if it is desirable to have an air separation while the seed is being scalped. The scalper with air takes off large foreign material with the top screen and sifts out sand and small weed seeds with the bottom screen.

After most of the foreign material is removed further special processing of the commodity may be required to prepare it for final cleaning. Clipped blue grass seed may have to go through either machine to break the seed free from the plant even before scalping. Other seeds may go to a debearder machine, which in effect finishes the threshing of the seeds by removing awns, points of attachment, beards and excess chaff and delivering them as individual seeds ready for accurate cleaning with the finishing cleaner.

The debearder is made up of a horizontal steel drum in which stationary arms are positioned along the inside to prevent the mass of seeds from swirling inside the machine and a central beater shaft with hardened arms extending out into the body of the debearder which turns through the seeds to finish the threshing. One function of the debearder is to break apart grass seed doubles. Another is to remove the awn and outer glume from watergrass seed harvested with sudangrass seed and in the process to break apart clusters of sudangrass seed. When the glumes and awns have been removed by the debearder, the size of the watergrass seed is greatly reduced so that a very easy and quick separation can be made with a screen. Other uses for the debearder are the shelling of unthreshed wheat kernels commonly called whitecaps, the debearding of barley and the removal of barley points of attachment, removing the whiskers from carrot seed and the partial decortication of sugar beet seed. The most common use is for clipping seed oats. When seed oats are clipped by the debearder, those oats that are still wrapped in the outer glumes are detached from the glumes, double oats are separated, awns (if the oats carry awns) are removed, fuzzy tips of chaff on the oats will be clipped, the oats will be polished and their test weight greatly increased. Oats thus processed can be easily elevated and accurately fed through a cleaner hopper. The cleaner in turn can then make a very accurate separation since there will be no doubles or unthreshed glumes riding over the top screen into the screenings. The finished product will not only be exceptionally clean but the appearance of the oats will be greatly enhanced. While clipping the oats greatly improves the test weight, the removal of the chaff, awns and other material hardly affects the actual weight of the product. This trashy material is so light that the loss of weight can hardly be measured.

Some seeds must be hulled with special hulling machinery before they are ready for cleaning; therefore, in many seed plants seed hullers are used before the finishing cleaners.

Many kinds of legume seed carry a percentage of hard seeds making it desirable to scarify (slightly scratch the surface of the seed so that it will absorb water and germinate the first year that it is planted) the seeds either before or after the final cleaning. Some varieties of seeds will be scarified long after they have been thoroughly cleaned, since the scarification may reduce the length of time that the seeds will maintain viability in storage. Scarification in those varieties may be performed shortly before the actual planting time. Other kinds of legume seeds may require both hull

ing and scarification. The hulling of many kinds of grass seeds in the hulling and/or scarification of legume seeds is generally accomplished with a huller and scarifier machine which in some manner causes the seeds to be abraded by a rough surface to effect the hulling and scarification. The machine our company makes performs its hulling and scarifying by impelling the seeds at controlled velocity against carborundum surfaces within the unit which abrade the coat of seed and either remove the outer coat or scratch the inner coat as is required. This same machine is available with rubber huller surfaces for use in hulling only. It is especially useful in the case of thin skinned legume seeds which have an inner coat that is too thin to resist the abrasion of the carborundum yet which seedsmen desire to hull before planting or finish cleaning.

After the seeds have been properly scalped to remove the excess foreign material harvested with the seed and after they have been clipped, debearded, hulled and if necessary scarified, they are ready for additional processing by means of the cleaning machines normally used by a seed cleaning plant.

Use of Screens

There are now over 200 sizes and shapes of screens in either perforated steel or wire cloth. Some 50 or 60 new screens have been added in recent years to permit seedsmen to make special separations with a screen and air seed cleaner that could not otherwise be made. One example is the size 3 x 16 Special—a new screen woven of tempered steel wire and planned for use as a top screen for market cleaning flax. This same size has developed into a very popular screen used as a top separation of small ragweed from small Korean lespedeza seed. The size 3 x 17 Special, also made of tempered steel wire and especially designed as the top screen for cleaning seed flax, has proved to be excellent as a top screen for red clover and sweet clover. It separates dock, ragweed and other plump seeds as efficiently as the 3/64 x 5/16 perforated metal screen that has long been used for this purpose. The new wire screen gives greater capacity. Triangular perforated screens make special separations of weed seeds from grains and grass seeds. Oblong cross slotted screens permit good separations of split beans from flat beans. Many special sizes of bottom screens for grains have been added to the previous list to permit special separation and perfect cleaning of new varieties of seed grains. The size 6 x 60 wire has a specific usage as a screen to separate yarrow seed from red top seed. These examples will emphasize that it is important to understand the various screens available today in order to get the most from a screen machine.

Large Round-Hole Perforations: The number of a large round-hole perforated screen gives the diameter of the perforation as measured in 64ths of 1". For example, a 64 is 64/64ths of an inch in diameter or 1". This system is used for numbering screens where the diameter is 5½/64ths and larger.

Small Round-Hole Perforations: Round-Hole perforations smaller than the size 5½ carry numbers showing the diameter of the perforation as expressed in fractions of 1". Fractions of an inch relative to small screens are used to permit furnishing perforations that are much closer together as compared to the numbering system used on the larger perforations.

Large Slotted Screens: The size of the perforation of a large slotted screen consists of two numbers—the first indicating the width of the slot as expressed in 64ths of one inch and the second number expressing the length of the slot in fractions of one inch. Generally speaking, the direction of the slot will be in the direction of the flow of seeds on the screen. In many large slotted screen sizes, however, the screen can be had as cross slots with the direction of the slot across the direction of the flow of seed. These are particularly useful as bottom screens for separating split beans from varieties having a relatively flat shape.

Small Slotted Screens: The first number given shows the width of the slot in fractions of one inch. The second number shows the length of the slot in fractions of one inch. An exception to this system is the size 3/64x5/16. This size is almost exactly the same in width as a 1/21 slot, which being one of the very earliest slotted screens used in seed cleaners, is familiar to many seedsmen who have used the older numbering system for years. Among the group of small slotted screens there is a 1/22x½ diagonal which has its slots turned at a 45° angle from the usual direction of seed flow. This screen is useful in some instances when it will allow relatively short seeds to go through or causing relatively longer seeds to float over the screen.

Triangular Perforations: The size given for triangular screens represents the length of each side of the triangle as measured in 64ths of an inch. The 11 Triangle, therefore, measures 11/64th of an inch for each side. A. T. Ferrell & Co. uses this method whereas another common system expresses the size of a triangle perforation by giving the diameter of the largest circle that can be inscribed.

Wire Mesh Screens: The size of both square wire mesh and rectangular wire mesh screens indicates the number of openings per inch in each direction of the screen. There are two sizes that are sometimes considered oblong for their openings are not perfectly square, yet which are so near to square that the eye cannot detect the difference. These are sizes 18x20 and 20x22. When the letters "SP" are added to the wire mesh screen numbers it indicates that a special tempered wire is used. The 4x24 Sp. is an old screen designed many years ago to be used as a bottom screen for separating buckhorn seeds from clover. It had 24 openings per inch across the screen but the screen was woven from thinner wire than usual so that the openings were larger than the openings of the regular 4x24 screen. This screen is becoming less popular, because while it was satisfactory years ago for use in cleaners that did not have brushes to sweep beneath the screens and keep the perforations clean, the wires are so thin that the action of the brushes tends to distort them. A 6x21 screen is recommended today to do the same job. It is much sturdier and has the same width of opening.

Indented Perforations: Round and oblong screens with the perforation indented below the top surface of the screen are available for corn sizing machines. The purpose of these indented screens is to encourage the kernels to turn on end and fall into the opening rather than to lie flat and slide over. These screens are recommended only in corn sizers which have rubber rolls beneath the screens to keep the perforations clean.

It is of prime importance to select screens which will accommodate the shape of the seed being cleaned. Crop seeds are generally round, long or lens-shaped.

Round Shaped Seeds: Generally a round-hole top screen and a slotted bottom screen are used to clean

round shaped seeds. The round-hole top screen will not accept straw, trash, pods and other large and long material, while the slotted bottom screen will drop broken seeds and weed seeds thinner than the round crop seeds.

Long Seeds: The screens generally selected for cleaning long seed are an oblong top screen and an oblong bottom screen. The oblong top screen will separate any weed seeds or large foreign material that are rounder or thicker than the crop seed. The oblong bottom screen drops thin weed seed, broken crop seed or hulled crop seed and any other material thinner than the long crop seed.

Lens-Shaped Seed: An oblong or rectangular top screen and a round-hole bottom screen are generally selected for cleaning lens-shaped seeds. The oblong or rectangular top screen will permit the lens-shaped seed to turn on edge and go through while rounder or plumper seed and foreign material will go over the screen. The round-hole bottom screen will hold up the lens-shaped crop seeds while permitting any round weed seeds so small that they pass through the top screen to be sifted through the openings and be separated. If the cleaner is a two-screen type the above principle achieves the best cleaning possible.

Most seed cleaning plants today use cleaners having more than two screens to permit special separations with other shapes of openings in the same cleaning operation. As an example, oats containing freshly killed insects with bodies about the same thickness as the oat kernel, yet which are considerably longer, can be cleaned very effectively with a round-hole top screen. The oats in this case drop quickly through the round-hole screen and the very light insects will lie flat on the screen and be scalped over. In using cleaners having more than two screens it is generally recommended that the top screen in the cleaner be a round-hole screen as this opening will screen over straw and long weed seeds better than any other shape. It is recommended that the first screen for use on the lens-shaped Korean lespedeza be a No. 6 Round which will take off the straw, stems, leaf material and cheat seeds before the main separation is made with the rectangular wire mesh top screen. Because Korean lespedeza seeds are lens-shaped, when they are placed on a square wire mesh top screen, the seeds fit diagonally across the square and drop through a smaller mesh than other seeds that have a more round shape. The seeds of rough button weed (also known as pojo) are not distinctly lens-shaped, so the 12x12 wire mesh makes a good separation of this weed seed from Korean lespedeza—at the same time the seed are so near the same size and shape as the lespedeza that neither round or slotted screens will give a clear-cut separation.

The seeds of Kobe lespedeza are also relatively lens-shaped but unfortunately are slightly wider across the seed than Korean seeds so that they will not go through the square wire mesh opening that drops the Korean. Consequently, a larger mesh must be used to drop Kobe lespedeza seed. Unfortunately in this case the larger mesh also passes the rough button weed seeds so that a worthwhile separation will not be made. If this common weed is present in a relatively small percentage, as the seeds come from normal cleaning with a round-hole and slotted top screen the percentage in Kobe will be reduced so that the seeds are salable. On the other hand, if this percentage of weeds is very high, no screen or combination of screens will remove enough of the pojo from unhulled Kobe lespedeza seed to make those seeds pure. The answer is to hull the Kobe and change its relative size making it comparatively easy to remove the rough button weed seeds. It is advantageous to have a mental picture of the crop seed size and shape and a mental picture of the relative size and shape of the weed seed to be separated before choosing the screens that will be used. A good set of hand testing screens are instrumental in determining the size and shape of the screens needed.

The current screen size chart listing various sizes of the various shapes avaliable emphasizes that several different lengths of slots of screens are available or offered. A 1/18x¼ is a good top screen for Korean lespedeza. The short ¼" long slot drops the small Korean seed and at the same time causes longer weed seeds such as cheat to lie flat and be floated over. The use of this screen, however, reduces the normal capacity that is expected from the cleaner by about three-quarters. The reason is that the width of the Kobe lespedeza seed lying flat on the screen is almost as great as the length of the slot so that each seed has to fit very exactly into the perforation in order to get through. The 1/18x½" and 1/18x¾" slots which have a longer opening yet retain the width, will drop Kobe lespedeza much faster while making the same good separation of plump or round-shaped weed seed.

In selecting a bottom screen for wheat, the purpose is to drop split kernels of wheat as well as long, grassy weed seeds such as cheat and wild oats. The wheat kernels are relatively round and the length of slot whether it be short or long is immaterial relative to holding up the commodity. This length of slot, however, can very drastically effect the long weed seed which must drop through. The best job, then, is done with a slot long enough to quickly and easily accept these long weed seeds permitting them to be quickly screened from the wheat as soon as possible.

When selecting a bottom screen for oats the fact must be considered that a long shot will give the oats an extra opportunity to pass through, therefore, while a better separation might be possible with a ¾" long slot it might be far more economical to use a ½" long slot instead.

The constant brushing of the screen cleaning brushes under wire screens causes them to wear out faster than the perforated metal type. Many seedsmen have asked if perforated metal slotted screens were available in the same sizes as wire mesh screens for cleaning small legume seeds. There are two major reasons why a substitute of this kind would not be practical. One is that the irregularities of the surface of a wire mesh screen permits it to do a better job of sifting than is possible with a flat perforated metal screen. The other basic reason has to do with the percentage of open area. Obviously it is possible to weave a wire mesh screen with a much higher percentage of open space than would be possible with a perforated metal screen having the same size opening. A wire mesh screen has literally tens of thousands more openings, therefore, we find tens of thousands more opportunities for small material to be sifted through, with the end result that a wire mesh bottom screen will give much greater capacity and a better separation than could be had with an equal size of perforated metal.

There are two simple, inexpensive devices used to get greater efficiency from the screens. One is a blanket which is put over the top screen to hold long sticks and stems flat on the screen so they cannot

turn on end and go through with the good crop seeds. The other is a series of screen dams which are placed on the bottom screens to retard the sliding motion of the seed traveling down the screen causing the commodity to be heavily sifted so that the small weed seeds will work their way to the bottom of the seed depth and be sifted through as is expected. These dams will permit running a heavier layer of seed on the bottom screen with the assurance that better separation and greater capacities are obtained.

Handling of Air

Improper air trunking installations from the cleaner and into the dust house or collector causes up to 90% of the difficulties our salesmen have had in conjunction with improper air movement. Sharp turns, improper junctions, poor connections and poor collection equipment will all contribute to air deficiency in a cleaner. Improper air clearance also results in a very dirty, dusty plant operation. The following are a few of the common errors found in various plants and how each can be avoided or corrected:

A single fan cleaner having only the variable-speed bottom blast fan must have a booster fan between it and a cyclone dust collecter if a cyclone is to be used. These single fan cleaners are generally installed with the fan discharge near an outside wall so the fan can discharge out into the open air. In some cases it is necessary to blow the dust so that it is run into a large expansion chamber that will permit dust and light chaff to settle while permitting the air to continue on through and be discharged relatively clean.

The dustless cleaners with top suction fans and the bottom blast fan develops sufficient velocity that cyclone type collectors or dust houses can be used to settle the dust and chaff from those air streams without a booster. Usually the dustless model cleaners have two top suction fans discharging side by side. Some larger models have as many as three fans, in which case the third fan must be handled separately. Separate collectors, one for each fan, are the ideal set up. However, unless too much air volume is dealt with, it is cheaper to bring them together by means of a junction with a divider valve installed into a single air pipe and use a single air collector or single dust house. When such a junction is made, the approach angle should be held to a minimum and, I repeat, the junction divider is very important. If the pipes are brought together too abruptly or if the divider is not installed, back pressures are created which impede the proper flow of air. In fact, as the two air streams converge one opposes the other and it is found that when an air adjustment is made on one fan it will affect the separation that is being made with the other fan.

Refrain from installing elbows which have a sharp change of direction. Back pressures are created at such points and in most cases light chaff will be dropped into the pipe and finally plug the entire run. A rule of thumb used at our plant is that the inside radius of the elbow should be at least two times the diameter of the pipe.

The final source of trouble is in the cyclone or dust house itself. If it is either too large or too small or isn't designed properly or has a cap over the pipe discharging from the top of it or in some other way causes back pressure or pressure drop or turbulence that interferes with the cycloning action of the air inside of the collector, the installation will cause real trouble.

Many seedsmen build their own dust houses. If a house is properly designed and is large enough, it will serve the purpose very well. Space does not permit detailed explanations of the following eight basic rules governing good dust house construction:

1. The dust house should be deep.
2. The entry duct should be horizontal.
3. The entry duct should be below the pitch of the roof.
4. The entry duct should enter along one side.
5. The exhaust opening should be greater than the entry area.
6. The exhaust pipe should extend below the entry duct.
7. The exhaust pipe cover should not restrict the opening of the exhaust pipe.
8. The clean-out opening should be as large as possible.

A common mistake is the use of a single dust house to handle the air from two separate cleaners. If the individual air streams from each cleaner were adjusted exactly the same, it is possible that a single dust house or cyclone would be satisfactory, however, so many times the plant will be cleaning large seed on one cleaner and small seed on the other and the air streams from the fans will seldom be identical. If one cleaner is operating and the other is idle, there will probably be a blow back into the air ducting of the inoperative machine. This will either plug that cleaner's piping with dust or cause the dust to be blown back into the work room. It is impossible to adjust one cleaner in this situation without affecting the standing adjustment of the other cleaner.

Summary

The following is a condensed summary of this article emphasizing the very important factors which determine the efficiency of a seed cleaning operation.

1. Know the screens that are available.
2. Be able to recognize the nomenclature of the screens so that if additional screens are needed, they can be quickly ordered.
3. Learn the principles of selecting screens according to the shape of the seeds being cleaned.
4. Have a knowledge of the seed being cleaned and the weed seeds that must be separated so that the most efficient sizes and shapes of openings can be selected.
5. Be equipped with a good selection of hand testing screens so that pre-run tests can be made.
6. Install the cleaner with proper air trunking and correct dust collecting devices.
7. Make certain that the screens, brushes, rollers and other operating parts are in A-1 condition so that the cleaner can do the work for which it was designed.

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