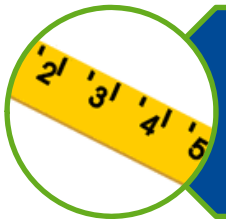
# APPLICATION TECHNOLOGY: UPGRADING YOUR SPRAYER

Tom Wolf & Brian Caldwell
Agrimetrix Research & Training, Saskatoon

# Spray Schedule

| Month | Treatment |
|---|---|
| **April - May** | Pre-Seed (glyphosate & Grp 2, 4, 6, 14) |
| **May-June** | Post-Emerge (Grp 1, 2, 4, 6, 9, 10, 14, 27) |
| **June** | Insecticide |
| **July** | Fungicide |
| **August** | Insecticide |
| **September** | Pre-Harvest / Desiccate (Grp 9, 14, 22) |
| **October** | Post-Harvest |

## Sizing Nozzles



Spacing

Volume

Speed

| Nozzle Size | Pressure (psi) | Nozzle Flow (US gpm) | Travel Speed (columns, mph) at listed application volume (US gal/acre), 20" spacing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 | 18 |
| | | | US gpa | | | | | | | | | | | |
| 015 Green | 30 | 0.130 | 12.9 | 9.6 | 7.7 | 6.4 | 5.5 | 4.8 | 4.3 | 3.9 | 3.2 | 2.8 | 2.4 | 2.1 |
| | 40 | 0.150 | 14.9 | 11.1 | 8.9 | 7.4 | 6.4 | 5.6 | 5.0 | 4.5 | 3.7 | 3.2 | 2.8 | 2.5 |
| | 50 | 0.168 | 16.6 | 12.5 | 10.0 | 8.3 | 7.1 | 6.2 | 5.5 | 5.0 | 4.2 | 3.6 | 3.1 | 2.8 |
| | 60 | 0.184 | 18.2 | 13.6 | 10.9 | 9.1 | 7.8 | 6.8 | 6.1 | 5.5 | 4.5 | 3.9 | 3.4 | 3.0 |
| | 70 | 0.198 | 19.6 | 14.7 | 11.8 | 9.8 | 8.4 | 7.4 | 6.5 | 5.9 | 4.9 | 4.2 | 3.7 | 3.3 |
| | 80 | 0.212 | 21.0 | 15.8 | 12.6 | 10.5 | 9.0 | 7.9 | 7.0 | 6.3 | 5.3 | 4.5 | 3.9 | 3.5 |
| | 90 | 0.225 | 22.3 | 16.7 | 13.4 | 11.1 | 9.5 | 8.4 | 7.4 | 6.7 | 5.6 | 4.8 | 4.2 | 3.7 |
| | 100 | 0.237 | 23.5 | 17.6 | 14.1 | 11.7 | 10.1 | 8.8 | 7.8 | 7.0 | 5.9 | 5.0 | 4.4 | 3.9 |
| 02 Yellow | 30 | 0.173 | 17.1 | 12.9 | 10.3 | 8.6 | 7.3 | 6.4 | 5.7 | 5.1 | 4.3 | 3.7 | 3.2 | 2.9 |
| | 40 | 0.200 | 19.8 | 14.9 | 11.9 | 9.9 | 8.5 | 7.4 | 6.6 | 5.9 | 5.0 | 4.2 | 3.7 | 3.3 |
| | 50 | 0.224 | 22.1 | 16.6 | 13.3 | 11.1 | 9.5 | 8.3 | 7.4 | 6.6 | 5.5 | 4.7 | 4.2 | 3.7 |
| | 60 | 0.245 | 24.2 | 18.2 | 14.5 | 12.1 | 10.4 | 9.1 | 8.1 | 7.3 | 6.1 | 5.2 | 4.5 | 4.0 |
| | 70 | 0.265 | 26.2 | 19.6 | 15.7 | 13.1 | 11.2 | 9.8 | 8.7 | 7.9 | 6.5 | 5.6 | 4.9 | 4.4 |
| | 80 | 0.283 | 28.0 | 21.0 | 16.8 | 14.0 | 12.0 | 10.5 | 9.3 | 8.4 | 7.0 | 6.0 | 5.3 | 4.7 |
| | 90 | 0.300 | 29.7 | 22.3 | 17.8 | 14.9 | 12.7 | 11.1 | 9.9 | 8.9 | 7.4 | 6.4 | 5.6 | 5.0 |
| | 100 | 0.316 | 31.3 | 23.5 | 18.8 | 15.7 | 13.4 | 11.7 | 10.4 | 9.4 | 7.8 | 6.7 | 5.9 | 5.2 |
| 025 Lilac | 30 | 0.217 | 21.4 | 16.1 | 12.9 | 10.7 | 9.2 | 8.0 | 7.1 | 6.4 | 5.4 | 4.6 | 4.0 | 3.6 |
| | 40 | 0.250 | 24.8 | 18.6 | 14.9 | 12.4 | 10.6 | 9.3 | 8.3 | 7.4 | 6.2 | 5.3 | 4.6 | 4.1 |
| | 50 | 0.280 | 27.7 | 20.8 | 16.6 | 13.8 | 11.9 | 10.4 | 9.2 | 8.3 | 6.9 | 5.9 | 5.2 | 4.6 |
| | 60 | 0.306 | 30.3 | 22.7 | 18.2 | 15.2 | 13.0 | 11.4 | 10.1 | 9.1 | 7.6 | 6.5 | 5.7 | 5.1 |
| | 70 | 0.331 | 32.7 | 24.6 | 19.6 | 16.4 | 14.0 | 12.3 | 10.9 | 9.8 | 8.2 | 7.0 | 6.1 | 5.5 |
| | 80 | 0.354 | 35.0 | 26.3 | 21.0 | 17.5 | 15.0 | 13.1 | 11.7 | 10.5 | 8.8 | 7.5 | 6.6 | 5.8 |
| | 90 | 0.375 | 37.1 | 27.8 | 22.3 | 18.6 | 15.9 | 13.9 | 12.4 | 11.1 | 9.3 | 8.0 | 7.0 | 6.2 |
| | 100 | 0.395 | 39.1 | 29.3 | 23.5 | 19.6 | 16.8 | 14.7 | 13.0 | 11.7 | 9.8 | 8.4 | 7.3 | 6.5 |
| 03 Blue | 30 | 0.260 | 25.7 | 19.3 | 15.4 | 12.9 | 11.0 | 9.6 | 8.6 | 7.7 | 6.4 | 5.5 | 4.8 | 4.3 |
| | 40 | 0.300 | 29.7 | 22.3 | 17.8 | 14.9 | 12.7 | 11.1 | 9.9 | 8.9 | 7.4 | 6.4 | 5.6 | 5.0 |
| | 50 | 0.335 | 33.2 | 24.9 | 19.9 | 16.6 | 14.2 | 12.5 | 11.1 | 10.0 | 8.3 | 7.1 | 6.2 | 5.5 |
| | 60 | 0.367 | 36.4 | 27.3 | 21.8 | 18.2 | 15.6 | 13.6 | 12.1 | 10.9 | 9.1 | 7.8 | 6.8 | 6.1 |
| | 70 | 0.397 | 39.3 | 29.5 | 23.6 | 19.6 | 16.8 | 14.7 | 13.1 | 11.8 | 9.8 | 8.4 | 7.4 | 6.5 |
| | 80 | 0.424 | 42.0 | 31.5 | 25.2 | 21.0 | 18.0 | 15.8 | 14.0 | 12.6 | 10.5 | 9.0 | 7.9 | 7.0 |
| | 90 | 0.450 | 44.6 | 33.4 | 26.7 | 22.3 | 19.1 | 16.7 | 14.9 | 13.4 | 11.1 | 9.5 | 8.4 | 7.4 |
| | 100 | 0.474 | 47.0 | 35.2 | 28.2 | 23.5 | 20.1 | 17.6 | 15.7 | 14.1 | 11.7 | 10.1 | 8.8 | 7.8 |

| Nozzle Size | Pressure (psi) | Nozzle Flow (US gpm) | Travel Speed (columns, mph) at listed application volume ( | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | | US gpa | | | | | | | |
| 025 Lilac | 30 | 0.217 | 21.4 | 16.1 | 12.9 | 10.7 | 9.2 | 8.0 | 7.1 | 6.4 |
| | 40 | 0.250 | 24.8 | 18.6 | 14.9 | 12.4 | 10.6 | 9.3 | 8.3 | 7.4 |
| | 50 | 0.280 | 27.7 | 20.8 | 16.6 | 13.8 | 11.9 | 10.4 | 9.2 | 8.3 |
| | 60 | 0.306 | 30.3 | 22.7 | 18.2 | 15.2 | 13.0 | 11.4 | 10.1 | 9.1 |
| | 70 | 0.331 | 32.7 | 24.6 | 19.6 | 16.4 | 14.0 | 12.3 | 10.9 | 9.8 |
| | 80 | 0.354 | 35.0 | 26.3 | 21.0 | 17.5 | 15.0 | 13.1 | 11.7 | 10.5 |
| | 90 | 0.375 | 37.1 | 27.8 | 22.3 | 18.6 | 15.9 | 13.9 | 12.4 | 11.1 |
| | 100 | 0.395 | 39.1 | 29.3 | 23.5 | 19.6 | 16.8 | 14.7 | 13.0 | 11.7 |
| 03 Blue | 30 | 0.260 | 25.7 | 19.3 | 15.4 | 12.9 | 11.0 | 9.6 | 8.6 | 7.7 |
| | 40 | 0.300 | 29.7 | 22.3 | 17.8 | 14.9 | 12.7 | 11.1 | 9.9 | 8.9 |
| | 50 | 0.335 | 33.2 | 24.9 | 19.9 | 16.6 | 14.2 | 12.5 | 11.1 | 10.0 |
| | 60 | 0.367 | 36.4 | 27.3 | 21.8 | 18.2 | 15.6 | 13.6 | 12.1 | 10.9 |
| | 70 | 0.397 | 39.3 | 29.5 | 23.6 | 19.6 | 16.8 | 14.7 | 13.1 | 11.8 |
| | 80 | 0.424 | 42.0 | 31.5 | 25.2 | 21.0 | 18.0 | 15.8 | 14.0 | 12.6 |
| | 90 | 0.450 | 44.6 | 33.4 | 26.7 | 22.3 | 19.1 | 16.7 | 14.9 | 13.4 |
| | 100 | 0.474 | 47.0 | 35.2 | 28.2 | 23.5 | 20.1 | 17.6 | 15.7 | 14.1 |

## Label says “Coarse”


Assume GA11003 to apply 10 gpa

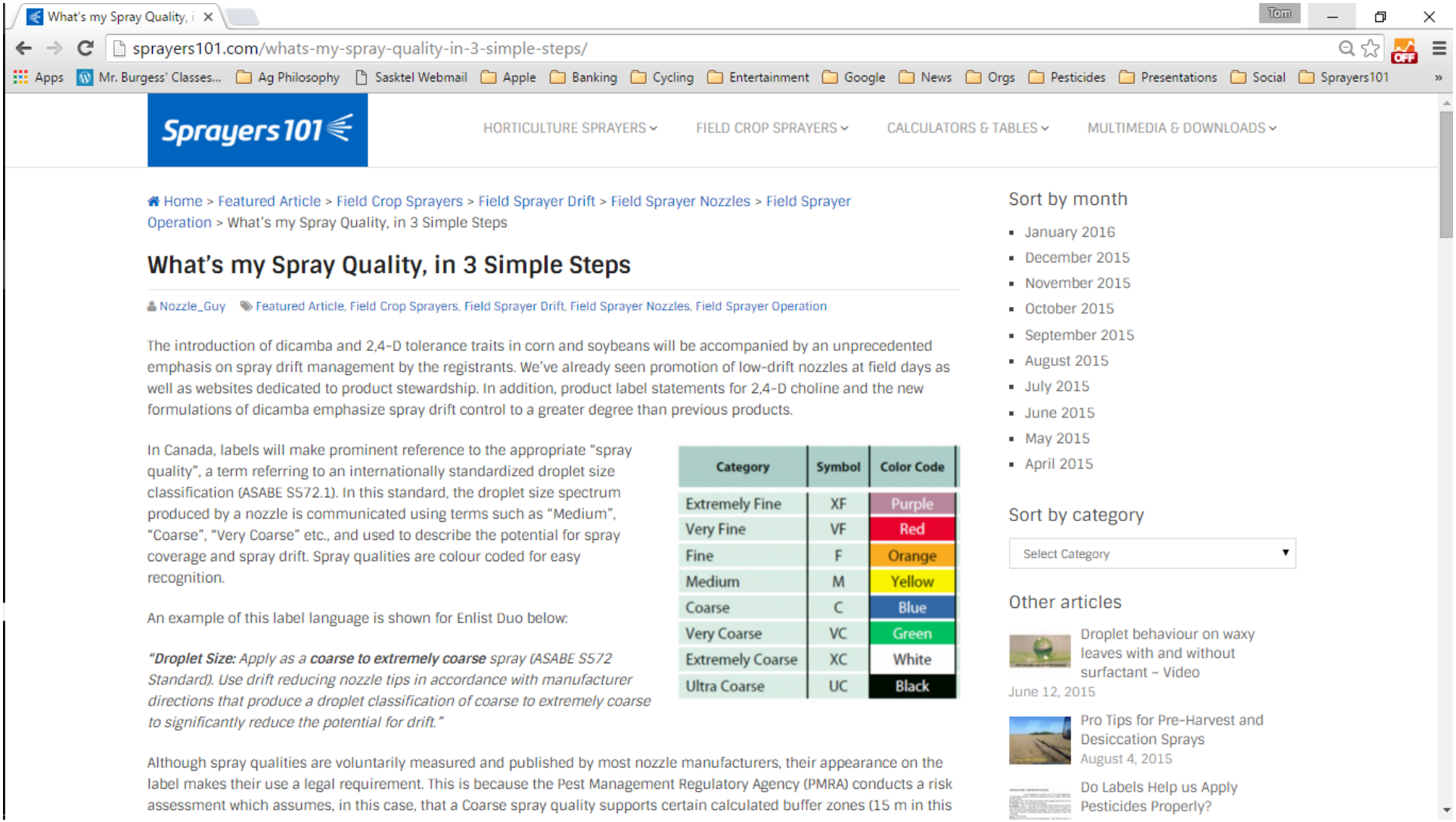
What travel speeds are possible?

# 10 gpa, 110-03 Guardian AIR nozzle


| PSI | MPH | Spray Quality |
|---|---|---|
| 15 | 5.3 | UC |
| 20 | 6.2 | UC |
| 30 | 7.7 | XC |
| 40 | 8.9 | VC |
| 50 | 10.1 | C |
| 60 | 11.0 | C |
| 70 | 11.9 | M |
| 80 | 12.5 | M |
| 90 | 13.4 | M |
| 100 | 14.0 | M |
| 115 | 15.1 | M |

# Spray Quality Categories

| Category | Symbol | Color Code | Approximate Dv0.5 (VMD) (microns) |
|---|---|---|---|
| Extremely Fine | XF | Purple | ≈50 |
| Very Fine | VF | Red | <136 |
| Fine | F | Orange | 136–177 |
| Medium | M | Yellow | 177–218 |
| Coarse | C | Blue | 218–349 |
| Very Coarse | VC | Green | 349–428 |
| Extremely Coarse | XC | White | 428–622 |
| Ultra Coarse | UC | Black | >622 |


What's my Spray Quality, i
Tom
sprayers101.com/whats-my-spray-quality-in-3-simple-steps/
Apps
Mr. Burgess' Classes...
Ag Philosophy
Sasktel Webmail
Apple
Banking
Cycling
Entertainment
Google
News
Orgs
Pesticides
Presentations
Social
Sprayers101
Sprayers101
HORTICULTURE SPRAYERS
FIELD CROP SPRAYERS
CALCULATORS & TABLES
MULTIMEDIA & DOWNLOADS
Home > Featured Article > Field Crop Sprayers > Field Sprayer Drift > Field Sprayer Nozzles > Field Sprayer Operation > What's my Spray Quality, in 3 Simple Steps
What's my Spray Quality, in 3 Simple Steps
Nozzle_Guy
Featured Article, Field Crop Sprayers, Field Sprayer Drift, Field Sprayer Nozzles, Field Sprayer Operation
The introduction of dicamba and 2,4-D tolerance traits in corn and soybeans will be accompanied by an unprecedented emphasis on spray drift management by the registrants. We've already seen promotion of low-drift nozzles at field days as well as websites dedicated to product stewardship. In addition, product label statements for 2,4-D choline and the new formulations of dicamba emphasize spray drift control to a greater degree than previous products.
In Canada, labels will make prominent reference to the appropriate "spray quality", a term referring to an internationally standardized droplet size classification (ASABE S572.1). In this standard, the droplet size spectrum produced by a nozzle is communicated using terms such as "Medium", "Coarse", "Very Coarse" etc., and used to describe the potential for spray coverage and spray drift. Spray qualities are colour coded for easy recognition.
Category
Symbol
Color Code
Extremely Fine
XF
Purple
Very Fine
VF
Red
Fine
F
Orange
Medium
M
Yellow
Coarse
C
Blue
Very Coarse
VC
Green
Extremely Coarse
XC
White
Ultra Coarse
UC
Black
An example of this label language is shown for Enlist Duo below:
"Droplet Size: Apply as a coarse to extremely coarse spray (ASABE S572 Standard). Use drift reducing nozzle tips in accordance with manufacturer directions that produce a droplet classification of coarse to extremely coarse to significantly reduce the potential for drift."
Although spray qualities are voluntarily measured and published by most nozzle manufacturers, their appearance on the label makes their use a legal requirement. This is because the Pest Management Regulatory Agency (PMRA) conducts a risk assessment which assumes, in this case, that a Coarse spray quality supports certain calculated buffer zones (15 m in this
Sort by month
January 2016
December 2015
November 2015
October 2015
September 2015
August 2015
July 2015
June 2015
May 2015
April 2015
Sort by category
Select Category
Other articles
Droplet behaviour on waxy leaves with and without surfactant – Video
June 12, 2015
Pro Tips for Pre-Harvest and Desiccation Sprays
August 4, 2015
Do Labels Help us Apply Pesticides Properly?

# Sprayer Upgrades

# NOZZLES

The most important part of the sprayer

# *Air Bubble Jet*

- **Sizes:**
  - 01 to 06
- **Pressure:**
  - 30 – 75 psi (30 – 100)
- **Spray Quality:**
  - Medium to Coarse
- **Retail Cost:**
  - $10 - $12

Sprayers101

# *Greenleaf AirMix*


- **Sizes:**
  - 01 to 06
- **Pressure:**
  - 15 – 90 psi (30-100)
- **Spray Quality:**
  - Medium to V. Coarse
- **Retail Cost:**
  - $4 - $6

Sprayers101

# *Hypro Guardian Air (John Deere LDA)*


- **Sizes:**
  - 015 to 05 (035)
- **Pressure:**
  - 15 – 115 psi (30 – 100)
- **Spray Quality:**
  - Medium to V. Coarse
- **Retail Cost:**
  - $4 - $6

Sprayers101

# *TeeJet AIXR*


- **Sizes:**
  - 015 to 06
- **Pressure:**
  - 15 – 90 psi (30 – 100)
- **Spray Quality:**
  - Coarse – Extr. Coarse
- **Retail Cost:**
  - $4 - $6

Sprayers101

# *Wilger SR, MR*


- **Sizes:**
  - 01 to 20
- **Pressure:**
  - 20 – 80 psi
- **Spray Quality:**
  - Medium to Extr. Coarse
- **Retail Cost:**
  - $15

Sprayers101

# FLOW CONTROL

The most annoying part of the sprayer

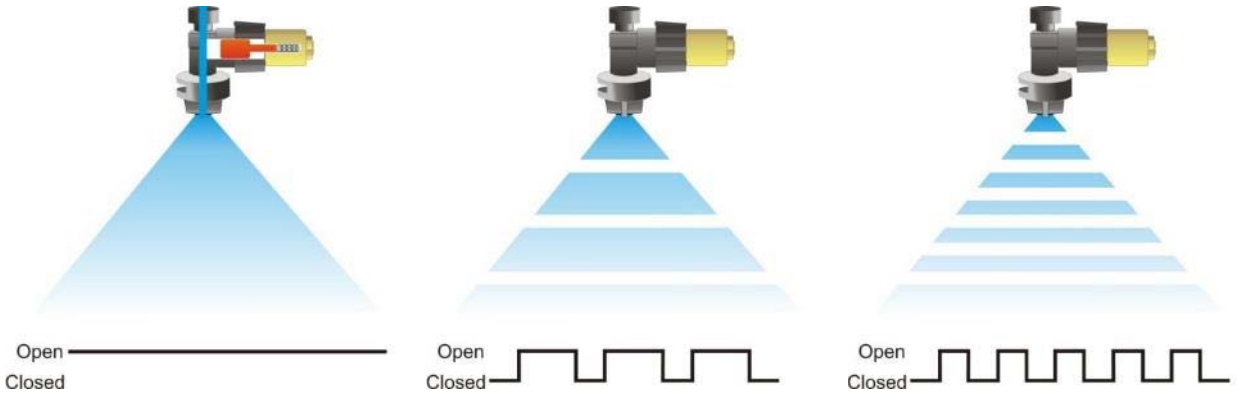
# 10 gpa, 110-03 Guardian AIR nozzle

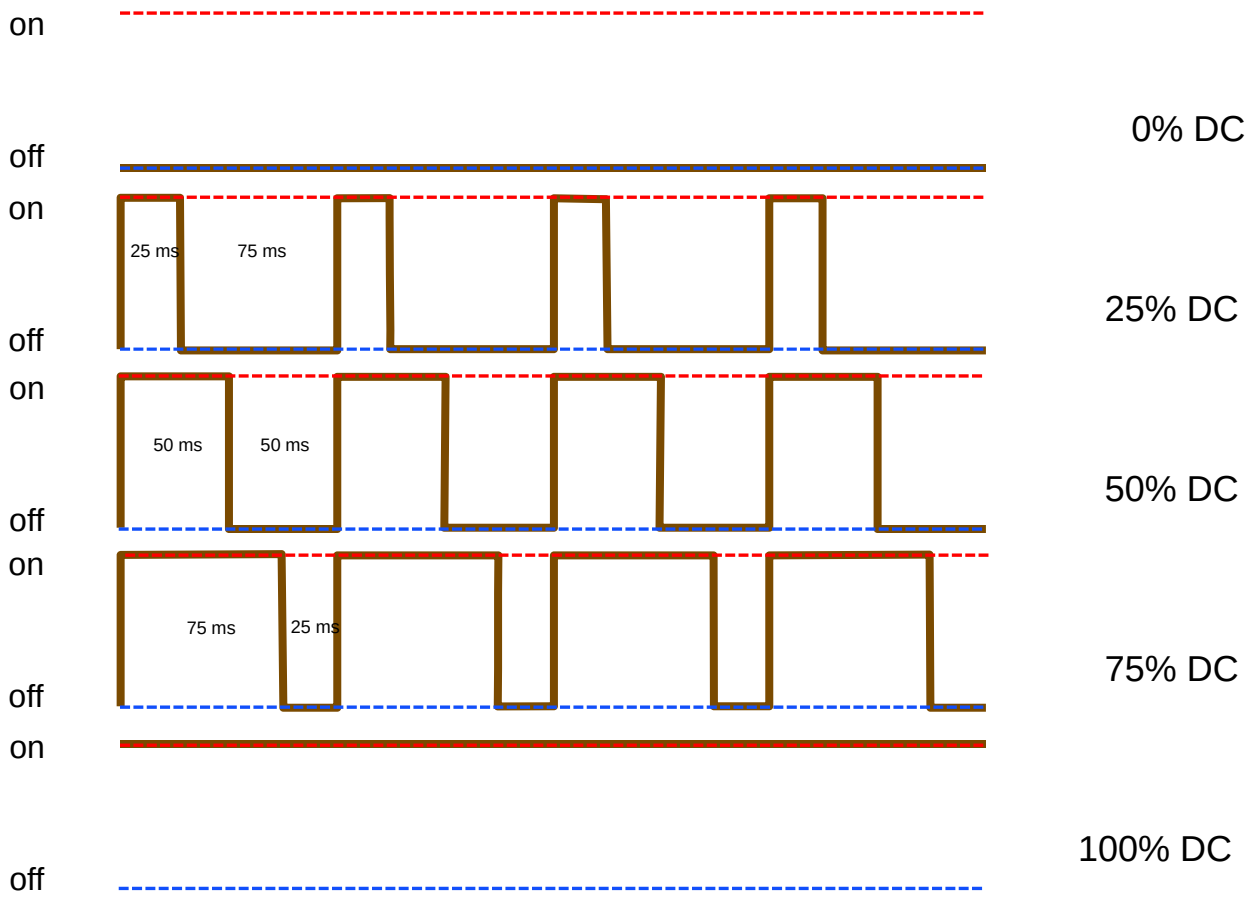

| PSI | MPH | Spray Quality |
|---|---|---|
| 15 | 5.3 | UC |
| 20 | 6.2 | UC |
| 30 | 7.7 | XC |
| 40 | 8.9 | VC |
| 50 | 10.1 | C |
| 60 | 11.0 | C |
| 70 | 11.9 | M |
| 80 | 12.5 | M |
| 90 | 13.4 | M |
| 100 | 14.0 | M |
| 115 | 15.1 | M |

90 psi / 30 psi = 3

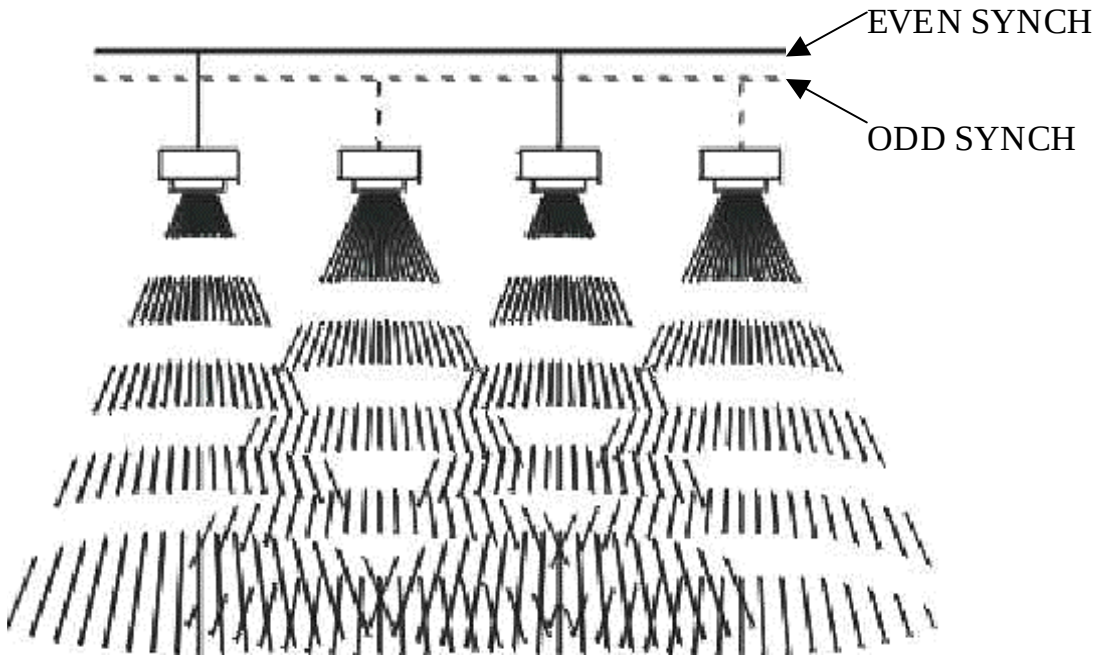
13.4 mph / 7.7 mph = 1.73

# Pulse Width Modulation


Open
Closed
Open
Closed
Open
Closed


on
off
on
25 ms
75 ms
off
on
50 ms
50 ms
off
on
75 ms
25 ms
off
on
off
0% DC
25% DC
50% DC
75% DC
100% DC

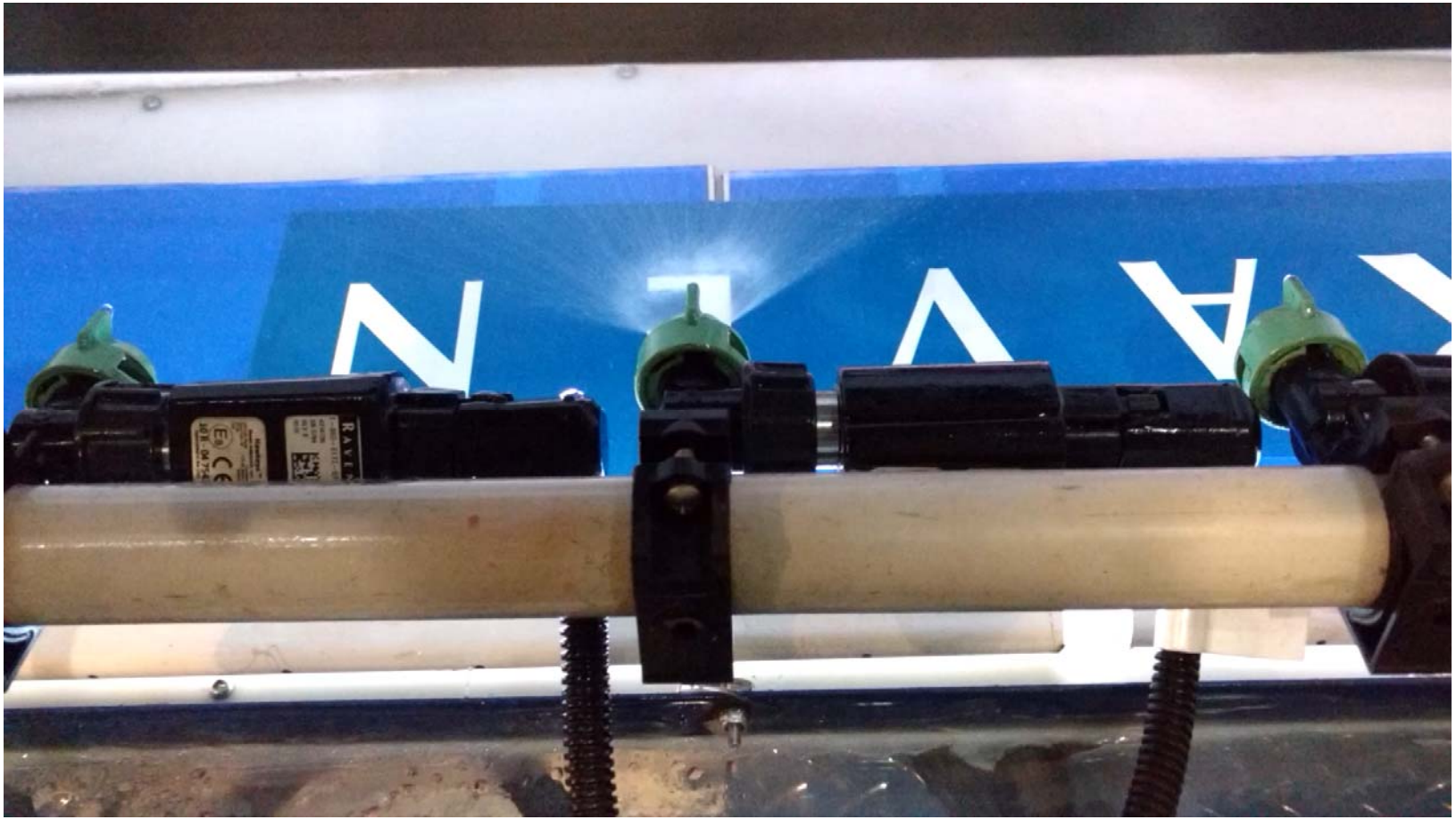
# Pulse Width Modulation

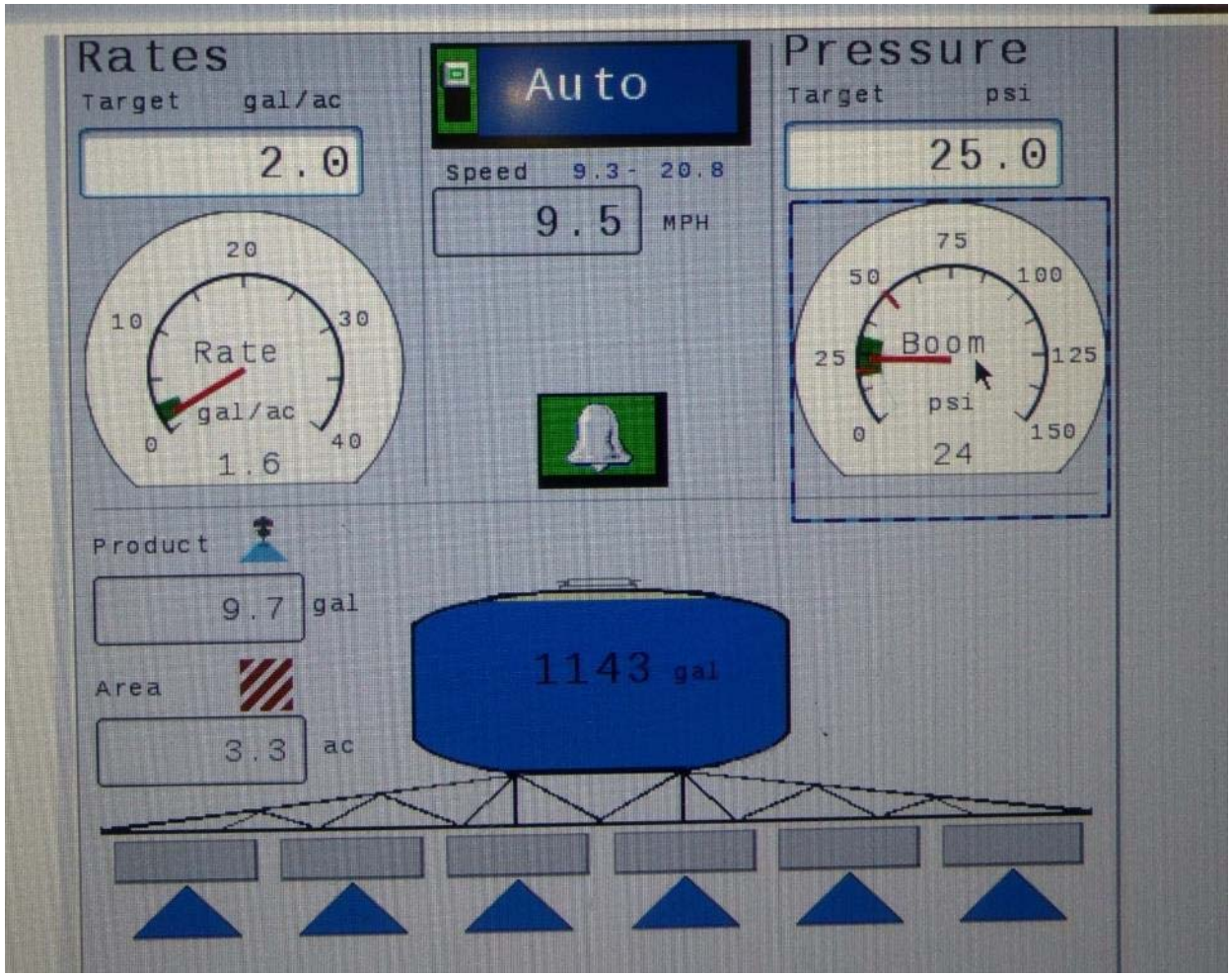


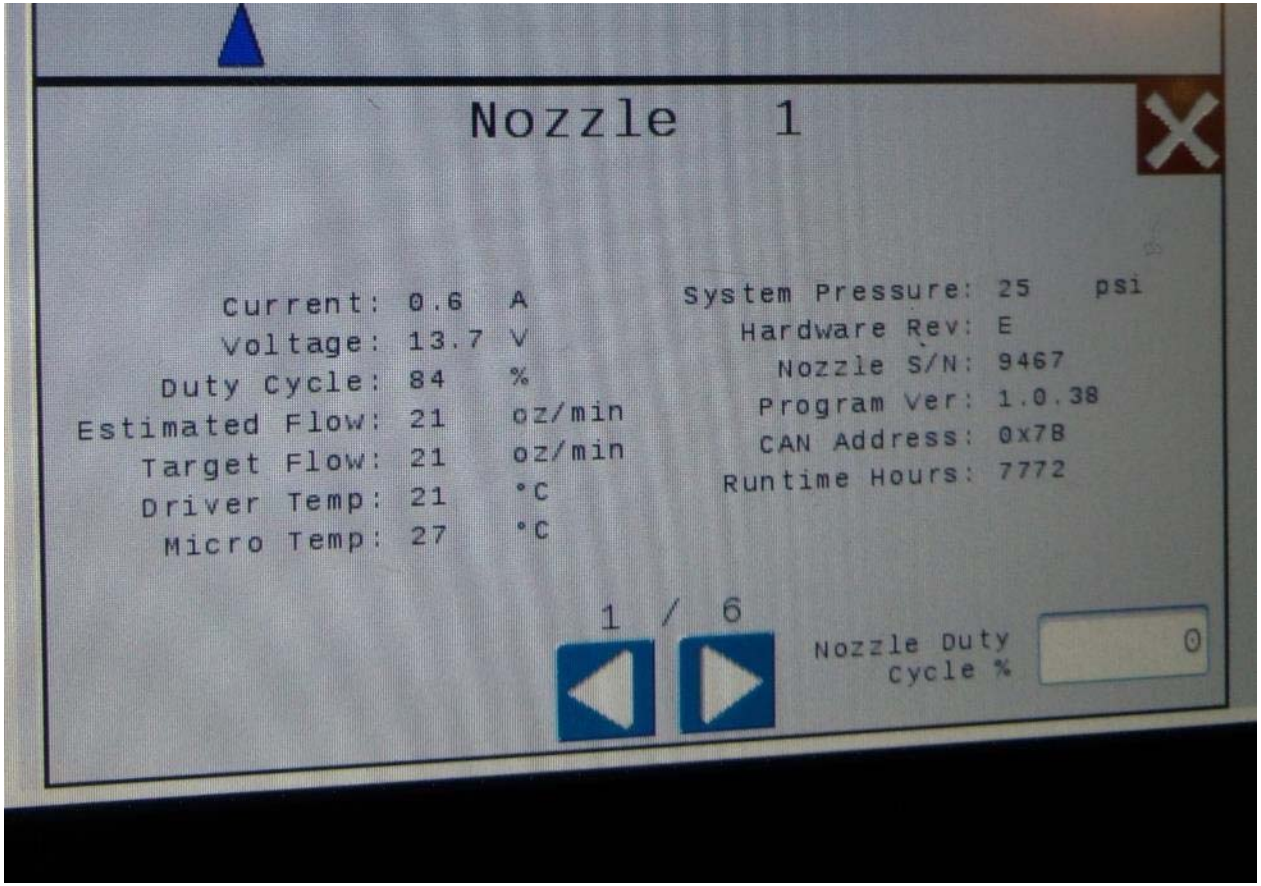
RAVEN

# Hawkeye™

## Nozzle Control System




Rates
Target gal/ac
2.0
Auto
Speed 9.3 - 20.8
9.5 MPH
Pressure
Target psi
25.0
20
10
30
Rate
gal/ac
0
40
1.6
75
50
100
25
Boom
125
psi
0
150
24
Product
9.7 gal
1143 gal
Area
3.3 ac


Nozzle 1
Current: 0.6 A
Voltage: 13.7 V
Duty Cycle: 84 %
Estimated Flow: 21 oz/min
Target Flow: 21 oz/min
Driver Temp: 21 °C
Micro Temp: 27 °C
System Pressure: 25 psi
Hardware Rev: E
Nozzle S/N: 9467
Program Ver: 1.0.38
CAN Address: 0x78
Runtime Hours: 7772
1 / 6
Nozzle Duty Cycle %
0

# *TeeJet DynaJet Flex 7120*

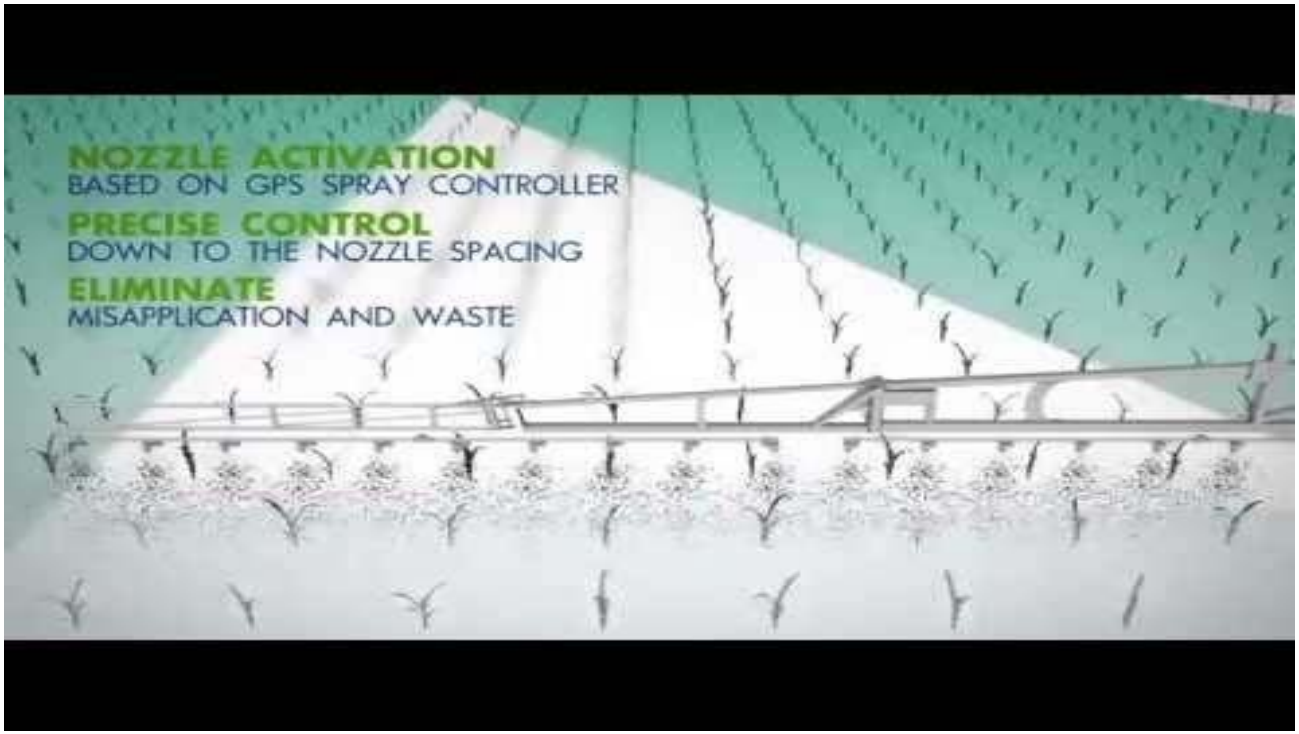
# Pressure Gauge is your Speedometer

# SECTIONAL CONTROL

The part of the sprayer with the highest ROI

# *Pro Stop E*


- ¼ turn ball valve
- Low current draw
- 200 ms response
- Low pressure drop

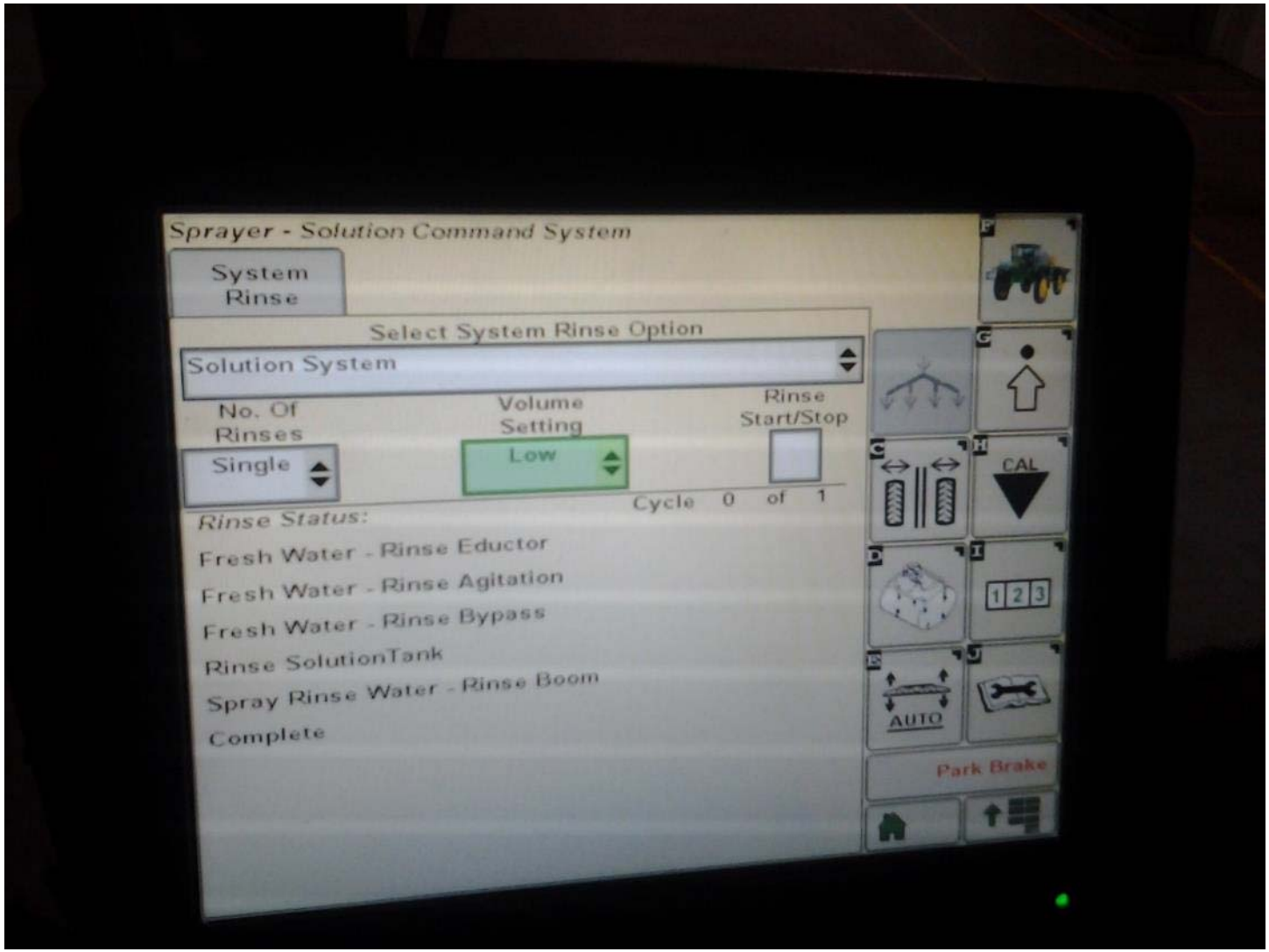

NOZZLE ACTIVATION
BASED ON GPS SPRAY CONTROLLER
PRECISE CONTROL
DOWN TO THE NOZZLE SPACING
ELIMINATE
MISAPPLICATION AND WASTE

# SPRAYER CLEANOUT

The most mysterious activity on a sprayer


ADTS

# Cleanout


Sprayer - Solution Command System
System Rinse
Select System Rinse Option
Solution System
No. Of Rinses
Single
Volume Setting
Low
Rinse Start/Stop
Cycle 0 of 1
Rinse Status:
Fresh Water - Rinse Eductor
Fresh Water - Rinse Agitation
Fresh Water - Rinse Bypass
Rinse SolutionTank
Spray Rinse Water - Rinse Boom
Complete
CAL
1 2 3
AUTO
Park Brake

## Power of Serial Dilution

**10 gal remainder**

**1 x 150 gallon flush**
16-fold dilution

**3 x 50 gallon flush**
216-fold dilution

=

**1 x 2150 gallon flush**

**50 gal remainder**

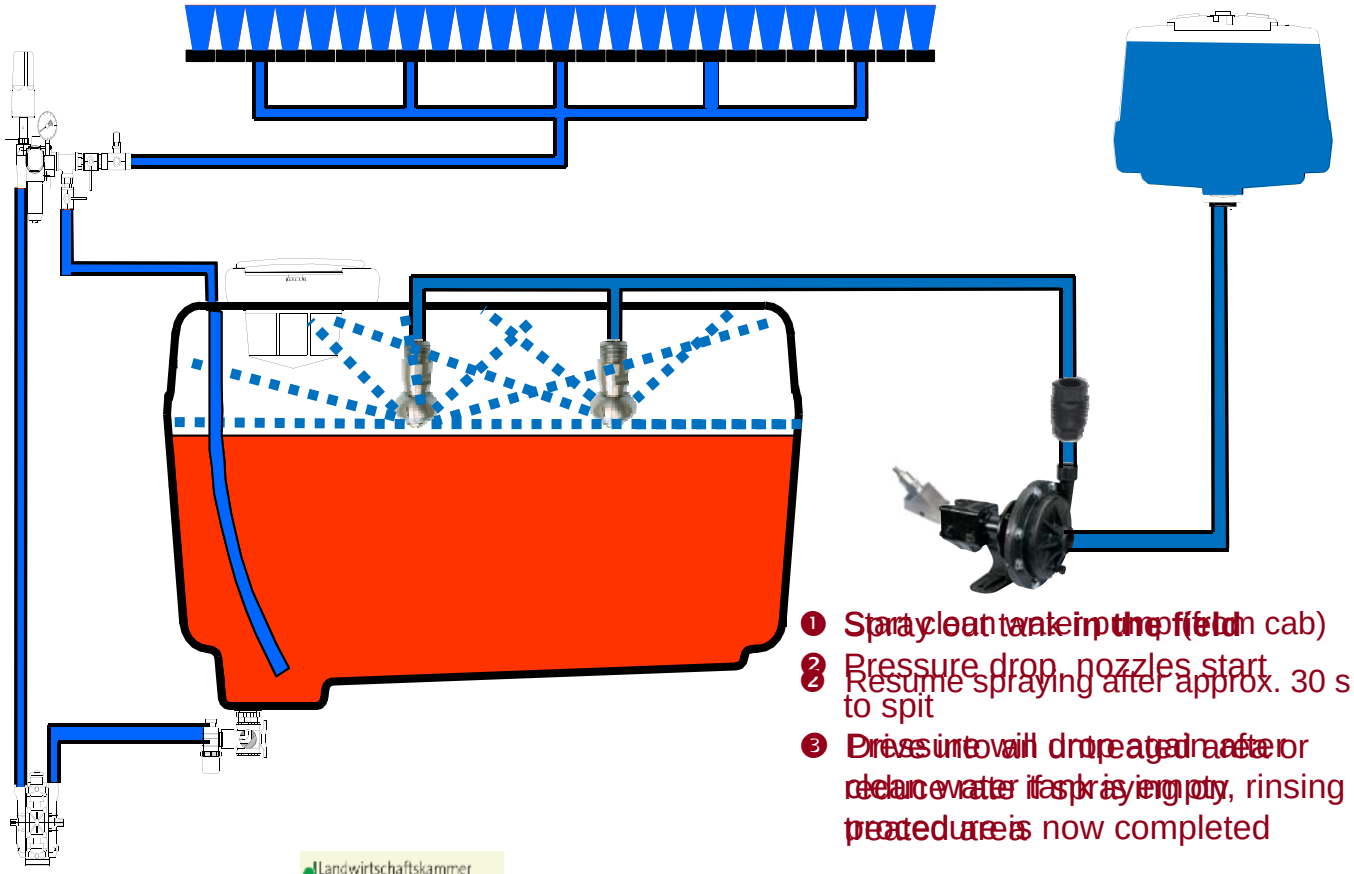
**1 x 150 gallon flush**
4-fold dilution

**3 x 50 gallon flush**
8-fold dilution

=

**1 x 350 gallon flush**

# Continuous internal sprayer rinsing



❶ Spray out tank in the field (from cab)

❷ Pressure drop, nozzles start to spit

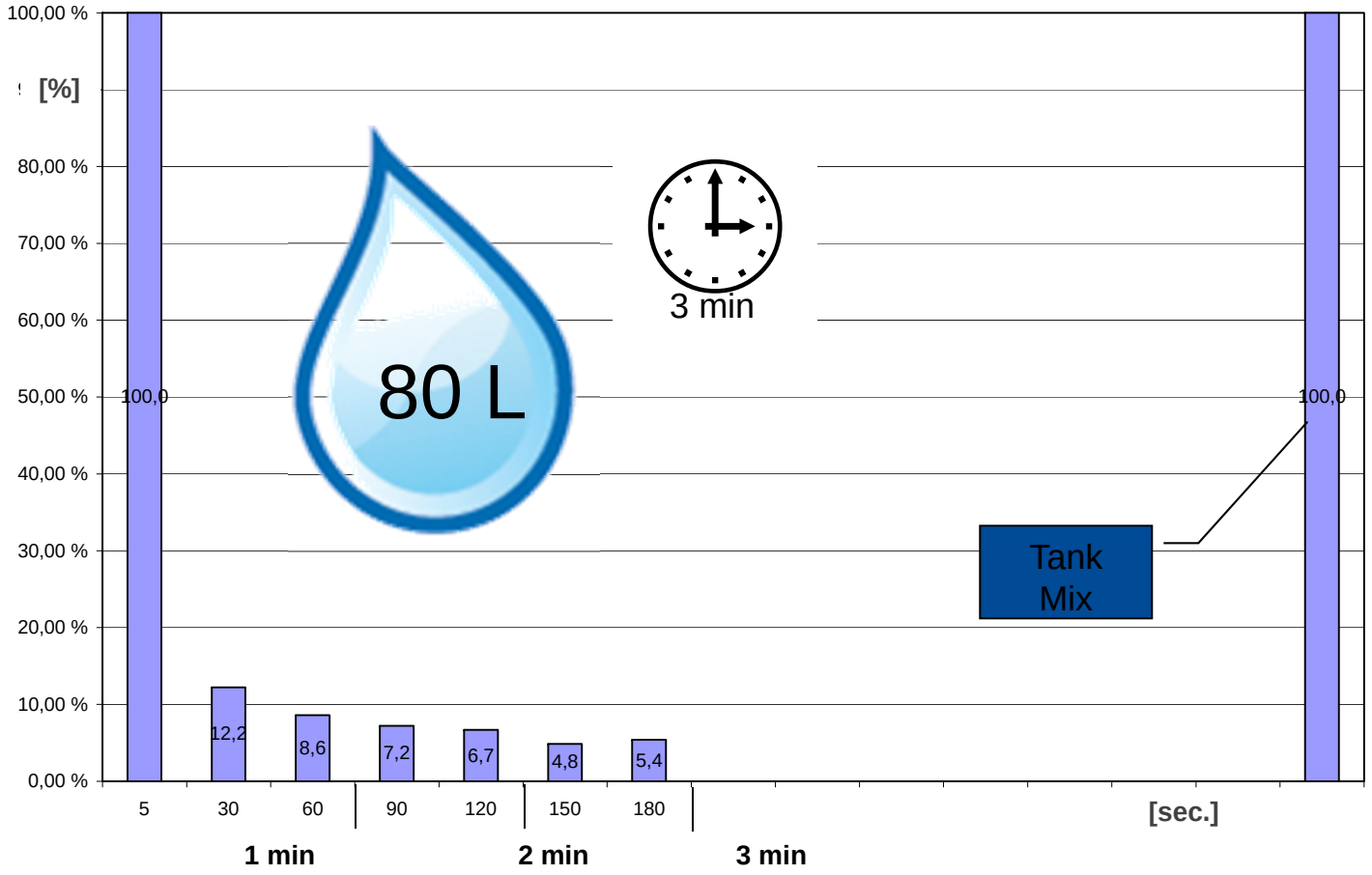
❸ Pressure will drop again after clean water tank is empty, rinsing procedure is now completed

Modified according to Harald Kramer

Landwirtschaftskammer Nordrhein-Westfalen

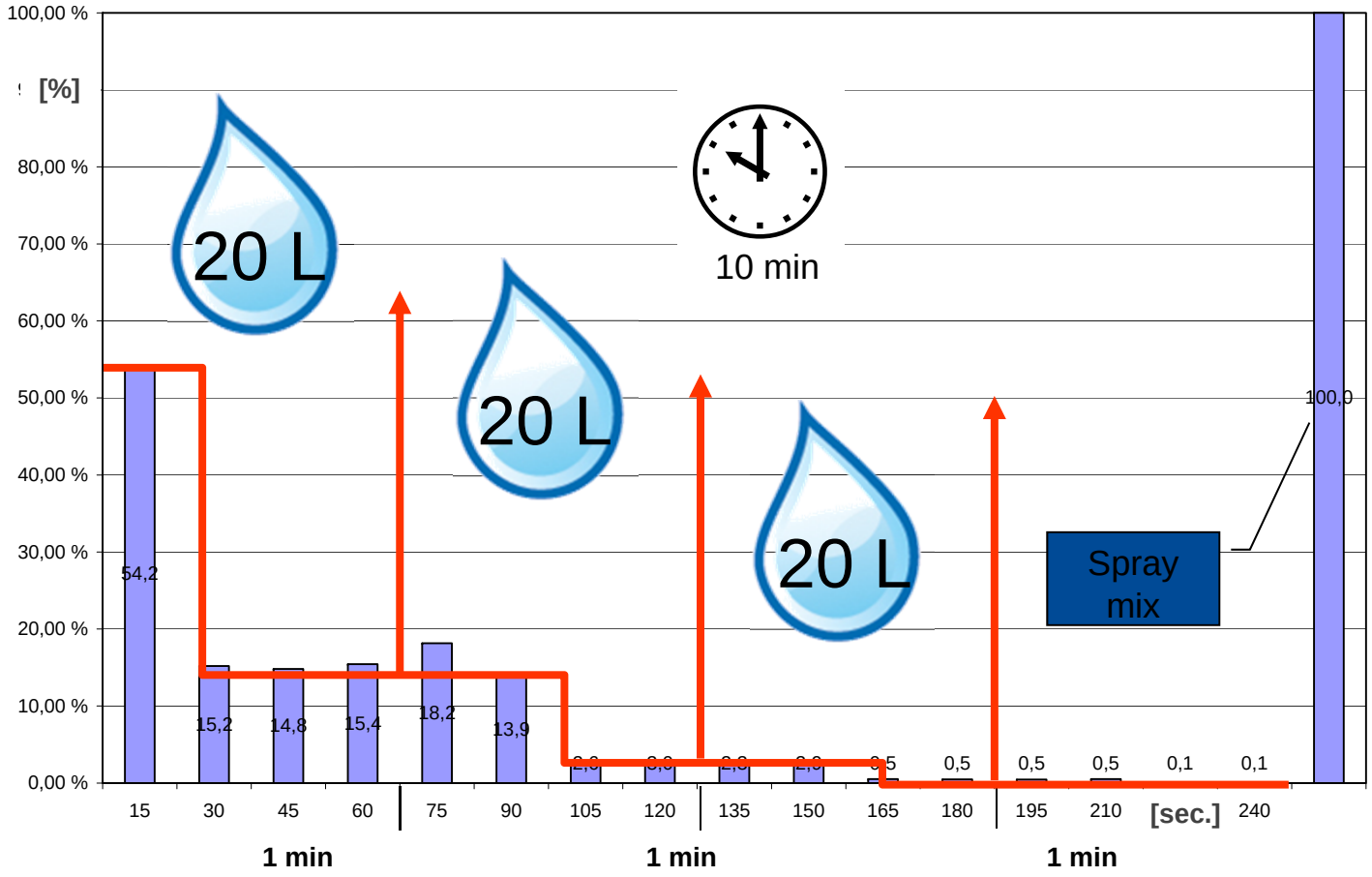
**600 L, 12 m**

80 L $H_2O$ (1 x 80 l) – Airmix 03 – 1.7 L Remainder (8.5 %)



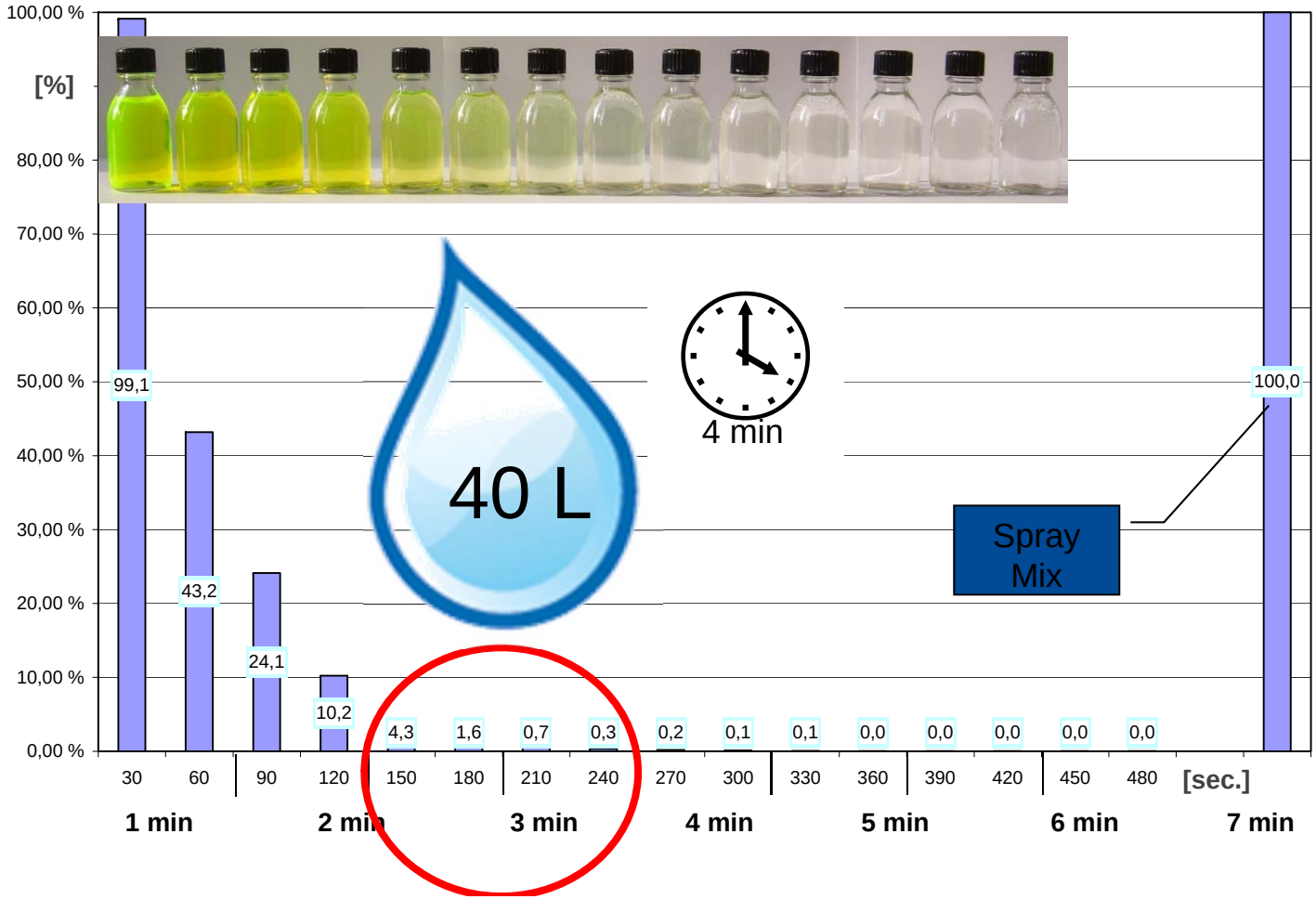
**600 L, 12 m**

80 L $H_2O$ (4 x 20 L) – Airmix 03 – 1.8 L Remainder (6 %)



**600 L, 12 m**

10 L/min $H_2O$ continuous – Airmix 03 – 1.6 L Remainder (7.5 %)



# BOOMS

The most poorly designed part of the sprayer


HAGIE

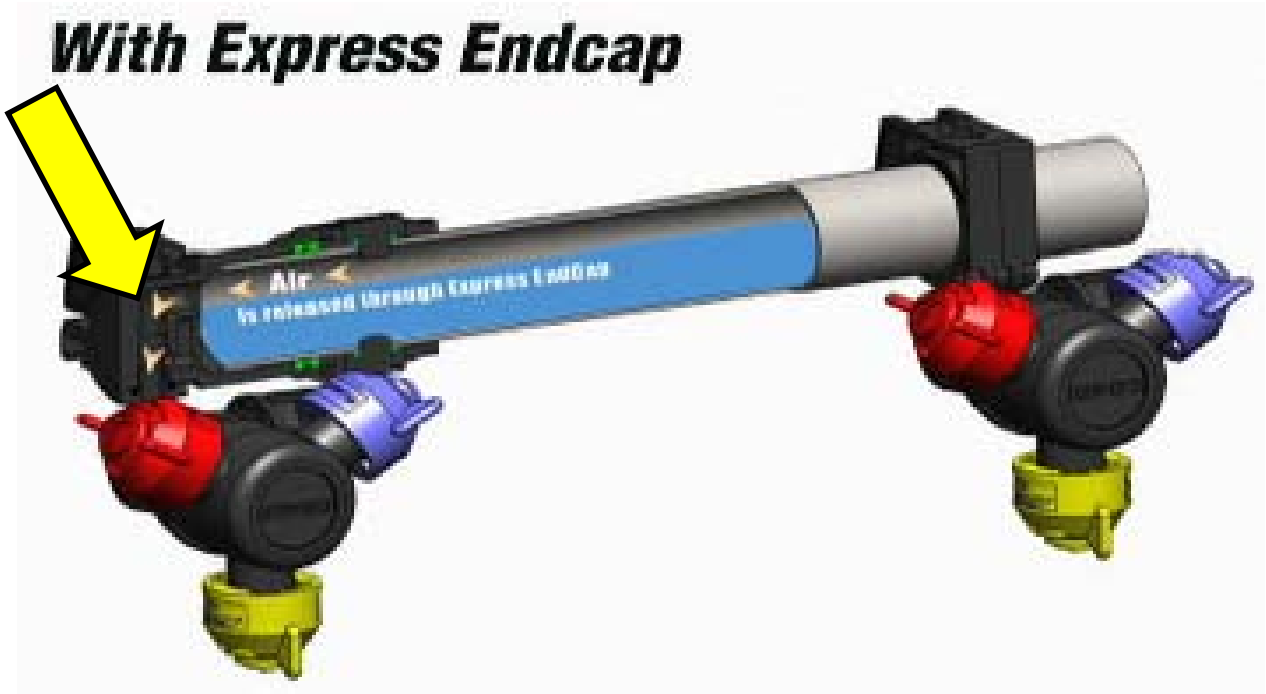
Operation

Shutoff

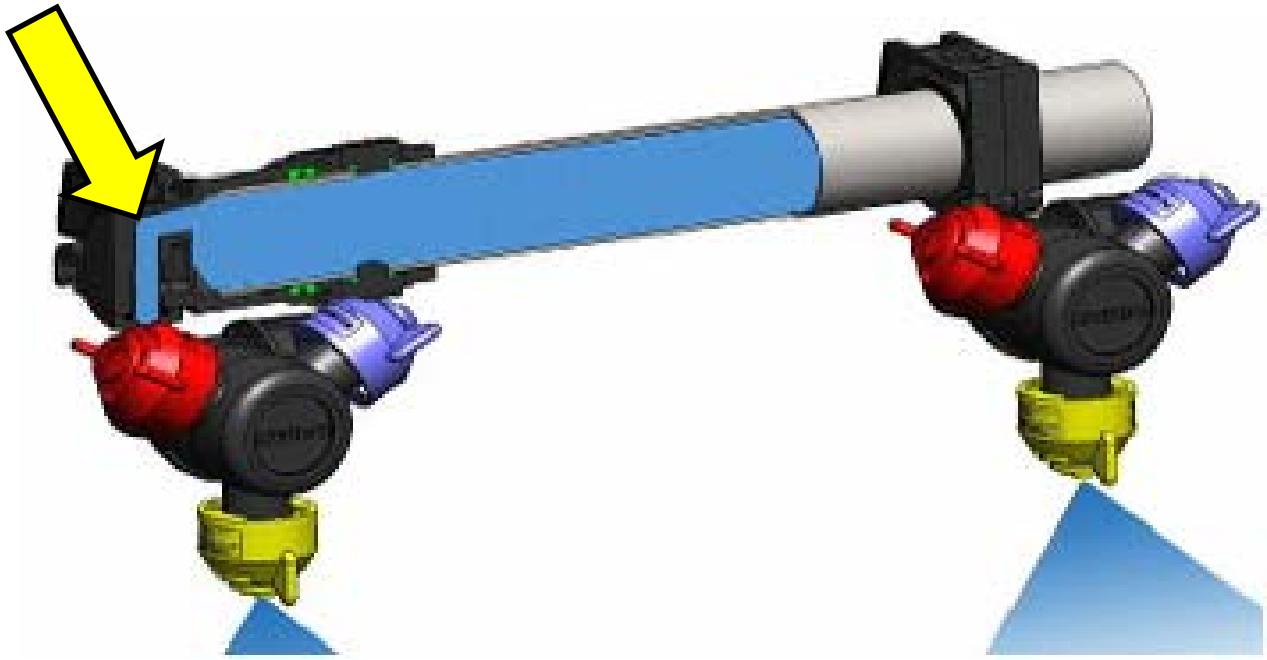
5 seconds later…


Photo: Michael Wipf

# *Express*™ End Cap



# *Express*™ End Cap



# Express™ Nozzle Endcap

# Express™ Nozzle Endcap

# Recirculating Boom

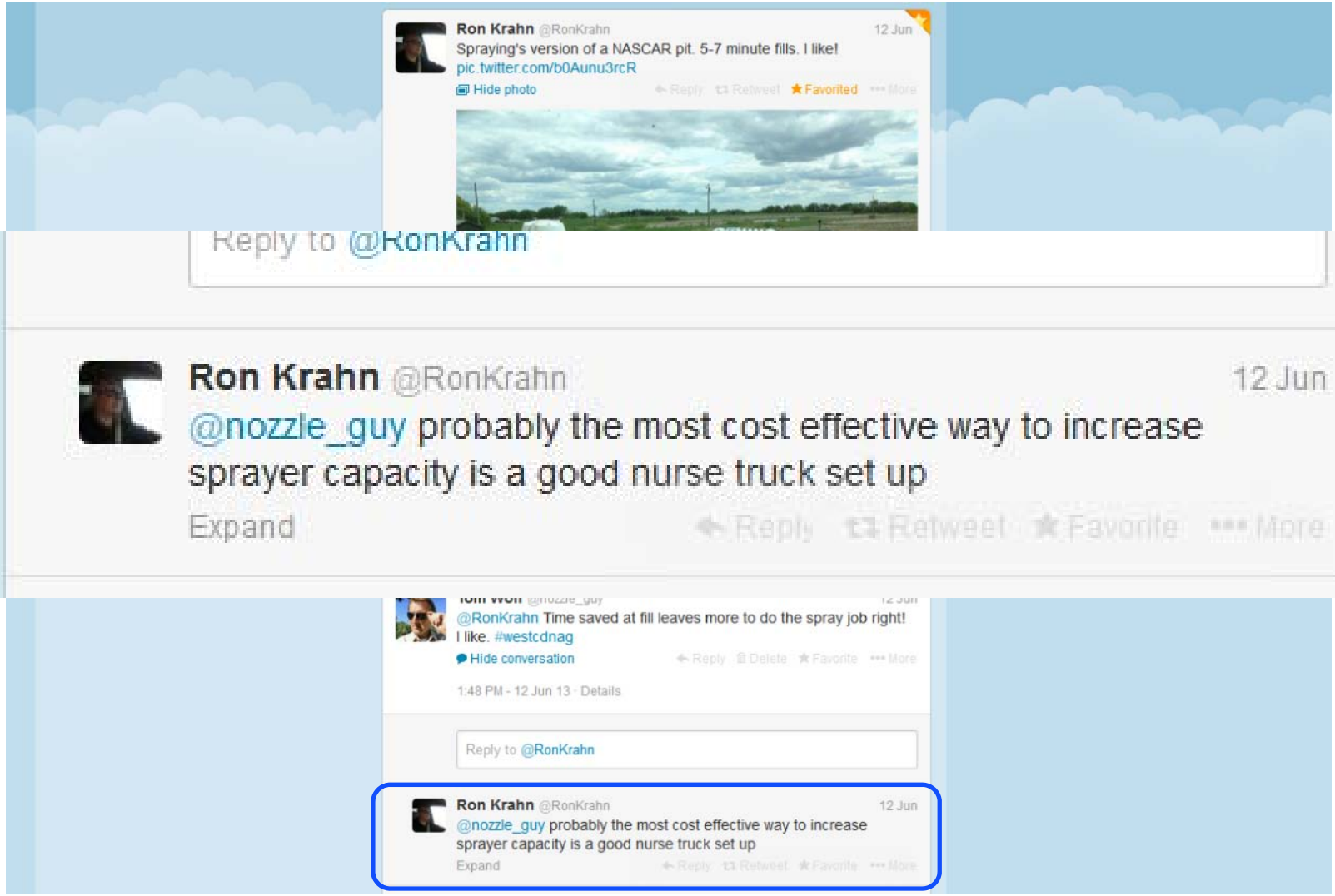
- No boom ends
- Sectional control by nozzle
- Easy prime

# PUMP

The heart of the sprayer

# FILL EFFICIENCY

The easiest path to efficiency gain


Ron Krahn @RonKrahn 12 Jun
Spraying's version of a NASCAR pit. 5-7 minute fills. I like!
pic.twitter.com/b0Aunu3rcR
Hide photo Reply Retweet Favorited More
Reply to @RonKrahn
Ron Krahn @RonKrahn 12 Jun
@nozzle_guy probably the most cost effective way to increase sprayer capacity is a good nurse truck set up
Expand Reply Retweet Favorite More
@RonKrahn Time saved at fill leaves more to do the spray job right! I like. #westcdnag
Hide conversation Reply Delete Favorite More
1:48 PM - 12 Jun 13 · Details
Reply to @RonKrahn
Ron Krahn @RonKrahn 12 Jun
@nozzle_guy probably the most cost effective way to increase sprayer capacity is a good nurse truck set up
Expand Reply Retweet Favorite More


WARNING
Check for fuel leaks or spills.
Stop engine prior to refueling.


Tank Flush
Wash Hose
Roto Rinse


SETTER SPRAYERS
1", 2" AND 3"
ELECTRIC HOSE REELS
DANGER
WARNING
TOXIC CHEMICAL HAZARD
WARNING
CAUTION


3
HIGH
DANGER
CAUTION


HANDLER III
DANGER
Power base engines
210cc


HANDLER III

To learn more about spraying,
subscribe to
www.sprayers101.com

# Sprayers101

Dr. Jason Deveau
@spray_guy

Dr. Tom Wolf
@nozzle_guy

. . . and follow us
on Twitter