APPLICATION EQUIPMENT FOR AMENITY USE

Introduction

The use of pesticides in the amenity sector is extremely diverse involving a very wide range of techniques and equipment. Statistics for pesticide use in this sector are hard to come by but herbicide application to hard surfaces (with a high risk of polluting water) appears to form a large proportion of the total amount applied and the application of herbicides, fungicides and insecticides to managed amenity turf is also significant. Due to the diversity of use situations application techniques and equipment are also very diverse, ranging from pedestrian application and vehicle mounted application to water, bowling greens, tennis courts, golf greens, etc. to specialist applications to trunk roads, motorways and also railway lines requiring very high vehicle speeds (and hence specialised equipment).

Much of the application equipment used has tended to be a ‘spin off’ from standard agricultural application equipment, with some manufacturers serving particular amenity needs. Some users have developed their own bespoke equipment, often making alterations to existing sprayers or making their own unique equipment.

The vast majority of pesticides applied in the amenity sector (as in agriculture) are applied as liquids, generally through standard hydraulic pressure nozzle application equipment. For vehicle mounted application equipment, boom widths tend to be smaller than in agriculture (between two and six metres - usually in three sections) with equipment often also fitted with one or two hand lances. In recent years shrouds for booms used on managed amenity turf have become popular.

Hand held and pedestrian operated application equipment is widely used, and ranges from standard knapsacks/spot guns/trolley sprayers with hand lances and small multi nozzle booms (up to two metres in width) for herbicide application to knapsack mistblowers and trolley mounted high pressure or airblast units for insecticide/fungicide application. Hand held Controlled Droplet Application (CDA) sprayers are used mainly for non-crop application of herbicides, and are particularly useful for low volume applications. Weedwipers are also used in some specific situations. Granular applicators (mostly hand-held units) are used for the application of granular herbicides to shrub borders and also in non-crop situations e.g. semi-loose path surfaces, fencelines and other smaller non-crop situations. There is also specialised application equipment for gels, etc. and injector units for trees, Japanese knotweed, etc.

Overview of application equipment used in the amenity sector

Because of the specialised/non-standard nature of much application equipment it is not possible to cover all equipment types – discussion is limited to liquid sprayer application equipment, which can be split into:

a) portable sprayers;
   b) small pedestrian and vehicle (ATV) mounted sprayers; and
   c) larger vehicle mounted sprayers (generally with a tank size exceeding 100 litres).
Excellent general guidance is available in two (priced) BCPC Handbooks (see [www.bcpc.org](http://www.bcpc.org)) – ‘Small Scale Spraying’ (which covers most application equipment used in amenity spraying) and ‘Field Scale Spraying’ (for larger boom and air blast sprayers) – although these do not specifically cover amenity use/situations.

All sprayers use some form of atomiser to break up the spray liquid into droplets. The size and range of the spray droplets produced is referred to as the spray quality and is determined by the nozzle type and size, liquid flowrate and pressure for traditional hydraulic pressure nozzles (spray quality from air induction nozzles is also influenced by the amount of air included and specific nozzle design features) and by atomiser speed and liquid flow for spinning disc atomisers. The BCPC International Spray Classification System (and the BCPC Nozzle Code) are now used internationally as standard:

- **FINE** sprays give good cover and retention (useful for contact acting pesticides) but are prone to drift and should not therefore be used close to sensitive/susceptible areas;

- **MEDIUM** sprays are most commonly specified (and should be used when no advice is available) as providing effective droplet sizes yet being less susceptible to drift;

- **COARSE** sprays are useful for some soil acting pesticides or liquid fertilisers (but can reduce efficacy and should therefore only be used if there is a specific label recommendation);

- **VERY FINE** or **VERY COARSE** sprays should only be used in exceptional circumstances or if advised/recommended for the specific operation.

Nozzles must produce the spray quality specified on the product label and be of the type and size to match the equipment being used.

Commercial nozzle types are:

- **DEFLECTOR** nozzles (flooding or anvil) which generally produce a **COARSE** or **VERY COARSE** spray and fairly even deposit, and are thus often used for applying residual or total herbicides from hand-operated/knapsack sprayers;

- **CONE** nozzles (full or hollow cone) are typically used to produce a **FINE** spray at higher pressures where good cover is required (e.g. insecticide/fungicide application) but care must be taken regarding possible spray drift;

- **FLAT FAN** nozzles are available to produce all spray qualities but generally produce a peaked spray pattern suitable for mounting on booms where patterns overlap (if single nozzle use is required e.g. for band spraying with a knapsack lance, use an ‘even spray’ tip). Low pressure and pre-orifice tips are available to produce coarser sprays;

- **AIR INDUCTION** nozzles can be flat fan or hollow cone and generally produce **COARSE** sprays with reduced drift (but a peaked spray pattern) and require pressures greater than 200 kpa (2 bar) to operate properly. Air induction
nozzles do differ in design and therefore performance (primarily of spray quality produced);

- TWIN FLUID nozzles can produce all spray qualities and can use a wide range of flow rates. In this case an air compressor is used to provide air and the droplet size depends on the combination of air and liquid flow rates and the specific nozzle design (therefore ALWAYS check the manufacturer’s recommendations). These nozzles can be used for low volume applications and to reduce drift, but the use of an air compressor adds cost (and complexity);

- ROTARY ATOMISERS use the centrifugal force of a spinning disc (or cage) to create a spray rather than pressure. The spray quality produced depends on the combination of rotational speed and liquid flow rate and will vary with the specific design (therefore ALWAYS check the manufacturer’s recommendations). When correctly set rotary atomisers should produce a narrow range of droplet sizes which allows use of low volumes and can reduce spray drift (when set to produce larger droplets). However, rotary atomisers are generally more complex than pressure nozzles and need an electrical power supply (this is usually the vehicle battery or small batteries for hand-held units).

On spray booms nozzles need to be identical, correctly aligned and set at the correct working height (as specified by the manufacturer) to ensure the desired pattern across the boom. Maintaining a constant boom height is critical for both spray pattern and drift control. Accurate marking of spray swaths is also essential to avoid overlaps or missed areas (using foam markers, dyes, or, most recently, GPS guidance systems). Application using booms should be in parallel swaths avoiding a curved path (which can result in differential application rates).

It is difficult to accurately match swaths when using hand-held equipment so lines or marker pegs are often used, particularly on sensitive areas (e.g. golf greens). It is essential to keep the nozzle at a constant height and to walk at a consistent forward speed to apply product evenly – practice is usually adequate, but chains for height, metronomes for speed, etc. can also be used.

Control of spray pressure is also critical to ensure consistent spray quality (apart from when using rotary atomisers). It is therefore essential to have an accurate pressure gauge fitted and to check it (care is needed with sprayers fitted with a speed related spray pump e.g. driven by a ground wheel, to ensure pressure is within a range that will maintain the desired spray quality).

Some recent developments aimed at minimising risks to the environment are:

- use of shrouded nozzles or booms to contain the spray and thus minimise drift;
- use of sensors to only spray target weeds or areas;
- use of non-broadcast application methods to deliver liquids only to the target e.g. weed wipers, injectors, etc. (even simple spot guns can help optimise spray targeting).
Regular calibration is essential to ensure consistent results and should be done prior to the start of each new operation. Calibration procedures are similar for all liquid sprayers. Always check that the nozzles are undamaged and are giving the desired spray pattern – check the manufacturer’s handbook for specific recommendations (particularly for bespoke/non-standard equipment). It is always sensible to record nozzles used, flow rates, etc. both for accountability and to assist future calibration operations.

Regular testing of sprayers is essential to ensure good operation/performance. However, NSTS (which has been very successfully taken up in agriculture) has not been widely taken up in the amenity sector – although work is now taking place to make the scheme more relevant to amenity users, with the new scheme planned to be launched in April this year.

Spray drift can contaminate bystanders, pollute water, damage sensitive crops and the environment and should therefore be avoided. The Code of Practice for using plant protection products, nozzle manufacturers’ guidance/catalogues and various advice sheets (e.g. Voluntary Initiative guides) all give advice on minimising the risk of spray drift (critical equipment factors are nozzle choice, pressure, boom/nozzle height, and, with vehicle mounted equipment, forward speed). There have been significant advances in nozzle design to reduce spray drift with a range of low drift nozzles available (e.g. low pressure flat fan, air induction, twin fluid and rotary atomiser nozzles) – those that have been tested under the Local Environmental Risk Assessment for Pesticides (LERAP) scheme which allows modification of label requirements for buffer zones next to watercourses to protect aquatic life are shown on the PSD website (www.pesticides.gov.uk). The LERAP scheme does not apply to kerbside gullies, French drains, etc (or temporary ditches – as found in forestry) which are often present in amenity areas where it is essential to take all necessary precautions to avoid contaminating surface or ground water. These are generally hard surfaces (man made pavements, tarmac, concrete, etc.). Application to these surfaces can result in much higher risks of water pollution therefore specific guidance exists for application on these surfaces and MUST be followed. Research has shown that application techniques/equipment can dramatically affect the risk of water pollution from application to hard surfaces, but this is not yet recognised by UK regulatory authorities.

Spraying in the right meteorological conditions is very important to minimise drift (see, for example, the Code of Practice for safe use of plant protection products) and can help improve product efficacy. ALWAYS spray with the wind direction away from sensitive areas. Low volume spraying is used widely in agricultural applications to optimise spray timing and increase work rate (which reduces the overall costs of application). However, with traditional hydraulic pressure nozzles lower volumes are usually achieved by using smaller spray droplets which can increase the risk of drift, so it is recommended to either use drift reduction methods (e.g. shrouds) or to instead use drift reducing nozzles (e.g. air induction nozzles, twin fluid nozzles or rotary atomisers). There are specific guidelines with respect to using volumes lower than recommended on the label (see the ‘Reduced Volume’ section of the Code of Practice for the safe use of plant protection products).

It should be remembered that mixing and filling and emptying and cleaning operations are often the riskiest parts of the application process for the operator and the environment. There is considerable guidance available on best practice for both
operations (see for example guidance on the VI website – particularly the TOPPS project recommendations) and always study the product label and equipment manual for any special cleaning procedures – with these operations posing a significant risk of water pollution if carried out on hard surfaces close to drains or water. Ensure there is always a supply of clean water on hand (larger vehicle mounted sprayers should have a specific clean water tank) and that there is an emergency plan in case of spills or operator contamination. If at all possible use a dedicated permanent area which drains to a recycling tank or biobed, or a portable bunded area, or, for mixing and filling, use Closed Transfer Systems if available and always ensure you have equipment that can pressure, or triple, rinse empty containers. Cleaning equipment is of paramount importance to avoid possible contamination and damage in subsequent operations. Internal sprayer tank cleaning is speeded up considerably by using special tank rinse nozzles which require minimal amounts of water (with larger vehicle mounted sprayers now fitted with an integral flushing tank to provide clean water) and external cleaning procedures can be carried out using a brush and water. Ideally a dedicated sprayer should be used for total weed killers to avoid any risk of residues contaminating subsequent applications.

The operation should always be pre-planned to minimise surplus spray solution which can be applied onto untreated or under dosed areas or put into a fully contained wash down area with recycling tank. Any disposal of surplus spray and washings to land that does not conform to this requires a ‘Groundwater Authorisation’ from the Environment Agency.

Appropriate personal protective equipment (PPE) should always be worn (again guidance exists in the Code of Practice for the safe use of plant protection products and on the Voluntary Initiative website). PPE must be properly cleaned, maintained and stored after application to ensure it continues to provide adequate operator protection (PPE which is not adequately maintained or stored can actually increase risks to the operator).

**Training and Certification**

It should never be forgotten that the operator is critical to the performance and safe use of most application equipment and a trained operator will also be capable of understanding when equipment is not functioning properly.

By definition the application of pesticides in amenity situations will, in the majority of situations, be in areas where the public have access either during or soon after an application has been made. This very public use of pesticides requires that only the highest standards of care are required and this demands high levels of training, including update and refresher training.

Spray operators should all be trained to the appropriate NPTC standard, and preferably be a member of NRoSO, to ensure that they understand how to use their application equipment correctly (details of this, and guides for specific aspects of good practice, are available on the Voluntary Initiative website, [www.voluntaryinitiative.org.uk](http://www.voluntaryinitiative.org.uk)). In the amenity sector operator certification is generally accepted as the norm, although in some contracted situations with high turnover of labour there are instances of non certificated labour being used. Unfortunately uptake of the NRoSO scheme in the amenity sector has been poor due to a lack of ‘drivers’ for membership. Poor contract specification and supervision are
a major area of action to improve standards – with local authority contracts sometimes actually specifying illegal usage! The Amenity Forum is currently in discussions with NRoS0 to discuss ways of improving the take up of this scheme, and has also developed guidance for those who employ contractors and published a model contract document (see the Amenity Forum website www.amenity.org.uk).

The need to undertake Integrated Amenity Management programmes and protect the environment is critical at all times (see the Amenity Forum website). NB Best practice will often depend on the particular situation. There are many examples where an integrated approach is well established e.g. in managed amenity turf where there are good examples of management/cultural techniques blended with limited use of pesticides. However, there remain many areas within the amenity sector where the use of pesticides remains the primary approach e.g. vegetation management on hard surfaces.

The new DEFRA ‘Pesticides: Code of Practice for using plant protection products’ (available from the DEFRA website, www.defra.gov.uk, or the PSD website, www.pesticides.gov.uk) is an invaluable source of practical advice on how to use pesticides safely, minimise any risk of adverse environmental effects and meet the legal obligations covering the use of pesticides.

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