Calibrating Sprayers for Effective Weed Control

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Component of Spray Equipment

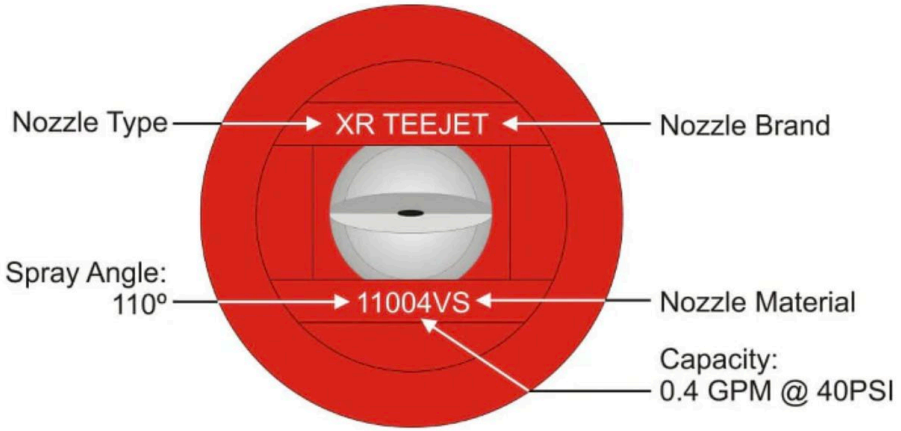
- Tank – various sizes
- Pump – different types
- Filter – typically 50-100 mesh
- Nozzles – flat fan, cone
- Regulator – to adjust and maintain pressure

Pumps

- Several types (diaphragm, roller, centrifugal, piston)
- Gas and electric
- They need to provide even pressure and volume
- They tend to wear over time and lose original specs

Nozzles

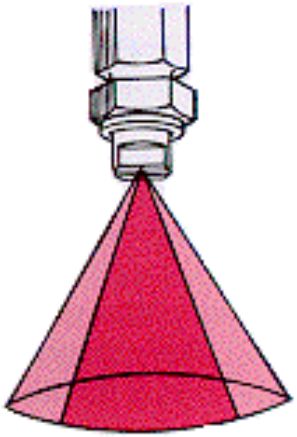
- **Flat fan nozzles are most commonly used for herbicides**
- **Sizes -**



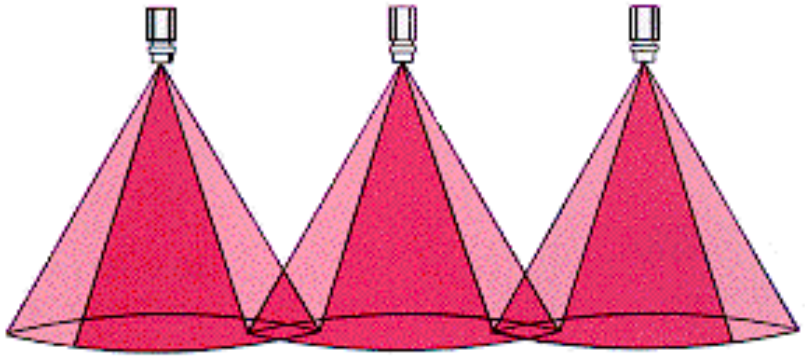
Tip Size	Colour	Flow Rate	
		US gpm @ 40 psi	L/min @ 3 bar
01	Orange	0.10	0.4
015	Green	0.15	0.6
02	Yellow	0.20	0.8
025	Lilac	0.25	1.0
03	Blue	0.30	1.2
035	Brown Red	0.35	1.4
04	Red	0.40	1.6
05	Brown	0.50	2.0
06	Gray	0.60	2.4
08	White	0.80	3.2

Flat Fan Nozzles

- Typically 20 inches apart on boom
- The pattern tapers at the edges
- Overlap 40-50%
- Height 15-24 inches



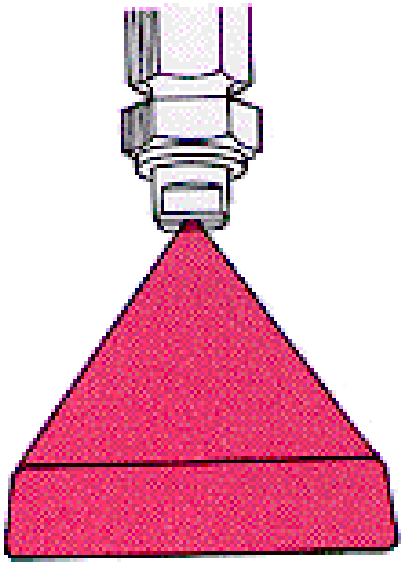
Flat Fan Spray



Flat fan nozzle set-up with proper pattern overlap

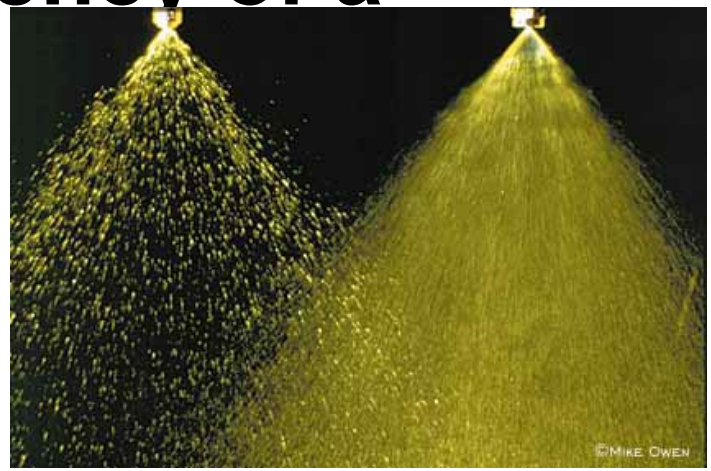
Even Flat Fan Example

8002E



Drift

- Factors affecting drift
  - Spray pressure; spray angle; nozzle type; orifice size
  - All these affect droplet size which can increase the tendency of a material to drift
- To minimize drift
  - Use 20-30 psi
  - Use nozzles with larger orifice
  - Special nozzles to reduce portion of small droplets
  - Spray additives



To Increase the Rate

- Slower travel speed
- Larger nozzles
- Increase pressure
- Decrease nozzle spacing

To Decrease the Rate

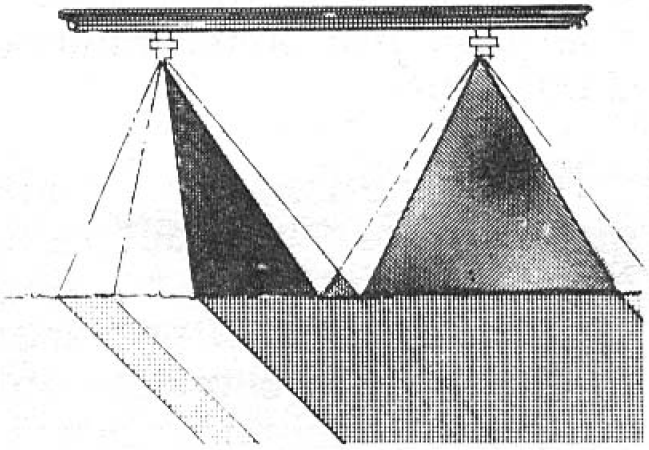
- Faster travel speed
- Smaller orifices
- Decrease pressure
- Increase nozzle spacing

Maintenance

- It is critical to maintain nozzle and pump screens to maintain flow rate and pressure

Maintenance

- **It is critical to maintain nozzles to maintain an even application pattern**



Worn or plugged nozzles cause poor application.

Boom vs Hand-Held

- **Boom application**

- **Hand-held sprayer**

To Calibrate a Boom Sprayer Step 1

- **Determine the average speed of the tractor/ATV**
  - **Be sure to be going at the normal speed for the terrain that you are going to treat**
  - **Measure the time it takes (in seconds) to drive a set distance (i.e. 200 feet)**
  - **Repeat the measurement three times and take the average of the times**
  - **This gives you your speed in feet/minute**
  - **e.g. 100 feet/minute**

To Calibrate a Boom Sprayer Step 2

- **Measure the width of the spray pattern for the boom at the height that you will use for the application**
  - **Go to a dry spot and with just water in the tank**
  - **Start the sprayer at the pressure you will use for the application**
  - **measure the width in feet of the spray pattern**
  - **e.g. 10 feet**

To Calibrate a Boom Sprayer Step 3

- **Calculate the area per minute covered by the sprayer**
  - **Multiply the boom width by the speed (feet per minute covered by the sprayer in step 1) to get square feet per minute e.g. 100 feet/min x 10 feet wide = 1000 square feet/minute**
  - **Divide feet per minute by 43,560 to get acres/minute**
  - **1000 square feet/43,560 = 0.02 acres/min**

To Calibrate a Boom Sprayer Step 4

- **Measure the volume of output by each nozzle and the total amount put out by the boom**
  - a. Using pure water, measure the output of each nozzle into a measuring cup for 1 minute to get gallon/minute/nozzle
    e.g. 0.5 gallons/minute/nozzle
  - a. Add up the output of all the nozzles and convert to gallons
  - b. Calculate the output of the boom in gallons per minute (GPM)
    4 nozzles/boom x 0.5 gallons/minute = 2.0 gallons per minute (entire boom)

To Calibrate a Boom Sprayer Step 5

- **Calculate the output of the sprayer in gallons per acre**
  - **Divide gallons/minute (step 4 2.0 gallons/minute) by acres/minute (step 3 0.02 acres/minute) to get gallons/acre**
  - **(2.0 gallons/minute)/(0.02 acres/minute) = 100 gallons/A**

To Calibrate a Boom Sprayer Step 6

- **Calculate the number of acres that a tank load can cover**
  - **Divide the capacity of the tank by gallons/acre applied by the sprayer**
  - **50 gallon tank/100 gallons per acre applied = 0.5 acre per load**

To Calibrate a Boom Sprayer Step 7

- **Calculate how much material to add to the tank**
  - **Multiply the gallon per acre capacity of the tank by the label rate**
  - **Example: 4.0 ounces/A Transline times 0.5 acre capacity of the tank = 2.0 ounces/tank load**

Hand-Held Applications

- Hand-held spray equipment is commonly used to spot treat infested areas in a pasture
- Most applications are based on a percent concentration of herbicide rather than rate/unit area (i.e. material/acre)
- Typically, applications are made to wet the targeted weed before material runs off

Hand-Held Applications

- Rate/unit area applied with hand-held equipment can be quite variable
- A good way to calibrate a hand-held application is using the 128^{th} acre calibration method
- Ounces applied in this area gives you gallons/acre being applied

128th Acre Calibration Method

- 128th of an acre is equal to an area 18.5 x 18.5 feet
- Time how long it takes to spray this area (walking at your normal relaxed speed)

  e.g. 25 seconds

128th Acre Calibration Method

- Measure the amount of water in ounces that your sprayer puts out in 25 seconds

  e.g. 20 ounces

  This is the rate you are spraying in gallons/A - 20 gallon/A

128th Acre Calibration Method

- If you want to apply 0.75 gallon of roundup/A
- 0.75 gallons/A in the calculated 20 gallons spray volume/A would be 0.75/20 = 0.0375 gallons or 4.8 ounces
- The rate of roundup to add per gallon of spray volume is 4.8 ounces roundup

Calibrating a Sprayer

- Boom sprayer hand out on Devii's website that walks you through the steps we just discussed
- 128th acre procedure. On YouTube the University of Arkansas has a nice explanation of the proceedure