

# COMPACTION AND SPRAYERS:

Risk Reduction and Recommendations

## What's Inside:

- ① What is Compaction?
- ② The Role Sprayers Play
- ③ Reducing Compaction Risk When Spraying
- ④ Other Compaction-Preventing Practices
- ⑤ Summary

## COMPACTION RECOMMENDATIONS

### What is compaction?

Modern farm machinery makes it possible for farmers to grow more crops on fewer acres in less time. Today's growers use larger and more powerful tractors, sprayers and combines than their predecessors. Crop management also has evolved; between planting, pesticide, fertilizer treatments and harvest, it is not uncommon for an individual field to be driven over several times a year by various pieces of machinery weighing tens of thousands of pounds apiece. While each field operation is important in the crop production process, the combined weight and frequency of machinery passes over a field also can produce an unintended consequence: soil compaction.

Compaction is the reduction of soil volume as soil particles are pressed together by external forces, including heavy machinery. When soil is compacted it is more difficult for air and water to penetrate the surface and reach seeds and plant roots. Compacted soil layers can hamper crop emergence, as well. Farmers should understand the role machinery plays in compaction and best practices to reduce soil damage, but still maintain proper crop management. This white paper addresses compaction specifically as it relates to self-propelled sprayers.

### The role sprayers play

Generally speaking, self-propelled sprayers are lighter than tractors and combines. That is especially true of Apache Sprayers, which weigh about 20,000 pounds dry — 10,000 to 15,000 pounds less than comparable models. Tractors and combines usually tip the scales at around 40,000 pounds, with some models approaching 60,000 pounds. As most self-propelled sprayers weigh less than tractors and combines, they in turn exert less compaction pressure on soil during a single pass. However, if two or more spray applications in a crop season are necessary because of a high incidence of weeds, insects or plant diseases, the cumulative machine weight can rival that of heavier equipment.

Soil conditions also present challenges for farmers who need to make timely applications to address pest problems. Wet soil is a greater compaction risk than dry soil. If soil is soggy but critical applications need to be made, farmers are left with the difficult decision of risking compaction by driving their sprayers through those soft fields, or postponing applications and allowing pests to gain a stronger foothold in their crops.

# COMPACTION AND SPRAYERS:

Risk Reduction and Recommendations

## Reducing compaction risk when spraying

No spray application practice can eliminate all soil compaction, but there are a number of strategies farmers can employ to keep soil damage to a minimum.

First, start with as light of sprayer as possible. As previously mentioned, Apache Sprayers are lightweight yet durable. Apache Sprayers range from 19,700-21,000 pounds, depending on model and chemical tank size. Other sprayers of comparable horsepower and tank size weigh 10,000-15,000 pounds more.

Second, choose the right tires and properly maintain them. Wider tires known as flotation, or float, tires disperse a sprayer's weight over a larger area, resulting in less overall compaction force. Flotation tires usually measure 20-22 inches across, compared to row crop tires that are about 15 inches wide. In parts of the western United States and Canada where wheat is a dominant crop, farmers also might consider installing dual rear tires for even greater flotation.

Tread designs not only affect sprayer performance but also compaction. According to research by Michelin North America's agricultural tire division, tread angles of 45 degrees provide better traction and ride, while reducing compaction pressure. Rounded or crowned tread patterns tend to sink in soft soil, contributing to compaction.

Also, keep an eye on tire air pressures. Overly inflated tires exert more compaction force than tires with less air. A third risk-reducing strategy is using longer spray booms to cut down on the number of trips through a field. For example, by selecting a 120-foot boom instead of a 90-foot boom, a farmer will make five fewer passes over an 80-acre field.

Finally, observe weather, field conditions and pest pressure patterns during a crop season, to determine if an application operation is absolutely necessary or can wait. If fields look clean and crops healthy, additional treatments might not be needed. Not only will that eliminate extra passes through fields, it can save you money on farm chemicals.

## Other compaction-preventing practices

Along with the sprayer-specific recommendations in the previous section, there are a number of compaction-minimizing strategies applicable to all farm machinery and general soil management.

- Avoid driving on soil that clumps easily. There is a simple test that can be done to check the soil's clumping capability, also known as plasticity. Take a handful of soil and try forming a ball. If it balls easily, refrain from field traffic, if possible.
- Keep machinery axle loads below 20,000 pounds. Axle loads are responsible for subsoil compaction, which is more difficult to correct. Ideally, axle loads should be less than six tons.
- Drive all machinery in the same tire tracks. Limiting traffic to designated driving lanes in each field should preserve surrounding soil from compaction pressure.

# COMPACTION AND SPRAYERS:

Risk Reduction and Recommendations



- Increase soil organic matter to build soil structure and strength. Soil rich in organic matter is more resistant to compaction and better suited to recover from minor compaction damage. Organic matter can be increased by leaving crop residue in the soil, growing cover crops in the off season and adding compost and manure.
- Adopt no-till or strip-till cropping systems. Tilled soil is more vulnerable to compaction than soil that is uncultivated after harvest, or when tilling is limited. Undisturbed soil usually has stronger structure, higher organic matter content and biological activity, and fewer problems with water and nutrient runoff and erosion.

Should soil already be compacted, tillage might be necessary to break up surface ruts or hard layers below the surface. Compaction at or near the surface can be removed with a chisel plow on the upper 8-10 inches of soil. Compaction 11-18 inches below the surface might require subsoiling, an expensive fix that requires a significant return in crop yield to be worth the investment.

## Additional information on compaction diagnosis, risks and prevention can be found in these online resources:

- "Avoiding Soil Compaction," Sjoerd W. Duiker, associate professor of soil management and applied soil physics at Penn State University – <http://extension.psu.edu/plants/crops/soil-management/soil-compaction/avoiding-soil-compaction>.
- "Soil compaction: Causes, concerns, and cures," Richard P. Wolkowski, Extension soil scientist, and Birl Lowery, professor of soil science, University of Wisconsin-Madison – <http://www.soils.wisc.edu/extension/pubs/A3367.pdf>.
- "Reducing Compaction," Michelin North America – <http://www.michelinag.com/Learning-and-sharing/Reducing-compaction>.

## Summary

Soil compaction can damage crops when plants cannot access the air and water they need to grow. Farm machinery driven over agricultural fields is a leading cause of compaction. Although most self-propelled sprayers are lighter than tractors and combines, their repeated use in crop fields can contribute to compaction. Choosing the lightest sprayer to meet application needs, installing flotation tires, maintaining proper tire air pressure, utilizing longer spray booms and limiting unnecessary passes over a field can reduce compaction risks when making spray applications.

Looking to get additional information or have any questions?  
Contact [service@etsprayers.com](mailto:service@etsprayers.com) to talk with an  
Application Specialist today!

Equipment Technologies reserves the right to make changes in engineering, design and specifications; add improvements; or discontinue manufacturing at any time without notice or obligation. All brand or product names are or may be trademarks of, and are used to identify products and services of, their respective owners or its subsidiaries and divisions. in the U.S. and/or other countries. All specifications are subject to change without notice.

Learn more about the advantages of running with Apache! Visit your local Apache dealer or [apachesprayers.com](http://apachesprayers.com).

 877-398-6164