

# ART OF APPLICATION



➤ Right Product

➤ Right Time

➤ Right Place



syngenta

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Watch Glenn Kirby's advice  
for targeting applications

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## ➤ THE ART OF APPLICATION – INTRODUCTION



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**The latest turf protection products are capable of achieving exceptional results. But it is the skills of the sprayer operator and developments in the technology used that can make the crucial difference.**

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Turf sprayer operators face a number of unique challenges to achieve accurate and consistent results, often whilst under the close appraisal of a critical audience of players, public and legislative bodies.

Understanding the fundamentals of the mechanics of spray application, recognising the targets to be hit and the need for effective timing are all key elements of the Art of Application.

Furthermore, today's operator has to be ever more mindful of the essential area of spray stewardship, avoiding problems of waste and minimising risk to the environment.

Sprayer operation involves balancing multiple aims and interacting factors with every application; there is rarely one right solution, particularly with tank mix applications. The key is making a conscious compromise, to aim to get the most important elements of any treatment into the optimum target zone.

**Glenn Kirby**  
**Syngenta Turf & Landscape UK**  
**Technical Manager**





## > KNOW YOUR TARGET



- **Pathogen/Pest**
- **Product activity**
- **Sprayer operation**
- **Turf conditions**
- **Timing**

For many applications, such as preventative fungicide treatments, timing is critical. Understanding the fundamentals of spray application will ensure operators can make the right decisions to get the best results out of every available opportunity.

Targeting a soil-borne pathogen or turf pest larvae demands a very different sprayer set up and operation, compared to a foliar disease treatment.

With nutrition, precise timing may be less crucial, but application targeting is crucial – to hold foliar uptake nutrients on the leaf, or get root uptake fertiliser down into the soil zone, for example.

Trials have consistently shown that the success of any application can be attributed to the timing and the application techniques used.

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## ➤ THE SKILLS OF SPRAYER SET-UP



The complexities of turf spray mixes and prioritising targets makes almost every application different. Understanding spray dynamics helps the operator to make informed decisions

- **Conscious compromise**
- **Picking the priority**
- **When only one will do**

Practical application involves balancing multiple aims and influencing factors. There is rarely one right solution; particularly with tank mix applications.

Knowing and understanding how and where products work is the first step to targeting applications.

### EXAMPLES OF PRODUCT ACTIONS AND TYPICAL APPLICATION TARGETS:

<b>Contact fungicide + turf pigment</b>	➤	hold on the leaf, with complete coverage of the surface
<b>Systemic product + foliar nutrition</b>	➤	run across the leaf down to crown, for maximum uptake and upward redistribution in the leaf
<b>Soil pest + wetting agent + fertiliser</b>	➤	minimise retention on the leaf; get spray quickly down to the soil

Aim to get the highest proportion of the most important elements of any tank mix combination in the optimum target zone.

#### Variable parameters

- **Nozzle choice**
- **Sprayer operation**
- **Water volume**
- **Forward speed**

Some treatments that are crucial to turf health and quality, such as winter contact fungicide application, may need to be applied separately to ensure the best possible results.

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➤ **BALANCE YOUR  
BOOMS FOR  
CONSTANT PRESSURE**

Watch all of Glenn's  
Top Tips

## > NOZZLE CHOICE



Appropriate nozzle selection can do most of the work for the target being sprayed, provided they are operated at the optimum pressure and speed for the required water volume

- All nozzles produce a range of droplet sizes
- Select the option with the highest proportion of the size droplets you want
- Operate nozzles in the right pressure range to optimise droplet size

All nozzles produce an array of droplet sizes; large nozzles tend to produce more large droplets with greater velocity, whilst small nozzles create more small droplets. In general, small droplets are well retained on the leaves of turf grass plants, whilst large solid droplets have a tendency to bounce or roll off.

However, the nozzles' operation has to be understood in tandem with the water volume being applied and the sprayer's operating pressure.

### NOZZLE SELECTION

**025**



> masses of smalls; lots of mid-size; very few large

**04**



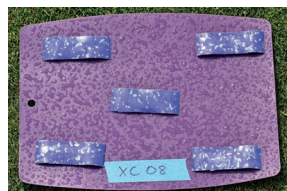
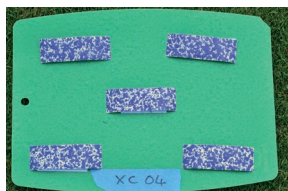
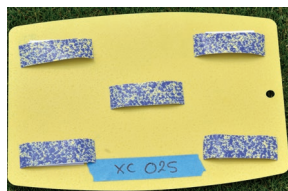
> quite a few small; loads of mid-size; quite a few large

**08**

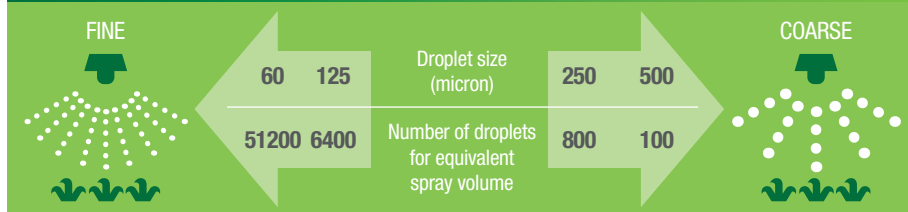


> very few small; plenty of mid-size; mainly large

## ➤ NOZZLE CHOICE



When you halve the diameter of a droplet, you get eight times as many small droplets



### ➤ APPLICATION ACADEMY TUTORIAL VIDEOS

Watch Glenn Kirby's advice on nozzle selection

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A good selection of nozzles to have available for consistent application in most turf situations, at two to three bar, would be a set of:

- **XC025 Nozzle** - for greens, delivering a water volume of 200 - 300 l/ha at four to five km/h – targeting foliar treatments
- **XC04 Nozzle** - applying 220 - 380 l/ha at five to seven km/hr on fairways for foliar and crown target treatments
- **XC08 Nozzle** - delivering 450 - 770 l/ha at five to seven km/hr for soil target treatments

## MANAGING PRESSURE

- Increasing pressure typically produces a higher proportion of fine droplets and less coarse droplets from any nozzle
- Decreasing pressure too much risks losing spray pattern and control of droplets
- Smaller droplets, or droplets created at high pressure, are more susceptible to drift
- Syngenta XC Nozzles are designed for optimum operation between 2.0 and 3.0 bar – with 2.5 bar the target

It is commonly believed that increasing the pressure will help “force” the application through the sward. The opposite is true – increasing the pressure will lead to higher % of fines, leading to more loss and more surface retention. Low pressure will keep a higher percentage of larger droplet sizes, which have a better chance of penetrating the canopy.



### BE AWARE OF EFFECTS OF AUTO RATE CONTROLLERS

Increasing forward speed automatically increases pressure to maintain a consistent application rate. That will alter the spray droplet pattern, and can produce more small droplets susceptible to drift.

Auto-rate controllers are capable of delivering excellent results, but be careful not to allow them to overtake the skills of sprayer set-up.

#### Potential effects of auto-rate controller operation



**FASTER  
SPEED**



**INCREASED  
PRESSURE**



**CONSTANT  
APPLICATION  
RATE**



**REDUCED  
AVERAGE  
DROPLET SIZE**



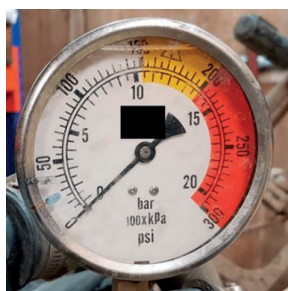
**INCREASED  
RISK OF DRIFT**



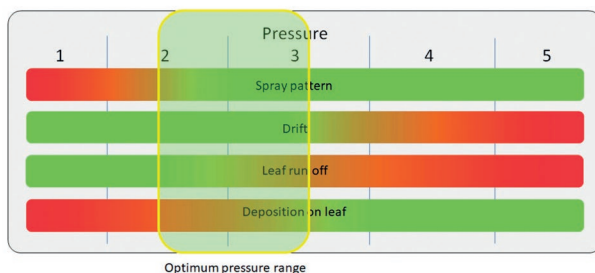
## > MANAGING PRESSURE

**Always watch the pressure gauge and aim to maintain pressure in the two to three bar zone.**

Sprayer gauges frequently have a wide range of pressures indicated, where the sprayer can physically operate. However, the optimum for nozzles to work most effectively is much smaller. Use a marker pen to indicate the optimum range for your operation.



Operating pressure affects many aspects of nozzle performance and droplet movement. Always aim to work in the optimum zone.



### > APPLICATION ACADEMY TUTORIAL VIDEOS

Watch Glenn Kirby's Top Tips for pressure gauge setting



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## ➤ WATER VOLUME



Calibrate regularly to check consistent nozzle output and water volume flow rates. Use a measuring cylinder for accuracy. Also, fit a flow meter on the sprayer filling source to accurately fill the tank for the area to be sprayed.

- **Lower water volume tends to increase retention on the leaf surface**
- **Greater water volume increases coverage of the leaf surface, but excess can lead to run off and loss**
- **Higher water volumes typically enables a greater proportion of spray to reach soil**

For systemic fungicides, lower water volume will optimise retention on the leaf and uptake by the plant.

For contact fungicides, raising the water volume would give greater coverage of the leaf, but take care to avoid over wetting the surface, leading to run off.

For soil acting products or root uptake, higher water volume and increased droplet size will help maximise movement through turf to reach the surface. Slowing forward speed is an underutilised tool to increase water volume without increasing the pressure.

Application at lower water volume reduces time spent filling the sprayer and may help facilitate more timely operation, but needs to be balanced with any potential compromise in efficacy.

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➤ **USE A MEASURING  
CYLINDER FOR  
NOZZLE CALIBRATION**

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Top Tips

## ► BOOM HEIGHT



Fit nozzle height indicators at each end of the boom to help set and maintain a constant 50 cm above the target zone

- **Optimum nozzle height, for most nozzles, is 50 cm above the target.**
- **Measure the height from the tip of the nozzle to the target, not just the boom.**

Nozzle height above 50 cm can have a significant implication for fine low velocity droplets failing to hit the target, resulting in increased drift and inconsistent coverage.

If nozzle height falls below 40 cm consistency of coverage at the target point can be severely affected. When applying iron or a turf pigment, for example, the visual effect of stripes or turf leaf mottling can be seen.

XC Nozzles have been designed to maintain an even spray coverage more effectively if height varies from the optimum - retaining the spray patten as low as 30 cm and up to 70 cm.

Be aware that when the sprayer goes up onto an elevated green, the boom height can initially drop low, and then high as the sprayer crests over the

slope. The further the boom is mounted behind the sprayer rear axle, the greater the variation in boom height at the top or bottom of slopes.

Ensure any boom stability systems and dampers are working smoothly to quickly return to horizontal. Keep auto height adjustment sensors clean, if fitted.

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► **MAP YOUR GREENS  
THE WAY YOU  
SPRAY THEM**

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Top Tips

## ➤ FORWARD SPEED



Slower forward speed typically delivers more consistent results. Be aware of the implications of increasing speed and effects on pressure for nozzle performance

- **Use forward speed to fine tune water volume**
- **Watch speed when negotiating features to retain consistent application rate**
- **Calibrate forward speed over timed 100m run**

Sprayer speed will have a significant impact on even coverage; slower speed typically delivers a better result for overall accuracy.

At higher speed there is always an increased risk of spray drift. Increasing pressure to deliver a given water volume at faster operation will create a finer, drift susceptible spray.

Faster sprayer operation can also have an adverse effect on boom stability, especially on undulating fairways or when spraying rough.

On greens, be aware of speed varying when negotiating features. An auto rate controller can be very effective in these situations, but should be operated to keep pressure in the optimum zone of two to three bar (see page 8).

Study nozzle output charts to understand how varying forward speed can be used to fine tune water volume application rate for any selected nozzle.

Run a speed calibration on the sprayer, stop watch timed over a 100 meter run, to check accuracy of any on-board speedometer. Mobile phone speed check apps can also prove accurate.

### ➤ APPLICATION ACADEMY TUTORIAL VIDEOS

**Watch Glenn Kirby's Top Tips for  
measuring forward speed**

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## ▶ PREVENTING DRIFT



Using XC Nozzles can significantly reduce the risk of drift, whilst still optimising results (right half of boom), compared to conventional flat fan nozzles (above, left). Always operate with pressure in the ideal two to three bar range

- **Keeping product on target**
- **Consistent coverage**
- **Optimising efficacy**
- **Stopping losses**

Every application on golf and sports turf is under intense scrutiny. Preventing drift is good stewardship, and can ensure the optimum performance of products from more consistent coverage.

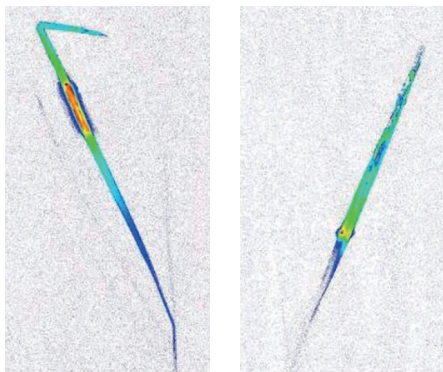
All elements of the Art of Application: nozzle selection; water volume; forward speed and operating pressure, can be managed to reduce the risk of drift.

Measure wind speed at boom height. Met Office wind speed records are taken at a height of 10 metres, which can be significantly different to sprayer operating height. Understand the implication of different wind directions and shelter on greens around the course, to tailor spray actions to appropriate conditions.

Use the GreenCast Spray Window forecast to pick the best conditions for spray applications.

**Shrouds can work effectively for stopping drift being lost, particularly on exposed or coastal sites where spraying opportunities may otherwise be limited. However, they don't always mean better coverage. If droplet sizes are too small (using the wrong nozzle or pressure) internal shroud swirl will stop spray reaching the target and result in accumulation within the shroud, potentially leading to concentrated deposits dripping from shroud. Operators still need to understand and think about the rules of the Art of Application.**

## ➤ PRODUCT FORMULATION



Phosphor imaging shows how product formulation has a significant influence on the speed of uptake and movement of an active ingredient in the plant

- **Product formulation can have a significant effect on active uptake, spray pattern droplets and retention on the leaf**
- **Adjuvants may be useful in some situations, but results can be inconsistent; always seek advice**
- **Tank mixes can affect how each component will perform**

In addition to understanding the fundamentals of a product's action to enable optimum targeting, its formulation has a significant impact for application characteristics and uptake by the plant.

The highly complex science of formulation chemistry, including balancing adjuvants, stickers and wetters, can alter the whole droplet spectrum from a nozzle, to help better hit the desired target.

On the leaf, it can influence how much is held on the surface and the coverage achieved, or how easily it can be moved to crown or soil targets.

The formulation can also influence how quickly the product is taken up into the plant, or sticks to the leaf surface, to make it rainfast from washing off.

Extensive Syngenta research and field trials give an understanding of how a product will perform in practice, and the application advice to achieve the best possible results.

Furthermore, tank mixes of products, including liquid fertilisers; pigment; wetting agent or PGR, for example, could also influence how each component would work.

Trial work on Syngenta products has also shown with adjuvants shows inconsistent results – always ask for data when adjuvants are recommended.

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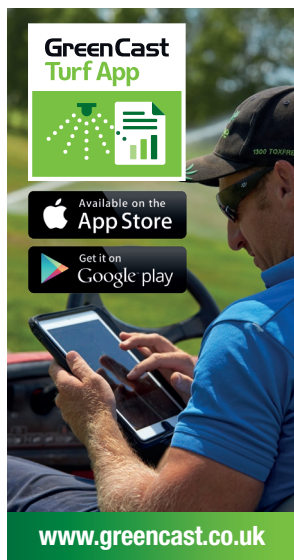


➤ **GET YOUR SPRAYER  
NSTS TESTED**

Watch all of Glenn's  
Top Tips

## > SUPPORT TOOLS

Utilise the full range of Syngenta support tools to make better decisions with application targeting, timing and product use:



- GreenCast weather data and spray windows
- Disease pressure maps
- Art of application videos
- GreenCast Turf App
- Pack recognition
- Recording sheets



## > SYNGENTA APPLICATION ACADEMY

The pioneering world-first Syngenta Application Academy gives the chance to delve into the world of precision application—and get the very best from every treatment for turf.

Focussing on scientific research and practical advice, the three day Application Academy syllabus modules include:

- Understanding spray dynamics
- Nozzle design and development
- Biokinetics of plant physiology
- Microscopy of droplet movement
- Digital Innovations Laboratory
- Product R&D trials and results
- Setting-up testing and operating your sprayer

Led by Syngenta specialists and independent experts in spray research and accurate application, successful candidates will achieve Academy test certification.



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