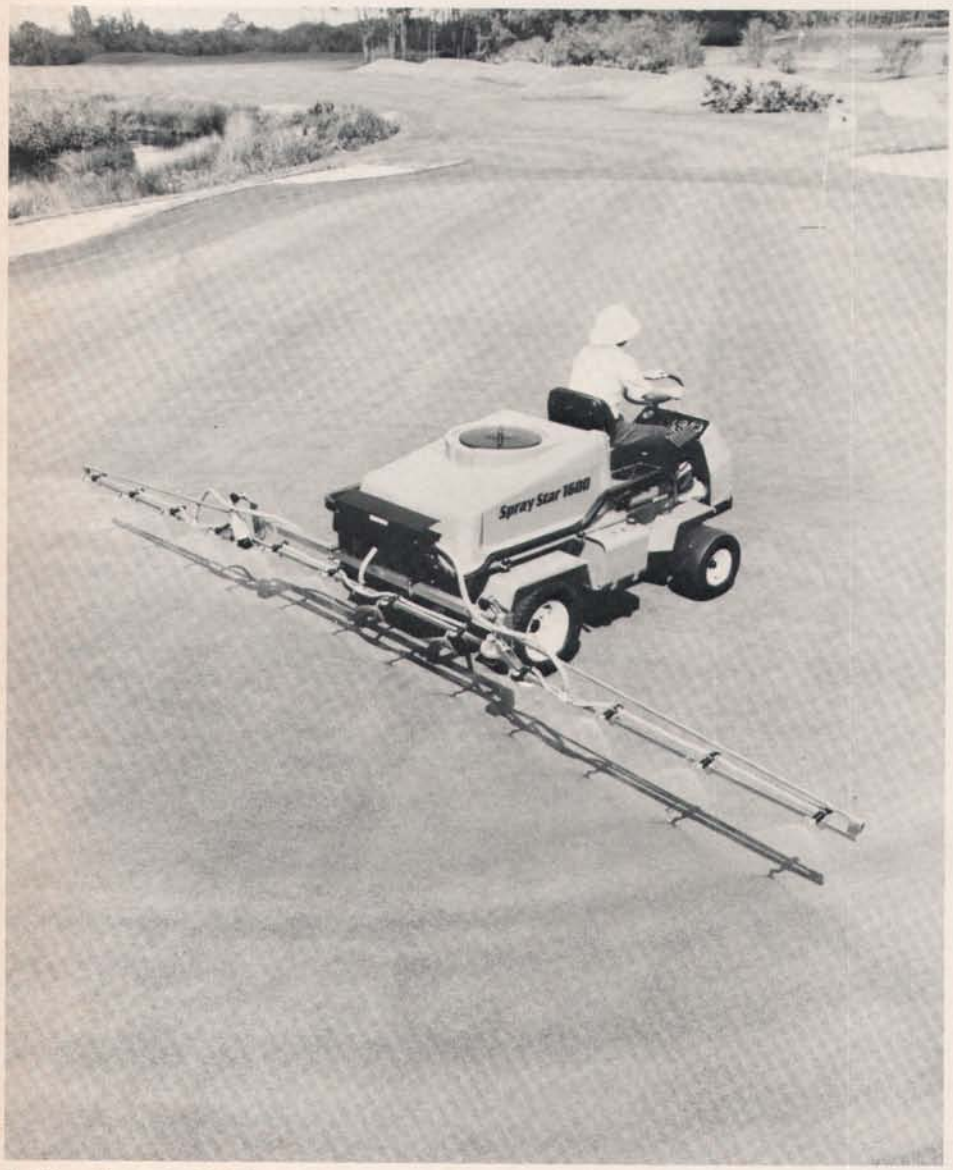
Spraying Systems:

Proper Performance Saves Chemicals



Smithco Spraystar 1600 boom sprayer.

Who would have thought ten years ago that an automobile could get the same gas mileage as a motorcyle? Back then if you were on a trip you'd have to stop every 200 miles to fill up your tank.

Today most cars and small trucks can go twice as far on a tank of gas. And their tanks are smaller, not larger, than before. You still get where you're going, but you are saving gas in the process. The point is, if we set a goal to conserve anything, we can achieve it through technology. Gasoline is just one example.

According to a recent survey, the average reader of *sportsTURF* spends $25,000 each year on turf chemicals. If you were able to reduce the amount of chemicals you need to maintain turf in its present condition by 20 percent, you'd save $5,000 in the first 12 months. In fact, that is probably what you're wasting if you are applying chemicals with a sprayer without certain precautions or adjustments.

Spraying chemicals is not just an economic issue. It has become an environmental one as well. Whether you overapply or underapply herbicides, fungicides, insecticides or fertilizers, you are wasting money and possibly misusing extremely valuable turf management products. The only way to be sure that the safe and effective rate of a chemical is being applied is to stay on top of the condition and calibration of spray equipment.

Spraying systems can uniformly apply ounces of solubles, emulsifiable concentrates, and wettable powders to acres of turfgrass. At such low rates, small variations in equipment performance, the applicator's concentration, or weather can effect pesticide performance.

Still, sprayers are the closest thing the turf industry has to a syringe for precise, target-only treatment for diseases, insects

and weeds. They are a tool which when used properly, allows you to put down just the amount of pesticide necessary to do the job with the least impact on the environment.

Like other aspects of turf management, sprayers have been adapted from agriculture. They have evolved from high-pressure, high-volume units to lower-pressure ones where droplet size and spray pattern are carefully regulated to improve distribution and coverage. Like an irrigation system, each component must fit certain specifications to achieve the desired results.

The ultimate goal is to apply a precise amount of pesticide to a target site. Depending upon the type of insect or disease, this may be either the leaves, thatch, or soil. For postemergence herbicides the material needs to coat the leaf surface of the weed. In the case of preemergence herbicides, the material must be placed in the soil where weed seeds are located.

Manufacturers determine rates for each of their products based upon the target pest and its location. These rates are listed clearly on the package label along with a recommended amount of water to carry the pesticide.

For contact or foliage-absorbed pesticides, they may include a sticker with the pesticide or recommend that you add one to the tank mix. For pesticides which work in the thatch or soil, manufacturers will often advise irrigating with up to one-half inch of water immediately following application. Some fertilizers may also need to be watered in, while others can be absorbed through the foliage.

Broyhill self-contained spray unit mounted on skid fits on most turf vehicles or trailers.

From this point on, it's up to you, the applicator, to deliver the fertilizer or pesticide to the target site at the appropriate rate. That's where a properly working spray system comes into play.

The first step is to calculate the area to be treated. This is essential to determine the amount of pesticide you need. If all goes

continued on page 26

continued from page 25

well, you will run out of tank mix at the end of the job, not before and not after.

Whether you use a knapsack sprayer or an automatically self-adjusting spray vehicle with booms, the basic components are the same. First there is the tank where the material(s) are mixed with water.

Since applicator exposure to the concentrated chemical is greatest during mixing, manufacturers have created various methods to protect him. Self-contained measuring spouts for liquids and water-soluble packets of premeasured dry materials are just two examples. Lesco, Inc., has developed a closed chamber that fits over the mouth of spray tanks. Bags of dry material are broken open inside the chamber, protecting the applicator from dust.

An agitator is important to keep suspensions and emulsions uniformly mixed. A line strainer between the tank and the nozzles is essential to avoid clogging. If you are using a diaphragm, piston or roller pump, the strainer should be installed upstream. It can be placed downstream with centrifugal pumps. The strainer should be checked and/or cleaned daily.

Two things are critical to spraying system performance: flow and pressure. Nozzles are designed to spray a given pattern of liquid, usually a cone or flat fan-shape, within a certain range of pressure. The flow rate increases with pressure, while the droplet size decreases. When pressure exceeds the nozzle's range, the pattern will "blow" or become deformed. This results in poor coverage and increased drift.

Pressure also influences the spray angle of nozzles. Since boom height and nozzle spacing are based upon spray angle, you don't want pressure to change to any great extent.

Manufacturers offer a variety of nozzles so that you can match pressure with flow rate while maintaining proper droplet size and spray angle. You may need one set of nozzles for high-volume materials such as fertilizers, preemergence herbicides and soil insecticides, and a separate set for low-volume products such as herbicides, fungicides and growth regulators.

Applicators must gauge their speed when using a walking boom sprayer.

Nozzles should be inspected often and replaced if necessary.

"It's not practical to change the application rate by adjusting the pressure," explains Richard Gould of Spraying Systems, Inc. "You'd have to multiply the pressure by four to double the application rate. Turf nozzles just don't have that type of range."

The current heightened concern over drift has inspired a trend toward nozzles and spraying systems with lower pressure. Manufacturers such as Spraying Systems and Delavan have begun to make low-pressure nozzles that provide the same flow rate, coverage and spray angle as higher-pressure nozzles.

A second approach to low-pressure technology is controlled droplet application. North American Micron markets a type of applicator developed in England, which uses a revolving disc after the nozzle orifice to break the spray solution into uniform size droplets.

"We know that droplets of 400 microns will roll off foliage and end up on the ground," states Roger Burtner, vice president of the company. "We also know that droplets much below 140 microns tend to drift. By regulating the speed of the disk, we can control the droplet size, reduce drift or runoff, and lower the volume of material applied."

Both Gould and Burtner point out that nozzle orifices don't last forever. After a certain period of time, especially under high pressure, their shape and size change. This not only deforms the pattern, it increases the flow rate. The problem is most severe with brass orifices used for wettable powders. Stainless steel nozzles are more durable, and for this reason are most common on spraying systems today. Research into ceramic and plastic nozzles is underway to extend nozzle life.

Whether you have a spray wand with one nozzle, or a boom sprayer with 20, it should be calibrated before each use. The idea of calibration is to gauge the flow rate of every nozzle to assure that you are applying the correct amount of material uniformly over the turf surface. The flow rate must be balanced by the speed of the sprayer to apply the volume of liquid specified on the product label to a given area.

Start with a close check of the nozzles. Information from the nozzle manufacturer will give you the flow rate of each type of nozzle at certain pressures. Check the pressure of your sprayer, then check the flow rate of each of your nozzles by placing a container under the nozzle and letting the sprayer run for one minute. If the rate is not close to the manufacturer's specifications, and it isn't clogged, it needs to be replaced.

The flow rate of all nozzles on the spray boom should be within ten percent of each

continued on page 28

continued from page 26

other. If more than one nozzle on the boom is defective, you should probably replace all of them.

Once all of the nozzles have the same flow rate, you can calculate the proper sprayer speed to apply the volume of chemical specified on the label. There is a mathematical formula for this purpose. Special calculators with these formulas built in are also available.

Since there is a practical limit to the speed at which a sprayer or individual using a walk-behind sprayer can travel, it is important to determine a sensible speed first, one that can be maintained fairly consistently. Then use the formula to calculate a nozzle flow rate that provides the correct volume for the turf area being treated. It's simpler to change nozzles than it is to adjust either speed or pressure.

It takes practice to use a wand, walking boom or backpack sprayer with reasonable accuracy. Applicators should mark off an area of 1,000 square feet and practice spraying with water to apply a consistent amount of volume each time. For small areas, you may want to use a precalibrated push sprayer such as Wheel Spray's Greens Wheelie. The pumps in this sprayer are driven by the wheels. If the applicator changes speed, so does the pump speed, to keep the application rate the same.

For large areas where spray vehicles are necessary, new accuracy is possible with sprayer control systems. These units can automatically adjust flow rate to the speed of the vehicle.

Sensors feed information on speed and flow rate to a small computer which constantly calculates application rate. If the vehicle slows while going uphill, the units either alert the operator that the application rate has increased or change the flow rate so that the sprayer maintains the right application rate at all times.

One great advantage of these systems is the warning they provide if a hose comes loose or a nozzle clogs while spraying. Sensors on each boom section, or for each nozzle if desired, alert the operator immediately so repairs can be made. This assures a uniform application of material, eliminates chemical waste, and saves the time usually required for reapplication.

Companies such as Broyhill, Cushman, Deere, Hahn, and Smithco offer the control systems as options for their sprayers. You can retrofit your present sprayer with kits from companies such as Micro-Trak Systems in Mankato, MN, or Raven Industries in Sioux Falls, SD. Spraying Systems has a system which alerts the sprayer operator of changes in pressure.

With any spraying system it is wise to use a spray pattern indicator in the tank mix. These colorants provide a short-term visual indication to help applicators avoid gaps or excessive overlaps in coverage. In some cases, they can also give a quick indication of a clogged nozzle or leaking hose.

Sprayer control mounted on Hahn 435.

There are two other developments which can lead to savings in your chemical budget. The first is a multi-tank spraying system, like the one manufactured by Green Pro in Hempstead, NY. Geared toward integrated pest management, the system enables the applicator to apply a specific pesticide only where it is needed.

For example, if you are spraying fertilizer to a fairway or athletic field and you notice an outbreak of weeds in one area, you can add herbicide to the spray mix with a control on the spray gun. You don't have to come back to treat the area separately, nor do you have to treat an entire site when the problem is localized. A second hose to the spray gun from a separate tank allows you to inject the herbicide just where you need it.

The second system is under development primarily for soil pesticides. This work is being carried out by Dr. Harry Niemcyk at Ohio State University in Wooster. Instead of applying soil insecticides or fungicides to the turf and watering them in, the material is injected directly into the soil. The pesticide lost by adhering to thatch or foliage is eliminated completely, so lower rates of application can provide the same results.

Niemcyk points out that thatch is a major factor in hampering the effectiveness of turf pesticides. Thatch traps up to 95 percent of most turf chemicals. On one site, the depth of thatch may vary from 1/4 inch to an inch or more. This can result in a wide range of pesticide effectiveness for control of insects, such as grubs, mole crickets, chinchbugs, and billbugs.

He also points out that uniform coverage of foliage is essential for the control of the greenbug aphid, black vine weevil adult, leafhoppers and caterpillars. A poorly functioning spraying system can greatly reduce the effectiveness of pesticides.

Dr. David Kudney, weed control specialist at the University of California at Riverside, states that coverage is essential for the

Sprayer control system by Micro-Trak monitors flow rate and ground speed to maintain a desired application rate.

effectiveness of postemergence and contact herbicides. Nearly all postemergence herbicides must come in contact with weeds to work. A sufficient volume of the material must be absorbed through the weed foliage to enter the plant and kill it. That includes herbicides such as 2,4-D, mecoprop, dicamba, and MSMA. Poor coverage due to small droplet size and inadequate volume can result in wasted chemicals.

There is no doubt that a small investment in equipment and maintenance can result in big savings in chemicals. It also allows you to gain the greatest control of weeds, diseases and insects with the least amount of pesticide. That is important from both an economic and environmental standpoint.

It will be a long time before automobiles can travel without gasoline, and it will be just as long before sports turf managers can provide durable, healthy turf without pesticides. However, we can begin to cut waste and increase efficiency through technology. First we need to make conservation a goal and support products which help us achieve that goal. We did it for automobiles and we can do it for turf management.