Calibration Procedures

Sprayer Calibration

Sprayer calibration is the process of determining the correct nozzle size, type, speed, and pressure to create a desired droplet size at a given application rate (GPA). To properly calibrate a sprayer, determine the wanted GPA and then use manufacturers guides to determine the correct nozzle size, type, and pressure to obtain a desired droplet size. Herbicides are typically applied with medium to coarse droplets, and fungicides and insecticides with fine to medium droplets. Air induction (A.I.) nozzles are a good choice to reduce the amount of driftabe fines in the spray application. Note that some chemical labels specify which type of nozzles you must use to apply that chemical. Once on the sprayer, a manual check should be made of the correct flowrate at a given pressure. This procedure is performed by collecting the output of liquid emitted from each nozzle with time using a calibration jug (or similar device). Any tip deviating more than 10% from the average should be replaced. More automated measuring systems, such as the "SpotOn" calibrator can greatly reduce the time needed to perform this process and prove beneficial. Visual checks should be made in the field for any booms or nozzle tips that are "misting" as this can be sign of clogged nozzle tips, filters, or screens. Details on this process are given to the right:

1. **Measuring the flow rate of individual nozzle tips:** Put the sprayer in manual mode where spray can be produced at a certain pressure without sprayer movement. Measuring the flow rate of each tip (GPM) and record. Once all nozzles have been measured, calculate the average GPM for all the nozzles and compared to each individual nozzle. If the GPM falls outside +/- 10 percent of the average value, the nozzle should be replaced. If the average GPM of all nozzles is above or below the target value, the pressure may need to be adjusted to obtain the correct flowrate and a check of the flowrate sensor may be necessary. Nozzle tests should be performed once a year. Note that in the field, the flow rate sensor may supersede pressure readings to create a desired flowrate (GPA), and misting can occur if boom sections, nozzles, or filters are clogged. In this case, disassemble each section and clean. The general equation for calculating nozzle flow is:

$$GPM = \frac{GPA * MPH * W}{5940}$$

Equation abbreviation key:

- ***GPM:*** gallons per minute of liquid used per application width
- ***GPA:*** gallons per acre of liquid used
- ***MPH:*** the average speed of the vehicle through the field
- ***W:*** the nozzle application width in inches
  (typically the distance between the nozzles for broadcast sprayers **or** banding width for banding sprayers)

2. **Calibrating sprayer speed:** Sprayer speed is essential for a rate controller to determining the correct flowrate in constant orifice type spray system. On newer sprayers, speed is usually determined with a GPS sensor and no calibration is required. On older sprayers, the system may use radar, wheel sensors, or a GPS sensor that mimics a radar sensor. In these sprayers, the sprayer may have to be operated over a set travel distance in a calibration mode to determine the correct number of pulses per distance and speed. Check manufacturer's directions for this procedure. Calibration of the speed sensor should be performed at least once a year. If problems persist, check that the radar unit is securely fixed to the vehicle frame and has the correct angle between the unit and the ground (typically 30 to 45 degrees, although some newer units are mounted horizontal). The speed versus travelling distance and time of a sprayer can be checked using the equation given below: Perform over at least 500 feet to ensure 0.5 mph or better accuracy.

$$MPH = \frac{360 * \textbf{Distance Travelled in Feet}}{528 * \textbf{Time Needed to Travel that Distance in Seconds}}$$