



Where Grain Hides in a Combine

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Introduction

Grain quality and purity have never been more important for U.S. farmers than they are right now. The introduction of grains with more desirable end-use traits, combined with the unwillingness of some consumers to use genetically modified grains, have created a substantial need for identity preservation (IP) and quality assurance programs. Crop quality and purity demands often go hand-in-hand. To assure both quality and purity in the “finished product,” quality assurance must be built into production practices. The cleanliness of the combine is one harvest factor that can have a direct and significant impact on the quality and purity of harvested grain.

Residual Grain Contamination

A combine can hold almost 200 pounds of grain and material other than grain (MOG), even after the machine is allowed to “run empty” for several minutes (Figure 1). The data depicted in Figure 1 were collected from machines that were allowed to “run empty” for several minutes in an attempt to remove as much material as possible before cleaning. While it is hard to say exactly how much of this remaining material will end up in the next crop, preliminary research shows that contamination does occur to some extent even after the “initial flush” of a new crop has moved through.

While contamination will still exist in subsequent loads, the rate of decrease in the contamination level is very rapid (Figure 2). The first hopper load (approximately 200 bushels)

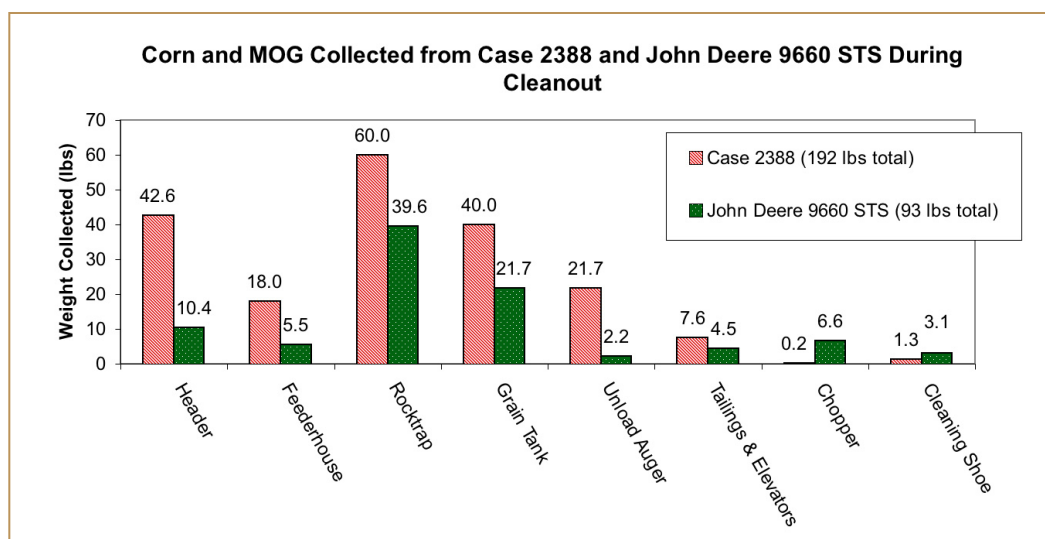


Figure 1. Material collected inside combines during cleaning.

John Deere data courtesy of: Hanna, H.M., Quick, G.R., and Jarboe, D.H. 2004. Combine Cleanout for Identity Preserved Grains. Proceedings of the 2004 International Quality Grains Conference, Indianapolis, Indiana. July 19-22, 2004

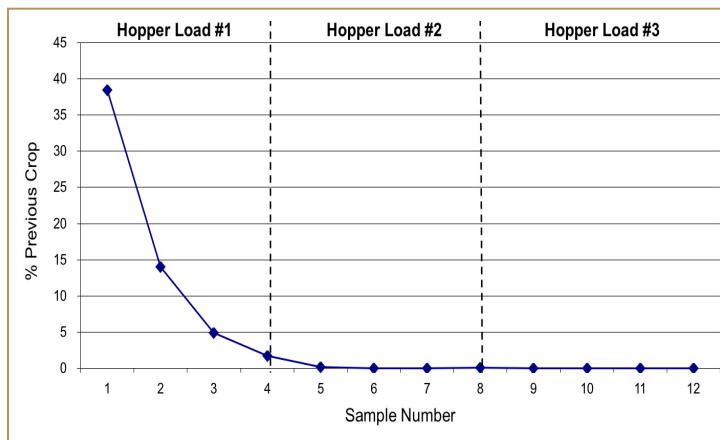


Figure 2. Amount of contamination in the first three hopper loads harvested by the combine following cleanout. The Case 2388 combine harvested corn before soybeans in the fall of 2004. The points on the curve represent where samples were collected.

removed the majority of the previous crop, with trace amounts in hopper two and none detected in hopper three. Once the third hopper had been emptied, approximately 600 bushels of new crop had been run through the system. If the first 200 bushels of crop had been segregated from the rest of the IP grain (and sold as a regular commodity grain) the purity levels of the resulting crop might well be sufficient. It is important to keep in mind that not all of the previous crop will be removed with the initial flush. Grain will collect on ledges in the grain tank and be scoured off a little at a time with subsequent loads (Figure 3). Using an initial flush load that fills the grain tank completely



Figure 3. Ledge in grain tank after approximately 6,000 bushels of corn harvested. Note residue from prior wheat harvest.

can help with this consideration but cannot eliminate it. The only sure way to remove all previous grain from a combine is to physically clean the combine.

Cleaning a combine can be quite the formidable task. It can take anywhere from 45 minutes for a quick cleanout that basically consists of opening access doors followed by blowing off with compressed air, to more than 12 person-hours for some seed producers where identity preservation is essential. However, spending large amounts of time on cleanout does not guarantee pure grain. The combine in Figure 2 had approximately five person-hours of cleanout before it was taken to the field, yet the first of four samples from the first hopper load of soybeans consisted of almost 40 percent (by weight) of corn and MOG that had contaminated the combine.

Cleanout Recommendations

The recommended tool for cleanout is air — compressed and vacuum. If water is used for cleanout, residue inside the machine can form a paste that sticks to internal surfaces and becomes difficult to fully remove. Cleanout should be started at the front of the machine with the header, feederhouse, and rock trap



Figure 4. Emptying of the rock trap.

(Figure 4 & 5). Removing the header may facilitate this process. Once these areas are satisfactorily cleaned, the process should then move to the top of the machine (e.g., grain tank, unload auger and sump) and work its way down, eventually getting to the cleaning shoe and out the back of the machine.

When cleaning a combine, it is important to consider where the greatest chances are for previous grain to enter and commingle with the new grain. For example, cleaning the engine compartment will keep the machine in good condition and prevent fires, but it is not a critical area



Figure 5. Using compressed air to clean out the feederhouse.

with respect to grain quality and purity. There is very little chance that any grain near the engine (or other external surfaces as in Figure 6) will end up in the clean grain stream. In contrast, it is very likely that any material in the header and feederhouse will dislodge and travel through the combine. Fortunately, these areas are fairly easily cleaned with compressed air. For producers who adopt a total systems approach to grain purity, exterior grain and material could pose purity problems because it could be carried into other fields, where it could fall from the machine and start to grow.

Yield Monitoring Moisture Sensor

One often-overlooked area on many combines is the moisture sensor used for yield monitoring. These sensors are located in the clean grain stream and generally do not unload completely without assistance. For example, the Case 2388 combine used in this study contained more than half a pound of clean grain in the moisture sensor when emptied.

Summary

It is important to remember that none of the strategies described above can guarantee total removal of every

For more information about grain quality, visit the Purdue Web site at www.grainquality.org.

possible contaminant. On the other hand, failure to adequately clean the combine will almost assure grain impurity.

Cleaning a combine can take anywhere from a few minutes to many hours, depending on the technique used. Choosing the appropriate technique should be based on the desired level of purity of the grain. The purity level, in turn, is determined by the contract to be filled or by the market for the grain.



Figure 6. Exterior surface material like this has little chance of entering the grain stream. However, it could be carried to and deposited in other fields if not removed.

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