Advances in Hort Sprayer Technology

or "what have you done for me lately?"

“Drift: a ground-breaking advancement in multi-row applications” 😊

Photo courtesy of Gail Amos and David Zamora

Dr. Jason Deveau
Application Technology Specialist
OMAFRA, Simcoe, 2014
• Working to reduce pesticide wastage and off-target contamination
• Developing methods to spray crops consistently
• Developing educational resources for sprayer operators

Jason Deveau
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defining sprayer advancements

**Technologies:** Equipment or chemistries that make spraying safer, easier, more efficient or more effective

**Methods:** Techniques to improve a spray application *(or a sprayer operator)*

**Regulations:** Company, municipal or federal rules that positively impact spray applications
So, sprayer advancements are not *just* nifty gadgets.

..but they’re fun, so I’ll show you a lot of them!
Pentair HyPro’s Dual Reflex

• The dual body has a manual turret, but the operator can switch between the two tips from the cab

• e.g. from fertilizer to fungicide, from conventional flat fan to air induced or to dual asymmetrical fans
Pattern-Master brushes

• Brushes mounted in front of the nozzle cut apparent windspeed, retaining many of the small droplets lost to wind and preserving the finer portion of the spray pattern.

Winner of the ASABE AE50 Award for 2015

Pattern Master Brushes on the boom
- photo by Dean Scott
Pattern Master Brushes in action

12.3 MPH  8006 Flat Fan Tips

15gPA

Brush

20gPA

Brush

15gPA

no Brush

20gPA

no Brush

Pattern Master Brushes in action
- by Dean Scott
“New” herbicides are coming...

- Our old friends dicamba and 2,4-D are volatile actives now chelated to salts like a balloon to an anchor. Even if vapour drift has been addressed, particle drift is still a concern...
auto-level boom systems

- How do you keep a 120 foot boom at 20 inches at 25 mph?

- Slow down, drive on level ground and use auto-adjust
Agritronics’ LED-illuminated booms

• Drivers can see the boom clearly during transport and the operator can assess tip patterns in poor light
Pentair HyPro Express end bodies

- Faster shut-off valve operation, act as air aspirators and eliminate “dead zones” that retain pesticide during cleanout.
Peek-A-Boom remote boom control

- After-market remote control to turn boom sections on-or-off from outside the cab. Perform timed-output tests safely and with ease

- Deere and others offer similar systems to open and close boom sections
• This calibration tool from Innoquest Inc. is much better than the classic pitcher & stopwatch approach

• +/- 2% accuracy and it will gauge a hollow cone’s output (US G/min, L/min or Oz/min) in ~15 sec
airblast sprayers evolved

- We’ve come a long way since this c.1910 Ontario orchard crew
- BUT, there haven’t been many advancements in Canada’s airblast fleet until recently.

...poor horse
moulded tips on airblast

- Moulded tips are bright, colour-coded, fool-proof and last longer than disc-core... but don’t have high rates (I’ve asked TeeJet why)

- Air induction tips, for example, create coarser droplets that resist drift and move more reliably when spraying high up but be careful - they produce fewer droplets

You *may* have to change nozzle bodies, and sometimes that’s tough...
moulded tips on airblast

- TeeJet AITX
- TeeJet TXR low-profile cone
- Albuz 60 degree cone
- Albuz low-Profile cone
H.S.S. Hol sprayer

Flexible ducts and a gantry comprise the tower
Each duct is paired to a nozzle body, including the option woolly apple aphid attachment.
Adjustable, offset double axle distributes weight and reduces ruts
Access port separate from fill basket (operator safety during inspection)
H.S.S. Hol sprayer

150 L clean water tank supplies water to onboard tank rinse system
H.S.S. Hol sprayer

SS hydraulic tank screen and (optional) tank level sensor
H.S.S. Hol sprayer

Hydraulic Jet Action in Tank Screen

Hydraulic jet breaks up pesticide without a slurry
H.S.S. Hol sprayer

Clean water source for handwash
Stretch out with your feelings, young Padawan

The force is strong with this sprayer...
the Intelligent Sprayer
The *real* Intelligent Sprayer...
Fact: Optimum spray coverage saves money and maintains or improves efficacy

Problem: Sprayer operators have to make detailed changes to the sprayer for each significantly different crop

Objective: Develop an Intelligent Sprayer that makes the changes automatically
Sprayer Anatomy
what is pulse width modulation?
demo day
demo day
Intelligent Sprayer coverage
• In U.S. tests in 2013, the Intelligent Sprayer reduced spray loss up to 87% and reduced spray volume by as much as 73% - and efficacy was great

• Wow...
• **Cost:** $21,000 USD (not including labour to assemble or profit). For future mass production, component costs should decrease dramatically.

• So, you can’t have one. What can you do to emulate it?
Crop-Adapted Spraying

- Most pesticide label rates reflect the area of the planting (e.g. g/ha), not the area-density of the plant canopy

- A fixed, prescribed spray volume and/or rate is insufficient to match orchard variability

- An acre of corn is an acre of corn, but an acre of apple trees...
1,000 L spray mix /ha (1 g active / L)
500 L spray mix /ha (1 g active / L)
250 L spray mix /ha (1 g active / L)
Our Crop-Adapted Spraying (CAS) model is based on the work of many other people. It adapts the amount of active ingredient per unit ground area such that the amount of active ingredient per unit target area (usually the leaf area) remains constant for canopies of varying shape and density.

When this is achieved with sufficient accuracy, the pesticide efficacy is maintained.
Two years of testing in four orchards has demonstrated rates can be dropped by ~30% and there is no significant difference in pest activity or damage.

Next year will be the third optimized rate spray program for 2 of the orchards – we are not expecting any issues related to prolonged use of reduced rates.
app is in development – free in 2015
Using LiDAR in apples, Bernard found more surface area was exposed when using just enough air to rustle leaves versus no air at all.

He also found that too much air (too fast, really) reduced surface area versus no air at all.
airblast air
airblast air
adjusting airblast air

- Set deflectors, fan gear, tractor rpm’s and ground speed
- Attach three 25 cm lengths of flagging tape at top, middle and bottom of far side of canopy
- Do this to three plants
• Have a partner observe the tape as the sprayer drives by
• If air is too fast, increase ground speed, reduce rpm’s or lower fan gear
• This is a large tree – 20 feet in diameter

• However, it is an easy spray target because it is not the size of the box, it’s what’s in the box that matters

• A good trick is to look at the tree’s shadow. Then you’ll know if it’s open to spray
• Towers bring nozzles closer to the target

• Towers have the potential to improve spray penetration and reduce required output

• Towers reduce drift
Gear Up, Throttle Down

• Who says 540 rpm’s is the only way to go? As long as your tractor doesn’t lug, and you’re using a positive-displacement pump, you can try this.
and so much more...

- This was too much, too quickly, but hopefully it inspires you to find out more. For more information, go to:

Follow me!

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