Novel nozzles reduce drift

The Sustainable Use Directive (SUD) aims to reduce the risks to the environment, particularly waterbodies, associated with pesticide use. Compliance with buffer zones associated with pesticides is a fundamental part of protecting our water.

Ciaran Collins & Dermot Forristal
Teagasc Crops Environment and Land Use Programme

Michael McCarthy Teagasc Mallow

Francis Quigley Teagasc Machinery Specialist

STRIPE – **S**urface water **T**ool for **R**educing the **I**mpact of **P**esticides in the **E**nvironment – allows farmers to reduce the mandatory buffer zones associated with pesticides, providing they use spray drift reducing technology. The farmer further benefits by keeping the spray on-target.

Buffer zones are applicable to all surface waterbodies. Waterbodies are defined as "'a feature which is capable of holding water permanently, or at any stage, during the year" and are measured from the top of the bank of the waterbody. Buffer zones can vary in size (1m – 70m) but a one-metre minimum applies in all cases regardless of application rate. There are three instances where the mandatory pesticide buffer zone can be reduced:

- When using DAFM-approved drift reducing nozzles.
- When using reduced application rates.
- When using DAFM-approved drift reducing nozzles and reduced application rates.

It is important to refer to the PCRD website to establish the required buffer zone when using STRIPE. In the example in Table 1 and Table 2, the mandatory buffer zone is 10m, but can be reduced depending on the rate and nozzle type used. If there are multiple products in the tank, the largest buffer zone must be adhered to.

Note that statutory 'no-use' zones (called safeguard zones) apply around all drinking water abstraction points (public and private boreholes and rivers/lakes), ranging from five metres to 200 metres, depending on the size and extent of the supply. These safeguard zones cannot be reduced using STRIPE.

Sprayer nozzles

Selection of the most appropriate nozzles is essential. The nozzle used, in combination with spraying pressure and forward speed, determines:

- Application rate (litres/ha).
- Risk of drift (and STRIPE category).
- Deposition pattern on the target crop, weed, soil or insect.

Drift risk and deposition on the target are largely determined by the spectrum of droplet sizes produced by the nozzle. With multi-nozzle holders, it is best to fit nozzle options that include standard fan jets and low-drift air-induction nozzles.

There is a trade-off between drift reduction and droplet size. Droplet size can be measured in many ways, with BCPC 'spray quality' frequently quoted (very fine, fine, medium, coarse, very coarse, extra coarse and ultra coarse).

Most drift reduction strategies work by producing larger, fewer droplets, which are less prone to drift and can give good canopy penetration, but will give less coverage on the target.

So, how does this affect the product performance in the field? Plant protection product manufacturers are cautious and often recommend the evaluation settings of 200 litres/ha application rate and a 'fine' or 'medium' spray quality.

Does this mean that working outside of these recommendations will give poorer performance, as most low-drift nozzles will produce coarser spray quality?

Table 1:

	Nozzle type			
Elatus Plus ¾ rate	Non drift reducing nozzle	50% drift reducing nozzle	75% drift reducing nozzle	90% drift reducing nozzle
Buffer zone (metre)	8m	4m	2m	1m

Table 2:

Fungicides				Buffer zones				
Product name	PCS	Active substance	Concentration	Mandatory (non drift reducing nozzles)	When using 90% drift reducing nozzles	When using 75% drift reducing nozzles at various application rates		
Elatus Plus	05380	Benzovindilflupyr	100g/l	Non STRIPE	STRIPE 90%		STRIPE 75%	
				Full rate	Full rate	Full rate	3/4 rate	1/2 rate
				10m buffer	1m buffer	3m buffer	2m buffer	1m buffer

Less drift means less loss of product and less variability across the field in windy conditions. It allows better timeliness with more spraying days. This helps offset the disadvantage of the coarser droplets.

Many trials have shown that efficacy with air-induction nozzles can be as good as conventional nozzles, but not in all situations. Where target plants are small (eg. grass weeds), the fine or medium spray quality from a standard nozzle may be better.

In practice, a three option approach on sprayers may be best, reserving the coarsest low drift nozzles for extreme conditions or where the maximum STRIPE benefits must be gained. But for more typical use, a 50% or 75% STRIPE nozzle giving 'very coarse' and 'extremely coarse' spray quality may be a better choice to balance drift reduction with good target deposition (Table 3).

Table 3: Standard and air-induction nozzle options to give 140 l/ha at 10kmh from one manufacturer

Nozzle name	Nozzle type	Size	Pressure	Spray quality	STRIPE category
XR 110 03	Flat fan	03 (blue)	2.8	Fine	Std
AI XR 110 03	Air Induction	03 (blue)	2.8	Very Coarse	50%
AI 110 03	Air Induction	03 (blue)	2.8	Extremely Coarse	75%
TTI 110 03	Air induction	03 (blue)	2.8	Ultra coarse	90%

When using 50% drift reducing nozzles at various application rates			When using non drift reducing nozzles at various application rates		
STRIPE 50%			Non STRIPE nozzles		
Full rate	3/4 rate	1/2 rate	Full rate	3/4 rate	1/2 rate
5m buffer	4m buffer	3m buffer	10m buffer	8m buffer	5m buffer

Farmer profile: John Kelleher

John Kelleher is a tillage farmer from Killavullen just outside Mallow in Co Cork, farming just over 300ha, predominantly a mixture of winter and spring cereals. Add in his contract farming land, and John sprays over 4,500ha each year.

John has always been a fan of low drift technology and prior to 2018, he ran a 24 metre 4000lt Hardi Navigator with Hardi's own air bag system.

"With the air bag, I was always very confident in achieving good coverage with a standard flat fan nozzle as opposed to using the older type low drift nozzles, which simply increased the droplet size,"John says.

"Good coverage is key especially when applying herbicides and targeting tricky weeds such as wild oats and canary grass."

In 2018, John upgraded his sprayer to a 6,000lt Amazone with a 36 metre boom and GPS section control: "While I was slow to move away from the airbag, I felt my Hardi had enough done and with the TAMS grant available, this was an opportune time for me to change. I wanted to increase both my tank capacity and boom width and the best deal I could get was on an Amazone."

With the change of sprayer, John also changed his nozzle technology. He now uses both 75% and 90% low drift red 04 air induction nozzles.

"I find I am mostly spraying with the 75% drift reduction nozzles, as I am still a little sceptical of the large droplet size with the 90% DR nozzle. I tend to use these when conditions are very poor or the product I'm spraying requires me to do so, for buffer zones and STRIPE etc."

John also has automatic height control on the boom, which he says is a brilliant addition. The boom is automatically maintained at a height of 50cm above the crop at all times.

"When I was controlling the boom height myself, I tended to keep it high to protect it, but with the auto height feature, the boom is closer to the crop and drift is noticeably reduced, which is what we're all after," he concludes.

Michael McCarthy