

Reduce Compaction And Tire Slippage In The Field

For many growers, soil compaction and tire slippage are two major concerns that they know can affect yield and productivity. When soil becomes compacted, it cannot be easily penetrated by water, which can lead to lower yields. At the same time, without good traction in the soil, a farmer can see a loss in fuel efficiency and productivity.

According to Titan Tire Corp., manufacturer of Goodyear farm tires, compaction and slippage problems can be easily improved by minor adjustments to tires. By making an adjustment that improves one area of performance, however, the grower may be giving up some performance in the other. This leaves many growers trying to find the perfect balance between flotation and traction.

“Farmers need to decide what is important to them, and what kind of performance they’re looking for in the field,” says Jeff Vasichek, vice president of sales and marketing at Titan International, Inc. “Then they need to understand exactly how adjustments to the tire will affect the areas of performance they’re looking to improve. When it comes to traction and flotation, load and inflation pressure are the major factors.”

Load And Inflation Pressure

Load has a significant impact on both compaction and traction. Although increasing the load will improve traction, it will also increase compaction, which has been a major concern as today’s farmers are carrying heavier loads than ever before.

In the 1940s, the average weight of tractors on the market was about 3 tons, but it’s not uncommon for today’s high-powered tractors and heavy implements to weigh around 20 tons, according to the company. As such, compaction has grown to be a major concern for farmers over the last few decades.

“In general, the lower the inflation pressure of a tire, the less ground-bearing pressure there will be to cause compaction,” says Vasichek. “Lowering the inflation pressure of a tire also lowers its load capacity, while maintaining the optimum footprint, so making adjustments to air pressure based on load is very important.”

Finding The Optimum Footprint

Increasing a tire’s footprint allows the weight to be distributed over a larger area, which reduces ground-bearing pressure and thus compaction. Removing weight from a tire will also decrease its footprint, so in order to maintain good flotation, it’s important to let some air out of the tire when taking off weight.

When adding weight, it’s important to increase inflation pressure. Running a tire at inflation pressures that are insufficient to support the weight can lead to sidewall damage and other premature wear. “You need a large footprint to help reduce compaction, but you also need to carry heavy loads, to help improve traction,” says Vasichek. “So, to get the best of both worlds, a farmer should try to find a tire that carries the most amount of weight at the lowest inflation pressure.”

Tire Selection

Although bias tires are often the cost-conscious choice, radials are able to carry weight at lower inflation pressures, which means they will provide better flotation and cause less compaction, according to the company. Similarly, a radial can carry more weight than a bias at the same inflation pressure.

“Radials are very versatile; they simply provide better flotation and higher load capacities, which is the key to reducing compaction while maintaining traction,” says Vasichek. “The size and shape of tire can also affect flotation and load capacity.”

In some parts of the U.S., because of the type of crop, the tendency is to use taller and narrower tires that offer a longer footprint — one to two additional lugs — on the ground, resulting in increased traction. The larger tire chamber in these tires also means the tire will carry the same load with less air pressure, causing less compaction.

Tall, narrow tires are often used in dual and triple setups, which further improve flotation and load capacity. With extra tires on the ground, the weight is distributed over more area, which leads to less compaction in its tracks. However, with more tires, there are more tracks, which isn't always a good thing, explains Vasichek.

“Studies show that 70% to 90% of subsoil layer compaction occurs on the first pass across the field,” says Vasichek. “So, it's important to limit wheel traffic as much as possible. Having duals or triples creates extra tracks and extra areas of compaction.”

It's important to base decisions on how the tire will be used the majority of the time. While some applications require superior traction, others require flotation.

“When performing high-draw pull applications like heavy tillage, you're going to need a lot of traction,” explains Vasichek. “If you don't have that traction, you're going to lose a lot in fuel efficiency, which will likely outweigh the cost of any lost yield due to compaction. You really have to decide what makes the most economic sense.”

Vasichek also explains that soil type can factor into the decision. “In terms of compaction, soils with a high sand content are much more forgiving than soils with a high clay content,” says Vasichek. “So, if you're working in clay soils, and aren't performing a lot of high-draw pull applications, compaction should be much more of a concern than traction.”

Other Simple Tips For Reducing Compaction

The leading cause of compaction is wheel traffic in wet soils. Studies have shown that the wetter the soil, the deeper the compaction occurs. When dry soil compacts 18 inches, wet soils will compact 24 inches, at the same axle load.

“Try to limit wheel traffic on wet soils as much as possible,” says Vasichek. “This can be done by staying on the same tracks and standardizing wheel spacing on all equipment.”

In addition to wheel traffic, there are a number of causes of soil compaction that can be easily corrected, including persistent tillage operations at the same depth and lack of crop rotation.

If tillage operations persist at the same depth over a period of time, a dense tillage pan can form below the tilled soil. Lack of crop rotation leads to little variation in root structure, which does not help to break up the subsoil.

“The easy solution to limiting tillage pan is to regularly adjust the depth of the tillage equipment,” says Vasichek. “I’d also recommend rotating your crops as much as possible, because that loosened subsoil is going to lead to better yields.”

Limiting compaction and slippage is a balancing act, and improving performance in one area may lessen the performance in the other. To a certain extent, growers need to decide what is more important — reducing compaction or increasing traction. Compaction could mean lower yields, while tire slippage could mean lower fuel efficiency.

Deciding which outweighs the other is heavily dependent upon soil conditions, type of work being done and the load being carried. There are, however, several ways to minimize both compaction and slippage.

Additionally, a farmer can reduce compaction by simply reducing wheel traffic in saturated soils, tilling at various depths and rotating crops as much as possible. Doing so will ensure reduced compaction and increased yield.