

PB 3-16

## Anhydrous Ammonia Has Changed.

Saving 100 lbs. N/A and Millions of Tons of topsoil.

Exactrix® TAPPS applied at 170 lbs. N/A produces plot averages of 242.3 to 257.2 bushels per acre.



In the fall of 2014 at Seward, NE, large 2.1 acre plots (STEEP Type) were applied 30 times with high uniformity.

The results were 63 acres of applied Exactrix® TAPPS and TAPPKTS plus controls and comparisons to N-serve and DCD.

The plots were replicated and randomized 3 times with 10 treatments producing an Exactrix® Nitrogen Use Efficiency of .660 to .702 lbs. N/Bu.

Abnormally high rainfall events (3.6 in.) occurred twice in the vegetative stage between May and end of June.





Exactrix Mustang, No-tillage, Fall Banding, TAPPS, TAPPKTS, TAPP, TAPP-N-serve, TAPP-DCD

Large 2.1 acre, hybrid corn randomized and replicated plots were harvested at Seward/Tamora, Nebraska, October 6, 2015.

Reviewing N efficiency of the Kevin Meadow plots following a 2 year Soybean rotation.



Monosem Twin Row, 9/27 on a 36 inch bed in a zig-zag seeding pattern.





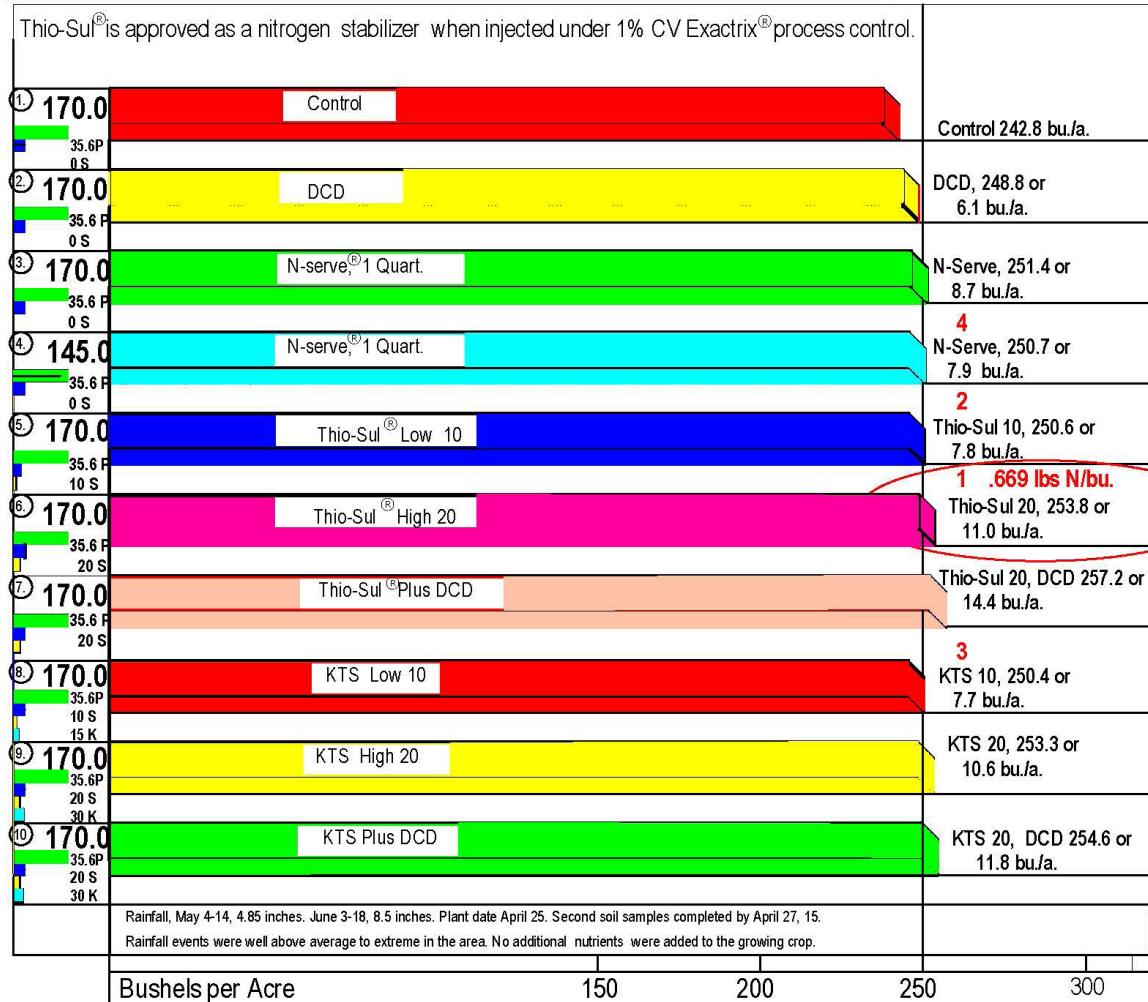
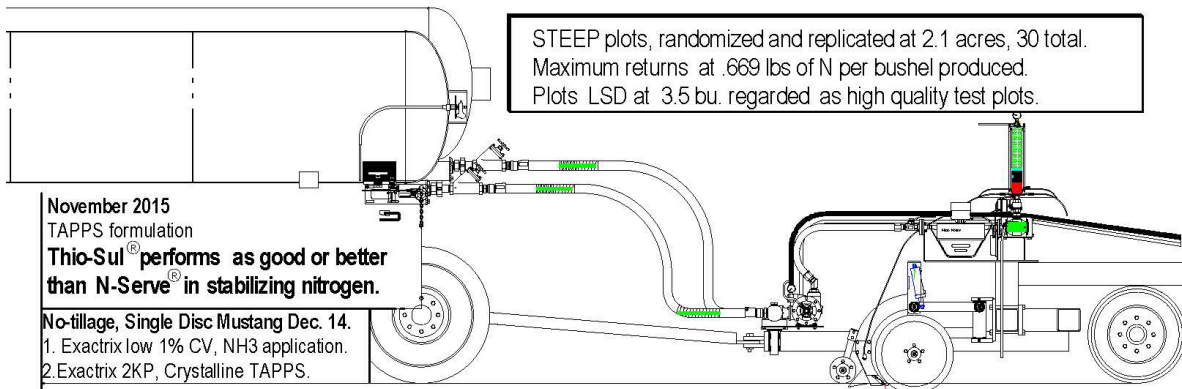
The Exactrix TAPPS bands applied on the outside of each row on 18 inch centers.  
Twin Row, 9/27 on a 36 inch bed in a zig-zag seeding pattern.  
The Exactrix TAPPS bands applied on the outside of each row on 18 inch centers.

2015

### Nitrogen Stabilization Fall Banding Kevin Medow, Seward/Tamora, Nebraska.

**CORN**

Exactrix Nitrogen Test Data supplied by Bert Bock Consulting, Jim Schepers, Dennis Francis, USDA-ARS ret. Funding provided by TKI.



The highest economic return was the Exactrix® application forming TAPPS, mixing NH3 with Thio-Sul® at 7 gallons (20 lbs. S) per acre in combination with 10-34-0 at 9 gallons (35.64 lbs. P2O5/A).

The application of TAPPS at 170 lbs. N, 35.64 P and 20S of 2.107 acre plots 108, 205, and 310 produced a mean of 253.8 bushels per acre at a total 170 lbs N/A. This resulted in a factor of .669 lbs. of applied N per bushel produced.

An \$11.00 per acre investment in Thio-Sul® resulted in an additional \$44.00 of return at \$4.00 per bushel. Thio-Sul® was the best overall performer as compared to N-serve®, and Guardian® DCD. Potassium Thio-Sulfate KTS®, was recognized as the second best performer.

Exactrix Uniformity at high pressure streaming NH3 and liquid flow produces typical results. Also noting historical No-tillage Rotational Band Loading of 3 years in a Corn Soybean rotation improved NUE to levels of .660 to .700 lbs.N/Bu.

The addition of an ammoniac nitrogen stabilizer improved overall yields 2.5% to 6%.

Thio-Sul® at 20 lbs. S improved yields 4.5% and produced the best economic return for the investment. “KTS® is superior to N-Serve in yield performance”.

Application Equipment, 2KC, Weigh Master, Weighing NH3, 2KP TAPPS formulator applying liquid volumetrically.  
Repeatability and Accuracy of Mass and Volume Flow rates, NH3+-.002 as Mass Flow, Liquid,.01 as Volume Application CV 1%.  
The 30 total plots were 2.1 acres each at 36 feet wide, 24 bands, at 2,550 feet in length.

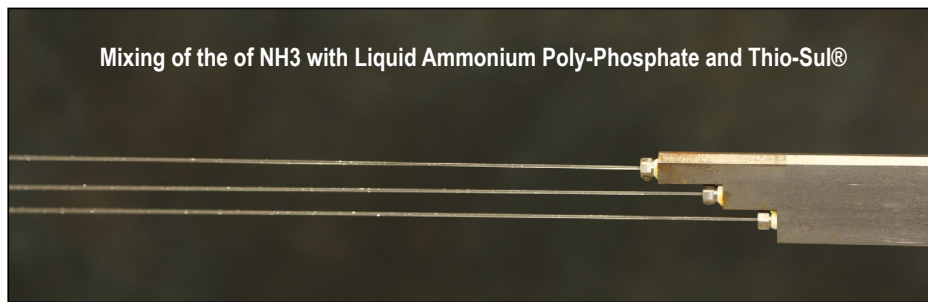
			Difference
			From
		Means	Control
1	<b>Control</b> 170 lbs. total N, 159.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N as 10-34-0 at 9 gallon/A.	242.8	
2	<b>DCD</b> 170 lbs. total N, 159.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N. as 10-34-0 at 9 gallon/A.	248.8	6.1
3	<b>N-Serve</b> , 1 quart tank mix NH3, 170 lbs. total N, 159.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N as 10-34-0 at 9 gallon/A.	251.4	8.7
4	<b>N-Serve</b> , 1 quart tank mix NH3, 145 N Total N, 134.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N as 10-34-0 at 9 gallon/A.	250.7	7.9
5	<b>Thio-Sul® 10S</b> +4.6 lbs. N at 3.5 gal/A., 170 lbs. total N, 154.9 lbs. N as NH3+ 35.6 lbs P205, 10.5lbs N as 10-34-0 at 9 gallon/A.	250.6	7.8
6	<b>Thio-Sul® 20S</b> + 9.2 lbs N at <b>7 gal/A.</b> 170 lbs. total N, 150.3 lbs N as NH3 + 35.6 lbs P205, 10.5 lbs. N as 10-34-0 at <b>9 gal/A.</b>	253.8	11.0
7	<b>Thio-Sul® 20S+ DCD</b> , +9.2 lbs.N at 7gal/A 170 lbs. total N, 150.3 lbs N as NH3 + 35.6 lbs P205, 10.5 lbs. N as 10-34-0 at 9 gal/A.	257.2	14.4
8	<b>Potassium Thio-Sulfate 10S, at 5 g/A, with 15 K</b> 170 lbs. total N 159.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N as APP as 10-34-0	250.4	7.7
9	<b>Potassium Thio-Sulfate 20S at 10 gal/A with 30 K.</b> 170 lbs. total N 159.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N as 10-34-0.	253.3	10.6
10	<b>Potassium Thio-Sulfate 20S + DCD. at 10 gal/A with 30 K.</b> 170 lbs. total N 159.5 lbs N as NH3 + 35.6 lbs P205 plus 10.5 lbs N as 10-34-0.	254.6	11.8

Heavy rainstorms occurred twice during the vegetative stage.



TAPPS



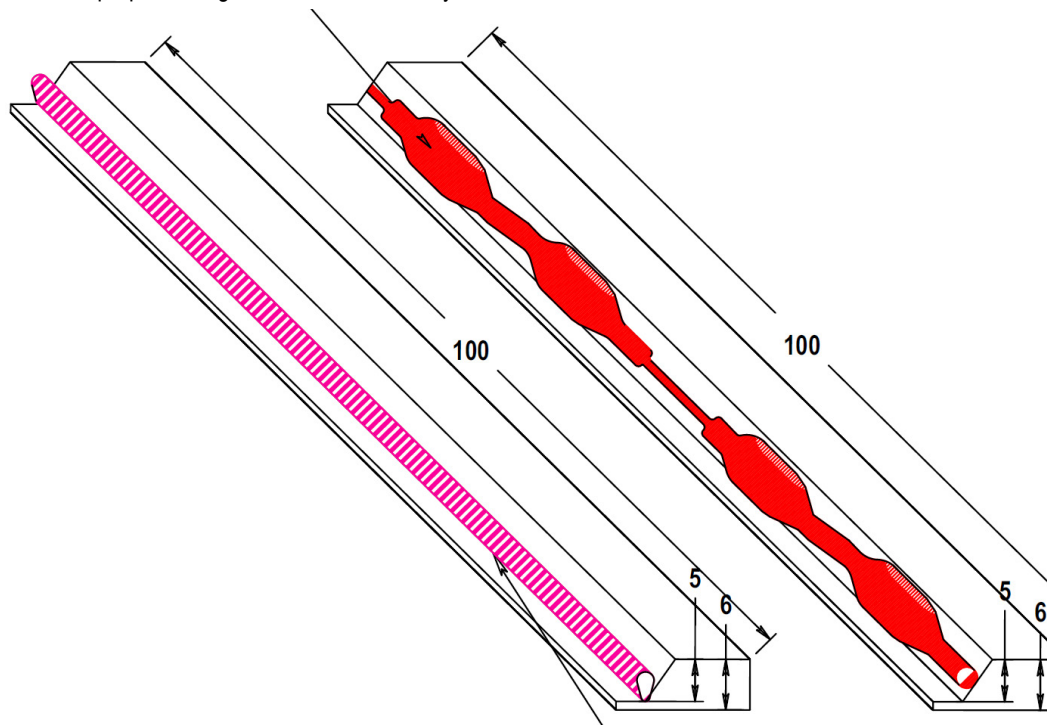


Two state NH3 flow has 1. Gas state and 2. Liquid state flow which results in a sine wave application of the material.

The two state application of old fashioned systems (no terminal orifice under high pressure) is steady by jerks creating hot spots.

NH3 is 800 times more concentrated in liquid state areas as compared to gas state areas of the band. Non-streaming bands have liquid blobs that are released. The blob areas of the lineal band are extremely concentrated and of no value to the growing crop. The applied blobs actually hurt yield as rates are increased. This explains why Aqua Ammonia always outperforms Anhydrous Ammonia in side by side comparisons.

This is called sinusoidal flow in the lineal band length. The oscillating stream flow is very common with the bow tie application technique of shanks. The advantage of liquid state streaming flow is clearly illustrated. The uniformity of the band length produces the yield punch since less nutrient is required and the NH3 can be reacted in the soil with on target Ammonium Poly Phosphate and Ammonium Thio-Sulfate, Thio-Sul® and Micro-nutrients. Non freezing lines are critical for the proper mixing and reaction efficiency.



NH3 is applied as a liquid state flow with the Exactrix high pressure direct injection system. Terminal Injection Orifices maintain a liquid flow for about .5 inches to 2 inches past the injection point mounted very close to the soil cut line. The terminal point is sharp as a pencil point.

The second products such as 10-34-0 and 12-0-0-26S react evenly with the streaming NH3 forming Tri- Ammonium crystals of similar to equal concentrations. The NH3 immediately reacts with soil organic matter, clay containing hydrogen (H2O) and placed products that crystallize as Tri-ammonium Poly Phosphate Sulfate or TAPPS. This is an Acid/Base elevated temperature reaction. The hydrogen is sourced from 3 locations.

The Exactrix band is about 8 to 20 times smaller than the old fashioned NH4 band. Thus Exactrix NH4 remains ammoniac longer since the band is not diffused as much. Lower levels of diffusion diameter means the nitro-bacteria or nitro-ammonias have less target area to feed and convert the band to mobile nitrate.

All commodity crops prefer NH4 ammoniac nitrogen. Starter fertilizers seldom use nitrate based N since corn cannot assimilate nitrate forms in the first 3 weeks of the plants life. This may also explain why highest economic returns are seldom achieved with solution 32 and other nitrate and urea forms. This may also explain why phosphate always works better with ammoniac N since the uptake efficiency is much higher early in the plants life. Sulfur also becomes a powerful player when ammoniac N assists in the uptake efficiency.

A critical note regarding mixing, crystallization and accuracy.

Mixing of the of NH<sub>3</sub> with Liquid Ammonium Poly-Phosphate and Thio-Sul® forms a highly uniform crystal of TAPPS in a lineal dilute band width.

Highest Uniformity of metering accuracy is achieved, with low 1% CV application in liquid streaming flows assures high crop availability of placed nutrients.

Commercial Fertilizer, NH<sub>3</sub> as 82-0-0, Ammonium Poly Phosphate as 10-34-0, Thio-Sul® as 12-0-0-26S and 2 quarts typical Ammoniated Zinc 15%, Potassium Thio-Sulfate, KTS® 0-0-25-17S.

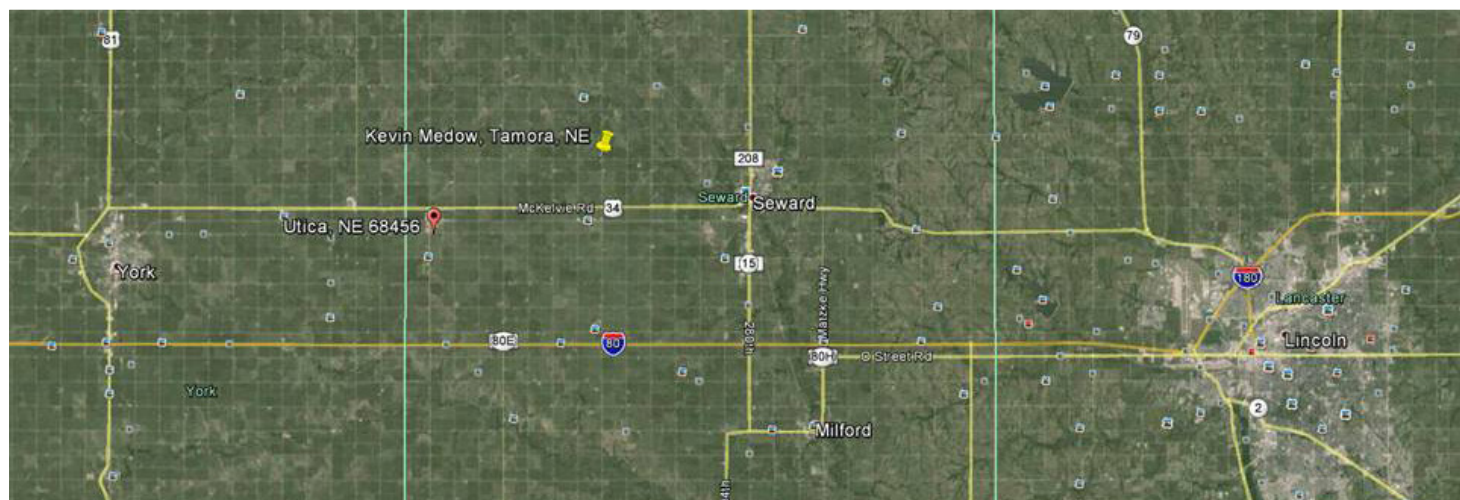
Fall Banding occurred in December of 2014 and just prior to the winter freeze of mid-December to mid-March, 2015.

Vegetative Growing period rainfall.

There was negligible rainfall between mid-March when the soil thawed and April 16.

**Rainfall from April 16 through June 24 was as follows:**

March 31—first soil sampling	May 24--0.27"
April 25—started planting before rain later in day.	May 28-- 0.18"
April 25-0.52"	May 29--0 .05"
April 27—second soil sampling	June 2--Trace
May 04--0 .55"	June 3--0.70"
May 06--3.10"	June 4--1.55"
May 10--0.30"	June 6--0 .60"
May 14-0.90"	June 12--3.60"
May 04 to 14—4.85"	June 15--1.15"
May 15--0.08"	June 18-- 0.90"
May 17--008"	June 03 to 18—8.50"
May 20--0.28"	June 24- -0.10"



Based on the point of diminishing returns and previous plots, the highest performing N rate the optimum N rate is between 145 lbs N to 170 Lbs N per acre.





Noting that previous years of testing with Kevin Medow have produced similar results.

Fall banding occurs during November 10 to December 10.

Fall banding with Exactrix TAPPS has been successful in the past 7 years with good to exceptional yields.

In the past, the confirmation of this top yielding technique was further explored by side dressing the growing corn with Solution 32.

In previous years, there has been no economic response to side dressing into the growing corn with Solution 32.



"Thio-Sul performs as good or better than N-Serve in stabilizing nitrogen with Exactrix process control." Guy Swanson



**Anhydrous Ammonia Has Changed Forever.**  
After 70 plus years of shank tillage application, **NH<sub>3</sub>** is finally a true **No-tillage material at depths to 7.5 inches at speeds to 12.5 mph.**

**TAPPS**

The Exactrix 1% CV injection process makes TAPPS 166% more crop available.

Stay in the game with crystalline Exactrix TAPPS and build soil test P.

[www.exactrix.com/mustang.htm](http://www.exactrix.com/mustang.htm). The payback is Mustang fast.

Nominal returns in wheat, corn, cotton and Milo at \$30 to \$100 more net income per acre or 12% more net margin.

Note: STEEP University test plots and producer tests confirm improved returns year after year.

Less is More.

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Scientifically reviewed and administered by Dr. Bert Bock and Dr. Jim Schepers

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N-Serve® is a registered trademark of Dow.

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