Pesticide Spray Drift

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Definition

Pesticides are used to control specific pests within specific areas. Pesticide applicators are licensed and must carefully manage the use of these chemicals and tools to achieve an accurate application. There are many factors that the applicator must understand in order to minimize pesticide spray drift.

"Spray drift is the physical movement of pesticide droplets through the air at the time of pesticide application or soon thereafter from the target site to any non- or off-target site. Spray drift does not include movement of pesticides to non- or off-target sites caused by erosion, migration, volatility, or windblown soil particles that occurs after application or application of fumigants unless specifically addressed on the product label with respect to drift control requirements." (Based on the definition of the

National Coalition on Drift Minimization).

Off-target spray can affect human health and the environment. For example, spray drift can result in pesticide exposures to farmworkers, children playing outside, and wildlife and its habitat. Drift can also contaminate a home garden or another farmer's crops, causing illegal pesticide residues and/or plant damage. The proximity of individuals and sensitive sites to the pesticide application, the amounts of pesticide drift, and toxicity of the pesticide are important factors in determining the potential impacts from drift.

EPA recognizes the importance of exposures to pesticides resulting from spray drift. There are thousands of reported complaints of off-target spray drift each year. Reports of exposures of people, plants, and animals to pesticides due to off-target drift (often referred to as "drift incidents") are an important component in the scientific evaluation and regulation of the uses of pesticides. Other routes of pesticide exposure include consuming foods and drinking water that may contain pesticide residues, applying pesticides, and contacting treated surfaces in agricultural, industrial, or residential settings. EPA considers all of these routes of exposure in regulating the use of pesticides.

When labels of pesticide products state that off-target drift is to be avoided or prohibited, EPA's policy is straightforward: pesticide drift from the target site is to be prevented. However, EPA recognizes that some degree of drift of spray particles will occur from nearly all applications. Applicators and other responsible parties must use all available application practices designed to prevent drift that will otherwise occur. In making their decisions about pesticide applications prudent and responsible applicators must consider all factors, including wind speed, direction, and other weather conditions; application equipment; the proximity of people and sensitive areas; and product label directions. A prudent and responsible applicator must refrain from application under conditions that are inconsistent with the goal of drift prevention, or are prohibited by the label requirements. EPA uses its discretion to pursue violations based on the unique facts and circumstances of each drift situation.

Pesticide applicators and others, including landowners, play a very important role in pesticide application—deciding whether or not to apply a pesticide and if so, how best to make that application. It is their responsibility to know and understand a

product's use restrictions. They are responsible for complying with all other pesticide laws regarding pesticide applications and ensuring that their application equipment and techniques will produce a minimum of spray drift. EPA also expects applicators to exercise a high level of professionalism in making decisions about applications.

To understand how to minimize spray drift, we must first understand what causes it. There is a distribution of different droplet sizes in the spray leaving the nozzle during pesticide applications. Smaller droplets may sometimes stay suspended long enough to move to a non- target site, while larger droplets have less propensity for such movements. Application equipment factors have a significant influence on the droplet size, while tank mix components (pesticides, water and/or oil, and any adjuvants) have a much less significant effect. Weather conditions, natural and man-made physical barriers, and type of target site, are additional factors which will influence spray drift.

Research has shown that for most applications, some spray drift will occur. This is not necessarily unacceptable, as very small amounts of most pesticides will generally not affect non- target sites. However, great precautions should be taken to minimize

drift where highly sensitive sites are known to be in close proximity. Highly sensitive sites include areas occupied by humans, non-target crops, wildlife habitat, aquatic habitats, and organic farms. Special laws also apply to endangered species.

Types of Pesticide Drift

There are two types of drift: spray drift and post-application drift. Spray drift occurs during and immediately after a pesticide application. Post-application drift occurs after the application is complete, hours and even days later.

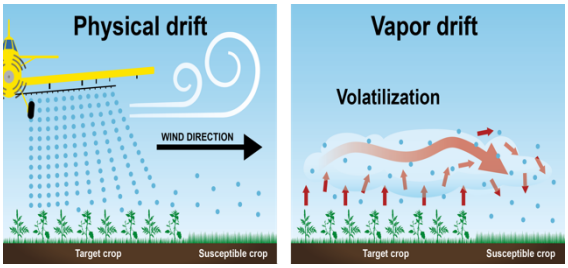
Spray Drift

Spray drift occurs during and immediately after a pesticide application when wind or application equipment blow spray droplets, dust or gases off the intended site. The pesticide droplets sprayed out of nozzles are the most problematic and can drift long distances before settling. These pesticides may be applied by a crop duster, airplane or by a tractor. Applicator error can cause drift; however, even when pesticides are applied correctly, drift can still occur.

Post-Application Drift

Post-application drift occurs after application is complete, hours and even days later. There are two types of post-application drift:

Volatilization Drift



Some pesticides are applied as liquids or oils but then evaporate (or "volatilize") into a gas after they are applied to crops or fields. Once in gas form, volatile pesticides can drift long distances.

Fumigant pesticides (used to treat homes, storage bins, and soil before planting) are especially volatile, and pose the worst problem of all drifting pesticides. Unlike spray drift or drift of dust particles, volatilization drift is invisible, making it difficult to detect without monitoring equipment.

Drift of Pesticide-Coated Dust Particles

Sometimes high winds in agricultural areas create clouds of dust

from pesticide-treated fields. This dust may end up in yards and parks, as well as in homes and cars, where it can be inhaled or ingested. Children are particularly vulnerable to this type of exposure because they play on the floor and often put their hands or other objects into their mouths. Most pesticides can become adsorbed to dust and be transported in this way.

Pesticide Poisoning

Pesticides and Human Health

Just as smokers have a higher risk of getting lung cancer, emphysema, and heart disease than non-smokers, studies show that people who regularly work with pesticides have a significantly elevated risk of certain types of cancer, neurological disorders, respiratory disease, miscarriages and infertility relative to a control group with less pesticide exposure. But exposure to airborne pesticides is not limited to workers, nor are the associated diseases and conditions. The ability of pesticides to drift away from where they are applied ensures secondhand exposure opportunities for those who just happen to be in the area, through breathing pesticide-contaminated air or dust and contact with surfaces contaminated by residues resulting from pesticide drift.

Two types of poisoning can result from exposure to pesticide drift, acute and chronic. Acute poisonings cause symptoms soon after the exposure occurs. Symptoms of acute poisoning are usually obvious, such as eye, skin and respiratory irritation, asthma attacks, nausea, vomiting, headache, tremors, numbness and more. Symptoms may mimic those of flu, colds and headaches. Farmworkers, their families, farmers and "fence-line" communities are on the front lines for this type of poisoning.

Chronic poisoning is a result of pesticide exposures, often at low levels, over a long period of time. Like secondhand cigarette smoke, chronic exposures to drifting pesticides can have long-term health effects, even though people may experience few or no symptoms until long after their exposure.

People Affected by Pesticide Drift

The developing fetus, infants, and young children are the most vulnerable to both acute and chronic health effects from drift. Both urban and rural communities can be

affected by drift. Farmworkers are most at risk of pesticide drift exposure because of their proximity to and involvement with pesticide applications. While it is illegal to spray a field occupied by workers, no law prevents spraying a field located beside another with workers present.

Organic farmers suffer economic damage when contamination from drift lengthens the time required to obtain organic certification, disqualifies produce for the certified organic label and disrupts beneficial insect populations. Even conventional farmers can sometimes lose part of their crop because of drift.

Residents in suburbs on the agricultural-urban interface and people living or working in agricultural communities have daily exposure to multiple pesticides from post-application drift of pesticides.

Urban residents are exposed to drift from pesticide applications in neighboring homes and gardens. Structural fumigations can result in pesticide drift. City residents can also be exposed to low levels of pesticides in air through long-range drift from agricultural areas.

Short-term health impacts of pesticide drift

Pesticide exposure can result in serious short-term (acute) health impacts from exposure to high levels of the pesticide in air. Some immediate effects of being exposed to pesticides include:

- Eye, nose, or throat irritation
- Difficulty breathing
- Vomiting, nausea
- Skin irritation, rash
- Dizziness, tremors, muscle weakness
- Headaches
- Vision blurred, eye irritation
- Stomach aches, diarrhea
- Excessive sweating, fever

These symptoms can occur a few minutes to a few days after being exposed to pesticides. If you ever get sick and think it might be related to pesticides, be sure to tell your doctor. It is important to report poisonings to your doctor so you can be properly treated and the incident can be reported.

In rural areas, farm workers, their families, and communities located next to agricultural fields are most at risk of acute

poisoning. Acute poisonings in urban and suburban settings are typically the result of pesticide applications in and around buildings to control termites, ants, and/or roaches, or near commercial nurseries. Pesticides applied to lawns and gardens can also cause acute poisonings, especially to children and pets.

Drift also occurs in urban environments. In the picture above, a house is tarped and fumigated for termites with Vikane (sulfuryl fluoride), which is then vented to the atmosphere. This process exposes neighbors to high levels of this toxic pesticide.

Long-Term Health Impacts of Pesticide Drift

Long-term (chronic) health problems can result from both a single high-dose exposure to pesticides and from exposures over a long period of time even when exposure levels are low. Even though people may not know they have been exposed, health problems may emerge years after a serious poisoning incident or from low-level, long-term exposure. The following conditions have been shown to be linked to pesticide exposures:

- Brain cancer
- Birth defects
- Leukemia

- Miscarriage
- Infertility
- Asthma
- Parkinson's disease
- Sterility
- Non-Hodgkin's Lymphoma
- Infertility

Key Practices to Minimize Drift - A Checklist of Possibilities

The following checklist indicates that a large number of factors can influence spray drift, and illustrates some general application principles (though exceptions exist depending on the specific situation). The many options for each factor result in an endless combination of spray conditions. New developments in drift minimization application equipment and nozzles ensure that the application choices will continue to expand. Be careful that efforts made to reduce drift do not create other issues (for example, increasing droplet size can sometimes reduce efficacy, if more spray washes off the canopy onto the soil surface).

- Application Equipment and Technique
- Weather Conditions

- Pesticide Selection
- Crop Selection
- Buffers
- Vulnerability of the Area

Application Equipment and Technique

Swath Displacement

During normal application of pesticides, some displacement of each swath may carry pesticide to the adjacent area. Applicators usually allow for this when determining their spray run positions; for example, they may not spray to the edge of the outermost rows by adjusting those swaths. Swath displacement is a normal practice, particularly in aerial application, and can be an effective drift mitigation technique. In orchard spraying, some rows of trees may be skipped when spraying using a similar type of swath adjustment.

Sprayer Type

New equipment technology such as tower sprayers, wrap-around sprayers, tunnel sprayers, and hooded sprayers can reduce drift.

Always follow manufacturer's directions to ensure the proper combination of sprayer and nozzles.

Boom

Position as low as possible without causing vortex bounce. Position 18-24 inches above target for ground application. Aerial boom length should be less than 75% of wing or rotor length. Shorter boom lengths can significantly reduce drift without necessarily decreasing effective swath width sufficiently to require many additional passes. A drop boom allows the aircraft to lower the boom in flight, decreasing drift potential by lowering the effective release height of the spray at the time of application. A currently experimental design of wing tip modification device may facilitate modification of the wing tip vortices, which may mitigate drift.

Nozzles

New nozzle technology can reduce drift. Consider low pressure or low-drift nozzles producing a medium to coarse droplet size spectrum and minimizing fine droplets < 150 microns, although smaller droplets

are needed for contact products and for post applications. Usually, small droplets can be reduced by selecting a narrower angle nozzle, but realize that this will affect spray overlap patterns. Refer to nozzle manufacturer literature or USDA models for information on droplet size for specific nozzles, using the droplet size classification scheme defined by the American Society for Agricultural Engineers (ASAE) Standard S-572. There is more on nozzles later in this article.

Shield

A shield permits spraying with ground equipment in higher winds. Shields are usually mechanical, although under some circumstances, air shields may also be effective in minimizing off-target movement of small droplets.

Pressure

Pump pressure should be no more than 40 psi for ground equipment. Pressure selection is more complicated for aerial application, where decreasing pressure sometimes increases drift because large droplets are more

susceptible to wind shear. Usually, lower pressure causes an increase in droplet size, but with very narrow angle sprays such as solid streams, the opposite can occur.

Calibration; Rate Controllers; Ultrasonic Canopy Sensors

These can reduce drift by reducing the application of excess chemical.

Ground Speed

Preferably, speed should be no more than 10 mph when spraying small droplets.

Maintenance

Keep equipment and nozzles in proper condition, because pressure regulators and nozzles that are not working properly can increase the number of small droplets most subject to drift. Worn nozzles can also increase flow rate, meaning that more pesticide is released than intended.

For other best management practices relating to application equipment and technique, refer to state extension and other publications relevant to a given application type.

Weather Conditions

Monitor weather conditions prior to and during application

Wind Speed

3 to 10 mph, no gusty conditions, measure in open area at the site

Wind Direction

Away from sensitive adjoining crops or other sensitive areas

Inversion

Do not spray within an inversion (whether on the ground or aloft)

Temperature

Below 90° F

Humidity

Above 50% RH

Pesticide Selection

Phytoxicity

Avoid using a pesticide that is highly toxic to other crops in the area.

Rate

Use the lowest rate registered for effective control of the target pest(s) under the given conditions.

Formulation

The potential for drift varies depending on the formulation of the pesticide. Liquid formulations, such as emulsifiable concentrates and suspension concentrates, are more prone to drift compared to granular formulations. Factors such as droplet size, wind speed, and application equipment influence the extent of drift. Formulations with smaller droplet sizes are more susceptible to drift, while larger droplets are less likely to be carried away by wind. Proper application techniques and equipment calibration are essential to minimize drift and ensure effective and targeted pesticide application.

Timing

Consider using pesticides that can be applied:

- When non-target crops are not emerged (especially herbicides)
- When bees are not foraging (especially insecticides)
- When the target crop intercepts much spray
- When weather conditions are optimum (i.e. flexible application window)
- Only when needed, rather than as a protective spray (unless this jeopardizes the crop)

Placement

- Consider all options; for example:
- Banded application reduces amount of chemical subject to drift, versus broadcast.
- Directed application reduces amount of chemical subject to drift, versus broadcast.
- Spray the outer rows only from the outside toward the inside.

Method

Consider all options; for example:

- A concentrate spray reduces volume, versus a dilute spray.
- Certain methods, such as drench, dip, soil injection, and seed treatment, usually eliminate the potential for drift.

Adjuvants

Use low-drift agents according to product labels, but make sure that they work with the nozzle and application equipment being used; that they are compatible with the pesticide and the pumping/delivery method being used in the field; and that they actually reduce the number of very small droplets, instead of simply increasing the average droplet size.

Thresholds

Make sure the pest population justifies a pesticide application. This will depend on the pest, the effect on and value of the crop, and the time of year.

Tank-Mix Partners

If additional pesticides are common and/or required in the mixture, take additional drift reduction steps if their characteristics (effects on droplet size, toxicity, timing, etc.)

increase the potential for drift.

Crop Selection

Growth Habit

Shorter, less dense targets allow lower booms and larger droplets. Only small drops get to the center of dense canopies or canopies with large overlapping leaves like grapes, so accurate placement of small droplets is necessary.

Life Cycle

It may be possible to spray fall-seeded or early spring-seeded crops when sensitive non-targets are not emerged.

Stage of Development

The crop may require pest control only at a specific stage of development so that the planting date can be adjusted based on sensitive non-target organisms.

Conversely, the pesticide may have a wide application window, which allows flexibility relative to weather, non-target organisms, etc.

Crop Rotations in the Area

These indicate what non-target crops will be present.

Diversification

If many different crops are grown simultaneously, there is more potential for non-target effects from drift.

Buffers ("No Application Zones" - Where the Pesticide is Not Directly Applied)

Landowners, growers, and applicators should consider buffers an integral component of drift management.

Permanent Buffers

Areas or strips of land maintained in permanent vegetation, designed to intercept runoff and soil particles transported by wind and/or water. Permanent buffers provide the most benefits - reducing drift, chemical runoff, and soil erosion while improving water quality, wildlife habitat, and

aesthetics.

For drift management, **less permanent** buffers are a more common strategy than permanent buffers. The size and location of these buffers are determined on an application-by-application basis, considering all factors influencing drift to sensitive areas. Most application sites have a prevailing wind direction that allows a downwind buffer (upwind of non-target organisms) to be sufficient.

While growers and landowners establish permanent buffers, applicators have the responsibility to properly define fewer permanent buffers. The less permanent buffer may be very small when other drift reduction techniques are sufficient.

Developers of re-zoned farmland should also consider the multiple benefits of placing buffers around the development - aesthetics, privacy, wildlife habitat, and reduced potential for drift, runoff, and soil erosion.

Type

The choice of buffers will depend on whether the main purpose is to control drift, soil erosion, chemical runoff, or a

combination of these.

Size

Applicators can and should vary the size of the buffer depending on the other factors affecting drift at the time and location of the application.

Location

Buffers must be downwind of treated crops and upwind of sensitive non-target sites.

Permanency

Landowners should determine whether a permanent buffer, while least flexible, is justified.

In order from *least* to *most* permanent, the following are common types of buffers:

- Untreated Crop Rows

- Contour Buffer Strips
- Conservation Covers
- Field Borders
- Critical Area Plantings
- Vegetative Filter Strips
- Pasture
- Vegetative Barriers
- Windbreaks
- Riparian Buffers

Vulnerability of the Area Distance Downwind to Non-Target Sites

Sensitivity of Non-Target Sites

- Areas occupied by humans
- Bodies of water
- Sensitive crops
- Non-target organisms

Nozzle Tips

Spray Tips, or Nozzles, perform the functions of metering the liquid and then atomizing and distributing it into the desired pattern, or the pattern that comes closest to what we want to do in the field. Good, quality, and accurate spray tips are critical to the success of the operation and yet they are rarely checked for wear or visible damage, which often results in ineffective application, coverage, crop damage and loss of yield.

We tend to be frugal up front by saving as much as possible on the spray tips, when really, we should be thinking of investing in the assurance that they will perform properly and give us better results in the long run. Installing nozzles that will resist wear and calibrating them on a regular basis will save money in chemicals, alone. A 500-acre farm using nozzles that have a wear of 10% will add over $4500.00 to its chemical costs. Then you add the cost of the inefficient applications, crop damage and low yields.

Tips should be correctly maintained, with regular checks for visible damage and inaccurate flow. You should replace your tips when the original flow rate goes over 10%.

How do you calculate wear?

The nozzle industry works on a parameter that indicates that a brass nozzle at 200 psi will achieve a 10% wear in 10 hours. Just think how long you've been running your nozzles out there without even thinking that they may be wearing. Other materials are more expensive than the standard brass tips, and the wear resistance increases with the material hardness and, of course the cost.

However, a few years ago the Europeans made a breakthrough in producing nozzles in Polyacetal, an "engineering plastic" material that, with the help of the latest computer technology, can be precision molded to extremely fine tolerances. Also, where other plastics such as nylon readily absorb water and swell up in the process, polyacetal is particularly stable. But perhaps the most striking quality of polyacetal tips is their remarkable resistance to wear - superior even to stainless steel.

Relative Nozzle Tip Wear Life

Material Wear	Factor
Brass-Aluminum	1
Stainless-Steel	2 to 3
Hardened stainless steel	10 to 15
Ceramic	Lifetime
Carbides (Tungsten,	Lifetime

The above chart shows the wear factors of the common spray tip materials in the low to medium price range. Ceramic and Tungsten Carbide spray tips, which have a practically negligible wear factor, are three to five times the cost of spray tips made out of the materials shown on the chart. Polyacetal tips are available in most popular configurations such as fan, disc/core, hollow cone and deflected fan tips.

Choosing the Right Spray Tips

Droplet size and spray quality are affected by various factors, including the properties of the liquid, specific gravity, viscosity and surface tension. The applicator can significantly influence the quality of the spray pattern by the choice of:

Nozzle Type

A hollow cone tip will generally produce a finer spray than a fan tip of the same output, pressure and spray angle.

Nozzle Size

A small output spray tip will generally produce a finer spray than a large one - given the same nozzle type, spray angle and pressure.

Operating Pressure

The spray from any tip will become finer as the pressure is increased.

Fan Spray Angle

A 110-degree fan spray tip will give a finer spray than its 80-degree counterpart, where output and pressure are the same.

Choosing the Correct Application rate

The spray volume or application rate is normally recommended on the chemical label and expressed in gallons per acre or liters per hectare, with upper and lower limits.

Select the application rate on the basis of the chemical label information or consultant data.

Special Crop Requirements

Penetrating a dense canopy may require the higher end of the volume range.

The limits of the sprayer pump capacity at the PTO speeds to be used. Always allow plenty of spare capacity for agitation - especially with wettable powders. If in doubt, use the high-volume rate, ensuring that the spray quality is consistent with what has been recommended.

Spraying in Wind

Wind speeds are critical when spraying. Spraying when it is too windy leads to poor application patterns as well as drift. Great care must be taken when assessing wind speeds before and during spraying. Generally, wind speeds of 2 to 5 mph are ideal for spraying.

Air Stability

Horizontal air movement (wind) is generally recognized as an important factor affecting drift, but vertical air movement often is overlooked. Normally, air near the soil surface is warmer than higher air. Warm air will rise while cooler air will sink which provides vertical mixing of air. Small spray droplets suspended in the warm air near the soil surface will be carried aloft and away from susceptible plants by the vertical air movement. Vertically stable air (temperature inversion) occurs when air near the soil surface is cooler or similar in temperature to higher air. Small spray droplets can be suspended in stable air, move laterally in a light wind and impact plants two miles or more downwind. Vertically stable air is most common near sunrise and generally is associated with low wind and clear skies. Three times more spray was detected 100 to 200 feet downwind and 10 times more was detected 1,000 to 2,000 feet downwind with vertically stable air as compared to normal conditions with a given wind speed.

Increasing spray droplet size can reduce spray drift in vertically

stable air. Herbicides should not be applied near susceptible crops when vertically stable air conditions are present. Observing smoke bombs or dust from a gravel road can often identify vertically stable air. Also, fog is an indication of vertically stable air and dew formation generally indicates vertically stable air.

Spray Pressure

Spray pressure influences the size of droplets formed from the spray solution. The spray solution emerges from the nozzle in a sheet, and droplets form at the edge of the sheet. Increased nozzle pressure causes the sheet to be thinner, and this thinner sheet will break into smaller droplets than from a sheet produced at lower pressure. Also, larger orifice nozzles with high delivery rates produce a thicker sheet of spray solution and larger droplets than smaller nozzles.

Nozzle Spray Angle

Spray angle is the angle formed between the edges of the spray pattern from a single nozzle (Figure 1). Nozzles with wider spray angles will produce a thinner sheet of spray solution, and smaller spray droplets than a nozzle with the

same delivery rate but narrower spray angle. However, wide-angle nozzles are placed closer to the target for proper overlap than narrow angle nozzles and the benefits of lower nozzle placement offsets the disadvantage of slightly smaller droplets for drift reduction.

The angle of nozzles relative to direction of travel can influence drift from aerial application.

Because of greater wind shearing when nozzles are pointed into the wind, nozzles pointed toward the direction of travel will produce smaller droplets than nozzles pointed back. The smallest droplets are produced from nozzles 45 degrees forward of vertical, while the largest droplets are produced by a straight-back (90 degree) orientation. Droplet size becomes progressively larger as the nozzle is rotated back from 45 degrees forward to the straight-back position.

Nozzle Type

Nozzle types vary in droplet sizes produced at various spray pressures and gallons per minute output (Table 3). "Flat fan,"

"flood" and "hollow cone" nozzles produce similar-size droplets and a similar volume of small droplets when compared at equal spray pressure and equal delivery rate. The flood nozzle tends to produce slightly larger droplets than the flat fan, while the flat fan produces slightly larger droplets than the hollow cone.

Setting the Boom Height

Each tip on a spray boom must not only deliver the correct flow rate, but must distribute the spray evenly across the boom width. When using flat fan spray tips, the spray from each tip should overlap the neighbor's by at least 50%. This is a function of tip height and spray angle. When using hollow or full cone pattern tips, the boom height should be such that the edge of each pattern touches the edge of the neighbor's pattern at the target height.

To test the even pattern of your spray, regardless of the nozzle type, fill the sprayer with clean water and spray an area of dry concrete. If the surface dries leaving "wet streaks", the application is incorrect and the boom height should be adjusted so that the surface dries out evenly, assuming that the nozzle tips are in good order and are spraying correctly.

A new line of sprayer nozzles, called venturi-type nozzles, reduces spray drift without sacrificing uniformity of application. A recent study conducted by engineers at the AgTech Centre in Lethbridge, Alberta shows venturi nozzles can potentially reduce drift by over 90 percent.

New to North America, the nozzle is designed to produce fewer, but larger spray droplets, says Brian Storozynsky, AgTech Centre sprayer project manager. "This design reduces drift, yet uniformity of application and chemical efficacy are not compromised."

The secret of the venturi nozzle's impressive drift reduction capabilities is in its design. The nozzle works by passing spray solution through a tapered passage in the nozzle. As the passage diameter decreases, the spray is accelerated. At the tapered passage outlet, the acceleration creates a natural vacuum, causing air to be sucked from outside the nozzle tip through one or two small holes. The spray solution and air mix in the chamber before exiting the nozzle tip. Compression in the mixing chamber results in air bubbles forming inside the liquid spray droplets. This produces the larger spray droplets,

which are less likely to drift.

Reduced drift means less waste and big savings for farmers, he says. Reduced drift also lessens the risk of environmental contamination. “An added advantage for farmers is that the venturi nozzle tip fits into existing nozzle caps.” The venturi nozzle’s designed pressure range also significantly impacts spray drift. “High- pressure venturi nozzles reduce drift by 60-90 percent over Spraying Systems’ wide-angle Turbo TeeJet nozzle, well known for its good performance in windy conditions. Lower pressure venturi nozzles resulted in a 35-60 percent reduction,” says Storozynsky.

Low-pressure venturi nozzles are most effective at reducing drift when set at 40 psi and high- pressure venturi nozzles operate best between 70 and 80 psi, he says. Low-pressure nozzles are recommended for pull-type sprayers that have booms operating at normal heights and when spraying with chemicals requiring application uniformity. High-pressure venturi nozzles are suggested for high-clearance sprayers operated above recommended nozzle spray heights.

A TurboDrop venturi/Turbo TeeJet tip combination proved the most effective in the AgTech Centre study, averaging more than 90 percent drift reduction, says Storozynsky. “This combination is excellent for reducing drift, but farmers must be cautious as the spray droplets are coarse and may negatively affect herbicide efficacy.” But technology is only as good as the person using it, Storozynsky says. “Operator skill and following product recommendations will ensure the technology performs to its designed capacity. This is even more true for venturi nozzles.”

The Applicator’s Role and the Grower’s Role in Minimizing Spray Drift

The Applicator’s Role - Knowledge and Flexibility

Drift management at the time of application is the legal responsibility of the applicator, who must combine his knowledge of the site conditions and application variables to minimize drift. Flexibility is a key component to minimizing drift, since there are so many factors that influence drift that can

be modified by the applicator, depending on the particular circumstances. A well- trained and experienced applicator will be able to customize an application for successful drift control for specific conditions. For example, there is more flexibility in choice of nozzles or acceptable weather conditions if the buffer size is increased or a shield is used on the sprayer. In addition, the needs and choices for aerial, ground, airblast, and chemigation equipment differ significantly. Forestry, right-of-way, recreational areas, lawn, and home and garden require different drift mitigation strategies than agricultural crops, and even different agricultural crops require different strategies

Always check label requirements, because some products require buffers of a specific size to minimize drift to sensitive areas. Always consider safety when applying pesticides. Consider any obstructions to the application, and do not apply when tired or under stress.

The Grower's Role – Buffers and Crop/Pesticide Selection

The grower can have a significant impact on the applicator's flexibility in minimizing drift, through his careful short- and long-term consideration of buffer type, size, and location as well as his crop and pesticide choices.

Considerations

Pesticide drift can leave residues on adjacent crops, be a hazard to nearby people and livestock, and reduce the amount of material in the target area so that it is ineffective. People applying pesticides should make every effort to minimize or prevent pesticide spray drift by doing one or more of the following:

- Being aware of the toxicity of the pesticide being used
- Read the label
- Use buffer strips around watercourses and neighboring fields
- Select the correct water rate
- Proper nozzle selection
- Be aware of the weather conditions
- Spray plume protection (hoods, shrouds, screens and air curtains)
- Use drift-reducing adjuvants

- Utilize wick weeders
- Select the correct nozzle-to-target distance
- Don’t spray if conditions are not suitable