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## SELECTION OF SCREENS FOR CLEANING SEED

James Henderson<sup>1/</sup>

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 separations 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 5 1/2/64ths and larger.

Small Round-Hole Perforations: Round hole perforations smaller than the size 5 1/2 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

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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  $3/64 \times 5/16$ . 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  $1/22 \times 1/2$  diagonal which has its slots turned at a 45 degree 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  $11/64$ ths of an inch for each side. A. T. Ferrell and Company 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  $18 \times 20$  and  $20 \times 22$ . When the letters "SP" are added to the wire mesh screen numbers it indicates that a special tempered wire is used. The  $4 \times 24$  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  $4 \times 24$  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 open, the wires are so thin that the action of the brushes tends to distort them. A  $6 \times 21$  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 is 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 12 x 12 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 screen 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 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 saleable. 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 the various sizes of the various shapes available emphasizes that several different lengths of slots of screens are available or offered. A  $1/18 \times 1/4$  is a good top screen for Korean lespedeza. The short  $1/4$ " 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  $1/18 \times 1/2$ " and  $1/18 \times 3/4$ " 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 affect 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 slot will give the oats an extra opportunity to pass through, therefore, while a better separation might be possible with a  $3/4$ " long slot it might be far

more economical to use a 1/2" 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.