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Successful Opening, Closing The Seed Slot With No-Till Planters And Drills

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Row Cleaners.

Field observations by Phil Needham have illustrated that when residue is removed from the seed zone, and a band is lightly tilled either side of the row, its possible to increase soil temperature by 6-8°F (compared to an area of undisturbed soil/residue). This increased soil warming (illustrated right), aids in faster emergence and also facilitates better closing of the seed slot, especially in higher moisture conditions. Row cleaners can also help remove heavy previous crop residue (such as corn stalks) which frequently cause planter unit bounce and loss of seeding depth consistency.



Floating row cleaners are the design of choice for no-till conditions because they follow the contours of the ground to consistently clear residue. Ken Ferrie (Farm Journal Agronomist) was quoted within the magazine saying, “For the third year, running row cleaners so they can float over the terrain improved yields compared to the same row cleaners pinned into a static position. In 2006, floating row cleaners added 10 bu. to 13 bu. to yield in no-till fields. Ferrie believes the advantage would also be present in conventional-till fields, but would be less dramatic”. (link is attached at the bottom of this page)



Adding aluminum side treader wheels (both images right) allow floating row cleaners to be carried across softer areas of the soil surface, plus they allow row cleaners to follow the contours of the ground without gouging. Row cleaners can be adjusted down until the fingers engage the soil to clear residue evenly, but they should not move a significant amount of soil. If they move soil, this can result in a depressed seed zone where water can stand and reduce emergence. Soil erosion can also occur when the seed zones are left with a depressed finish.



Wheel weights or down-pressure kits may be added to most floating row cleaners to help keep row cleaners engaged and to help them push heavy residue aside. Wheel weights are illustrated in the image to the right. 4 weights per wheel can add approximately 20lb/row.

Link to Ken Ferrie Article in Farm Journal:
<http://www.agweb.com/FarmJournal/TestPlots/Article.aspx?id=134465>

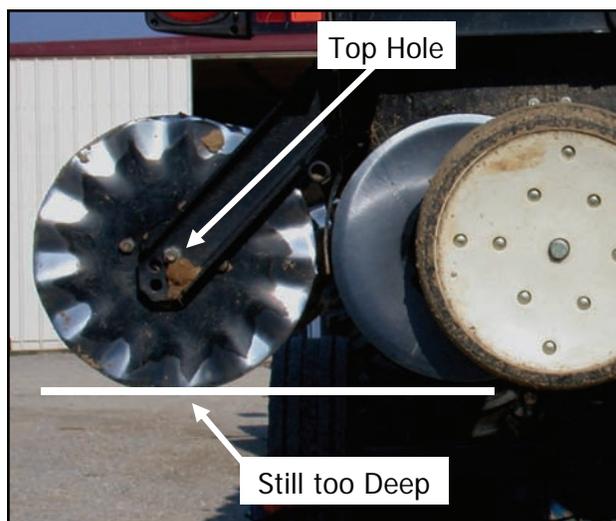
No-Till Coulters. Many successful no-tillers have removed their no-till coulters. This is a difficult step for some, but by removing one coulters and observing the results, many producers soon remove them all. The only situation where I have seen a no-till coulters to benefit is when planting into sod, where the dense mat of surface material confines the performance of the double-disc openers.

One of the problems which results from the use of no-till coulters includes throwing soils out of the seed zone (see image right). This presents problems because it can lower the seed zone, which can cause ponding within the rows - especially within high rainfall areas. When soil is thrown out of the seed slot, it also makes it difficult to gather soil back up to press around the seed and close the slot (see image middle right). When soil is thrown out of the seed zone as illustrated, it can also cause the gauge wheels to ride up and compromise seeding depth consistency. This results in some of the seeds being positioned too shallow in the soil, without enough soil to cover them. This problem is illustrated in the image to the right. Bouncing of the gauge wheels can also translate into unit vibration and seed losses from the meter.



Another problem with no-till coulters is that they can produce a false floor in the bottom of the seed slot, which leads to poor seed to soil contact and reduced emergence. This is common in dry areas and is compounded by the fact that some brands (and models) of planter do not allow the no-till coulters to be raised up above the lower working depth of the double disc openers.

The image (right) illustrates one example. It's a Kinze 2600 and even when the no-till coulters is positioned in the top hole, the bottom of the no-till coulters is still deeper than the bottom of the double-disc opener. The solution to raise the Kinze no-till coulters up higher is to place washers or a piece of flat-bar (with holes drilled in it), under the lower side of the coulters mounting bracket. This will push the no-till coulters forward and raise it slightly.



Closing Wheel Arm Settings. Once the seed has been positioned at a consistent depth to promote uniform emergence, it is critical to close both sides of the seed slot to optimize seed to soil contact and promote even emergence.

Adjustment of the closing wheel arm (side to side) will be required if the closing wheels are not centered over the top of the seed slot. Eccentric or slotted adjustment systems are fitted to most newer style planters to make this adjustment.

The photo (right) illustrates a poorly aligned closing wheel arm fitted with a pair of smooth closing wheels. Some producers may decide to increase the down-pressure of the closing system in higher moisture conditions, when in fact it increases the density of the soil either side of the seed slot, slowing emergence of the seedlings and resulting in sidewall compaction. The preferred option is to replace the smooth wheels with either a single or pair of spiked closing wheels.

Spiked Closing Wheels. Depending on the soils and moisture levels, both configurations can perform very well. Generally a pair of spiked closing wheels are best suited for higher moisture soils, because this combination can close the seed slot more effectively and spade both sidewalls to reduce sidewall compaction.

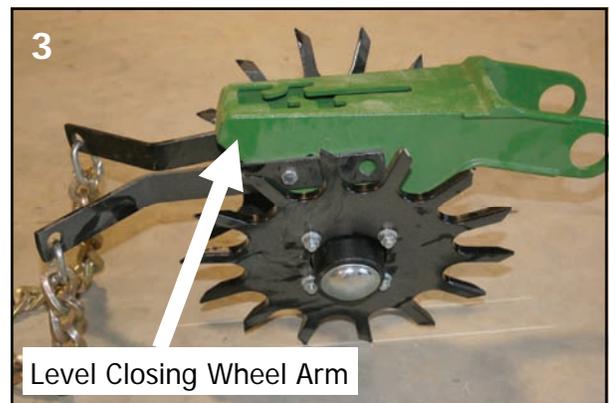
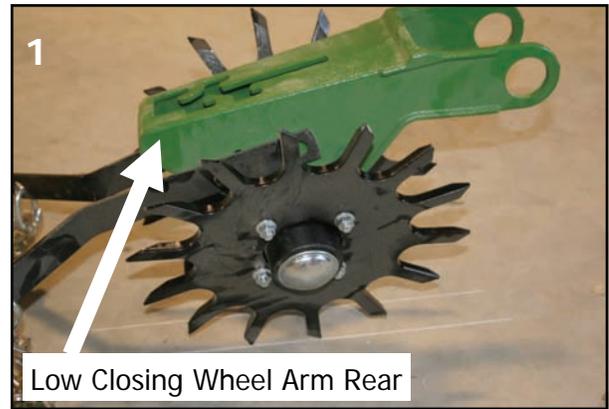
A single 15" spiked closing wheel alongside a smooth standard closing wheel configuration is illustrated right and these configurations perform well in minimum tillage situations and medium to dry soils. Adjusting the distance between the smooth wheel and the 15" spiked wheel is critical to their performance.

Both of the images right were taken on the same planter within the same pass, illustrating the ability to close a seed slot with a spiked wheel configuration, despite the higher moisture no-till conditions.



Closing Wheel Arm. Most producers are good at centering their closing wheel arm above the seed slot, but judging by my travels across the mid-west each spring, its amazing to see how many producers don't adjust their closing wheel arm to run level, especially with spiked closing wheels. While 13" spiked closing wheel are 1" greater in diameter than a standard smooth closing wheel, when they engage the soil in looser areas of the field or when operators apply too much down-force, you will find that the closing wheel arms descends too far at the back.

The image below illustrates the problem, the rear of the closing wheel arm is too low. It should be level at the top, not angled down.



The closing wheel arm angle is very important for the closing action of planters, especially when trying to close the seed slot in difficult conditions. As the rear of the closing wheel arm lowers, the gathering action of the closing wheels is reduced, in fact at a point around 10 degrees less than horizontal, it changes to a negative gathering action which makes closing the seed slot almost impossible in difficult conditions.

Close examination of images 1 & 2 will illustrate how the closing wheel arm (which is low at the rear) reduces the closing action and actually changes it to a negative gathering action. (look at the 2 lines drawn on the floor).

Compare images 1 & 2 to images 3 & 4 which illustrate the closing system improvements when the closing wheel arm is level.

Leveling The Closing Wheel Arm. First it is very important that any brand of planter is leveled, because if your planter drawbar is down at the tongue end, the planter closing wheel arms will be lower at the back. Some planters can benefit from being slightly higher at the tongue end of the drawbar, but not by more than 2-3". The image to the right illustrates how raising the drawbar (in this example too much) helps level the closing wheel arm (also too much).

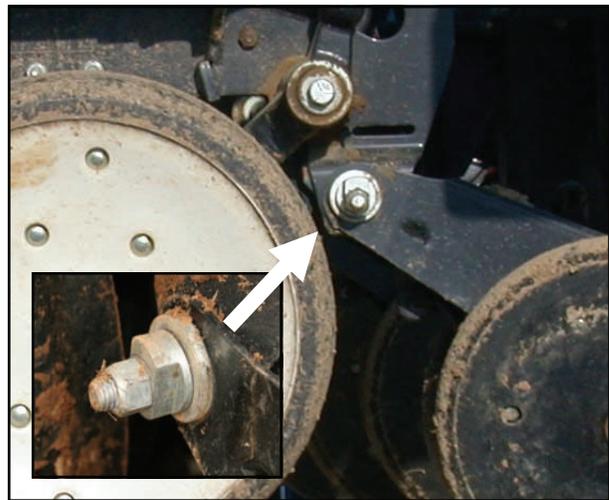
A 3000 series Kinze has an excellent way of helping to level the closing wheel arm, it comes in the form of an eccentric cam and this configuration is also used to center the closing wheel assembly over the seed row. The Kinze eccentric cam raises or lowers the arm around 1/4" either side of center, so by working both sides you can lower the front of the arm while centering the closing wheel arm over the row.

John Deere closing wheel arms are more difficult to adjust vertically because there is no eccentric cam installed within the closing wheel arm.

One aftermarket modification for John Deere or Kinze which helps level the closing wheel arm is called a drop-down kit and its shown in the image below right. This kit comprises of a small bracket which mounts to the closing wheel arm assembly (where the bolt usually attaches the closing wheel). Using a 2nd pin welded to the bracket, it bolts securely to the closing wheel arm and allows producers to mount the closing wheels approximately 1" lower on the closing wheel arm (illustrated below), thus allowing the assembly to run level - significantly improving the closing effect (especially with a pair of 13" spiked closing wheels).



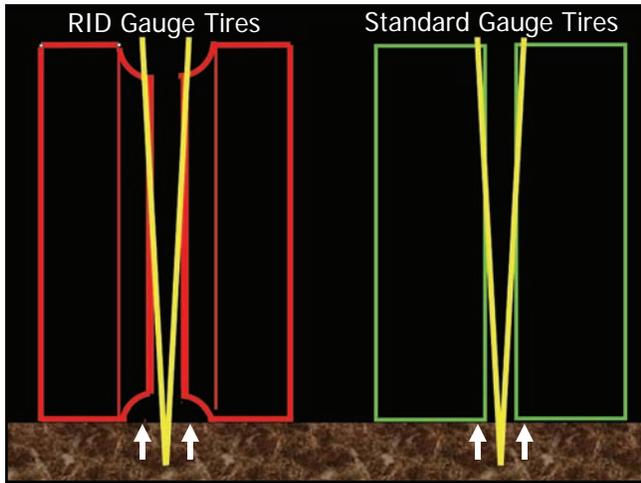
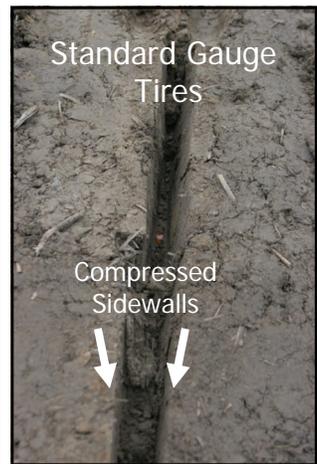
As the drawbar is raised at the tongue end, the closing wheel arms will raise at the back.



Reduced Inner Diameter Gauge Tires. To reduce sidewall compaction and improve seed slot closure in higher moisture soil conditions, 4 1/2 x 16" reduced inner diameter (RID) gauge wheel tires should be fitted to planters. If you are buying a new planter, most brands can be factory fitted with them as an option, at a minimal price increase.

Some producers in higher moisture regions also install them on John Deere single disc drills and air-seeders, claiming they can return to the field a day or two sooner after a rain and also reduce the amount of sidewall compaction.

RID gauge wheel tires reduce the amount of soil compression either side of the seed slot. The images below and right illustrates these benefits.



No compression around seed zone

Compression around seed zone



Drag Chains. While drag chains are a simple and economical addition to a planter, they can significantly add to its performance (especially when the surface finish of the closing system is found to be uneven or not completely closed). Such conditions are common in no-till fields and the purpose of the drag chain is to pull a hand-full of soil (as illustrated in the image to the right), level the seed zone and to drop loose soil into any unclosed areas of the seed slot. This technique has been found to make soil warming more consistent and help promote uniform crop emergence.

John Deere Single Disc Seeder Modifications

There are a number of simple modifications which can be added to John Deere single disc drills/air seeders to improve their performance. The first important topic is ballast. For example, a factory 30' wide JD 1990CCS (without any seed in the hopper) weighs 18,800lb. This is a lot of weight, but when its distributed over the 48 openers (assumes 7.5" spacing), that works out to only 395lb of weight per opener. (In reality some weight is transferred to the tractor drawbar, frame wheels etc, so 18,800lb would not necessarily be the correct weight to use). In heavy residue and hard soils, I have found that a weight per unit of 425-450lb is frequently required. A factory 1890 drill 30' wide only has around 354 lb of weight per opener, as there is no tank on the frame, so these drills need additional weight beyond what was previous discussed with a CCS.



Firming and Closing Wheel Modifications. The standard cast closing wheel on the John Deere single disc drill does not generally perform well in higher moisture no-till conditions. Many after-market options have been found to significantly improve soil warming and slot closure. Spiked closing wheels are best suited to higher moisture clay soils (as illustrated right). Spiked wheels close the seed slot in addition to lightly tilling the seed zone which has been found to speed up crop emergence and early growth.



Another variant of a closing wheel is illustrated right, this one is less aggressive than a spiked wheel, so its more suitable for medium moisture to dryer soil conditions.



Narrow after-market firming wheels also offer significant improvements over factory wheels because they can fit down into the seed slot better and imprint seeds into the bottom of the furrow. Some are made out of flexible materials to help ensure the firming wheel remains in the base of the seed slot, even when working on sloping fields or when making gradual turns.

Narrow RID Gauge Wheels. New RID narrow gauge wheels are 2 3/4" wide and are an excellent addition to a John Deere single disc drill (or planter) that's intended to be used in no-till conditions (especially when no-tilling into standing corn stalks). One of these wheels is illustrated above, in this example it's narrow width avoids many of the corn stalks (compared to a 4 1/2" wide standard gauge wheel) to help the unit maintain more consistent depth control. 2 3/4" narrow gauge wheels also feature 3/8" of relief (this is half of the relief commonly featured on standard RID gauge wheel tires). 3/8" of relief allows sidewall compaction to be reduced while preventing the degree of lift which may be encountered when seeding or planting in dry conditions with standard 4 1/2" x 16" RID gauge wheel tires.