The Simon-Carter Precision Grader is a unique, rugged, extremely precise, yet simple width and thickness separator. It is available in seven different styles or models, all of which employ either slotted or round perforated cylindrical screens and hold 1, 2, 4 or 6 screens per machine. (Figure 1 illustrates a 6-cylinder machine).

Construction

The primary component of the Precision Grader is the cylindrical shell which is approximately 12 inches in diameter and 60 inches long. These shells or screens are produced from cold rolled aluminum killed steel and are cyanide hardened by immersion in a molten cyanide bath of 1300 to 1350 degrees Fahrenheit for approximately 12 minutes before being cold water quenched.

There are three types of perforations used in the production of these screens. The slotted perforations are available in widths of 3/64" to 24/64" and are located at the base of a "corrugated" groove having steeply slanted sides (Figure 2). Each slot in one entire screen is punched by the same die and maintains a tolerance of plus or minus 13/10,000 of an inch. The shape of the screen is that of a many-sided polygon with each row of slots contained in its own flat surface plane.

Round hole perforations are available in two styles. The hole sizes from 13/64" to 26/64" are perforated at the bottom of a deep recess or indentation (Figure 3). For those in the size range of 4/64" to 12/64" a different screen construction is used. In the smaller perforation sizes, periodic deep ribs running the length of the cylinder and spaced about 3/4" apart give rigidity to the shell (Figure 4).

For some separations, an inclined baffle plate or agitator blades are fastened inside the cylinder shells for added conveying and positioning of the product.

The various perforations are kept free of wedged grain by a soft, rotating, five-bladed rubber cleaner mechanism positioned at the top and running the full length of the cylinder shell (shown in Figure 4).

---

1/ Mr. Hartman is associated with Simon-Carter Company, Minneapolis, Minnesota; engineers and manufacturers of machinery for separating, sizing and cleaning grains, seed and other free-flowing granular material.
Operation

The cylindrical screen revolves at approximately 60 RPM while the material to be separated is fed into one end and rolls or tumbles gently, covering more than a third of the screen surface at all times. A combination of gravity, centrifugal force, and product pressure gently forces each particle into a perforation to accomplish a mild "press-fit" for accurate uniform sizing.

In the slotted shell used for thickness sizing, wafer-shaped seeds or particles wider than their thickness are tipped on edge by the humps or ridges between the slots, allowing them to be sized by their narrowest dimension. These ridges also tend to position long particles parallel to the slot for easy entry. The polygon shape of the cylinder increases product agitation and opportunity to contact the slot in the proper position. A continuous spiral channel and slight incline keep the "overs" moving through the shell.

The deep indented, round hole shell is used for width sizing and having the hole at the bottom of the indent forces seeds or particles to upend. If the width of the upended particle is less than the hole diameter, it will then be in the proper position for passing through the hole.

The full length ribs in the round ribbed screen perform the function of agitating and upending the product, not only positioning the particles for entry, but also preventing stratification.

Changing of the cylinder shells from one size or type to another can be accomplished in only three to four minutes due to removable stub shaft construction.

In some machine styles an internal baffle plate inside the cylinder is used with slots less than 8/64" in width to assist in conveying slick elongated seeds like oats and barley. Agitator blades are also used on occasion in the larger round recessed perforated shells to aid in tumbling large slick three-dimensional grains like corn. Both of these accessories prevent "sliding" of the material on the rising side of the cylinder wall.

The soft rubber-bladed cleaner mechanism mentioned earlier gently taps the cylinder, setting up a sharp but gentle vibration. Those wedged particles not automatically freed by this vibration are pushed back into the cylinder when contacted by a rubber blade.

The product passing through each shell depending on the style of machine will either discharge beneath and the full length of the machine or be collected in a vibrating conveyor for discharge at the intake end of the machine. The "overs" of each shell are discharged at the opposite or drive end of the machine.

Various flow arrangements are available which provide flexibility and the possibility of making from one to three separations in a single machine.
Capacities

Capacity per cylinder will vary greatly depending on the product being separated and the percent of total stream passing through the perforation. Generally, the higher the percentage of "throughs", the greater the capacity. The range of seed separation capacities is from 25 to 80 bushels per cylinder.

Conclusion

The above described method which is highly effective for width and thickness sizing, incorporates advanced methods of product orientation, screen cleaning, rapid screen changing, and accurate separation.

Figure 4 - Cylindrical Screen showing ribs running the length of the cylinder.
Figure 2 - Cylindrical Screen with slotted perforations.

Figure 3 - Cylindrical Screen with round perforations.