Introduction to GPS Guidance Systems

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These days, engineers are working more on making existing machines smarter and easier to use than trying to develop new ones. In agriculture, their aim is to let machines either do the job or assist the operator with mundane, repetitive tasks. Most field operations entail driving machinery in a series of parallel passes over a field. Operators must concentrate on driving accurately on parallel passes to avoid overlap or leaving gaps in the field. This operation can be very exhausting, especially with some of the new wider equipment and faster field speed operations. For years, farmers and machinery operators used different methods such as mechanical markers or foam markers to improve the accuracy of the parallel swath operations. New to the scene are Global Positioning System (GPS)-based guidance systems.

Fully automated guidance systems

There are two types of GPS based guidance systems; GPS guidance-aided systems and fully automated or "hands-free" GPS guidance systems which actually steers the tractor with the driver only supervising it. The fully automated system is capable of driving the tractor through the field in a straight line with a lateral accuracy of less than an inch. This system uses highly accurate Real Time Kinematic GPS. This system can work with any field operation including planting, cultivating and harvest.

The hands-free guidance system has only been adopted by a few farmers in Ohio due to a price tag of around $50,000. As more companies offer this system the cost will decrease.

GPS guidance-aided systems

With GPS guidance-aided systems, commonly known as light-bar guidance, the operator steers the machinery. These systems are much lower in cost, averaging about $5,000. With an accuracy of 8 to 20 inches these systems are suitable for broadcasting fertilizer, spraying pesticides, and drilling soybeans or wheat.

Benefits of these systems include:

- Less overlap or gaps; thereby increasing the efficiency of applying inputs
- Less driver fatigue improves productivity and safety
- Operators can drive faster
- Crop protection chemicals can be applied at night when there is less wind
- No need to buy and maintain a foam marker system

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Components of a GPS guidance system

The main components needed for a guidance system are a Differential Global Positioning System (DGPS) receiver, antenna, guidance display and wire harness.

Several optional items and features are available including:

- a sound device to signal end of row or off-track
- a data logger to record application information
- contour and straight parallel swathing
- a look-ahead feature for easier steering
- position correction for ground slope

The DGPS receiver determines the location information and sends it to the guidance system to create an accurate navigation path. The DGPS receiver has several options available for a source of differential correction signal; WAAS, Coast Guard, or subscription L-Band signals. When choosing a GPS receiver, be sure to select the receiver that will provide the signal choices that will give the most accurate signal for your region. Regarding compatibility, most guidance systems are capable of using any type of GPS receiver that meets the guidance system specifications.

The GPS antenna collect the GPS signal from both satellites and differential sources. There are several choices when it comes to a guidance system display, such as a light bar, moving lines or a visual picture of current application direction. All types of systems provide a means of directing the operator to stay on the desired path.

As the accuracy increases, there will be opportunities to use these systems for more precise applications in the agricultural community.