- Check wear on front grain pan auger bearings. Defective bearings cause augers to droop and pinch grain.
- Increase the fan speed incrementally.
- Open the chaffer (upper sieve) wide enough (5/8-inch) to prevent grain from getting carried to the returns system. Open lower sieve slightly (1/4 to 3/8-inch) to allow the clean grain to flow to the clean auger and then to the grain tank instead of entering the tailings returns system.
- Typical manufacturer chaffer settings are 5/8-inch and sieve settings are 3/8-inch.

Note that the combine shoe is fine-tuned to perform best when the engine is at rated speed. If you cause the engine to slow significantly, processor, and particularly shoe performance, is adversely affected, so that losses and tailings flow will escalate.

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SETTING COMBINES

for HARVESTING BEST SOYBEAN SEED QUALITY AND MAXIMUM YIELD

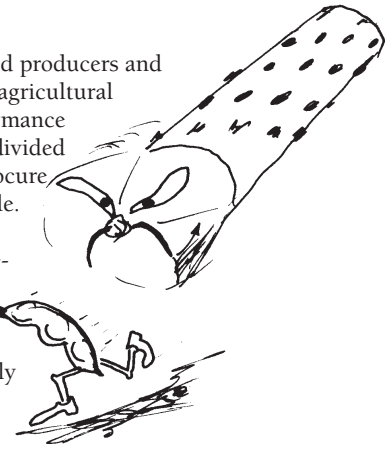
Definition of QUALITY:

Seed Quality and Grain Damage mean different things to different customers. Three methods are used to define seed damage, which affects quality.

1. USDA Soybean Grading Standards

These standards are used by elevator operators to grade field beans. The 10/64-inch by 3/4-inch slotted screen test is used to identify and measure soybean splits. Foreign material is any matter that passes through an 8/64-inch round-hole sieve and all material other than soybean remaining on the sieve after sieving.

2. Visible Damage Check



This check is used by seed producers and Iowa State University (ISU) agricultural engineers for combine performance evaluation. A sample is sub-divided with a Boerner Divider to procure a 100 to 200-gram sub-sample. The sub-sample is screened through the 10/64-inch x 3/4-inch sieve, and then the material on top is examined for damage discernible to the trained eye. Usually we have two people perform separate samples on any given batch from the combine tests and average the readings.

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'Splits + visible damage' is the main criterion used for soybean damage assessment in our engineering work.

3. Chemical Solution Tests

Chemical solutions are used to reveal seed coat damage and other defects. Chemical tests include soaking, dye and germinability. We do not regularly conduct chemical tests at ISU on our engineering soybean samples, simply because of the time needed to test each sample. The chemical soak or dye tests reveal more visible damage to seed coats than a visual damage check.

Combine settings and seed damage—SAMPLE PURITY:

Seed damage is caused by impact, pinching, and shearing. Damage takes place not only in the thresher but in grain handling equipment as well.

Augers are not the best way to move soybeans if damage is to be minimized. Where augers are deployed, *they need to be kept* full to reduce damage! *The same applies to the whole combine thresher and processor.* Seed damage can even start in the header cross auger.

The dominant combine setting affecting soybean seed damage is cylinder or rotor speed, but other settings are relevant. Grain damage tends to increase the square of thresher speed, so the optimal thresher speed is the slowest cylinder or rotor speed that will shell the pods with acceptable loss levels.

Damage also increases at lower moisture contents (<10%) as well as at excessive moistures (>14%). USDA recommends harvesting soybeans at approximately 12% moisture. Assuming that the machine is *run in* (more than 50 separator hours), here is a systematic procedure to minimize seed damage:

Start with the settings in the operator's manual first. Make only one adjustment at a time. An under-loaded machine will increase grain damage. Maintain engine speed for best threshing and processor performance.

1. GATHERING HEAD

- Use a floating cutter bar for lowest losses at the front!
- Check gathering auger and remove sharp edges from the cross auger flighting.
- Cross auger clearance: about 5/8 inch, or 15 millimeters above platform floor.
- Keeping the machine loaded with crop by adjusting forward speed reduces damage.
- Even crop feeding improves quality.

2. FEEDER HOUSE

- Smooth all sharp leading edges on the feeder chain slats.

3. THRESHER

- Smooth down all sharp edges.
- Start with the lower thresher speed recommendation in the operator's manual.
- Tip speed should typically be 3,500 ft/minute (range 2,400-5,000 ft/min peripheral speed, depending on crop conditions). On a 30-inch rotor machine, 3,500 ft/min would mean running the thresher at 445 rpm.
- *Do not* use surface chrome plated wear parts such as thresher bars for vulnerable crops. On chrome-plated wear parts, the brittle plating tends to chip and the underlying material wears away, exposing the hard, thin, sharp chrome edge, which will damage grain. Components made entirely of chrome alloy get better with wear, while chrome-plated parts only get worse. Chrome alloy wear parts are desirable for food and seed grade crops, especially if first conditioned in less delicate harvesting conditions. For example, alloy rasps maintain their rasping ribs.
- Removing concave wires may be desirable for earlier escape of seeds through the concave. Round rod concave bars are gentler than rectangular concave bars, if available.
- Increase concave clearance in small increments to reduce damage. Typical settings are around 3/4-inch open.

4. CLEANING SYSTEM

- Remove any perforated screens under elevator doors, cross augers, or the unloading auger-tube.