Articulated, High-Clearance Sprayer Has Front Wheel Steering, Too

Articulated steering lets sprayer's rear wheels exactly track the front wheels on end rows. When desired, the articulation joint locks and front-wheel steering takes over.

When Neil and Steve Soehren built their own high-clearance sprayer, they gave it something no commercial rig has – both articulated steering and front-wheel steering. The articulation lets the rear wheels exactly track the front wheels on end rows. However, when desired, the articulation joint locks and front-wheel steering takes over.

"Making slight adjustments on straight rows and at road speed is easier with front-wheel steering," notes Neil.

Flipping between the two steering modes is as simple as stepping on a clutch-type pedal on the cab floor. The pedal controls a valve that moves hydraulic fluid from the cylinders controlling the front tie rod to the cylinders on the articulation joint.

To lock the front end when needed, the Soehrens designed a tie rod using a square tube inside a square tube. When the front wheels are aligned straight ahead, a pin slips in to lock the two tubes in place when the control pedal is pushed. The same action unlocks the articulation joint as hydraulic fluid is directed to its cylinders.

Positioning the articulation joint was a challenge. To experiment, the brothers built a model tractor, rolling it around the floor and studying it. Eventually they determined that the halfway point between the rear end and the front of the boom would give the best tracking.

Neil describes his brother Steve as the idea man and himself as the builder. The process began by stripping down the old IH combine and evaluating parts. After overhauling the motor, they began to modify and assemble components. As Steve conceived how things should work, Neil figured out a way to make them work.

"We used almost all the drive and hydraulic components, as well as the cab, transmission and motor," says Neil. "We even used the sheet metal from some of the side access doors to make a cover for the engine on the sprayer."

The front frame was fabricated from pieces of the combine frame and 3 by 5-in. rectangular tubing. The rear frame was fabricated from 4 by 6-in. steel tubing from an old plow frame.

The articulation joint is about 30 in. high with Timken bearings at either end of the shaft. All the control cables and spray hoses run through a cable bracket attached to the top of the joint case.

Bi-modal steering is only one of the nifty features on the Soehren's sprayer. Because they wanted to use the sprayer as a high boy for late season applications, the brothers wanted 6 ft. of clearance. This required fabricating legs for steering wheels and drive wheels.

Part of the combine's final drive was used for the drop case chain drive on the rear wheel legs. After lengthening the combine's drive axle to 120 in., they attached sprockets from a Deere 6620 hillside combine to the drive stubs and dropped a #100 roller chain to it from a sprocket on the IH axle with all of it inside an oil bath. The Soehrens put jack screws on the upper sprocket so they can tighten the chain without opening the oil- filled chamber.

"It also avoided using a tightener that would loosen up whenever we backed up," says Neil.

To make the front legs, the combine steering axle was cut apart and the new design fabricated on the floor. The front axle was then lifted and fastened to the frame at a center pivot point. This allows the front end to flex with the contour while the rear axle is fixed to the frame. The front wheel spindles and hubs were from an old heavy-duty fertilizer spreader.

The shaft that connects the wheel to the tie rods/cylinder arm was about 4 ft. long and inside a leg-pipe fixed to the frame. Neil realized that once in place, it would be very difficult to work on bearings as the wheels would have to be at least 4 ft. off the ground in order for a wheel, bearing and shaft to be released.

"I cut the shaft off and turned male and female tapers that would fit together and cut a keyway in them. I ran a bolt up through the center from the bottom to lock them together," he says. "This lets me take the bolt out and drop the wheel and bottom foot of the shaft off if I need to work on the bearing or something."

Rear wheels were custom-made for 12.4 by 54 tires. The 12.4 by 42's were mounted on the front. The narrow wheels allow the sprayer to run down 15-in. rows without a problem.

The front-mounted boom hangs on a center pivot point on a sub frame that is raised and lowered with hydraulic arms from the main frame. Float is maintained with the aide of nitrogen accumulators that originally adjusted the header height on the combine.

The boom design is based on commercial booms and has 5-ft. breakaways at either end. For transit, it folds around the sprayer. Originally designed for a 90-ft. width to match a 12-row planter pattern, it was later cut back to 80 ft. for two passes of a 16-row planter.

"Having the cab up above the 6-ft. clearance frame keeps it above the spray pattern too," says Neil. "In high corn you can hardly see where the rows are if the wind is blowing the corn."

Two 440-gal. stainless steel tanks from Ag Chem sprayers are mounted to the rear half of the sprayer frame, just ahead of the engine. The sprayer pump runs off a belt drive on the engine.

"The pump is on a 12-volt actuator," says Neil. "To start the pump running, we just lower the pump to tighten the belt. To stop the pump, we just raise it enough to let the belt run loose."

Neil used electric window switches to run the actuator, with one mounted in the cab and a second switch beneath the frame.

"Having the lower one means we don't have to climb into the cab or onto the tanks if we want to agitate the spray solution," he says.

Neil estimates they spent approximately $12,000 on the sprayer. That includes $3,000 for the used combine and $1,500 each for custom-made narrow wheels to accommodate narrow row planting. The never-used sprayer pump was bought at auction.

"It will go 30 mph down the road and also crawl slowly as needed through the field," says Neil. "Usually we run at about 8-12 mph."

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