

*A New Variable Flow Rate
Nozzle for Aerial Application*

VeriRate Nozzle



Why to need VFR Nozzles ?



- Variation in pest density
- Variation in crop
- Variation in aircraft speed

Flow Rate - Droplet Size – Spray Coverage

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- It is important that *flow rate* be variable but *droplet size*, and *spray coverage* should be invariable.

Optimum Droplet Size



- Droplet size smaller than 200 microns tends to drift from the spray target.
- Droplet size larger than 600 microns provides poor efficacy.
- A spray with VMD in the range 300 - 400 microns for systemic pesticides and 200 - 250 microns for contact pesticides is **good** for *drift reduction* and *efficacy*.

Conventional Nozzles with Rate Controller

- Nozzle flow rate is controlled by spray pressure.
- Flow rate doubles as pressure increases by four times.

Conventional Nozzles with Rate Controller



Advantages

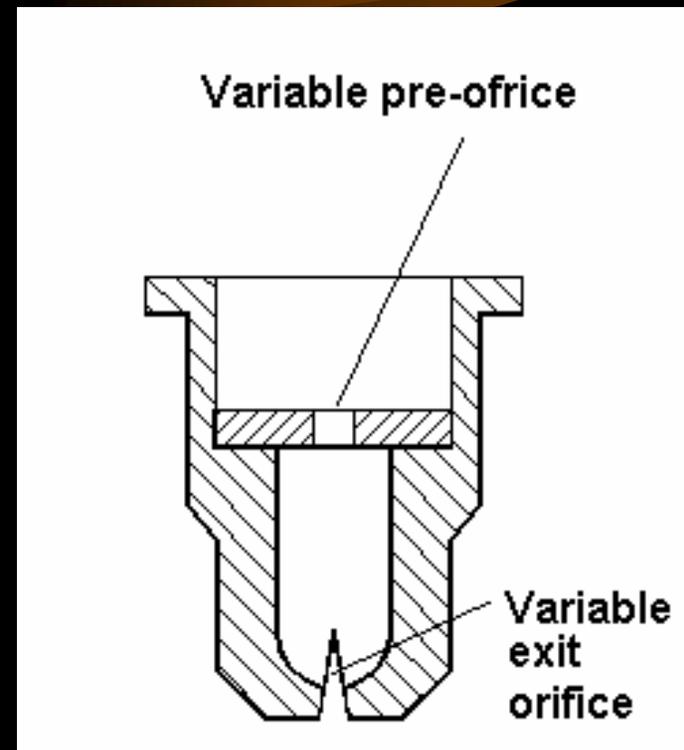
- Simple
- Flow rate controllable on the go

Disadvantages

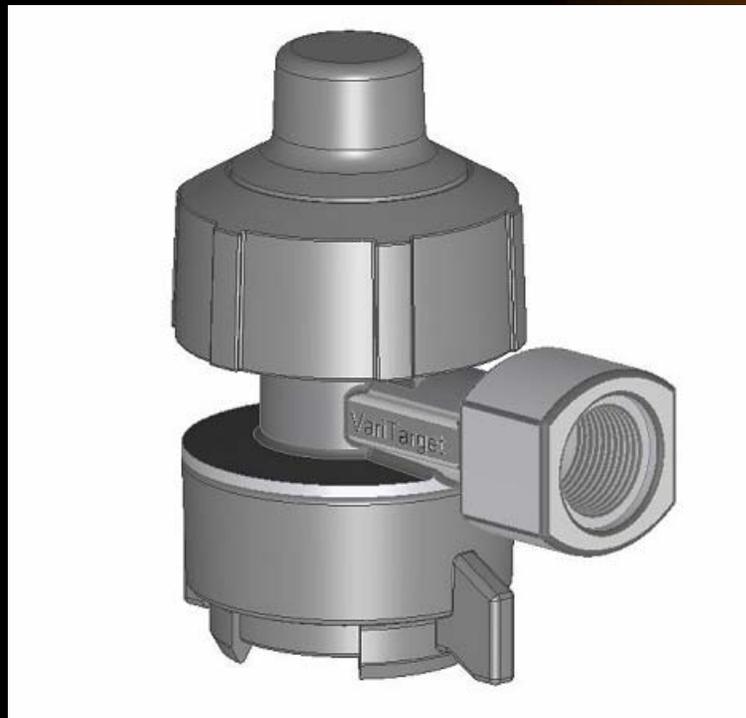
- ▶ Narrow range of flow rate control
- ▶ Significant variation in droplet size
- ▶ Significant variation in spray angle

New VFR Nozzle Concept

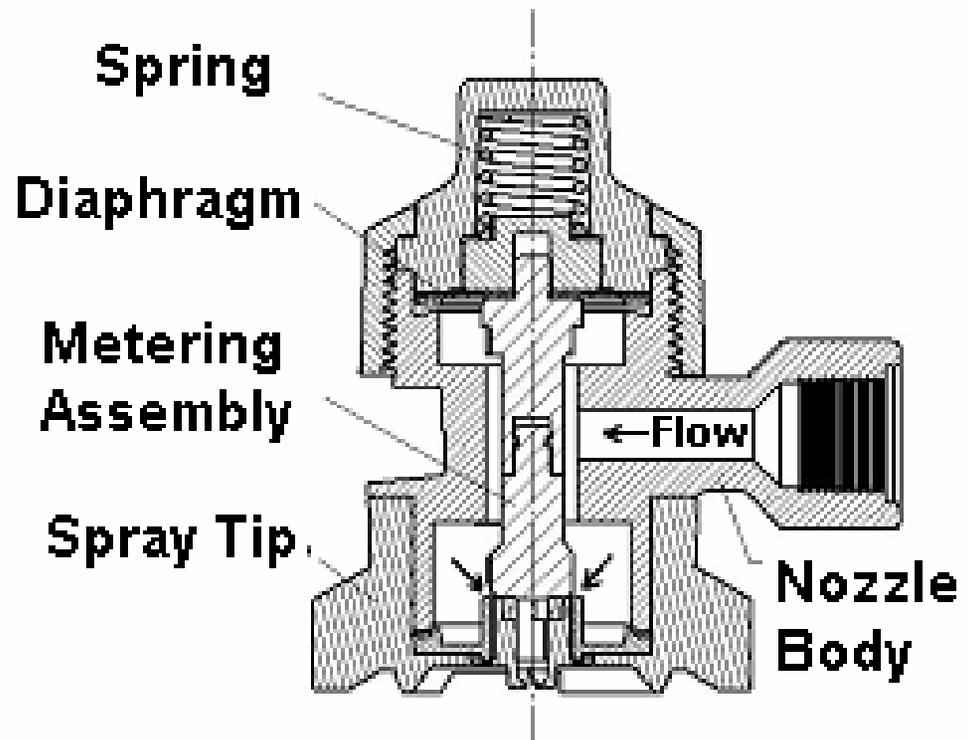
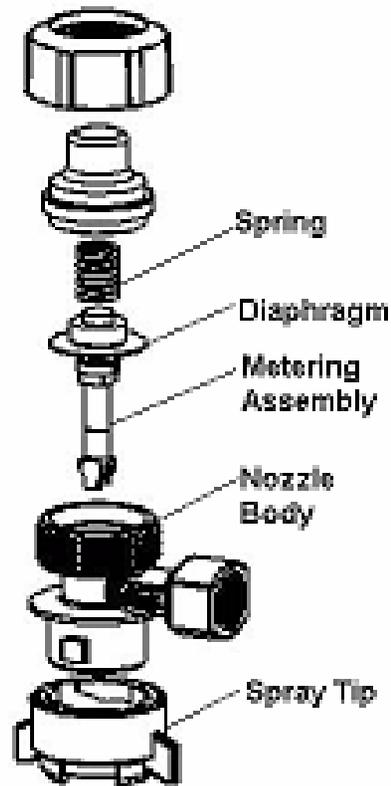
- Variable pre-orifice
 - ▶ Variable flow rate
- Variable exit orifice
 - ▶ Maintaining optimum droplet size
 - ▶ Maintaining spray pattern.



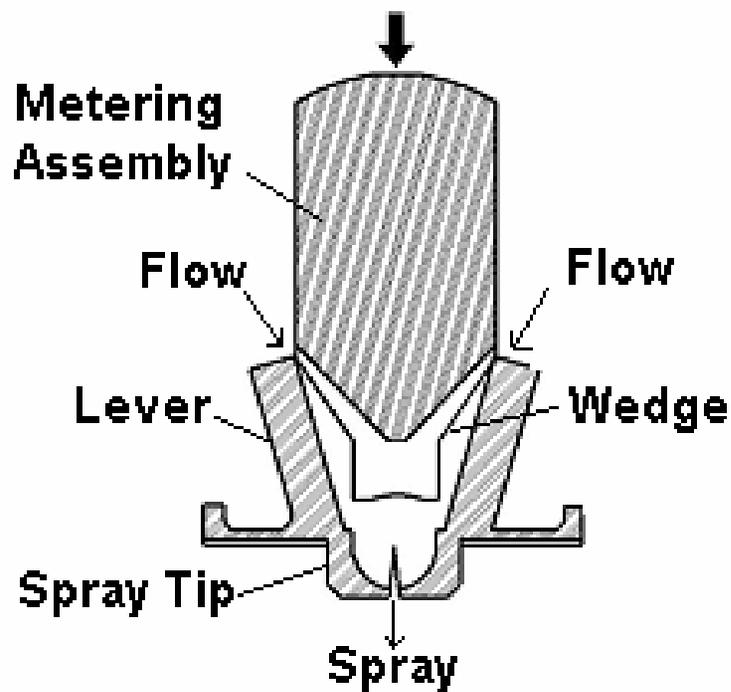
VeriRate™ Nozzle



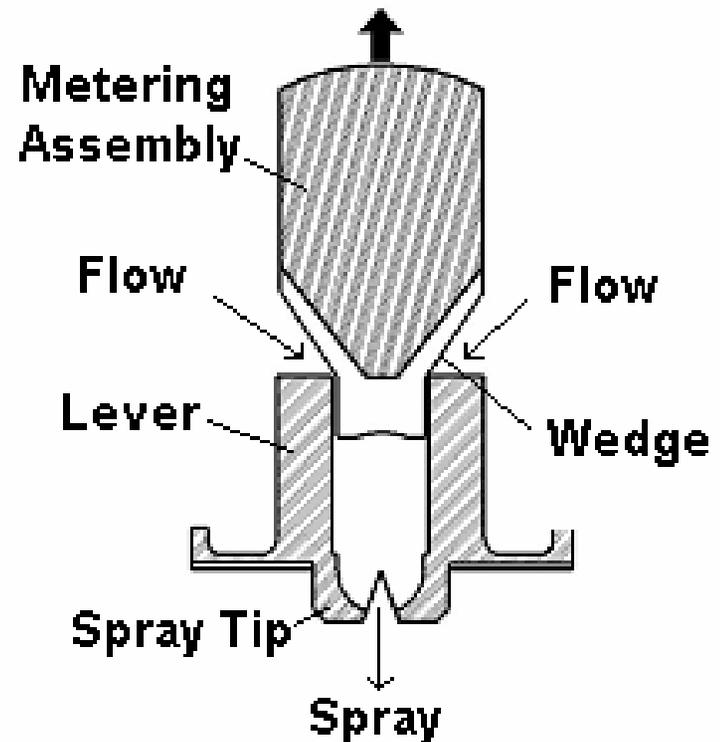
VeriRate™ Nozzle - Components



VeriRate™ Nozzle - Operation



Metering Position at 0.3 GPM



Metering Position at 3.0 GPM

VeriRate™ Nozzle – Flow Rate

Pressure (psi)	Flow Rate (gpm)
20	.30
25	.40
28	.50
30	.60
33	.90
36	1.4
39	1.9
42	2.3
45	2.7
50	3.0

VeriRate™ Nozzle – Droplet Size

Airspeed (mph)	Flow Rate (gpm)	D _{V0.1} (μm)	D _{V0.5} (μm)
120	.30	234	371
120	.40	263	426
120	.60	227	356
120	2.0	241	397
120	3.0	266	479
150	.30	203	302
150	.40	189	283
150	.60	181	279
150	2.0	195	310
150	3.0	207	332

VeriRate™ Nozzle – Features

- Flow rate variable .3 – 3.0 GPM as pressure varies from 20 - 50 PSI.
- Spray angle varies from 20 - 40 degrees
- Fast response to rate changes – less than 0.25 seconds.
- Adaptable to conventional spraying systems.
- Compatible with pressure regulators or automatic rate controllers.

Field Performance Issues



- Leakage at the diaphragm.
- Damage of the gasket seal at the spray tip resulting in distortion in spray pattern.

VeriRate Nozzles for Next Season



- Thicker Viton gasket seal
- Viton diaphragm
- New-design diaphragm retainer
- Droplet size category as a function of nozzle size and/or pressure, airspeed, and orientation will be available.



THANK YOU

SprayTarget

