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Understanding Anhydrous: Those White Tanks in the Field

As an agronomist who works with the community in a number of ways, I often get asked a curiosity question by those not in farming. It might be something that seems obvious to us, but I fully understand that much of what we do in farming is unknown to others. One frequent question that starts this time of year is “what are in those white tanks in the crop fields?” Those tanks carry anhydrous ammonia. Most tanks are labeled as such, which makes the real question is “what is anhydrous ammonia?” This column is partly for farmers, but mostly for you curious non-farmers.

What is it? Anhydrous ammonia is a nitrogen fertilizer gas that we pump into the soil before planting corn. It is often the cheapest and most concentrated form of nitrogen. Anhydrous ammonia is pure NH_3 , and since hydrogen doesn't weigh much, it means most of the gas is just nitrogen. Many people are concerned because those white tanks are required to have a hazard symbol on them. Anhydrous is not toxic, it's caustic. Anhydrous actually means 'without water', so much so that it will pull the water out of anything it touches. This includes skin, lungs, eyes, or anything else. Farmers must be careful with it.

Why do we use it? When injected into the soil, the NH_3 gas will find soil moisture and turns into NH_4 (ammonium). Ammonium infused water will then stick to the clay and organic matter, becoming stable in the soil. Later, when the soil warms up and after receiving some spring rain, the soil microbes turn the ammonium into NO_3 (nitrates). The nitrate form of nitrogen is what plants need to grow. During this process, the ammonium acidifies the soil from the release of hydrogen. Due to anhydrous, other fertilizers, and natural causes, soil becomes acidic over time. Ag lime is used to remove hydrogen from the soil and reverse the acidic effects.

Is it bad for the environment? It is not directly good for the environment, but it also isn't that bad. Anhydrous is often created regionally using natural gas and is a fairly energy intensive process. There are a number of advancements included in the process to make it more efficient. However, not all the world uses those advancements. In this area much of our anhydrous is

derived from a waste product created by the Coffeyville refinery. In the future our nitrogen fertilizer could be made with nuclear or other green powered energy sources, but it takes a whole lot of electricity. While nitrogen fertilizer is created using fossil fuels, it is not a mined product like phosphorus and potassium fertilizers. We will never 'run out' of nitrogen fertilizer because the nitrogen is pulled from the air.

Is it bad for the soil? When injected into the soil, the soil very quickly becomes alkaline, then slowly becomes more acidic over time. This acidification is gradual and requires years and years of nitrogen fertilizer to become a problem. There is no residual toxin, or really anything left in the soil from anhydrous application. In the plant, nitrates from chemical fertilizer are the exact same as nitrates from natural sources. There are no direct human health risks to chemical fertilizer being used in crop production. The only risk is the indirect effects of greenhouse gas emissions. I'm going to be honest though, while the area of application in the soil is pretty small, the worms directly in the path of the anhydrous application zone don't make it.

Without fertilizer we would grow a small fraction of what we do now. Farmers do their best to be efficient and environmentally minded decisions when it comes to using fertilizer, though there is still more progress that can be made. If you have any questions, ask a farmer, or reach out to Crop Production Agent, James Coover.

K-State Research and Extension has several publications for farmers on how and when to use anhydrous efficiently. For more information about liming your crop fields, contact James Coover at jcoover@ksu.edu or (620) 724-8233.

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