NELSON HARDIE®

AIR BLAST ORCHARD SPRAYERS

SPRAY CALIBRATION INSTRUCTIONS

SECTION 1: U.S. CALIBRATION

This section will be in U.S. Gallons per Acre (GPA), Miles per Hour (MPH), Tree row spacing in Feet and Water pressure in U.S. Pounds per square inch (PSI).

NOTE: Calculating Liters per Hectare (LPH) and Liters per Minute (LPM) is discussed in SECTION II: METRIC CALIBRATION.

Prior to spraying your orchard, it is important that your sprayer is calibrated properly. Use the advise of your Pesticide Control Advisor (PCA) for best spray output details. Critical information needed for calibrating you sprayer include:

1. Gallons per Acre (GPA)
2. Tree row spacing (In Feet)
3. Ground speed (MPH)
4. Desired water pressure (PSI)
5. Number of nozzles required

Your initial goal is to find what should be your Gallons per Minute (GPM) of spray output. After that you can easily choose your Swirl cores and Orifices.

STEP 1: GALLONS PER ACRE (GPA)

Usually GPA is determined by your Pesticide Control Advisor (PCA). Many times in California output is 100GPA but certain applications in cherries, for example, are more (sometimes 250GPA) and some applications in Citrus can be much higher. Most Nelson Hardie sprayers include Double Rollover valves that allow two different calibrations for different GPA or the sprayer might be calibrated for two different row spacings (e.g.: different crops).

Once you know your GPA, proceed to Step 2.

STEP 2: TREE ROW SPACING (FEET)

Tree row spacing means the distance between tree rows where you drive down the row, NOT the distance between trees within the row. Calculations measure distance in feet.

STEP 3: GROUND SPEED (MPH)

Best ground speed is determined by whether the spray droplets from your sprayer reach the tops of your trees as well as penetrate the tree canopy. Drive your sprayer down the row in your tallest trees (while spraying with water) to determine the best gear choice and engine RPM (540 PTO RPM maximum for PTO-drive sprayers).

Once you are comfortable with spray coverage you can calculate your miles per hour (MPH) using a stopwatch.

If you already know your MPH proceed to Step 4.

Two methods of calculating MPH are described below:

A. FIRST METHOD:

1. Fill sprayer ½ full with water so that tires and weight are averaged.

2. Mark off 200 feet* on the ground and bring front of tractor to start mark.
*NOTE: 200 feet is an average distance. The formula works for any distance. 100 feet works as well, but is less accurate, while 300 feet will be more accurate.

3. Start tractor with clutch depressed. If sprayer is PTO-drive, engage PTO. Adjust tractor to chosen gear and bring engine to proper RPM for spraying speed (540 PTO RPM maximum for PTO-drive sprayers).

4. Start tractor travel and stopwatch AT SAME TIME. Walk to finish mark and stop stopwatch when front of tractor crosses finish line. Record number of seconds to travel the chosen distance (in this example: 200 feet).

5. Calculate MPH.

FORMULA:

$$\frac{\text{Distance travelled in feet} \times .68}{\text{Total time in seconds}} = \text{MPH}$$

EXAMPLE:
If tractor travels 200 feet in 52.8 seconds:
200 ft. × .68 = 136
136 ÷ 52.8 seconds = 2.58MPH

Nelson Mfg Co., Inc., 2860 Colusa Hwy., Yuba City, CA 95993 · TOLL FREE: 1-877-673-0919 · www.NelsonHardie.com

B. SECOND METHOD:

Another method for calculating Miles per Hour (MPH) is to use a stopwatch (or wristwatch) for one minute while counting trees passed.

FORMULA:

$$\frac{\text{Tree spacing} \times \text{Trees passed in 1 minute}}{88} = \text{MPH}$$

EXAMPLE:
If trees are 20 feet apart (in the row, not where you drive) and you pass 14.5 trees in 1 minute:

20' spacing × 14.5 trees passed = 290
290 ÷ 88 = 3.3 MPH

STEP 4: WATER PRESSURE (PSI)

NELSON HARDIE sprayers are designed to work best with the water pressure between 100PSI and 150PSI, so 125PSI is a good choice for calibration. This pressure allows for best agitation with the Jet agitators while providing consistent pressure to the spray Nozzles.

Spray pressure can be adjusted anywhere from 50 to 200PSI however, when spraying at a low engine RPM, 200PSI may not be possible and water volume may be insufficient.

NOTE: Pump pressure and volume can be increased by installing a smaller pulley on the pump. A pump pulley ½" smaller in diameter usually will not require a shorter belt.

STEP 5: CALCULATE GALLONS PER MINUTE (GPM)

The Formula for calculating Gallons per Minute (GPM) is:

$$\frac{\text{GPA} \times \text{Row spacing (Ft.)} \times \text{MPH}}{495} = \text{GPM}$$

EXAMPLE:
100GPA × 25' × 3.3MPH = 8250
8250 ÷ 495 = 16.67GPM

NOTE: This formula is for spraying out both sides. If you are spraying out only one side, then divide by 990 (not 495) to find GPM.

STEP 6: CHOOSE AND ARRANGE SWIRL CORES AND ORIFICES

CAUTION! ALWAYS WEAR PERSONAL PROTECTION EQUIPMENT (PPE) WHILE SPRAYING AND WHEN CLEANING OR MAINTAINING THE SPRAYER. FOLLOW REQUIREMENTS OF LOCAL AND STATE LAWS AND AS LISTED ON CHEMICAL LABEL

A. TARGET TREE CANOPY

Position the sprayer in the orchard and, while standing behind it, determine which Discharge valves should be turned ON and which should be turned OFF to match the tree canopy.

Many times the bottom nozzle or two on each side are turned OFF because the lower tree limbs do not align with the bottom nozzles. In citrus, sometimes the lower limbs are on the ground and certain applications require spraying downward so the bottom valves will be ON.

Similarly, in orchards with young trees, the top one or two nozzles on each side of center might be turned OFF.

ANTI-DRIP ROLLOVER VALVES: Turn the Rollover spray valves OFF by rotating the Roll-over portion of the valve to 90° to the air flow out of the fan housing. Turn Spray Valves ON by rotating the Roll-over portion of the valve to parallel to the air flow.

NOTE: There are 3 detents to choose from on the Rollover valves. All positions emit the same amount of water. Generally the Rollover valves will be in the center detent, but can be adjusted to the upper or lower detents, if needed, for best direction and coverage. When the valve is rotated past the upper or lower detent the valve starts to turn off and flow is restricted. To achieve additional angle simply rotate the entire valve using a medium-size adjustable wrench or a small pipe wrench.

B. DROPLET SIZE DETAILS

Large droplets will travel farther (higher) and you will have less spray drift. Smaller (finer) droplets provide more "specks" per leaf and better coverage, but more drift.

Water pressure, and the number of nozzles used, influence spray droplet size and coverage in the tree canopy. Less nozzles means that they will need to be larger to get the same GPM and you will have larger water droplets. Higher water pressure will require smaller nozzles to achieve the same GPM and your sprayer will produce smaller droplets.

125PSI works well with the Nelson Jet agitation and usually provides a good droplet size.

Nelson Mfg Co., Inc., 2860 Colusa Hwy., Yuba City, CA 95993 · TOLL FREE: 1-877-673-0919 · www.NelsonHardie.com

C. CHOOSE SWIRLS & ORIFICES

1. Find how much each nozzle should emit by dividing GPM by the total number of nozzles you will be using (both sides).

EXAMPLE:
16.67GPM ÷ 16 nozzles = 1.04GPM per nozzle.

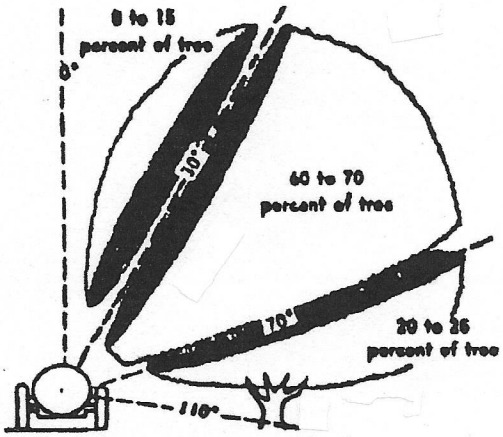
2. Use the Spraying Systems® Nozzle chart in this section to find the Swirl Core and Orifice Disc that comes close to the correct GPM. To keep it simple, Nelson recommends that you use the same Swirl Cores on all different calibrations and then use larger Orifice Discs with the greater GPM calibration. Of course, some applications may require Swirls with larger GPM output.

D. ARRANGE NOZZLES ON SPRAYER

1. NELSON HARDIE Rollover valves include a small "Plus" (+) sign on one side of the rollover and a small "Minus" sign (-) on the other side. If you have two different GPA calibrations you can use the Plus and Minus sides to differentiate between the two calibrations.

2. Arrange Nozzles on sprayer Discharge Manifolds to distribute the spray properly in the tree canopy. For best coverage, choose 2 or 3 different sized Orifice Discs so that you can have more water sprayed through the body of the tree and less water sprayed at the top and bottom of the tree.

In mature trees, for example, your orchard may require the larger Orifices in the 10 o'clock and 2 o'clock positions so that more spray is delivered through the thickest part of the tree canopy (see Diagram at right).



3. Install parts of the Nozzles onto the Rollover valves in this order (see picture on the Spraying Systems® Nozzle chart):

a. Nylon Strainer (Tip filter)
b. Swirl Core

NOTES: Ceramic Swirl Cores: It does not matter which side is up.* Stainless & Brass Swirl Cores: Swirl must be installed with "Bump" in center directed away from the Orifice Disc.

c. Orifice Disc (against the Cap)
d. Cap

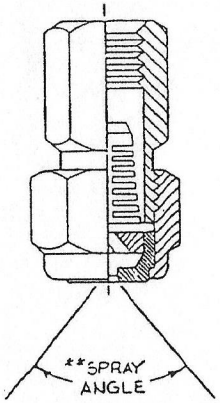
*IMPORTANT: When using ceramic Swirls and Orifices make sure the Swirl is properly seated inside the Orifice or it could chip and/or perform improperly.

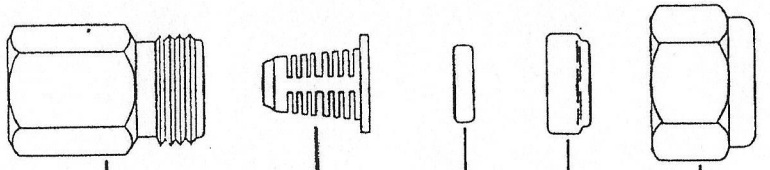
NOTE: To keep Nozzle parts together when installing into the Rollover valve it is easiest to, first, rotate the valve so that the threads are pointed down. Then arrange the parts of the Nozzling in the Cap with the Cap at the bottom in your hand. Finally, fit all parts into the Rollover valve and screw the Cap with parts onto the Valve.

DISC AND CORE NUMBERS	ORIFICE DIA. IN INCHES	CAPACITY IN G.P.M. (GALLONS PER MINUTE) AT LIQUID PRESSURE IN P.S.I. (POUNDS PER SQ. INCH)						
		50 P.S.I.	100 P.S.I.	125 P.S.I.	150 P.S.I.	200 P.S.I.	250 P.S.I.	300 P.S.I.
DCER2-13CER	.041"	0.09	0.12	0.13	0.14	0.16	0.17	0.18
DCER3-13CER	.047"	0.10	0.13	0.14	0.16	0.18	0.19	0.20
DCER4-13CER	.063"	0.13	0.17	0.19	0.20	0.23	0.25	0.27
DCER2-23CER	.041"	0.12	0.16	0.17	0.19	0.21	0.23	0.25
DCER3-23CER	.047"	0.13	0.18	0.19	0.21	0.24	0.26	0.28
DCER4-23CER	.063"	0.17	0.23	0.26	0.28	0.32	0.35	0.38
DCER5-23CER	.078"	0.20	0.28	0.31	0.34	0.38	0.42	0.46
DCER6-23CER	.094"	0.24	0.32	0.36	0.39	0.45	0.50	0.54
DCER2-25CER	.041"	0.17	0.25	0.27	0.29	0.34	0.37	0.41
DCER3-25CER	.047"	0.21	0.29	0.32	0.35	0.40	0.44	0.48
DCER4-25CER	.063"	0.32	0.45	0.50	0.54	0.62	0.68	0.75
DCER5-25CER	.078"	0.39	0.54	0.59	0.65	0.75	0.82	0.90
DCER6-25CER	.094"	0.50	0.70	0.77	0.85	0.97	1.08	1.19
DCER7-25CER	.109"	0.58	0.81	0.89	0.98	1.18	1.27	1.37
DCER8-25CER	.125"	0.68	0.97	1.08	1.19	1.36	1.52	1.68
DCER10-25CER	.156"	0.85	1.21	1.35	1.48	1.71	1.91	2.10
DCER2-45CER	.041"	0.23	0.32	0.35	0.38	0.44	0.49	0.53
DCER3-45CER	.047"	0.26	0.36	0.40	0.44	0.51	0.56	0.62
DCER4-45CER	.063"	0.39	0.56	0.62	0.68	0.78	0.86	0.95
DCER5-45CER	.078"	0.50	0.71	0.79	0.86	0.99	1.11	1.22
DCER6-45CER	.094"	0.66	0.93	1.05	1.15	1.33	1.48	1.64
DCER7-45CER	.109"	0.76	1.11	1.23	1.35	1.57	1.75	1.94
DCER8-45CER	.125"	0.95	1.35	1.50	1.68	1.94	2.20	2.40
DCER10-45CER	.156"	1.24	1.77	1.97	2.18	2.50	2.81	3.10
DCER2-46CER	.041"	0.30	0.42	0.45	0.50	0.57	0.63	0.68
DCER3-46CER	.047"	0.36	0.51	0.56	0.61	0.70	0.78	0.86
DCER4-46CER	.063"	0.62	0.88	0.97	1.07	1.23	1.40	1.52
DCER5-46CER	.078"	0.86	1.25	1.40	1.50	1.73	1.93	2.13
DCER6-46CER	.094"	1.23	1.73	1.95	2.16	2.50	2.80	3.06
DCER7-46CER	.109"	1.55	2.22	2.45	2.73	3.15	3.50	3.85
DCER8-46CER	.125"	2.05	2.93	3.26	3.60	4.17	4.60	5.05
DCER10-46CER	.156"	2.80	3.96	4.40	4.83	5.59	6.25	6.80

13 23 25 45 46

TeeJet® Nozzles with — CERAMIC DISCS & CORES





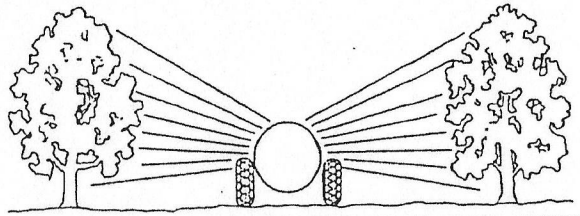
* USE 20229-NY GASKET WHENEVER 4514-NY STRAINER IS NOT USED.

CORE NO.	** APPROX. SPRAY ANGLE	SPRAY PATTERN TYPE
13	70°	HOLLOW CONE
23	80°	HOLLOW CONE
25	75°	HOLLOW CONE
45	75°	HOLLOW CONE
46	25°	HOLLOW CONE

IMPROVED PERFORMANCE

MOST USEFUL FOR ABRASIVE PESTICIDE FORMULATIONS (AND POWDER HERBICIDES). WEAR-RESISTANT CERAMIC DISCS AND CORES CAN BE USED WITH ALL TYPES OF TEEJET NOZZLE ASSEMBLIES.

For orchard spraying



FEATURES:

- LONGER SERVICE LIFE.
- REDUCED MAINTENANCE TIME.
- RESISTS CORROSION ATTACK.
- ACCEPTS MORE ABRASIVE PESTICIDE FORMULATIONS.
- LESS AFFECTED BY EROSIVE HERBICIDE POWDER MIXTURES.
- POPULAR NOZZLE SIZES FIT MOST SPRAYERS.
- OPERATES AT HIGHER PRESSURES UP TO 580 P.S.I. (POUNDS PER SQ. INCH).
- CAN BE USED WITH ALL TYPES OF TEEJET NOZZLE BODIES.

DESCRIPTION

TEEJET SPRAY NOZZLES WITH CERAMIC DISC-CORE TYPE HOLLOW CONE SPRAY TIPS

Spraying Systems Co.

Spray Nozzles and Accessories

North Avenue and Schmale Road

Wheaton, Illinois 60188

Ref :

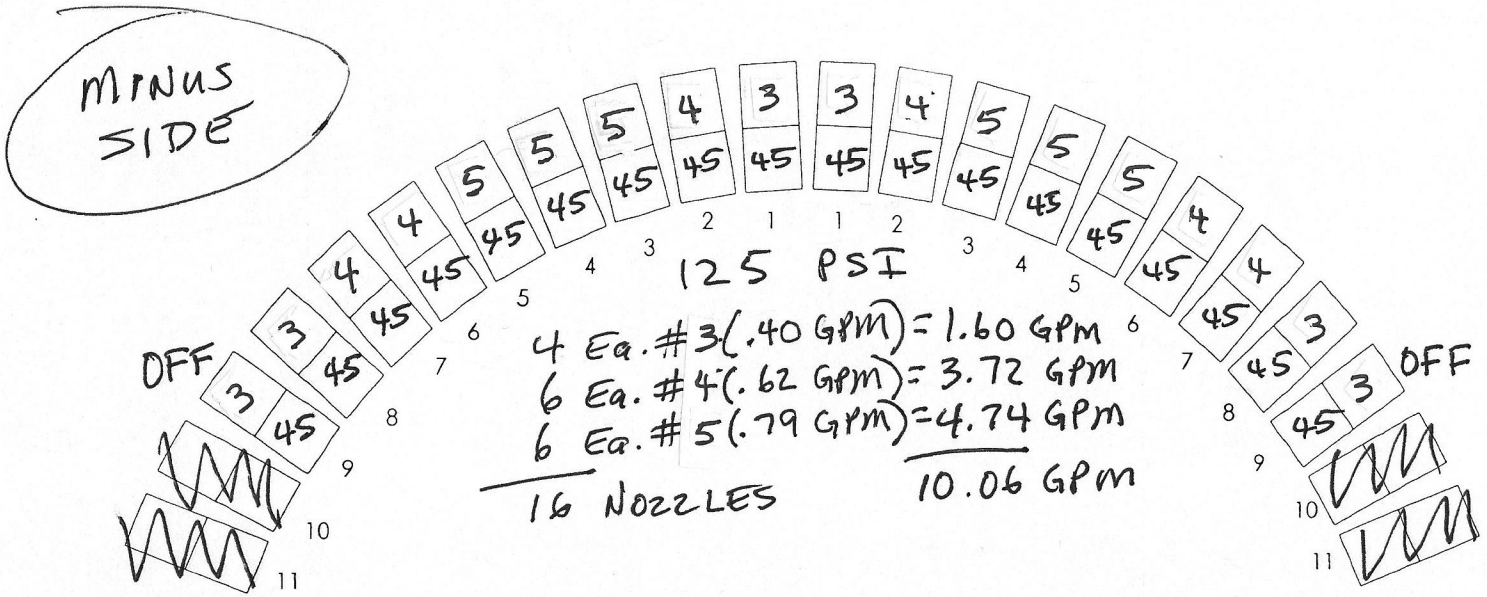
Revision No. 3

Data Sheet No. 20524

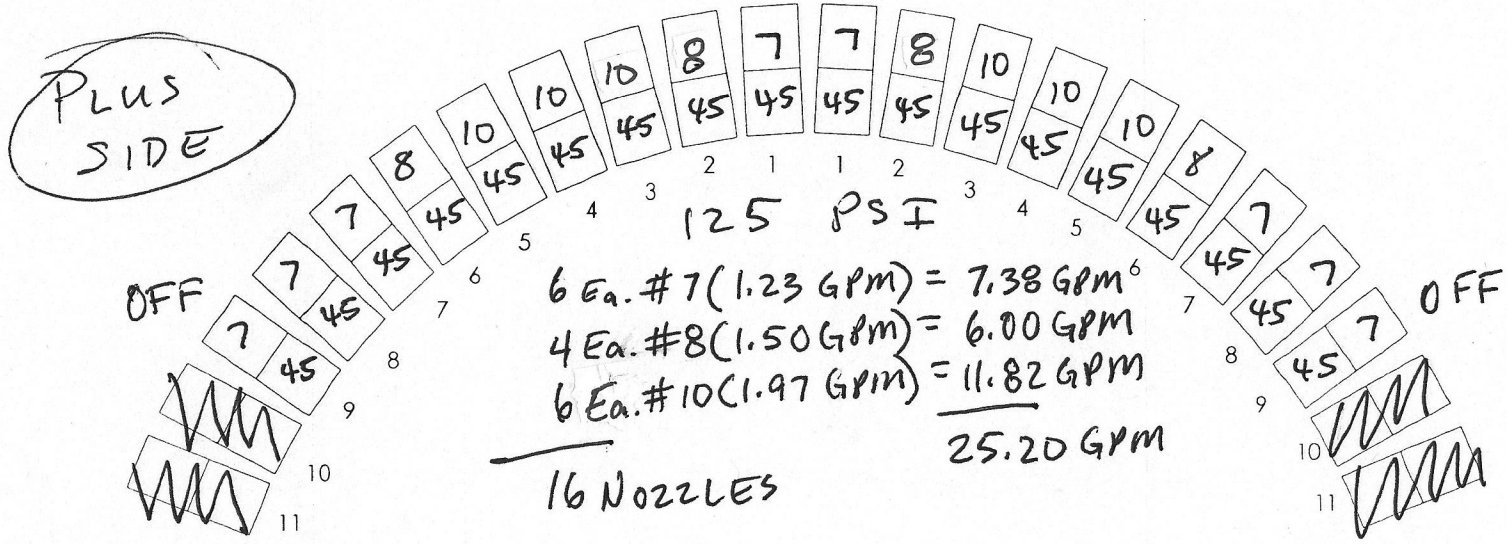
- DATE
- CUSTOMER
- SPRAYER

EXAMPLE

100 GPA
18' Row Sp.
1800
× 2.78 MPH
5004
÷ 495
10.11 GPM



250 GPA
× 18 Row Sp.
4500
× 2.78 MPH
12510
÷ 495
25.27 GPM



Date:

Dealer:

Owner:

Model:

_____ GPA

x _____ Tree Row Spacing:

_____ Subtotal

x _____ MPH

_____ Subtotal

÷ 495

_____ GPM Total

÷ _____ Total number of Nozzles

_____ Average GPM per Nozzle

_____ GPA

x _____ Tree Row Spacing:

_____ Subtotal

x _____ MPH

_____ Subtotal

÷ 495

_____ GPM Total

÷ _____ Total number of Nozzles

_____ Average GPM per Nozzle