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James Henderson

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## ADJUSTMENTS FOR EFFICIENT AND PRECISION SEED CLEANING

James Henderson<sup>1/</sup>

One of the recent developments that has contributed to more efficient and exact seed cleaning is the metering hopper for screen and air cleaners. The fluted roll with extended flights feeds a metered quantity of seed into the air leg and onto the screen. While the gate is adjustable for large changes of rate of feed, the basic adjustment is made by increasing or decreasing the speed at which the fluted roll turns and thereby increasing or decreasing the number of measured quantities fed into the air stream.

Spiked fingers on a shaft turning in the mass of seed in the hopper eliminate bridging of trashy seed across the hopper and tend to force the seed down to the fluted roll so that the flutes can pull the seed through into the air leg.

A variable drive mechanism is required for accurate control of feed with this hopper. If you have occasion to clean very trashy seeds with your seed cleaner, which is equipped with another type of hopper, you can change the speed of your hopper roll by simply switching the two outside gears on your hopper drive. The normal arrangement has a 15-tooth gear driving a 60-tooth gear. These are reversible so that you can have the 60-tooth gear driving the 15-tooth gear. This will cause a regular roll-feed hopper or a roll-feed brush hopper to feed very trashy seeds regularly and evenly to the screens. However, if the seed are not extremely trashy, you may find that the extra high speed you obtain by this reversing of gears will make it impossible for you to control the quantity fed onto the screen. For that reason, we offer an intermediate set of gears having 30 and 36 teeth, respectively, which you can substitute for the 15 and 60 tooth gears to give you two intermediate speeds and accomplish results similar to those obtained with the metering hopper.

Possibly you have observed the action of seed on a hand screen when you tap or jar the hand screen with your fingers. It causes seeds to be turned and tumbled so that they present themselves to the openings of the screen and go through faster. You can have a similar action on top screens of your cleaner by simply installing knockers that are adjustable to lightly tap the screens or to strike the knocker pads on the screens a sharp blow for heavy vibration. This serves a dual purpose of enabling you to vibrate the screens so that seeds will pass through very close and small openings and to jar loose any long weed seeds that become up-ended and wedged so tightly into perforations that brushes cannot remove them.

When you attempt to make a very close and accurate separation with a perforated metal bottom screen and at the same time attempt to put a heavy layer

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<sup>1/</sup>Mr. Henderson is Sales Manager, A. T. Ferrell & Company, Saginaw, Michigan; Manufacturers of Clipper grain, seed and bean cleaners and Randolph grain driers.

of seed over that screen, there is always the danger that some of the seed you must separate will be carried over the top of the screen without contacting the perforations and will not be separated. Screen dams can be fastened across the top of the screen to interrupt the smooth flow of the seed down the screen and cause them to be turned, tumbled and heavily sifted. These screen dams, if properly placed, will permit you to put a heavier layer of seed on that bottom screen with assurance that the separation will be correctly made.

Round seed, such as soybeans, have a tendency to bounce and roll over the top of a screen so that some of the beans never contact a perforation but pass over the top of the screen with the screenings. A scalper apron made of canvas can be draped over the upper half of the screen to cause these beans to stop their bouncing, settle and contact the perforations that go through. The apron should not be so long and heavy that pods and trash will be held up in its movement down the screen, but can serve as a baffle to make the bouncing seed settle to the screen and be passed through.

At other times you will be faced with the problem of long stems or weed seeds turning on end to go through a top screen when they could be separated if they would lie flat and slide over. If you drape oil cloth with the slick side down over the top screen, these long pieces of stem or weed seeds cannot turn up on end to go through the round hole top screen but will slide down the screen underneath the smooth oil cloth and be screened over.

You can assure a better separation of these long stems and weed seeds by blanking off the lower section of a top screen. After your good seed have gone through the screen, there is no reason to leave the rest of the perforations down the length of that screen open for trash and weed seeds to find their way through. A temporary blank-off section can be accomplished by putting masking tape and brown paper over the lower section. Permanent blanking off can be accomplished by simply making the screen with a blank metal lower section.

One of the most useful controls on a precision seed cleaner is the variable screen shake adjustment mechanism. This permits the operator to adjust the speed at which the screens are shaken from a very slow speed to a very fast speed. The variable shoe shake mechanism should be operated to accomplish a desired action of the seeds on the screen, not to attempt to get more capacity by shaking the screens faster. For example, if you are putting fescue seed through a small round hole screen, it will be necessary for you to shake the screens rapidly in order to cause the fescue seed to turn on end and go through the round screen. If you shake the screen slowly, they will lie flat and float over the top of that screen. Also, if you're putting bluegrass seed or canary grass seed through a small square wire mesh screen, it is necessary for you to shake the screen rapidly or the seeds will not travel down the wire mesh screen but will pile up on top of the screen and lie dead and will eventually be flooded over with the dirt and weed seed. On the other hand, if you are attempting to make a very accurate and close separation of a small round seed through a small

round screen, either top or bottom, you must shake the screen slowly to allow the seed to come in exact contact with the opening and pass through. Soybeans on a top screen without the apron will bounce if you shake the screen rapidly, therefore, a slow speed is required. Examples of cleaning operations requiring slow speed are a separation of dodder from Korean lespedeza with a 1/16 round hole bottom screen and cleaning of timothy using 1/23 or 1/25 round hole top screen.

Each screen in a precision seed cleaner must be adjustable for different degrees of pitch. Common ranges of pitch adjustment in seed cleaners range from four to twelve degrees. High capacity grain receiving separators may have greater screen pitch in order to move the grain over the screens rapidly but in a precision seed cleaner, these pitches are sufficient to give adequate cleaning capacity while remaining able to make the exact separations required in seed cleaning.

Screen pitch has a much greater effect on the speed at which seed moves through the machine than does shaker shaft speed. The latter can be increased with little effect on capacity, but seed will pass over a screen in the steep position almost twice as fast as over the screen in the flat position at the same shaker shaft speed. The speed at which the seeds pass over the screen has to be considered from the angles of the desired capacity and the desired separation. If the separation is a difficult one, and capacity is secondary, you will naturally want to leave the seed on the screen as long as possible in order to give every possible opportunity to make the separation. If capacity is the important thing and the separation is secondary, then a steep pitch is in order to accomplish a greater capacity. If the separation is quickly made and you wish to move the material separated over the top of the screen quickly, you will want to use steep pitch.

Since it is possible that you will have a different requirement of speed of travel over and through every screen in your cleaner, it is mandatory that every screen be adjustable for pitch and independent of any other screen, and of course, the best time to make a screen pitch adjustment is while the cleaner is operating so that you can observe the results that the changes of the pitch adjustment cause.

For the convenience of those seed processors who do not have multi-screen cleaners but who on occasion need to make more than one type of separation as the seed are passing over the bottom screen, we offer what we call combination screens. These will have two or more different perforations or meshes on one screen frame; for example, if you are attempting to separate hulled oats and wild buckwheat from oats and have only one bottom screen, you may be able to make this separation by using a combination screen that has one section of slotted screen material to drop the hulled oats and another section of triangular perforations to drop the wild buckwheat. There is one very popular combination screen used as a bottom screen for fescue which has four different

sections covered by different meshes or perforations and designed to accomplish a specific combination of separations that a processor requires.

When a manufacturer knows that the seed cleaner he is shipping will be used for cleaning one kind of seed it is easy enough to prescribe a fan speed that will give optimum results and maximum adjustability when cleaning only that kind of seed; however, seed cleaners are generally intended for cleaning several different kinds of seed and it is not unusual to see a cleaner being used in season for cleaning the seed of soybeans and the seed of red top. If the machine is shipped with the proper drive for the fans to supply enough air for cleaning soybeans, then the air adjustment when it is used for cleaning red top will be in the lowest portion of the adjustment and will be rather sensitive. On the other hand, if it is shipped with the fans adjusted for red top, there will not be enough air to make a good separation when heavy seeds such as soybeans are being cleaned. Since precision seed cleaners are equipped with a variable shoe shake mechanism and since the fan speed may be varied over a wide range and the variable shoe shake mechanism permits all other drives to be driven at normal speed, it is possible to furnish a dual drive for a cleaner that will be used for cleaning both heavy and light seed. This dual drive permits the operator to change the fan speed from a high speed supplying plenty of air for heavy seeds to a low speed offering wide range of adjustment for small and light seeds. To make it possible to accomplish this change of speeds quickly and easily, the motor pulley furnished can have double the usual number of grooves and the driven pulleys on the fan shaft be side by side of two different sizes. With different belts, it is possible just to change belts in order to change the fan speeds and this quick changeover assures that the cleaner will offer the best possible air separation for all weights of seeds.

Some of the things that can be built into a seed plant to give efficiency of operation are not necessarily a part of a cleaner but are part of the design of the equipment used in that plant. For example:

1. Every bin used should be self-cleaning with no ledges or flat slopes that will hold up seed, necessitating clean up by hand when changing over from one kind of seed to another.

2. Every elevator should be provided with clean-out slides at the bottom to permit quick and perfect removal of small, residual quantities of seed left in the bottom of the elevator when changing to another kind of seed.

3. Elevator buckets should be held away from the elevator belt by spacers between the bucket and belt to permit the easy and quick blowing out of seeds lodged between the bucket and belt. It is impossible to prevent seeds from getting behind the bucket no matter how tightly you may bolt the bucket to the belt, so the best solution to this problem is to give them room to be removed by a blast of compressed air.

4. Every spout leading from an elevator into a bin should be at a pitch

that will insure that it is self cleaning. Every feed from an elevator to a bin or cleaner should be equipped with an overflow device which could be a pressure sensitive device or an overflow spout. The installation of an alarm system or an overflow spout in a spout between an elevator in a bin or cleaner will prevent backing up of seed into the elevator and stopping and jamming the elevator full to stop its operation.

5. A seed cleaning plant that receives seed in bulk from trucks should be equipped with a receiving pit having a vibro pit that is self cleaning so there is no requirements for an operator to sweep out the truck dump between lots.

6. The pit which houses elevator boots must be large so that an operator can get into it and have free access to the clean out slide and room for vacuum equipment for cleaning up between lots.

7. A vibrating conveyor mounted beneath the cleaner to convey the cleaned seed from one side to the other cleans itself perfectly between lots so that there is no residue for the operator to sweep out and offers the advantage of an installation above floor level with plenty of room beneath the cleaner so that spilled seeds may be quickly and easily cleaned from the floor.

8. Pneumatic unloading installation eliminate the clean-up problem and add great efficiency to plants which must maintain identity without mixtures of lots of seeds coming in one after another.

Following some of these suggestions will assist you to increase the efficiency of your seed cleaning plant and properly adjust your machines for precision cleaning.