

New techniques in spray technology

Increased demand for use of multi purpose sports surfaces has created new problems for those involved in maintaining them. Today there is increasing pressure on people carrying out spray programs to minimise the impact of chemicals on the environment.

For the collective investment in sportsturf areas to be viable in the long term, the industry must adopt a hands-on role in protecting not only the economic value of the resource but also the environment. It is essential that legislators, lobby groups and allied industries see that we are taking responsible initiatives.

In today's competitive environment we are all looking to gain real advantages in the way we carry out our spray programs. This being the case it is necessary to be aware of some of the options available that will allow control programs to be carried out in an economic as well as environmentally efficient way. These new techniques fall into two areas, boom spray controllers and more sophisticated equipment; Controlled Droplet Application equipment (CDA), chemical in-line injection and Electrostatic Spraying.

BOOM SPRAY CONTROLLERS

Accurate, cost effective spraying is one result from using a spray controller but deciding which model will do the best job and at what cost can be difficult.

Before buying a controller several factors need to be taken into account including:

- How easy it is to set up.
- The provision of a comprehensive operation manual and if possible an instructional video.
- The daylight display should have a comprehensive, easy-to-read screen covering a number of functions, at least a dual display of application rate and forward speed.
- Rate options. More than one preset application rate can be useful as can the capacity to link a second boom line.
- Computer link. Many controllers now can be linked to a computer or printer.

Recording spray information has become increasingly important both in terms of monitoring the results and from legislation, which requires certain spray records to be kept. The notebook in the top pocket is no longer acceptable, the era of variable rate technology is here and many controllers are now compatible with Global Positioning Systems (GPS). This enables the use of graphics for field management and recognition of how much fertiliser, herbicide or pesticide must be applied at the respective points on the field. The data can be entered in the on-board computer enabling automatic precise regulation of the application quantity. The use of this type of technology increases efficiency and protects important resources by optimising application of chemicals and pesticides. In the past, precision application of agrichemicals has been the domain of specialised tractors or utility vehicles fitted with an electronic controller. The increased use of ATVs and 12-volt multi-purpose vehicles has often restricted the use of controllers but there is now an affordable spray controller that is compatible with this equipment.

The new spray controllers can:

- Measure the size of the area to be treated
- Control pressure electronically
- Digitally reads speed and distance
- Control sprayer output relative to vehicle speed.

This ensures that the application rate entered by the operator is maintained. It is compatible with conventional hydraulic technology and Controlled Droplet Application (CDA) booms. The unit can be used in conjunction with virtually any 12-volt sprayer and is easily installed.

CONTROLLED DROPLET APPLICATION

The aim of spraying is to apply chemical as efficiently as possible to the target, which may be soil, plant or pest. Very small droplets provide excellent coverage but do not deposit effectively and are highly susceptible to drift and evaporation. They also contain minute levels of chemical. Large droplets on the other hand are less prone to drift but provide very poor coverage, are highly susceptible to run off and contain almost all the chemical. Controlled Droplet Application offers economic and environmental benefits for the application of agrichemicals. Unlike pressure nozzle sprayers, which produce a wide range of droplet sizes, C.D.A is designed to produce droplets of uniform size. The droplets are less likely to run off target or be moved away by the wind. The spray fluid is therefore used more efficiently and water volumes can be reduced.

HOW DOES C.D.A WORK?

Rotary atomisers are used to generate the droplets. Fluid is metered through an orifice into the inside of a spinning atomiser housing. Centrifugal forces cause the fluid to rise up the grooved walls of the housing where it is broken into droplets. Carefully designed fingers throw the droplets horizontally outward from the spinning atomiser. They then fall to the target under the force of gravity. Droplet size is determined by the speed of the rotation of the atomisers. Most common are atomisers driven with small electric motors. These are used on both large and small boom spraying applications.

For a given spray volume C.D.A sprayers will cover 8-10 times more area than pressure nozzles when applying herbicides and more than 20 times more area when applying insecticides and fungicides. This is arguably the greatest advantage of C.D.A.

CHEMICAL INJECTION

Chemical injection involves introducing precisely metered amounts of concentrated chemical into the water or carrier just prior to the sprayer boom; chemicals and carrier are kept isolated until shortly before the mixture is discharged from the spray nozzles. This differs from conventional spraying where mixed chemicals are all in the one tank.

Chemical injection has many advantages over conventional spraying.

- Application costs may be reduced by using chemical injection systems because you have better control over the amount of chemical being applied.
- You only mix and apply the chemical at the time of application for the exact area you will treat.
- Chemical waste is minimised during mixing and handling.
- Savings in time and energy are possible because you can switch spraying from one chemical tank to another more efficiently.
- Spray tank clean out contamination problems can be avoided because chemicals are

- held in separate smaller tanks, and no chemicals are placed in the main tank.
- The volume of waste rinse water needed to clean sprayers is significantly reduced.
- Operator exposure is reduced because there is less chemical handling - no premixing in a smaller vessel typically performed to prepare spray solutions before adding to spray tank.
- The effects from a chemical spill can be reduced. The volume of potential chemical spill will be less and easier to contain than with conventional sprayers.
- Field operation flexibility is improved because pesticide application rates can be easily adjusted in field while spraying.
- Chemical injection allows the applicator to apply chemicals together that are normally incompatible in conventional spraying, because the chemicals are kept in separate tanks.
- Operated in conjunction with GPS technology this system provides a real reduction in work by interlinking all major values and data.
- Disposal of mixed chemical when we cannot complete our program due to adverse weather conditions has long been a concern. Being able to carry the water and chemical separately and mixing them only when we spray has many advantages.

ELECTROSTATIC SPRAYING

Modern Practitioners are faced with balancing the use of pesticides with possible adverse effects. Pesticides are a necessity, but some can cause serious environmental and worker safety problems. A large portion of the environmental impact is due to overdose and off-target movement of pesticides resulting from inefficient spray application. Presently most pesticides are applied with high volume hydraulic sprayers. Under leaf coverage and coverage onto hidden plant areas is poor. Newer systems such as ESS are more efficient. Electrostatic spraying (ESS) has been used to apply industrial coatings for many years. Electrostatic spraying systems offer an advanced method of low volume agrichemical application.

The main advantage is the accuracy with which the chemical is applied to the target. Spray drift and run-off are reduced markedly.

- Air-assisted Electrostatic sprayers produce electrically charged spray droplets that are carried into the canopy in a high-speed air stream;
- As the charged droplets enter the canopy, opposite charges on the plant surface attract the droplet.
- Although the charge is small, the force of attraction between the small uniform size droplets and the plant surface is strong, up to 40 times the force of gravity.
- Droplets will therefore move upwards against gravity when approaching the leaf surface.
- This results in significant improvements in droplet deposition. In some tests, under-leaf coverage has shown to be improved more than 70 fold.
- Electrostatics is a low volume system.
- Sprayers use 10-25 times less water carrier than standard hydraulic sprayers.
- Droplets are very small, typically in the 30 to 60 micron range and they are all charged with the same electrostatic charge, the droplets repel one another. This results in uniform droplet deposition over the plant surface, which decreases the risk of chemical burn seen with some other types of low volume spraying equipment.
- Most importantly it increases exposure of the pests to the chemical treatment.

Advances in spray technology are becoming increasingly important to turf managers as pressure grows to reduce chemical hazards to both humans and the environment. These advances are also helping reduce hazards to chemical budgets, with significant reductions in chemical wastage being achieved.

Although some of the technology outlined in this article was largely pioneered in the horticultural and agricultural industries, much of the technology is now available in a turf-friendly form. Innovations such as ATV mounted CDA sprayers and chemical injectors are useful and affordable tools available to turf managers to improve the efficiency of spray programs. There is little doubt that other developments, such as hand-held CDAs and Electrostatic applicators will soon become more widely available to turf managers, further improving the efficiency of spray programs in turf.

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