

## News Column

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### **Can dry soils affect anhydrous ammonia applications in Kansas?**

Many producers are getting ready for fall anhydrous application, however very dry soils in most of Kansas can be a concern. When the soil is dry, will it be able to hold anhydrous ammonia or will some or most of the ammonia be lost shortly after application?

There are three factors that come into play when applying anhydrous ammonia to dry soils.

**Chemical** - Ammonia ( $\text{NH}_3$ ) needs to react with water shortly after application in order to convert into ammonium ( $\text{NH}_4^+$ ), which is the molecule that can adhere to clay and organic matter in the soil. Ammonia is very soluble in water. After it is placed in the soil,  $\text{NH}_3$  reacts with water in the soil to form  $\text{NH}_4^+$ , which is retained on the soil cation exchange capacity sites. This process takes a little time – it does not occur immediately upon contact with the soil. The main controlling factors in the conversion of  $\text{NH}_3$  to  $\text{NH}_4^+$  are soil temperature, soil moisture, and soil pH. The higher the soil temperature and the wetter the soil, the more rapid the conversion occurs. If the ammonia does not react with water, it will remain as a gas that could escape from the soil. Also, equilibrium between  $\text{NH}_3$  and  $\text{NH}_4^+$  is affected by soil pH. More  $\text{NH}_3$  will remain unconverted in the soil longer at higher application rates and at higher soil pH levels.

**Physical** - Dry soils may be cloddy, with large air spaces where the soil has cracked. This can allow the gas to physically escape into the air before it has a chance to be converted into ammonium. Getting the soil sealed properly above the injection slot can also be a problem in dry soils. Loss of the ammonium gas can begin immediately after application continuing for several days to weeks if there is no moisture. N losses can be greater than 50%.

**Application depth** - The deeper the ammonia is applied, the more likely the ammonia will have moisture to react with, and the easier the sealing.

#### ***So, can anhydrous ammonia be applied to dry soils?***

The answer is **yes** - as long as the ammonia is applied deep enough to get it in some moisture and the soil is well sealed above the injection slot. If the soil is dry and cloddy, there may be considerable losses of ammonia within just a few days of application if the soil is not well sealed above the injection slot and/or the injection point is too shallow.

Producers should be able to tell if anhydrous is escaping from the soil during application or if the ammonia isn't being applied deeply enough. If ammonia can be smelled, the producer should

either change the equipment setup to get better sealing or deeper injection, or wait until the soil has better moisture conditions.

In short, producers can minimize this potential loss problem by applying the anhydrous ammonia at the proper depth (at least 6 to 8 inches in 30 to 40 inch spacings), and using covering disks behind the knives or sealing wings ("beaver tails") on the knives.

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