Deere Exactrix Wing Injection

Make sure you order the FREE video of the Exactrix Wing Injection system for your Deere 1690 and 1890 airseeders and 1590 no-till drills.

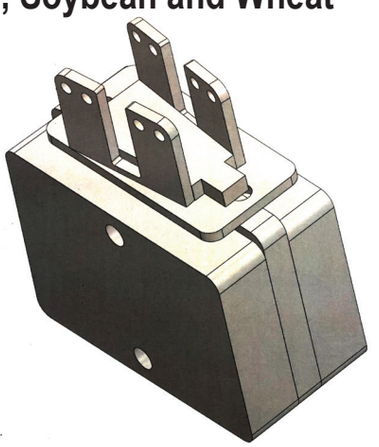
Case 500 considered
Case SDX reviewed

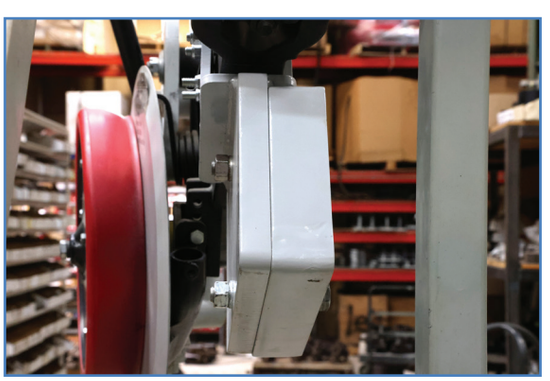
Meeting the Needs of the Most Advanced Corn, Soybean and Wheat

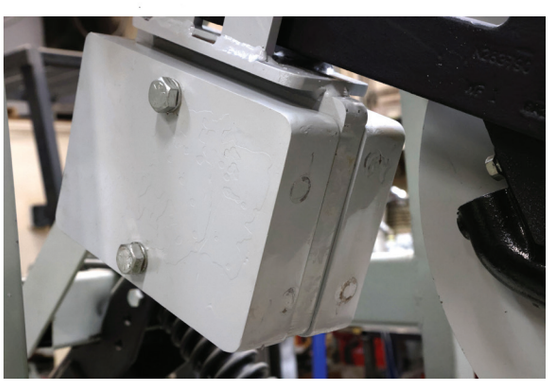
Banding In Tough Conditions

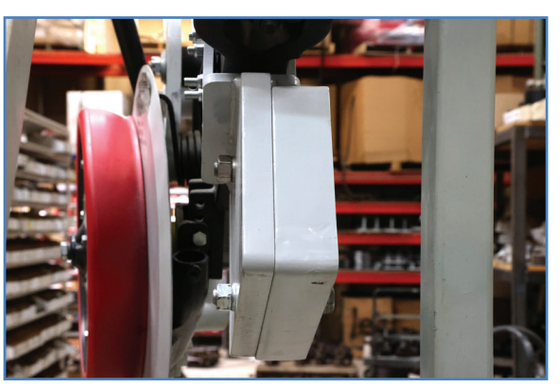
Deere 1890 and 1590 TAPPS Formulators

- ***Selective Row Counterweight***
- ***Extra Penetration For Tractor Rows & End Of Frame Rows***
- ***Tested In Hillside Farming For 3 Years***
- ***Ideal Arraignment For Deere 1985 MRB***
- ***Adjustable Weight, 65 lbs to 103 lbs***









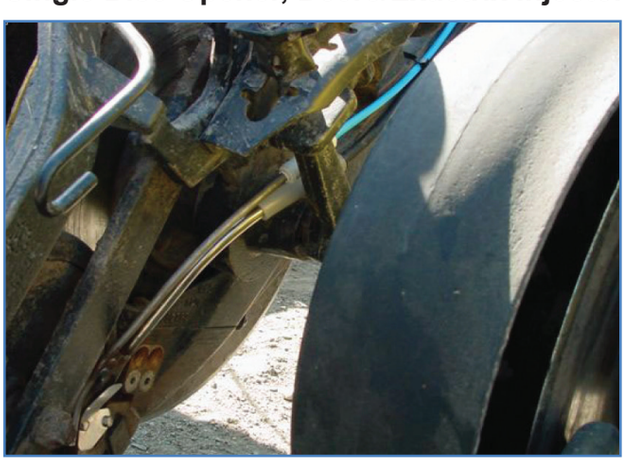
Deerre 1690, CCS, 42.5

Minor crops considered in rotation. Approved for canola, mustard, flax, peas, lentils, chickpeas, edible beans, safflower, oats, barley & alfalfa.

Exactrix Injector Wings offer ideal positional and chemical access to placed nutrients.
Get three times the utilization from your original Deere 1850, 1860, 1890, 1690, and 1560/1590. Use your Deere single disc airseeder and no-till drill 3 times per year in pre plant corn, winter wheat or spring wheat fertilization and seeding, and soybean fertilization and seeding.

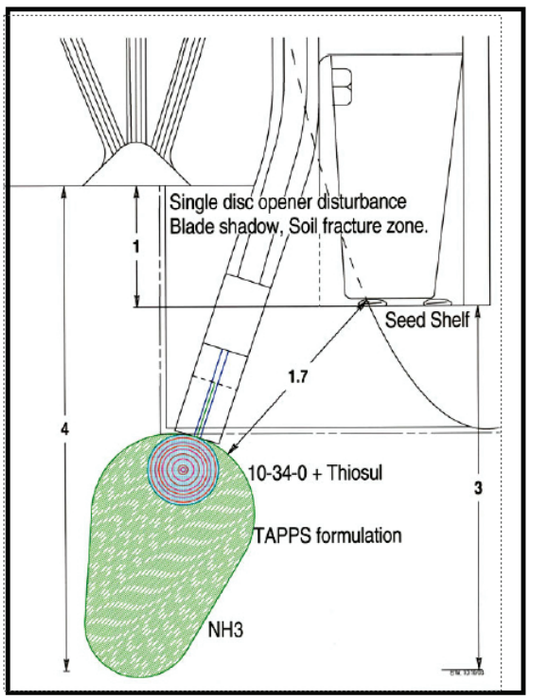
- ***Each seed row has a dedicated band of nitrogen, phosphate, potassium, secondary and micronutrients.***
- ***Placement is 1.5î to the side and up to 3î below the seed for radicle and seminal hair root access.***
- ***Weeds never have a chance at placed fertility.***
- ***The seeder requires no mid-row banders for wheat production.***
- ***Mid-row banding can starve the crop and feed the weedsÖ..A great improvement in fertilizer efficiency and weed control.***
- ***Machine design remains simple.***
- ***Guaranteed safe placement of toxic nutrients in dilute NH3 bands with the Exactrix 2KD and 2KF metering systems.***
- ***Dual placement of APP, 10-34-0 and 11-37-0 with Thiosul and Micronutrients forms tri-ammonium phosphate. Thee most available form of P.***
- ***Normal yield increases of 10% to 20% in pre-plant corn cropping systems. Band spacings of 7.5î, 10î and 15î are now possible.***
- ***Exceptional performance with tap rooted crops such as soybeans and canola.***

Single Disc Opener, Deere/Exactrix Injector Wing Review.



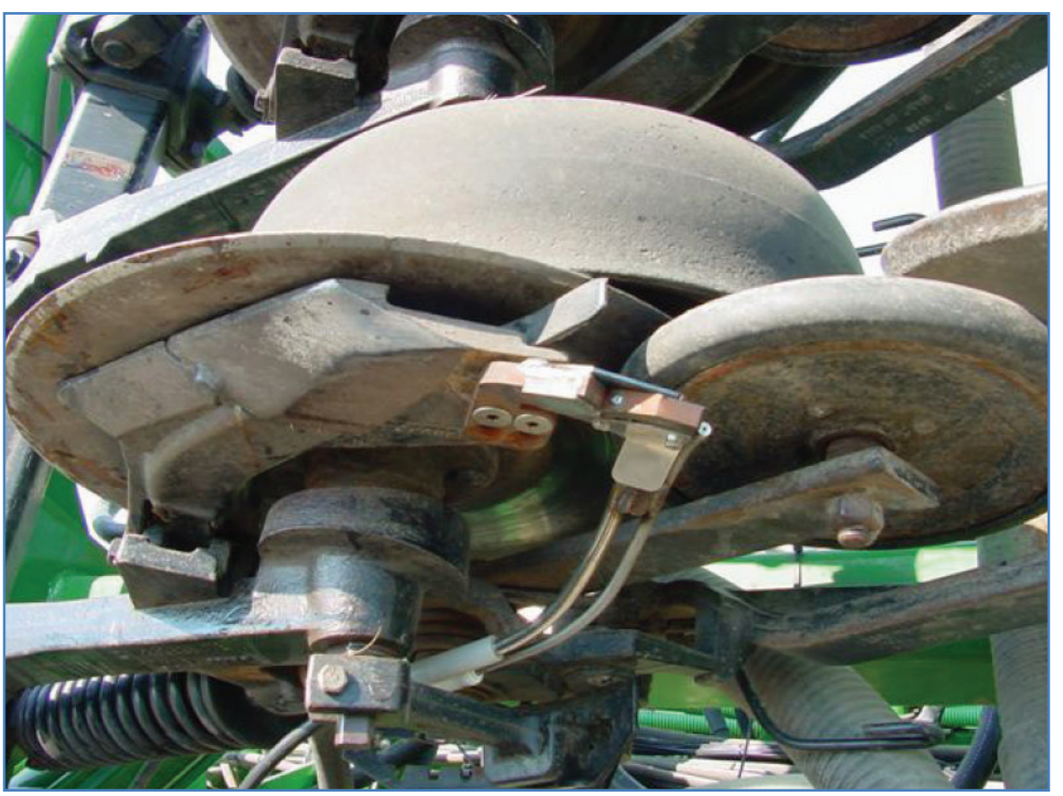
Great Plains And Canadian Prairies Small Grain Production.

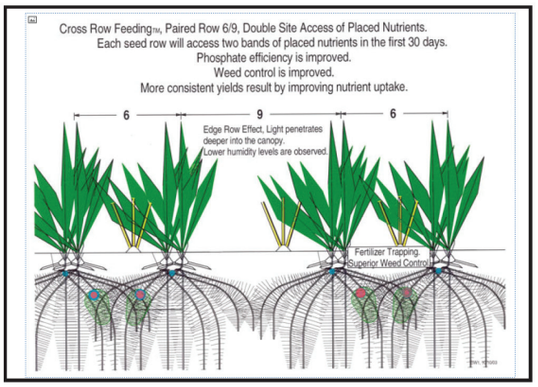
Deere 1860, 42.5í, 7.5î row spacing and band spacing. Applying Excactrix NH3 with a model 2KFA, dual product, 10-34-0/Thiosul with Dual Delta P Manifolds, VR site spacific application with Exactrix Wing Injection.
The yellow tape ruler represents the lateral seed row. The liquid NH3 and APP/Thiosul (10-34-0/Thiosul) is dual placed in a tight concentrated band to side and below the seed row. A terminal injection orifice is used to drive the NH3 into the soil at least 2 inches below the seed to a 3 to 4 inch soil depth in a vertical band column. The horizontal separation is 1.5 inches to the side of the dedicated seed row.



The APP/Thiosul is released with a terminal-stripping orifice. The terminal stripping orifice organizes the APP/Thiosul into a liquid lateral band column, which chemically combines, with the NH3 to form Tri-Ammonium Polyphosphate Sulfate (TAPPS). The toxic charge is safely located in exact alignment with row and safely away from the germination zone and the seminal/radicle root cap. A 7.5-inch row spacing application of NH3 in wheat production is typical at one pint of liquid NH3 injected in 600 feet of travel. The band of NH3 is extremely dilute and this allows the P and S to be readily absorbed by the plant root system in the first 30 days. The NH3 direct injection system from Exactrix allows this precision plant food placement to be possible

The 1860 split boot seed opener is shown and is drilled with 25/64î cobalt drill supplied with the Exactrix Injector Wing. A drill template is also supplied for the 1850, 1860, and 1890 to exactly center the mounting holes. Ample clearance is allowed for the firming wheel. Stainless steel tubes are mounted to Exactrix Injection Wing for added protection. A stainless steel shield is added to protect the tubes from damage from corn or sunflower stalks. A carbide insert provides excellent wear life at the wing tip injection point. The carbide insert extends the wear life beyond the seed boot wear life.

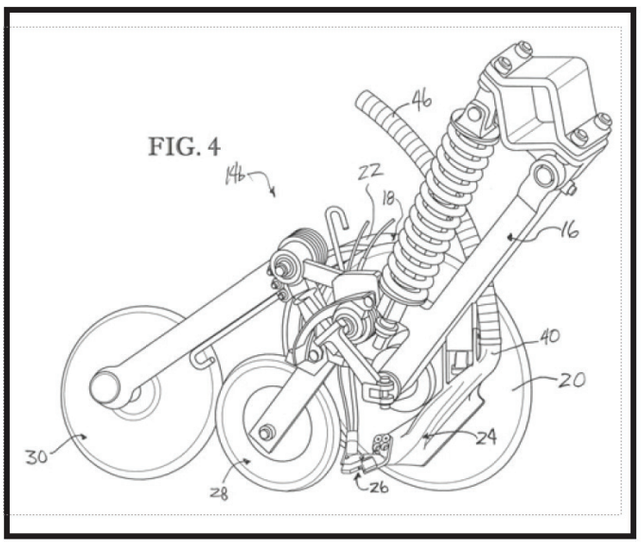


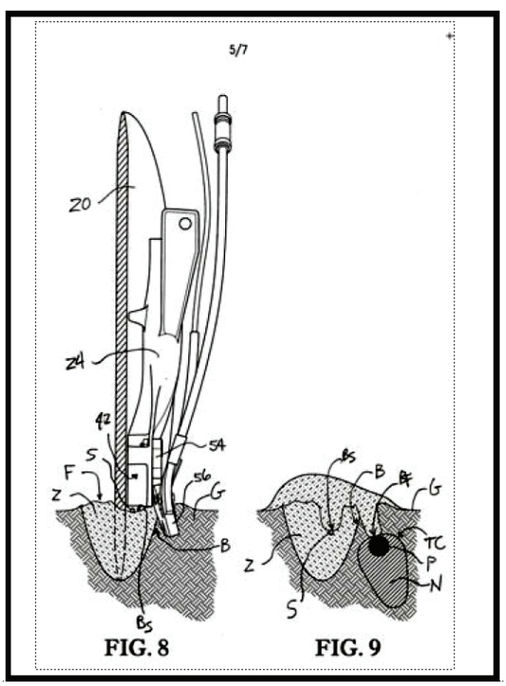


A root system view of wheat, barley or oats shows the ideal position for the radicle and seminal hair roots to access the placed plant food. As the cereal plant emerges the root system is absorbing uniform and balanced nutrients.

The plant radicle root is normally twice as long as the first leaf. This means that the fine hair roots have accessed the placed nutrients and especially the critical phosphate nutrient in the first 7 to 15 days after seeding of the crop. Cross Row Feeding can also be set up allowing double site access to placed Tri-ammonium polyphosphate sulfate. The openers are arranged opposite and facing at the front and rear gang. The openers are aligned 6î apart in a center line from the front and rear gang.

This paired row effect leaves the canopy more open allowing for lower canopy humidity levels and better light penetration to the outside rows. The outside light row or edge row effect is produced.
A right hand Deere 1890 opener is shown with the Exactrix Injector Wing, item 26. The 1890 has a different drill hole pattern than the 1860 and 1850. The seed boot, item 24, is set in the middle mounting position of the opener frame.
The correct seed boot mounting exposes about 1î to 1.5î of the blade, item 20, at bottom dead center. The firming wheel, item 28, easily clears the Exactrix Injection Wing, item 26. The stainless steel delivery tubes are formed to precisely clear the opener works. The stainless steel delivery tubes protect the NH3 black nylon injection lines and APP blue polypropylene injection lines from flying residue. The closing wheel, item 30, directs loose surface soil over the seed row and banded area. Atmospheric loss of NH3 has not been observed primarily due to the dilute, high pressure, injection of Exactrix NH3. The NH3 injection lines do not freeze. The NH3 is high pressure driven another 2î into the soil.





A rear view of the Deere single disc opener shows the Exactrix Injector Wing mounted to the seed boot. The Exactrix Injection Wing is located within the event horizon of the blade angle. The wing is formed outward below the soil surface to direct the toxic charge away from the seed row.
After the passage of the opener the soil cross section appears in Fig. 9. A soil berm, item B, is formed by the opener combination. The berm provides a visual dividing line between the seed boot area and the Exactrix Injector Wing area. The NH3, item N, is placed in a non-fractured soil column in a vertical band. The high velocity of the low mass, hydrogen/oxygen reactive, NH3 burns in deeper much like a cutting torch cuts steel. The APP/Thiosul, item P, is low pressure placed (stripping orifice) at the center of the NH3 band forming Tri-ammonium polyphosphate sulfate, thee most available form of phosphate....The addition of Thiosul slightly acidifies the placed nutrient band slowing the conversion of NH4 to mobile nitrate.
Thiosul feeds the plant with sulfur. Sulfur is critical in plant protein production. When Thiosul is used, N-serve can be deleted because of the delayed conversion to nitrate. The nitrate converting ìsoil bugsî will feed on the slightly acidic band of nutrients at a very slow rate. Remember that cereal and legume crops prefer amminical nitrogen. Crops such as corn can not use nitrate nitrogen in the first 3 weeks. Nitrate is not recommended in

cereal crop production due to nitrateís high cost and marginal use by the plant. Anhydrous ammonia always outperforms all other fertilizer types when accurately and uniformly applied (low CV), properly placed, and immediately sealed in crop production.

A plan view of the Deere 1890 seeder with Exactrix Injector Wings shows the ideal band alignment with each seed row. Each seed row has itís own dedicated, uniform, nutrient band located to the side and below each seed row. This is similar to 2 x 2 placement recommended by university agronomists and used on 30î spacing planters. Several advantages are produced with dedicated bands.

1. The machine becomes more cost effective since an additional $30,000 to $35,000 of investment is notrequired for a separate set of mid-row banding units and frame work.

2. The machine is more maneuverable in tight corners and field entry.

3. Less weight is required for penetration since the Exactrix Direct Injection System burns the NH3 into the soil 2 inches deeper with 1.5 horsepower per injection point.

4. Opener maintenance is less since an entire set of mid-row banding units is not needed.

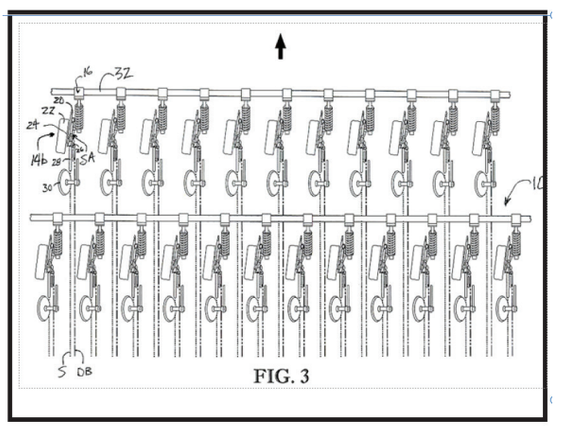
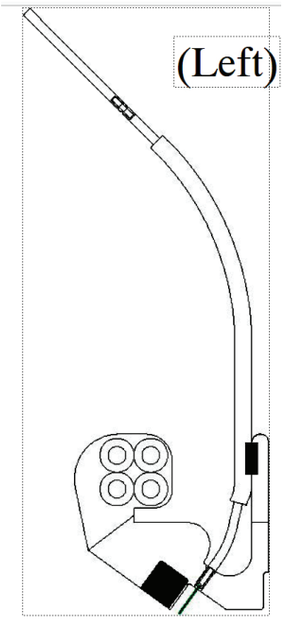


FIG. 3

5 Yields tend to be greater with Exactrix Injector Wings than mid-row banding systems. This is because only the seeded crop can use the placed fertility. Weeds are starved and the crop thrives. Nutrient uptake is much more rapid for short season crops.

6 Mid-row banding seeders have difficulty with turning since the band center and seed row center relationship becomes undesirable in the turn. The overall length of machine is increased about 8 to 10 feet with mid-row banders. When turning the inside row feeds readily at the inside radius of the bandÖ.the outside row or the wide radius row starves for nutrients. In very sharp turns the wide outside radius seed row can actually be on top of a concentrated 20-inch band of NH3 because of the extra machine length and resulting band misalign-ment. The toxic 20-inch band can easily damage the outside conjoined row. This is also why only 10 inch seed row, mid row 20 inch band center machines are produced. Yielder Drills are the only known machines to seed on 7.5 inch centers and band of 15 inch centers. This is because of the short floating tool bar arrangement and close rank of the openers keeps the seed rows in alignment with the nutrient bands.

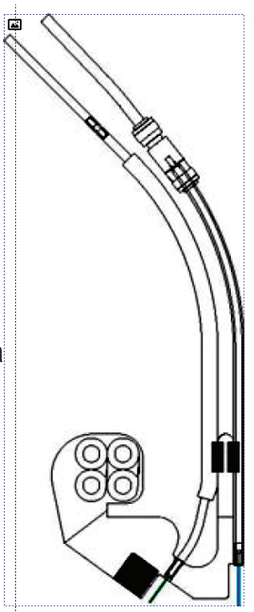
The Exactrix Injector Wing is shown as a single product liquid NH3 injector. Flathead stainless steel socket set screws and nuts are used to mount the Exactrix Injector Wing.



7.5 inch and 10î band spacing 3/16 inch outside diameter, 500 psi, black nylon line is used. For 12 inch and 15 inch band spacing ºî outside diameter, 500 psi, black nylon line is used. The Exactrix Injector Wing comes complete with chrome insert, stainless steel protection tube, sunflower shield, line coupler, and mounting hardware.

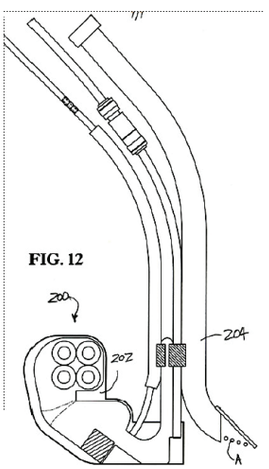
(Right) The Exactrix Injector Wing is shown as a dual product injector. A second stainless steel delivery tube is added behind the NH3 injector.

A pressed in stripping orifice spins the APP/Thiosul into a solid stream and places the material directly at the center of the NH3 band. The stripping orifice does not meter the APP/Thiosul. The metering occurs at the dual stage, high pressure, Delta P manifold. Two line sizes are used. When band spacing is 7.5 inch and 10 inch a º inch blue polypropylene line is used with the 3/16î black NH3 nylon injection line. When band spacing is 12 inch and 15 inch a 3/8 inch blue polypropylene line is used in conjunction with the black ºî NH3 injection line. A quick disconnect, low pressure, flow check valve is used at the end of the stainless steel APP/Thiosul tube to mount the blue polypropylene injection line. The Exactrix Injector Wing comes complete with carbide insert, two stainless steel delivery and protection tubes, sunflower shield, two line couplers and check valve, and mounting hardware.



Special Applications Reviewed: The Exactrix Injection Wing is shown as a triple product injector and dry material/seed delivery arrangement. The seed and dry material delivery tube, item 204, is located 1.5 inches away for the primary crop seed row. The tube is used primarily for nurse crop establishment of perennial grasses and biennial legumes.

A co-host trap crop such as Oriental Yellow Mustard (Pacific Gold) can also be established for suppression of nematodes, insects, and antagonistic soil fungus. Suppression of soybean cyst nematode, a very recent development, can be expected but has to date not been widely applied with co-host trap cropping in soybean crop production. A separate seed metering system is required with the addition of the third tube for seed delivery. Mustard meal and small amounts of KCL can also be applied with this stainless steel tube. The Exactrix Injector Wing comes complete with chrome insert, three stainless steel delivery and protection tubes, sunflower shield, two line couplers and check valve and mounting hardware. In steep slopes of the Palouse region of the PNW a hillside seed shield, item 202, is offered to maintain the seed position on 65% compound angle slopes.

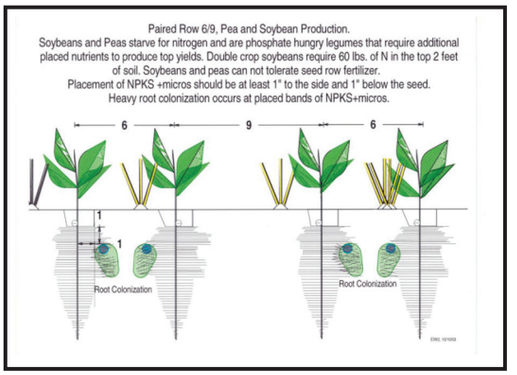


Exactrix agronomists always tests their systems on various crops to assure safety and performance. Flax is used as the base line indicator crop on high pH soils. Flax is the most sensitive of all crops to NH3 germination damage. Neil Power of Langdon, North Dakota stands in a flax field that was tested at a 2X rate of NH3 using Exactrix Injector Wings. Canola is also a sensitive crop. A typical canola stand is shown using Exactrix Injector Wings.

Soybean and Corn Rotation. Double Cropping Soybeans is more attractive.

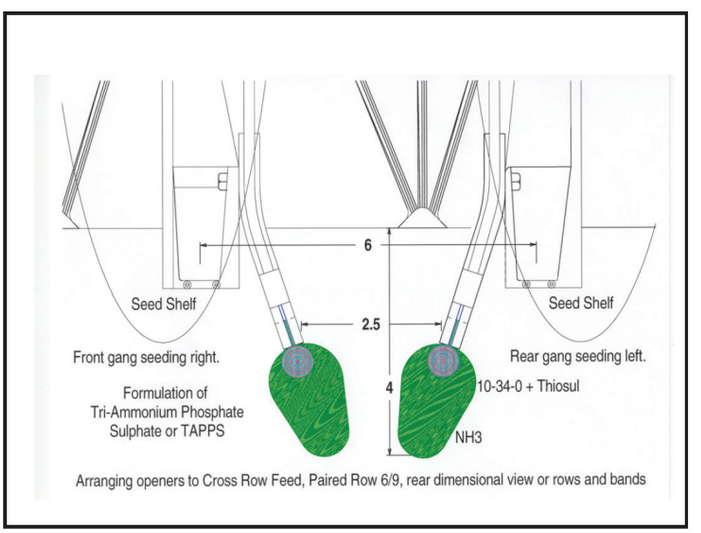
Finally a pre-plant, narrow band spacing, corn fertilization tool bar that just happens to also seed and fertilize soybeansÖ..No-till. Soybeans often starve for nitrogen in the first 60 days. The soybean plant needs 60 pounds of N in the top 2 feet of the soil profile. Less N means a poor start and a yield reduction. This explains why double-cropping soybeans on wheat ground does not prove up to full potential. Placed P and S with secondary and micronutrients is now possible because the tap rooted crop can access fertility through the radicle hair roots. The producer can select blend of solution 32 or 28 with APP/Thiosul.

If N requirements are quite high NH3 can also be direct injected and dual placed.
Soybeans on narrow rows can feed on nutrients as the plant emerges and the root system develops. Protein levels of soybeans can be increased to 36% and higher
with this unique Exactrix Wing Injection. Higher protein soybeans mean a more desirable export crop. NP and S are key in building Protein. Liquid micronutrients can be applied with zinc, boron, copper and iron. Soybeans use the leveraged fertility while the weeds starve.



In corn production a major yield barrier breakthrough occurs when band spacing is reduced utilizing pre-plant fertilization. The most desirable band spacing for corn is 7.5 inch when dual placing N and P. The synergism of dual placement is amplified by a factor of 4 times. This is because nutrients can be accessed by the corn root system at four locations rather than just one location. This also makes secondary and micronutrients more effective. Corn can be immediately planted behind the Deere 1890 and 1690 because the NH3 bands have become dilute and non-injurious to the corn root system. Immediate planting after application really adds to the crop productivity. The narrow band spacing approach has been time proven in Ontario as well as Nebraska. This allows for better nitrogen efficiency since now the NH3 can be applied just before planting. Leaching potential is drastically reduced over fall application of NH3. No-tillage is required after dual placing. Always dual place nutrients with no following tillage. Always apply the nutrients on narrow bands and then plant.

UNL and Nebraska producers are setting much higher yield goals. Hopefully, yields in the 300 bushel per acre range are repeatable using such techniques as dual placement, narrow band centers, VRT, RTK guidance, selective watering techniques, narrow plant rows, and no-tillage pre-plant placement of nutrients. This picture shows the condition of the corn crop, August 2003, using the Exactrix, dual placement and a Deere 1690 as a pre-plant no-till applicator.



Exactrix owners normally install the Exactrix system over a 3-day period when dual product systems are installed to the Deere 1690 or 1890. The installation is faster since Exactrix pre-builds and tests the systems on turntable mounts. The trailer tow hitch is also available as an option on the 2KD ìWeigh Masterî. The control system is CANbus. The control is capable of mapping the fields as the material is applied. You can also order the control system with VRT and RTK guidance. Custom application of nutrients often requires a higher level of service. Exactrix knows your tractor seat time produces income. The top of the line Legacy 6000 control system is standard on dual product applications. The Exactrix initial investment is paid back in the first year. Custom applicators budget $60,000 to $70,000 for the most advanced versions. Since the nutrients are applied at 10 mph at 42.5 feet high NH3 flow rates result. Thus bottom outlet valve NH3 tanks are required for accuracy and cold weather performance. Auto Farm RTK guidance is available for roll, pitch, and yaw corrections in rolling country. You can apply nutrients right to the centimeter if you so desire.

The Exactrix 2KD ìWeigh Masterî is a dynamic scale and weighs the NH3 as it is applied. Port to port accuracyís are sub 1% CV in all temperature and flow ranges because the NH3 is injected as a liquid and weighed as mass flow. Actual custody transfer is available at delivered field wide applied rates of within 10 pounds of NH3 in 10,000 pounds of NH3 appliedÖ. This is more accurate than a mechanical scale. This allows you to change fields without weighing tanks. Dual Exactrix NH3 manifolds can applied to the 2KD ìWeigh Masterî to split the machine into two application units. This is more efficient on point rows and irregular lands. Normally dual manifolds are used on machine widths of 40 feet or greater.

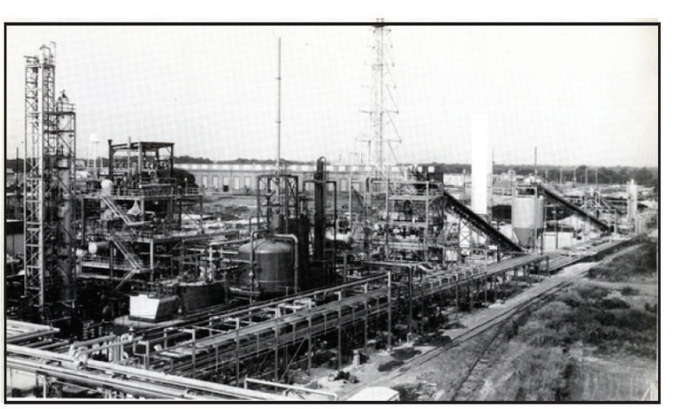
No Orifice Changes With Exactrix 2KM or 2KP

The Mini-Man manifold liquid phosphate, APP/Thiosul system uses a high-pressure, 300 psi diaphragm pump to meter APP/Thiosul over a wide pressure and flow range. The dual stage manifold is the key with the high-pressure range of the pump. Once the system is set up no orifice changes are required due to the dual staging manifold. The liquid APP/Thiosul is actually delivered at a very low pressure after the Mini-Man manifold to the Exactrix Injector Wing. Low-pressure injection at the injection point using stripping orifices avoids splash back of the material. Dual Mini-Man manifolds can be used on wide airseeders to split the machine into two application units.

Summary: The Deere 1890, 1690 and 1590 seeders can be utilized around the year with Exactrix Injector Wing technology. Up to 3 times better utilization of machine is possible. Nutrients can now be placed no-till with no seed bed disturbance. Timing of nitrogen and phosphate is critical to top yields. Fall fertilization locks the producer in when changes occur in markets and the federal farm program. NH3 can now be placed just before planting. When nutrients are placed more timely and more accurately, the actual cost per bushel is reduced. Exactrix systems apply 30% to 40% more crop usable nitrogen. Mini-Man systems apply 10% to 25% more crop usable phosphate. Crop proteins can be increased. Weed control is enhanced. Tri-ammonium polyphosphate sulfate can be formulated producing most available form of plant food. Biological control can be implemented with co-host trap cropping. Nurse cropping can be implemented. The negative environmental aspects of nitrate leaching and loss of phosphate to the rivers and streams is more manageable.

National Public Radio reports that low cost Anhydrous Ammonia is the single greatest technical development of the last 200 years. At least 2 times more land in the US would need to be in production to feed only our citizens if low cost Anhydrous Ammonia was not available. Millions of lives have been saved or improved around the world with the commercial availability of NH3, Anhydrous Ammonia. Two Nobel Prizes have been awarded to Haber and later Bosch for developing the manufacturing process of low cost NH3. A third Nobel Prize was awarded to Norman Borlaug for improved crop genetics that help feed a hungry world. Borlaugís Green Revolution would have not been possible without the availability of low cost NH3 to fuel the genetic performance.

Natural gas, atmospheric nitrogen and electricity are utilized to produce 1,500 tons per day of NH3 at a West Coast manufacturing plant.



The feasibility of producing NH3 from coal was carried out in the 1970ís by the TVA. Syngas is produced from the coal to make ammonia.

Considering all the technical achievements of the last 200 years it is almost unbelievable that NH3, Anhydrous Ammonia leads over such technical developments such as penicillin, harnessing the atom, air and land transportation, the human genome, and the computer. Not one technical development on this planet has affected your life more than low cost, Anhydrous Ammonia, NH3. Feeding a hungry planet with protein and carbohydrates is absolutely paramount in the development of our societies. The rise and fall of previous societies were directly related to soil productivity.

NH3, Anhydrous Ammonia reduces soil erosion by reducing arable acres. Mineralization of organic matter is produced by tillage releasing organic nitrogen. Soil tillage ìstirs the fireî by introducing excessive oxygen into the topsoil layer causing an organic nitrogen release into the soil profile. The organic nitrogen release or mineralization is used by growing crops. Summer fallow farming practiced
by the western pioneers and homesteaders provided the critical nitrogen to raise new crops.

Finally, a true no-till seed bed with all nutrients placed deep in pre-plant corn production.

Nebraska, Ideal no-till seed bed results with 15” band spacing dual applied, Deere 1690

Kansas, Ideal no-till seed bed results with 10” band spacing, Deere 1850

Maximum Applied Banded NH3, Aqua, and Urea, N Rate In Corn & Spring Wheat Production.
Avoiding Nitrogen Interference With Placed Phosphate Uptake In Dual Placed Bands.
Improving Placed Phosphate Efficiency In Spring Cropping.

Deep Band Spacing Ammonic Nitrogen Band Centers	Maximum Pounds Ammonic N Applied In The Dual Placement Deep Bands
20"	55
18"	65
15"	83
12"	97
10"	110
7.5"	165
6"	195

Phosphorus Fertilizer Considerations for Maximum Yields. Beaton and Harapiak, 1986.

CY5, 10/10/03

When dual placing NH3 with P in spring crops watch the band spacing concentration.....Corn and Spring Wheat Considered.....Why?

1. NH3 can interfere with the placed P uptake if the NH3 band is too concentrated. Corn and Spring Wheat need diluted NH3 bands for improved uptake of placed P. Pre-plant application of corn nutrients is now possible on 7.5" band spacing.....no-till using single disc openers. Burning of corn roots is not possible when NH3 bands are dilute and evenly applied.

2. Optimum band spacing for placed P efficiency is 6" to 7.5" irregardless if NH3 is dual placed. Corn and Spring Wheat respond to narrow bands of NH3 and P.

3. Remember, 70% of the placed P is needed by the plant in the first 30 days of spring seeded wheat. However, only 30% of the placed P be can be utilized.....so P rates must be elevated. Future crops must use the remaining P. The efficiency values of P placement vary with the type of P placement techniques. The Cross Row Feeding technique is the most efficient means of placed P utilization in no-till spring wheat production.

4. Consider placing all the placed P in the seed row if the NH3 band is too concentrated. Corn and Spring Wheat will respond better if the NH3 bands are less than 15" spacing.

5. Spring Wheat consumes 70% of it's nutrients in the top 1 foot of soil. Wheat consumes 0.9 lbs. of P per bushel produced. Wheat consumes a very high amount of P per bushel produced as compared to corn.

6. Banding N and P deeper than 4" is not recommended by most soil scientists in Spring Wheat. No better results can be obtained at 6" or 8" band depths. Seed bed quality, moisture infiltration, and moisture storage is compromised. Banding NH3 deeper than 4" is a form of ripping to control tillage compaction. Weed control is improved with 4" banding of N and P with dedicated paired rows of wheat. Cross Row Feeding enhances placed P utilization.

7. Utilize Sulfate S or Thiosul in combination with N and P to improve band stabilization and build protein. Sulfur is the most under-applied of all nutrients. Crop sulfur requirements continue to grow as power plants reduce emissions.

8. Micro-nutrients perform at a higher efficiency when applied as liquids. Uniform banded liquid application is most desirable when the band is in close proximity to the seed. Geometry (2 x 2) of the band in relation to the seed may produce higher micro-nutrient performance

9. Plant nutrients located in close proximity to the seed can produce new and better results with radicle and seminal root hair access. A great start of the crop can result in a great finish. A poor start of the crop never results in a great finish. A better start potential is possible with ideal nutrient band and seed row geometry. Phosphate is non-mobile and placed P is a target nutrient that is found by the plant in a very small soil volume.

CY5, 10/10/03

NH3 Consistently Outperforms All Nitrogen FertilizerTypes. Why?

1. NH3 is the most soil stable synthetic nitrogen source. NH3 requires conversion to the nitrate form for high downward mobility.
2. NH3 must be placed in the root zone. NH3 does not have a surface residue tie up problem.
3. NH3 must be sealed. The application slot must be closed. Sealing NH3 nitrogen assures higher use efficiency. Volatilization loss is less with NH3.
4. When NH3 is evenly and uniformly applied with a Low CV application highest yields are produced. Wind can cause irregular patterns with dry Urea application. Surface applied applications of Urea, UAN, URAN, are subject to runoff and surface volitization.
5. Weed control is improved as compared to all other surface applied fertilizer types. Banding nitrogen hides fertility from weeds.
6. Surface runoff of top dressed applied nutrients will not pass the environmental test. Always avoid surface application of nutrients. Surface stratification of nutrients can occur lowering pH at the soil surface.
7. NH3 is the highest analysis nitrogen source and is granted to be 82% nitrogen. Other fertilizer types may have a volatile loss in storage or transport. NH3 is always the lowest cost form of nitrogen. NH3 long term is 30% lower cost than it's cousin, 46-0-0, Urea.
8. Corn prefers NH3. Corn can not utilize nitrate in the first 3 weeks.

Corn Grain Yields as Affected by Several N Management Strategies at Wooster and Springfield, Ohio, 1984-1985.[1]

N Rate	N Source[2]	Application Time	Application Method	Corn Following Corn	Corn Following Soybean
Pounds per acre				Bushels per acre	
0				86	97
150	AA[3]	Preplant	Knife	154	162
150	UAN	Preplant	Broadcast	145	154
150	UAN	Preplant	Dribbled (30" Band Spacing)	154	155
150	UAN	Split 1/3 Preplant 2/3 Sidedress	Dribbled (30" Band Spacing)	150	157
150	UAN	Split 2/3 Preplant 1/3 Sidedress	Dribbled (30" Band Spacing)	151	156

1. Adapted from D. J. Eckert, 1987. UAN management practices for no-tillage corn production. Journal of Fertilizer Issues Vol 4: 13-18.
2. AA=anhydrous ammonia, UAN= urea ammonium nitrate solution.
3. Anhydrous ammonia applied as gas state with poor port-to-port accuracy. Liquid state application of anhydrous ammonia would produce better results.

CY2, 12/1/02

The Effect on Grain Yield of No-Till Corn by N Sources and Method of Application in Indiana.[1]

N Treatment	Average Grain Yield, Bu./A @15.5% Moisture.
NH3 Injected[2]	139
UAN Injected	135
UAN Surface	118
Urea Surface	123

1. Adapted fom D. B. Mengel et. al.,1982. Placement of nitrogen fertilizers for no-till and conventional corn. Agronomy Journal 74:515-518.
2. Pressure reducing NH3, gas type application system with poor port-to-port accuracy. It can be assumed that low CV, Exactrix, liquid NH3, would produce better results.

CY1, 12/1/02

First year corn yields following good alfalfa stands, 1985-1995[1]

Nitrogen applied in pounds per acre.	Corn Following Alfalfa Average Corn yield in bushels per acre.
0-24	166
25-45	165
55-75	167
80-100	166
110-130	167
140-160	167

1. Big Spring Basin Demonstration Project trials.
Northeast Iowa Demonstration Project trials
Department of Agronomy, Iowa State University.
Prepared by the Department of Agronomy, Iowa State University.

CY3, 12/6/02

Maximum Applied Banded NH3, Aqua, and Urea, N Rate In Spring Wheat Production. Avoiding Nitrogen Interference With Placed Phosphate Uptake In Dual Placed Bands. Improving Placed Phosphate Efficiency In Spring Cropping.

Deep Band Spacing	Maximum Pounds Ammonic N Applied In The Dual Placement Deep Band
20"	55
18"	65
15"	83
12"	97
10"	110
7.5"	165
6"	195

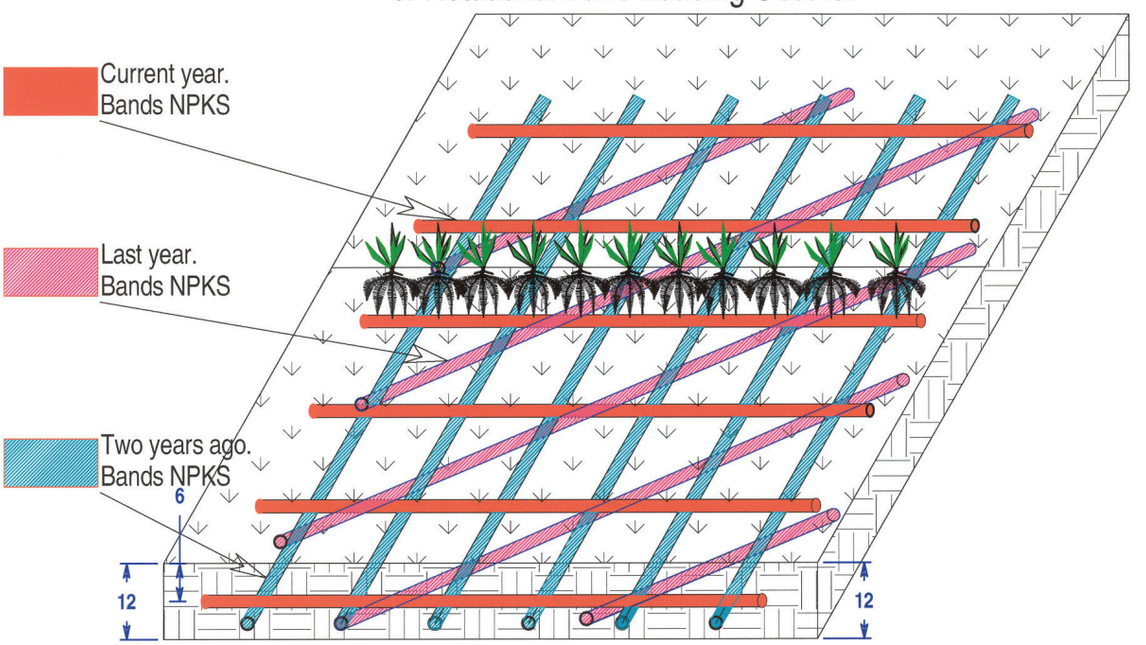
Phosphorus Fertilizer Considerations for Maximum Yields. Beaton and Harapiak, 1986.

When dual placing NH3 with P in spring crops watch the band spacing concentration....Corn and Spring Wheat Considered.... Why?

1. NH3 can interfere with the placed P uptake if the NH3 band is too concentrated. Corn and Spring Wheat need diluted NH3 bands for improved uptake of placed P. Pre-plant application of corn nutrients is now possible on 7.5" band spacing.....no-till using single disc openers. Burning of corn roots is not possible when NH3 bands are dilute and even.
2. Optimum band spacing for placed P efficiency is 6" to 7.5" irregardless if NH3 is dual placed. Corn and Spring Wheat respond to narrow bands of NH3 and P.
3. Remember, 70% of the placed P is needed by the plant in the first 30 days of spring seeded wheat. However, only 30% of the placed P be can be utilized.....so P rates must be elevated. Future crops must use the remaining P. The efficiency values of P placement vary with the type of P placement techniques. The Cross Row Feeding technique is the most efficient means of placed P utilization in no-till spring wheat production.
4. Consider placing all the placed P in the seed row if the NH3 band is too concentrated. Corn and Spring Wheat will respond better if the NH3 bands are less than 15" spacing.
5. Spring Wheat consumes 70% of it's nutrients in the top 1 foot of soil. Wheat consumes 0.9 lbs. of P per bushel produced. Wheat consumes a very high amount of P per bushel produced as compared to corn.
6. Banding N and P deeper than 4" is not recommended by most soil scientists in Spring Wheat. No better results can be obtained at 6" or 8" band depths. Seed bed quality, moisture infiltration, and moisture storage is compromised. Banding NH3 deeper than 4" is a form of ripping to control tillage compaction. Weed control is improved with 4" banding of N and P with dedicated paired rows of wheat. Cross Row Feeding enhances placed P utilization.
7. Utilize Sulfate S or Thiosul in combination with N and P to improve band stabilization and build protein. Sulfur is the most under-applied of all nutrients. Crop sulfur requirements continue to grow as power plants reduce emissions.
8. Micro-nutrients perform at a higher efficiency when applied as liquids. Uniform banded liquid application is most desirable when the band is in close proximity to the seed. Geometry (2 x 2) of the band in relation to the seed may produce higher micro-nutrient performance.
9. Plant nutrients located in close proximity to the seed can produce new and better results with radicle and seminal root hair access. A great start of the crop can result in a great finish. A poor start of the crop never results in a great finish. A better start potential is possible with ideal nutrient band and seed row geometry. Phosphate is non-mobile and placed P is a target nutrient that is found by the plant in a very small soil volume.

CY4, 10/10/03

Under No-Till Systems, Residual Placed Bands of Non-Mobile Nutrients Remain Chemically and Positionally Available for Present and Future Crops. A Unique Soil Chemistry Phenomeon of Rotational Band Loading Occurs.



Placed nutrients remain highly available for future crops using no-tillage. Old bands maintain a higher chemical availability since the bands are not disturbed. Maximum root uptake occurs when bands are positionally located at 4" to 8" below the soil surface. Roots find placed nutrients better because geometric access is maximized. Placed soil nutrients remain in soil solution longer under drought stress.

Tillage destroys band integrity and inverts nutrients to the drier soil surface reducing geometric root access.

Rband 12/1/02