EQUIPMENT

Not yet ready for pasture: New life for an old sprayer

by Ken Rost, Frost Services

Well designed and well maintained equipment can get decades of use and, just like the cars we drive, the older ones are sometimes our favorites. When we hang on to an old favorite car, we know that we miss out on recent advancements in technology. Auto engineers solve problems on previous models and introduce new technologies to create a competitive edge. The same applies to turf sprayer technologies. Every year, advancements and improvements are made in sprayer components. From pumps, tank agitators, valves, and controls to nozzle bodies and spray tips, incremental improvements are constantly being made to solve the little nagging problems that we experience when we spray. More importantly, advancements are made in the areas of safety and efficiency to improve of the experience of turf spray application.

The question then becomes, 'How do we keep our sprayers up-to-date?'

One answer would be to buy new spray equipment on a regular basis. This is a good choice if you want to minimize the hours of operation on the drive train and chassis. It also helps if you want to have new looking equipment on your course. This is the same philosophy as trading in your car every couple of years. If you can trade in or resell your sprayer before the booms lose all the paint, you might be able to get good value from a short replacement cycle. However, it's a little harder to do in a down economy when budgets are slim. Also, a short replacement cycle won't guarantee that components are updated, because sprayer OEMs can be slow in adopting new spray component technologies.

A second answer would be to address the little headaches that bother you as you make your applications. Sometimes addressing just one issue improves your equipment and can make you feel like you are using a new sprayer.

The owner of this sprayer chose to update rather than replace.

The answer we chose for a recent sprayer upgrade project was a more comprehensive overhaul of a beloved sprayer that had accumulated a few items that needed addressing. The sprayer was a Toro Multi-pro 1100 and it was built in 1995. It had an excellent drive train and handled very well. However, after fifteen years of use, the list for improvements to be made on the liquid system had grown.

Problems listed by the sprayer owner included:

- Pump – if prime is lost at the end of the tank, we can't get it back.
- Agitation – too little agitation at the beginning of the tank and too much at the end of the tank.
- Filter – not catching enough junk and the nozzles are getting plugged
- Valves – if one boom is shut off, the pressure for other booms goes up
- Boom Control and Pressure Gauge– lost function of the boom section switches and pressure gauge

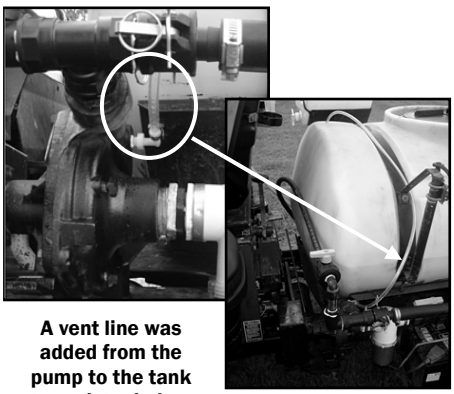
Additional functions requested by the sprayer owner included rate monitoring and multi-turret nozzle bodies.

The following was done to address these issues:

Pump

The pump on the prayer was a centrifugal pump. Centrifugal pumps are nice because they rarely need any servicing or repair, simply because they have few moving parts. However, centrifugal pumps need to have water in the impeller inlet in order to prime. If trapped air gets into the pump, it will not prime and the mechanical seal can be damaged.

New technology in seal material has solved the seal damage issue (Hypro LifeGuard seals) but we still need to get the trapped air out of the



A vent line was added from the pump to the tank to assist priming.

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Sprayer life... *(Continued from page 6)*

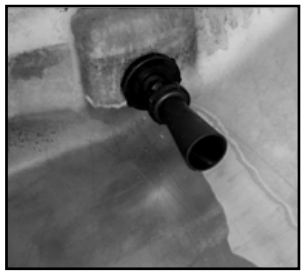
pump to get back to spraying. This was accomplished with a simple vent line installed in the uppermost vent port on the pump housing. The other end of the vent line went to the top of the tank. The vent line allows any air in the pump to be expelled back to atmosphere. Then, when the pump is primed a small stream of liquid is returned to the tank. The volume of this liquid is not significant compared to the rest of the volume of liquid that the pump can produce, so it has no effect on the availability of liquid for spraying.

Agitation

A lot of improvement has been made in agitation technologies since this sprayer was originally built. It was originally equipped with a 'sparge tube' which was simply a stainless steel tube with holes drilled in it to direct flow over the bottom of the tank. It moved very little liquid when the tank was full and it created no movement when the holes got plugged up.

Old sparge tube

The sparge tube was replaced with an inducting agitator. This device creates extra flow and turn over by shooting a stream of liquid through a venturi which draws in additional fluid. The ratio of fluid pumped into the device to the fluid that comes out is 5:1 for the version we used. That means if 5 gallons per minute goes into the agitator, then 25 gallons per minute of total flow exits the outlet. The longer the cone is on the 'horn' of the eductor, the more efficient the total turn over.

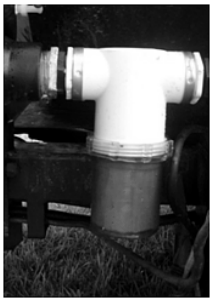


New inducting agitator

Sometimes it's preferred to shut off agitation when the tank level gets low. In our project, we repositioned the agitation valve to where it could be easily reached by the operator.

Filter

Filters are necessary evils that cause a lot of headaches. It is important to remember the intended purpose that they accomplish. They need to collect and remove only the maximum size of particle that could cause problems with components down stream. The choices are usually 20, 32, 50 or 80 mesh sizes. Pumps, valves and flowmeters can handle fairly large particles that would go through a 20 or 32 mesh filter screen. An 80 mesh filter screen will catch more particles than a 50 mesh screen, but it will need to be cleaned more frequently.



A new 80-mesh screen with 20-mesh backing was installed for better particulate removal.

The headaches begin when the screen plugs up before the tank can be sprayed out. Advancements in filters include a 'self-cleaning' feature that can address this problem. A valve and hose on the bottom of a self-cleaning filter allow for the trapped particles to be removed without having to completely disassemble the filter assembly.

Another way to avoid plugged filters is to not rely on your sprayer tank to mix difficult products. Using an on-board chemical mixer or premixing chemicals that do not mix well will help keep filters from plugging up early.

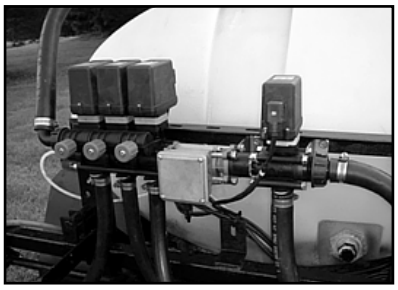
Spray tips are the most vulnerable and their ability to handle particulate depends on the size of their orifice. Many newer spray tips have extra protection with built-in tip strainers. Tip strainers are final insurance that your spray pattern won't be affected by a plugged tip. However, this is only true if they are checked and cleaned on a regular basis.

The filter on our project sprayer had a screen that was too short and material was getting past the screen. We replaced the screen with an 80 mesh screen that was supported with a 20 mesh backing. The golf course using our project sprayer pre-mixes chemicals which allowed for a finer mesh screen to be used on this sprayer.

Valves

Simple on-off solenoid valves on our project sprayer were replaced with motorized plunger valves that had a by-pass feature. The by-pass feature allows for adjustment to keep the boom pressure equal regardless of whether a boom section valve is turned on or off. An adjustment knob is used to adjust the amount of returned flow which is what equalizes the pressure. This feature is especially helpful for sprayers that are not equipped with an automatic rate control system.

Simple on-off solenoids (above) were replaced with motorized plunger valves with a bypass feature (below).



Boom Control and Pressure Gauge

When the valve controls and pressure gauge fail, the sprayer is pretty much useless. This is what happened to our project sprayer and the superintendent wanted to upgrade the controls. To upgrade application controls, we needed to review the options. We know that in-order to calculate the applied rate of spray, we need to know the application speed and flow output of the spray tips. With a pressure gauge and a nozzle rate chart, we can monitor and adjust flow by adjusting the spray pressure.

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Sprayer Upgrade *(Continued from page 7)*

For example, if we can maintain 40 psi with a 06 (ISO color gray) tip, we are applying 0.6 gpm. Add in a speed at 4 mph and from the rate chart we get 45 gpa or 1.0 gpk. Got it? What if we need to slow down to 2 mph? Hmm... go through it again.

Monitors and controls were updated and moved offset to the driver's right to avoid having to reach around the steering wheel.

I know that sprayer operators can walk and chew gum at the same time, but can they drive and calculate rates at the same time? To stay on the target rate, operators need to keep a constant speed or at least know what pressure to adjust to if a speed change is made. The big problem on our project sprayer is that it did not even have speed indication. We needed a big upgrade.

Sprayer operators can walk and chew gum at the same time, but can they drive and calculate rates at the same time?

The choice we were then faced with was whether a rate monitor would be sufficient or if a full rate control system was needed. Both the rate monitor and the rate control systems need a flowmeter and a speed sensor, but a rate control system will actively adjust the flow without the operators help. A rate control system costs about 80% more than a rate monitor.

The project sprayer had a mechanical drive system that could hold a fairly consistent speed over undulating terrain. With that, the monitor system was chosen because it was decided that relatively few adjustment would need to be made by the operator based on the rate shown by the monitor and the target rate.

Nozzle Bodies

The owner of our project sprayer wanted to update to multiple-position nozzle bodies. Turret style nozzle bodies allow for a quick change to different application rates without having to remove and replace nozzles. This seems simple enough, but there have been some technology updates on these products that can influence product choices.

Many nozzle bodies are made with Nylon™ material that swells slightly in the presence of water. This causes variability in the ability to rotate the turret. Newly engineered plastics have addressed this problem and the nozzle bodies that we chose for this sprayer used these materials. We also chose a 'wet boom' plumbing design that cleaned up the look of the boom and removed a lot of worm-gear hose clamps.

A wet-boom plumbing design cleaned up the look and removed a lot of worm-gear hose clamps.

Updates like these can get you through low budget years when new equipment purchases are not an option. Updates to your sprayer help you make better applications immediately and can increase the trade-in or resale value when a new sprayer purchase is made. But when adding technology to a sprayer, it is important to not add new headaches to the spraying experience. This is why professional quality components should be chosen that are simple to use and can stand up to the elements and the environment.

The work to update components can be performed by course technicians and mechanics. However, while mechanics usually spend a lot of time making sure that power and drive train systems on sprayers are well maintained, they are not always enthusiastic to tear into liquid system components. Something about the smell and look of green chemical residue does not excite them. In addition, the work and research into the best components to use for an improvement takes time for either the superintendent or the technician. If the appetite to take on a project like this doesn't exist, there are companies specializing in this area that can take on a sprayer improvement project for you.

This sprayer will see the pasture *much* later!

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