Air Blast Sprayer Calibration & Adjustment

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Tree Fruit
"AND JUSTICE FOR ALL"

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Where is Hillsborough County in New Hampshire?

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http://ceinfo.unh.edu
Thank You to NH Department of Agriculture, Markets and Food, Division of Pesticide Control and the New Hampshire Pesticide Control Board for awarding an IPM Grant to UNH Cooperative Extension to conduct the sprayer calibration project.

Alan Eaton UNH Cooperative Extension
Spraying has changed a lot in the past 100 years!
There's always more to learn.
Air Blast Sprayer Calibration!

- What is Sprayer Calibration?
- What does a Sprayer Calibration tell me?
Why Should You Care?

I know how much spray I am applying per acre!

But Do You!
75 gallon per acre

But Do You!
60 gallons per acre
So the Dealer Calibrated Your Sprayer?

- How do they (the dealership) determine your speed?
- Did they ask about spray coverage distance?
- About the pressure you need to operate at?
- Are the nozzles for the tree fruit orchard or the vegetables or for sweet corn?
Six Elements to Effect Air Blast Sprayer Efficiency

- Method
- Equipment
- Weather
- Product
- Target
- Operator

Dr. Jason S.T. Deveau
Application Technology Specialist - Horticulture Technology
1283 Blueline Rd
Simcoe ON N3Y4N5
# Six Elements to Effect Airblast Efficiency

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<th>Target</th>
<th>Product</th>
<th>Operator</th>
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<td>Droplet Size</td>
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<td>Nozzle Orientation</td>
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Why Sprayer Calibration?

• The effectiveness of any pesticide depends upon the proper application and placement of the chemical.

• The purpose of calibration is to insure that your chemical application machinery is uniformly applying the correct amount of material over a given area.
Some reasons to consider calibration:

- It is estimated that 60% of sprayers have a calibration error greater than ± 10%.
- 43% of sprayers have greater than ± 10% variation in discharge from what the operator thinks.
- 32% have inaccurate travel speed.
- 13% have inaccurate pressure gauges. Many of the gauges indicate too low pressure.
- 8% have inadequate hose size to supply nozzles, causing pressure to drop in the system.
My Dad’s Interpretation of *Sprayer Calibration*

- The cost of pesticide products is expensive and the application of the correct amount of chemical is critically important to the effectiveness of the product.
- Too much product could mean crop injury, while too little generally results in poor performance of the chemical.
- Means:

  $\begin{align*}
  \text{Dollars Spent or Dollars Lost!} \\
  \text{Dollars Saved or Dollars Gained!}
  \end{align*}$
When to Calibrate

Product rates and sprayer output requirements change, depending on the crop type, the plant spacing, and the crop and pest staging. Therefore, calibrate for each significantly different situation.

Read the Product Label – Before you apply the product! It’s the LAW!

Calibrate airblast sprayers:

• At the beginning of each season

• Mid-way through each season as crops grow and fill in

• After changes to application equipment or settings (e.g., nozzles, operating pressure, pump, tractor or tractor wheels)
Airblast Sprayer Operating Tips

• Check your tire pressure
• Flush those lines and nozzles
• Check your strainers and filters
  – that’s checking them more than once a day!
• Are you sure your pressure gauges are accurate?
• Be sure to check the pressure at the manifold or boom.
• Any leaks?
• How about the diaphragms or Hu valves?
  – Do they need replacing? Five years is a long time!
Preventative Maintenance

If it moves or carries fluid, check it or tighten it or lubricate it or replace it.
Travel Speed and Pressure

Check operating and manifold or boom pressures.

Time runs over a distance of 150 feet.
Match Spray Distribution to Target

The thicker the plant population or the further away the target, the more volume per nozzle.

If you are spraying sweet corn and you are using an orchard air blast sprayer, what does mean to you?
Spraying with an Orchard Setup Air Blast Sprayer!

Change Nozzles (sizes)
or you are doing “Recreational Spraying”
(looks good to the operator)

Do not forget to change the direction of the nozzle and air deflectors.
Air Handling and Output Volume

Adjust air and output to target size density.
Confirm Sprayer Output

Calculate each nozzle’s output and check with opposite side manifold or boom.
Confirm Spray Coverage

Use water sensitive paper to confirm spray is reaching the target!
Where to Calibrate

• Calibrate sprayers in a field, vineyard, nursery or orchard that is representative of the field, vineyard, nursery or orchard to be sprayed.

• Calibrating a sprayer on a hard surface (such as pavement) can induce errors as high as 15% compared to calibrating in the field.

• Calibrate away from buildings and wells.
Pre Air-Blast Sprayer Calibration Instructions

Prior to calibrating an air-blast sprayer, please complete the following tasks:

1. Triple rinse tank and piping. Take special care to flush manifolds and nozzles.
2. Pressure wash sprayers. Pay special attention to cleaning both sides of nozzles and around pump and filters.
3. Clean nozzles and record orifice and whirl disc sizes.
4. Flush out line to pressure gauge.
5. Clean filters, including: tank filters, suction filters, final filters and every screen behind nozzles.
6. Make sure all valves, diaphragms, and O-rings are in good condition and working properly.
7. Check tire pressures on both sprayer and tractor.
8. Make sure tachometer is working on tractor.
9. Fill sprayer ½ full with clean water.
10. Please have any operators or mechanics that work with the sprayer/tractor combination on hand for the sprayer calibration.
11. Have sprayer operators manual on hand.

Visit the PSU Pesticide Education Program Booth in the Trade Show! They have a video showing the process!

University of New Hampshire Cooperative Extension
Have a written copy of your sprayer's calibration!
Did YOU get that?

- Have a written record!
- Why?

<table>
<thead>
<tr>
<th>Calibration of Boom Sprayers in Hillsborough, N.H.</th>
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<tr>
<td>Survey of 10 farms conducting on-farm sprayer calibration demonstrations</td>
</tr>
<tr>
<td>90% of the sprayers were within a calibration error of plus or minus 10%</td>
</tr>
<tr>
<td>10% of the farmers had their sprayer calibration information recorded</td>
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<tr>
<td>80% of the sprayers had less than a 10% variation discharge for individual nozzles</td>
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<tr>
<td>80% of the sprayers had the proper distance between nozzles</td>
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<tr>
<td>90% of the sprayers had the proper boom height</td>
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<tr>
<td>90% of the sprayers had adequate hose size and/or hose fittings to supply nozzles</td>
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<tr>
<td>90% of the sprayers were operated at a proper travel speed</td>
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<tr>
<td>100% of the sprayers were operated at a proper pressure</td>
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</tbody>
</table>
The start!

Date ________________.
Farm____________________ Operator____________________ Phone ________________.
Address__________________ Town_____________________ State _____ Zipcode ________.
Tractor___________________ Sprayer____________________
Tractor Gear_______________ Tank______________gallons
Tractor RPM_______________ Pump Pressure_______PSI
Recording Information
Nozzle Tip Information!

Nozzle Output for Air-Blast Sprayer - To determine the left versus right side, look at the sprayer from behind.

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<th>Nozzle Output - Left</th>
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<tr>
<td>L-10</td>
<td>R-10</td>
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<tr>
<td>L-09</td>
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<td>L-01</td>
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Total Left Side Manifold Output in GPM

Total Right Side Manifold Output in GPM

Total Output for Sprayer in GPM
Nozzle Tip Information!
Speed Determination!

Measured Distance _______ feet

Time in seconds (down) _______ Time in seconds (back) _______

Average Time in seconds _______

Miles per Hour = \( \frac{\text{Distance in Feet} \times 60}{\text{Time in Seconds} \times 88} \) = \( \frac{______ \text{ Feet} \times 60}{______ \text{ Seconds} \times 88} \) = _______ = _______ MPH
Measure and Mark Off the Distance to Determine Speed.
Set Engine RPM to the Recommended Speed and the Tractor is in the Proper Gear and Range.
Time tractor-sprayer over given distance – minimum of two times (three is better).
Determining Spray Swath Width

For Orchards:
Block (#__________) Tree Height ______ ft Tree Width ______ ft Row Width ________ ft

For Vegetable or Other Crops Sprayed:
Block (#__________) Spray Swath Width ______ ft

Linear Feet of Row per Acre = \( \frac{43,560}{\text{Row Width}} \) = \( \frac{43,560}{\text{Or Spray Swath Width}} \) = (______) Feet per Acre

Speed in Feet per Minute = MPH \( \times \) 88 = (______) MPH \( \times \) 88 = (______) Feet per Minute
Output Per Nozzle Per Unit of Time

Nozzle Output for Air-Blast Sprayer - To determine the left versus right side, look at the sprayer from behind

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Total Left Side Manifold Output in GPM

Total Right Side Manifold Output in GPM

Total Output for Sprayer in GPM
Calculate Sprayer Output for Each Manifold

Airblast disc-core/disc-whirl and nozzles are sold based on their output per minute.

A set of nozzles on one boom or manifold, when added together, should produce the required output per side.

Are both side outputs the same?
Confirm Sprayer Output

Calculate each nozzle’s output and check with opposite side manifold or boom.
Calculating Gallons per Acre

Block (#______) Minutes/Acre = Linear Feet Row per Acre/Feet per Minute = (_______) = (_______) Minutes/Acre

Arrangement Nozzles (#_______) GPA = GPM X MPA = (_______) GPM X (_______) MPA = (_______)GPA
Example - Hillside Meadows Farm

New Hampshire Apple Orchardists using an air blast sprayer!

No names, phone numbers, and addresses are used to protect the INNOCENT!

Tractor - Case/IH JX85 operated in 1st Range 4th Gear

Sprayer - Rear - 500 gallons

Tractor RPM - 2200

Pump Pressure - 165 PSI
Example - Hillside Meadows Farm

Tractor - Case/IH JX85    Sprayer - Rear - 500 gallons

Travelled Sprayer (half tank) 200 feet in field.

Time 46.4 down and 45.8 back (averaged 46.1)

\[
200 \text{ feet times } 60 = 12,000
\]

46.1 seconds times 88 = 4,057

3.0 MPH
Example - Hillside Meadows Farm

Tractor - Case/IH JX85      Sprayer – Rears      Speed 3.0 MPH

Spray width – Apple Block is sprayed on both sides

Apple Block is 20 feet between rows with 14 feet between trees in row and trees are 12 feet tall - “A” shape.

This example, the spray width is 20 feet.
Example - Hillside Meadows Farm

Tractor - Case/IH JX85  Sprayer – Rears  Speed 3.0 MPH

Spray width - 20 feet

Linear feet of row per acre =

43,560 square divided by Spray Width in feet =

43,560  divided by 20 = 2,178 feet per acre

Speed in feet per minute =

MPH times 88 =

3.0 MPH X 88 = 264 Feet per minute
Example - Hillside Meadows Farm

Tractor - Case/IH JX85  Sprayer – Rears  Speed 3.0 MPH

Spray width - 20 feet

Linear feet of row per acre = 2,178 feet per acre

Speed in feet per minute = 264 Feet per minute
## Example - Hillside Meadows Farm

Tractor - Case/IH JX85  
Sprayer – Rears  
Speed 3.0 MPH

### Nozzle Output for Air-Blast Sprayer

To determine the left versus right side, look at the sprayer from behind.

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Example - Hillside Meadows Farm

Tractor - Case/IH JX85  Sprayer – Rears  Speed 3.0 MPH

Spray width - 20 feet

Linear feet of row per acre = 2,178 feet per acre

Speed in feet per minute = 264 feet per minute

Total Output for Sprayer in GPM = 9.47 gallons per minute
  (only using right side manifold/boom)
Example - Hillside Meadows Farm

Tractor - Case/IH JX85  Sprayer – Rears  Speed 3.0 MPH
Spray width - 20 feet  Total Output = 9.47 gallons per minute

Minutes of spray time per acre =

Linear feet of row per acre divided by speed in feet per minute =

2,178 divided by 264 = 8.25 minutes of spray time per acre
Example - Hillside Meadows Farm

Tractor - Case/IH JX85  Sprayer – Rears  Speed 3.0 MPH

Spray width - 20 feet  Total Output = 9.47 gallons per minute

Minutes of spray time per acre = 8.25 minutes per acre

Gallons per acre sprayed = Gallons per minute (times) minutes per acre

Gallons per acre sprayed = 9.47 GPM (times) 8.25 MPA = 78.1 GPA

Grower though they were applying 80 gallons per acre.
Penn State Extension - Pesticide Education Program

• Pesticide Education Program is purchasing a Mechanical Measuring Device for Conducting an Airblast Sprayer Calibration

• Visit the Penn State Extension - Pesticide Education Program Booth in the Trade Show! They have a video showing the process and talk to them about calibration!
Maintenance checklist for your sprayer!

Check your sprayer owners’ manual to see what your sprayer’s recommended checklist is.

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Why Calibrate?

- Insure Uniform Application
- Apply the Proper Amount Pesticide
- Help Insure Proper Pest Control
- Less Chance of Crop Injury
- Prevent Pesticide Carryover
- Minimizes Affects to the Environment
- Save Money
  - Cost of Over Application
  - Cost of Retreatment (Under Application)
When to Calibrate?

• Recalibrate the sprayer at the beginning of the season, mid-season and recheck periodically.

• By law you need to calibrate before you spray, every time you spray.
Calibration Notes

• It’s important to record and keep your sprayer calibration calculations.
• By having a record, you can compare your sprayer calibration calculations from calibration to calibration.
• This information can be useful to you or someone from your operation the next time you check the calibration.
Safety First -- PPE

• Check that your personal protection equipment is in good repair.
• You may need:
  – new cartridges for your respirator
  – new rubber gloves or boots
  – new eye protection or hat
  – new eye wash solution
Remember With All Pesticides
Always Read And Follow All Label Directions!
THE LABEL IS THE LAW!
Special Thanks to:

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