

APPLICATION TECHNOLOGY

First, a pest is identified. Next, the best pest control option is chosen. If that option is to apply a pesticide, then one should be chosen that will have the least impact on human health and the environment. Focus must then be placed on how to properly apply the chosen pesticide. This chapter covers how to choose, calibrate, use and take care of application equipment. Label terms common to application equipment are reviewed. Some aspects of pesticide drift are noted. The need to observe and respect environmental conditions when using pesticides is also dealt with.

Learning Objectives

Completing this chapter will help you to:

- Describe the goals of pesticide application and how to achieve them.
- Know the importance of proper application and care of application equipment.
- Know where to find information on pesticide application rates and the importance of using them correctly.
- Know the importance of calibrating application equipment.
- Know the effect of weather on pesticide application.
- Describe vapour and spray drift and know how to avoid them.

The two main goals of pesticide application are:

1. Bringing a pesticide to a target
2. Preventing the contamination of non-target sites

Using the proper application equipment for the target and pest type promotes effective pest control. The proper maintenance and use of equipment ensures that the pesticide is applied as per label directions. Application rates and sprayer outputs given on pesticide labels must be followed. To do this, application equipment must be calibrated.

Application Equipment

Pesticide application equipment is a key element in the transfer of an active ingredient (a.i.) from a storage container to the final target. The target can be an insect, disease organism, or weed. Many types of application equipment are available to apply pesticides. Some types can be used in a wide range of situations. Some are highly specialized and are only used for a few specific pesticides (e.g., equipment used to apply soil fumigants). The most common equipment is designed for use with either liquid or dry pesticides.

The product transfer process for liquid pesticides is as follows:

1. The pesticide is mixed in the spray tank at the recommended label rate.
2. The mixture moves through the nozzles, forming spray droplets.
3. Calibrated equipment (speed, nozzles and pressure) delivers the active ingredient evenly as droplets to the target.

For solid pesticides, the product is transferred as follows:

1. The pre-mixed granules or dust particles move through openings in the spreader equipment.
2. Calibrated equipment (speed and openings) delivers the active ingredient evenly to the target as granules or dust.

Pesticides must be applied evenly to a given target and at the given label rate. The contamination of non-target sites must also be prevented. To do this, the application equipment must be:

- Appropriate for the job
- Set up with the proper parts
- Calibrated
- Used according to manufacturer specifications
- Maintained
- Designed to minimize applicator exposure during loading and application

Selection of Application Equipment

As stated before, a whole range of equipment has been designed to apply pesticides. To choose the right equipment for a given application, the operator must have a good knowledge of what is available. Only the most efficient equipment should be used. Knowledge is also needed to calibrate and maintain application equipment. Applicators must also know the target pest and treatment area.

To select pesticide application equipment that is suited to the type and size of the job, the applicator must assess:

- The type of application (spray, fog, dust, fumigation, etc.)
- The location (outdoors or indoors)
- The pesticide formulation to be used (liquid, granular, etc.)
- Environmental factors (especially wind and rain)
- The size, shape, and terrain of the site
- The target site or pest
- Time available for application

Components of Application Equipment

Application equipment is usually constructed of a number of components or parts. These work together to apply the pesticide. Each part has a specific function (e.g., holding the pesticide, metering it, or moving it within the system). Applicators must know all of the parts, their purpose, their adjustments, and what is required to maintain them.

Operation of Application Equipment

Applicators must use pesticide application equipment in a safe and proper manner. To do this, they must:

- Know how the equipment works.
- Follow manufacturer instructions.
- Comply with all use instructions on the pesticide label.
- Calibrate equipment for uniformity and rate of application.

Operation of equipment can vary with the type that is used and the nature of the pesticide. The skills required to use a gun sprayer, for example, differ from those needed to operate a granular spreader or air-blast sprayer. Equipment must be used in a way that avoids misapplication, human poisoning, and environmental contamination. Causes of concern include:

- High winds
- Nearby sensitive areas (e.g., fish spawning beds)
- The location of a pest (e.g., in soil or tall trees)
- The presence of bystanders (e.g., children in a schoolyard)

Use of Appropriate Label Rates

The ‘Directions for Use’ section is found on the secondary panel of a pesticide label (**See Chapter 3: Labeling**). This provides the applicator with information on the amount of pesticide to use on a given pest or application site.

The label shows the amount of formulated pesticide that is to be applied per area or volume (the recommended pesticide application rate). For formulations that are to be diluted, the label also states the amount of diluent or carrier that is to be applied per area or volume (the recommended sprayer output). The wording used to describe pesticide application rate and sprayer output varies from one pesticide label to another.

Pesticide labels can also provide a range of pesticide application rates and sprayer outputs. This is done so that the applicator can choose the best rate for the situation. For example, if the pest pressure is light, the lowest recommended rate should be used. If the pest pressure is heavy, or if soil or weather conditions, or the pest’s life cycle

make it more difficult to control the pest, the applicator would choose a higher application rate. Pest management specialists are available to give advice to applicators on how to choose the best pesticide application rate. As well, one can consult a licensed pesticide vendor, or the pesticide manufacturer, to determine which rate would be best in a given situation.

Pesticide application rate can be stated on the label using terms such as:

- **Application rate**
- **Rate**
- **Dose**
- **Dosage**

Sprayer output can be stated using terms such as:

- **Application rate**
- **Spray volume required**
- **Volume**
- **Apply in**
- **Add to use**

Equipment Calibration

Calibration is the setting and adjusting of the proper output for the application equipment. Calibrated equipment delivers the required amount of pesticide to the treatment area in an accurate and uniform pattern. Output of the sprayer is referred to as 'calibrated sprayer output'. To ensure that application equipment is delivering the proper amount of pesticide, it should be calibrated before use.



Figure 8-1: Always keep speed constant to ensure even distribution.

There are many procedures for calibrating equipment. To determine which to use for a specific type of application equipment, refer to its operating manual.

Calibration must be correct and suited to the type of application equipment being used. Poor calibration can result in an improper rate of application or non-uniform distribution of pesticide. The result may be crop/plant damage or poor pest control.

Over-application of pesticides:

- Is an unnecessary use of pesticide
- Drives up costs
- Can contaminate human food, livestock feed and crops with residues
- Increases the risk of applicator or bystander exposure
- Increases the risk of harm to the environment

It is against the law to use pesticides in excess of label rates.

Under-application of a pesticide can result in failure to control the target pests. A re-treatment of the area may be required. This costs time and money. Under-application can also help to create pesticide-resistant pests.

Maintenance of Application Equipment

Application equipment will only work well if it is well-maintained. Good maintenance guards against:

- Loss of pesticide to the surrounding area
- Damage to nearby plants or animals
- Contamination of air or water

Application equipment in good working order:

- Ensures that the calibrated application rate is achieved at all times
- Prevents breakdowns that can result in exposure to people, or costly downtime
- Prevents contamination of the environment
- Increases the lifespan of equipment

A proper equipment maintenance program should include daily cleaning and checking of hoses, hose connectors, hopper or spray tanks, pumps, and all moving parts. Damaged or worn parts should be replaced or serviced immediately. Equipment should also receive a complete check and overhaul at the start and end of each application season.

In Review

The two main goals of pesticide application are:

1. **Bringing a pesticide to a target**
2. **Preventing the contamination of non-target sites**

Using the proper application equipment for the target and pest type promotes effective pest control. The proper maintenance and use of equipment ensures that the pesticide is applied as per label direction. Application rates and sprayer outputs given on pesticide labels must be followed. To do this, application equipment must be calibrated.

Environmental Conditions and Pesticide Drift

Weather can affect the pattern of pesticide placement or the effectiveness of the active ingredient(s). This includes air movement or wind patterns, relative humidity, and temperature. Applicators must take present and forecasted weather into account before applying any pesticide. Sometimes either the application equipment or the operation can be changed to adapt to less than ideal weather. Sometimes, an application must be delayed until better conditions exist.

High wind speeds or air temperatures increase the chance of a pesticide moving from the application site to off-target areas. This is referred to as pesticide drift. Off-target pesticides can harm people, wildlife, beneficial organisms, and nearby plants and crops. To avoid this, maximum wind speeds or temperatures may be stated on the pesticide label or governed under provincial law.

Types of Pesticide Drift

Vapour Drift

Vapour drift occurs when a pesticide evaporates or turns from a solid or a liquid into a gas. These vapours can then move away from the treatment area. Vapour drift can also occur when a fumigant is not properly sealed under cover.

Vapour drift occurs when pesticide vapours move away from the target site during or after application.

To reduce vapour drift, applicators should:

- Select a less volatile pesticide formulation (e.g., select a formulation that does not easily go from a solid or a liquid into a gas).

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- Refrain from using pesticides when weather conditions promote excessive evaporation or volatilization (e.g., high temperatures and wind speeds or low relative humidity).
- Seal an area being fumigated. This will contain the fumigant or any volatile pesticide.
- Do not apply pesticides during atmospheric, or temperature, inversions.

A temperature inversion occurs when the layers of air closest to the earth are colder than those above it. The air does not rise and mix with the warmer air and a stagnant air mass is created. Pesticide vapours can remain trapped in this air mass, close to the earth, for longer than normal periods.

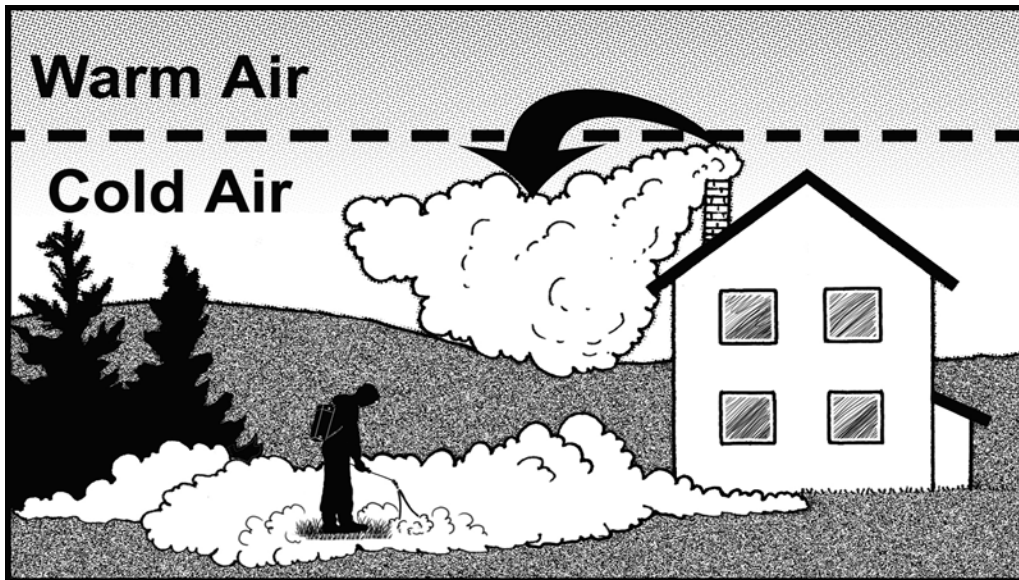


Figure 8-2: Temperature inversion.

Spray Drift

Spray drift occurs when pesticide droplets or particles move away from the treatment site during an application. The smaller the droplets generated, the more likely they are to drift.

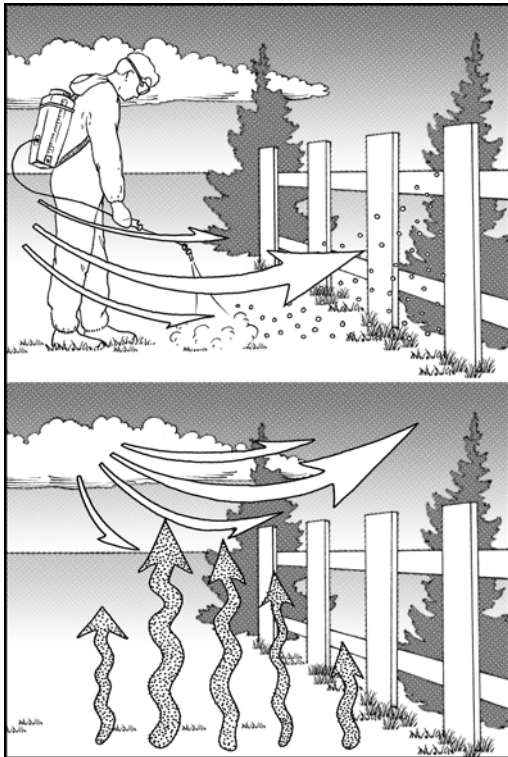


Figure 8-3: Above, spray drift during application. Below, vapour drift after application.

To reduce spray drift, pesticides should only be applied under certain weather conditions. You should avoid:

- High winds
- Unstable weather
- Very hot weather
- Low relative humidity
- Atmospheric, or temperature, inversions

Application equipment can also be set to reduce fine droplets by:

- Reducing pressure at the nozzle
- Reducing the distance between the nozzle and the crop
- Aiming nozzles to reduce wind shear
- Reducing the travel speed of the sprayer

Some product labels also advise that drift control agents be added to the pesticide mixture.

In Review

Environmental conditions such as high winds, low relative humidity, and high air temperature may prevent the uniform distribution of pesticides over a treatment area. Some weather factors can cause drift of pesticide vapours (vapour drift) or fine spray droplets (spray drift) over short or long distances. When a pesticide moves from a target area, it can damage the environment.

Summary

Pesticide application equipment is designed to apply the pesticide:

- Uniformly to a desired target
- At a specified rate
- Without contaminating non-target areas

It is necessary for applicators to choose the right equipment for the job. They must also have a good understanding of how it works. Equipment must be calibrated, well maintained, and properly operated. To avoid pesticide drift, weather conditions must be taken into account when applying any pest control product.

Self-test Questions

Answers are located in Appendix A of this manual.

1. List three (3) reasons why it is important to correctly use and maintain pesticide application equipment.

2. Why is the calibration of application equipment important?

3. Where would you look to find information on how to calibrate a sprayer?

4. List three weather conditions that could affect pesticide application.

5. Describe vapour drift and give three ways to prevent it.
