

Episode Title: Grain Bin Safety, Part 3: Stored Grain Management to Minimize Bin Entry

Topic: Preventing Grain Engulfment Through Stored Grain Management

Episode Summary: We continue our grain safety series by exploring how better stored grain management can reduce the need to enter grain bins and lower the risk of entrapment or engulfment. Listeners hear perspectives from farmers during a panel discussion connected to the film *SILLO*, where speakers discuss the importance of planning ahead, maintaining open communication, and having backup plans when grain does not flow properly. Their message is clear: slowing down, thinking through problems, and prioritizing safety over speed can prevent dangerous decisions. Iowa State Extension field agricultural engineer Kristina TeBockhorst returns to explain practical grain management strategies in greater detail.

Expert: Kristina TeBockhorst

Episode Quote:

“The grain doesn’t flow, it’s OK. You have a backup plan, then you have another plan that you can implement, then another and then another before you even have to go into the bin to see what’s going on.”

– Kristina TeBockhorst, Iowa State Extension

Transcript

00:10 E Presnall

Welcome to the *FarmSafe* Podcast brought to you by the Great Plains Center for Agricultural Health. In the blink of an eye, an injury can change your life and your farm forever. During each episode, we share first-hand stories and real-life tips for making safer and healthier decisions while on the farm.

00:32 E Presnall

In our last episode of this series on grain-related safety, we began the conversation about improving stored grain management on the farm, which starts with preparing your grain bins. This week, we are going to continue our conversation about how improved stored grain management can improve safety on the farm by reducing entry into grain bins. This episode, we are going to go into more detail about the three Cs for good management— Cooling it, coring it, and checking it.

E Presnall

As a reminder, out-of-condition grain increases the risk of entrapment. Make grain condition monitoring a weekly task on the farm, especially when temperatures start to rise in the spring. Check grain for signs of spoilage, such as crusting, damp or warm spots, musty or sour odors, or rising CO2 levels.

01:27 E Presnall

We received permission to share some of the conversation from a panel discussion on the film *SILLO*, a film released in 2023. From a farmer’s perspective, we will hear their approach to safety in their day-to-day operations on the farm and through good grain management.

01:36 Speaker 1

You are a farmer. You're actually in the middle of planting season right now. What's your approach to safety these days?

01:44 Speaker 2

Yeah, I think having a- a well laid out plan at the beginning of the week, in the beginning of every day for us. What do we do when we're pulling grain out of the bin? What are we doing when somebody's at the granary? We're basically adopted that model into loading in nitrogen, to bringing in seed totes, to escorting equipment.

Speaker 2

The grain doesn't flow, it's OK. You have a backup plan, then you have another plan that you can implement, then another and then another before you even have to go into the bin to see what's going on. And so that's kind of what we've instituted on the farm. It's OK if this goes wrong, OK, what can we immediately go to make sure that people are safe? And I think that one thing that we do every day is just try to communicate with people we know are going to be on the farm, whether it's vendors or salesman or family that may be coming by or the farmers we're going to tend the land for. And create this really open and honest dialogue and say if you don't think something's right, just let's pause because at the end of the day we set out what needs to be done. That's the minimum we need to get done today and everything else on top is gravy, so we're not always rushing just to get the next acre and having that level of planning has really changed how we operate day-to-day on the farm.

02:52 Speaker 1

Shifting gears to talk about the dangers of farm safety. You're a farmer. You run a family business. And obviously you're very involved in grain. What's some advice that you might give to farmers to control the quality of grain so that things can be safer in the future?

03:09 Speaker 3

Well, that's exactly right. It's the grain quality and that's why not only is it the grain bins, but the aeration floors, the fans, and heaters. Making sure you have the right air flow going through your bins to have a good quality product and that's what we try and work with the farmers on.

Speaker 3

But ah it's education, it's constant education. You know, when farming hits, you've got that time frame and they're going 24/7. And so that's when sometimes yah, you take a little bit more risk than you should and we have to always present that to our community of thinking it through, always having somebody else around. I think that's always the other aspect. A lot of times farmers think that they can do it by themselves. Well, you need some extra help there and we've got some new innovations we're coming out with trying to make grain bins more safe.

03:57 E Presnall

This week we will hear from Kritina TeBockhorst again. Kristina provided a more in-depth explanation of what good, stored grain management involves— starting with cooling your grain.

04:08 K TeBockhorst

The basics for good management is to cool it and have good aeration. Coming out of the field in the fall, that grain's going to be too warm for storage through the winter, so we're going to have to aerate it, most likely, unless we're harvesting super late in the year. Most likely we're going to have to aerate it to get it cool enough to store through the winter. We want to get it down to like 35/40°. We're running that fan when it's just above freezing. A lot of times we have to cool it down, kind of incrementally in the fall 10 to 15° at a time, but ultimately get it down to that 35 to 40° and keep it there as long as we can through the winter and then into the spring as long as we can. Throughout the winter, even if we've got it cool, we need to be making sure to run aeration cycles to get rid of any hotspots. If there's any, you know, mold activity going on, insect activity going on. Or there's any warming from, you know, that bin-steel material collects a lot of solar energy and can heat up the grain right next to it or under the roof. There's potential to add heat that way.

05:14 K TeBockhorst

And also, if we don't get it a nice, cool, even temperature, we could have moisture migration happening. If we don't get it cool that's going to happen and it's going to deposit some moisture on the surface and cause that kind of crusting in a commonplace that we see it. And really, we want to make sure we're keeping that fan on long enough so that the aeration cycle is complete, so the whole mass

of grain is that same cool temperature. There's programs like the University of Minnesota. They have an air flow, a fans program where you can put in your bin parameters and select a fan that you have on the bin and it'll tell you what airflow you have per bushel of grain stored, and that will help you determine how long it takes to cool fully cool that that bin. If it's just a small aeration fan, it's probably going to be on a matter of like a couple days to maybe a week with a smaller fan and a larger bin, if we've got the big drying fans more of like one to two CFM per bushel, that's probably, you know less than a day of running that that fan. We really want to know what we have for air flow, and that's based on the volume of grain, the depth of grain and the fan that we have there. So, that's a good thing to know and be proactive on. Storing at the right moisture content and temperature so, 15° or 15% moisture for corn and 13% for soybeans to get us through winter storage, and that's all to control and keep the humidity around that grain low enough so that insects aren't doing their thing and mold isn't happening as well.

06:52 E Presnall

Next, we look into coring the bin— removing the narrow cylindrical core of grain extending from the grain surface down to the unloading sump.

07:02 K TeBockhorst

The first good one is good aeration. Keep it cool. Coring that bin is essential if we don't have a spreader, we want to get rid of that core of grain especially. Two things it does is remove the fines and the icky stuff that insects and mold, really do well with and it also levels the surface of the grain. With a more level surface, we're going to get better aeration through the whole mass of grain. If we have that cone still in there, we're not going to get as much air flow through that center. And the center is typically where the yucky stuff is anyway. Poor aeration and more of the fines leads to more issues with crusting and spoilage and stuff. So, coring it if we have a spreader, using the spreaders is fine. If we have pretty poor grain with a lot of fines, maybe we don't try and store it or maybe we clean that grain before we put it in the bin. If you have maybe a place where you can take those fines or feed it or just sell it.

08:01 E Presnall

Lastly, Kristina offers some advice for checking grain on a regular basis throughout the winter to maintain good grain conditions.

08:11 K TeBockhorst

When we are checking our grain every couple weeks, through the winter even, the first thing we want to do is smell that first flush of air. From that, just the roof access door, have a buddy with you. Have them turn the fan on so that you're up there to smell that first flush of air. On a big fan that that only takes a few seconds, so you want to be ready to go. Smelling for any molds or musty smells. A sour smell is definitely a bad smell to smell. That's far in the game for spoilage. But smelling that first flush and even better would be using a handheld carbon dioxide monitor. There's \$200 to \$500 units. There's the handheld monitor that instead of just relying on our nose. That CO₂ monitor, if we're doing a good job going every two weeks to check our grain, we can use that monitor to see if the CO₂ levels are rising every time we come out there. If they if they do start to rise, that tells us we have some mold activity going on. Maybe it's just starting. Then, when they get high enough it tells us, we've got we've got a major problem, aeration's not doing it anymore. We need to move this grain and that's really a better indicator and a first indicator of any mold activity is that CO₂ level.

09:31 K TeBockhorst

Any temperature probes, those can be useful to check the surface of the grain to see if we've fully aerated and cooled that grain. Some people have cables, but that cable is a good tool, but it only tells us in the really close proximity to that cable what the temperature is. We might also need to be grabbing some samples off the top or using a long probe to see what the temperature is at the surface. And really just visually observing, does the surface look right? Do we see any like mold activity or crust? If the grain's have been removed, can we see that there's an inverted cone? Does the surface look different? If we know that we've taken a load out and the surface still looks pretty flat, or it has that cone still in there. That's a good indicator there might be a bridge or a crust that's not broken. Any kind of poking or prodding, we can do from the outside and from above the grain is what we want to do there even you know when we're emptying out bins and we've got a kind of crust or a wall in that bin, we still might want to be up above on the bin roof poking at it rather than down below at the access door and poking at it. When that wall you know falls, we want to think about where it's going to flow to very rapidly and we don't want to be anywhere below that. So, working from above the grain to prod it and poke it. Those are kind of the big ones for grain management.

11:00 E Presnall

We always recommend that people have a gas monitor for safety reasons, going to go into any confined space. It's nice to know that there is an actual economic benefit to it as well, because I think farmers tend to be more open to purchasing those types of things if it also benefits them economically. "Totally." And the reality is, is any safety and health thing is going to be beneficial because there are, I mean, just enormous costs that come with injury and fatality.

11:38 E Presnall

To recap what we discussed in this episode, here are a few grain storage practices to keep grain in good condition: only store good quality and clean grain; store at the recommended moisture content; don't attempt to store longer than half-life of the * maximum allowable storage life; run aeration cycles to maintain cool and even temperatures; and core every grain bin (or clean the grain bin) to remove fines and broken kernels. In the resources for this episode, you can find a link to cooling grain impacts on grain quality and shelf-life that provides more information on the maximum allowable storage life of grain.

12:20 E Presnall

Incidents of grain entrapments and fatalities are frequently linked to spoiled grain. If it is suspected that there is grain spoilage in the bin, exercise extra caution around grain bins. If entry into the bin is absolutely necessary, ensure that the recommended safety precautions are taken, including turning off and locking out and tagging out any unloading equipment; wearing a safety harness; having another individual observing you at all times; and making sure there isn't a crust on the grain surface. An inverted cone on the grain surface should always be present after grain has been unloaded.

13:00 E Presnall

I included several more grain safety shorts published by Kristina TeBockhorst in this episode's resources. The information covered in this episode, including coring grain bins and winter stored grain management, can be found in these articles. Stay tuned for Kristina's new series of grain safety shorts that will be coming out shortly, which can be found at crops.extension.iastate.edu/authors/3264.

E Presnall

If you already have a CO₂ monitor, go and check your grain using the monitor to see if the levels of CO₂ are rising in the bin. While doing this, review the recommended safety protocols when working around grain bins and practice them every time you check your grain. While keeping your grain in good condition is an economic advantage, also remember its importance for safety. Zero bin entry is always the goal— if our grain is kept in good condition, we don't have to go into that bin and risk experiencing an injury or a fatality.

14:09 E Presnall

If you don't have a CO₂ monitor, and you suspect grain spoilage in your bin, I would encourage you to look at the safety precautions that should be followed to avoid the collapse of bridged grain and vertical masses of grain. These safety precautions were included in the resources for episode 6 in the grain-related safety series or you can find them by going to www.ndsu.edu/agriculture/ag-hub/publications/caught-in-grain.

E Presnall

In our next episode, we will be joined by Kristina and Rich Gassman again, to discuss the hazards associated with grain handling equipment.

15:02 E Presnall

Listen in on the *FarmSafe* Podcast to join in on the conversation about keeping safe on the farm.

We want to hear from you. Share your stories about health and safety issues on the farm, about injuries that made you change the way you work, or about the ways you keep yourself and others safe on your farm. Also let us know if there's questions you have or topics that you want to hear about on the air. You can visit our website, gpcah.org, or email us.

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Episode Resources

- [Core Each Grain Bin This Fall](#), Kristina TeBockhorst, ISU
- [Winter Stored Grain Management](#), Kristina TeBockhorst, ISU
- [Cooling Grain Impacts on Grain Quality and Shelf-Life \(Maximum Allowable Storage Life of Grain\)](#), Charles Hurburgh, ISU

Photo

