Simplified Calibration of Boom Sprayers

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Accuracy and economy are two major reasons for increased attention to sprayer calibration today. Overapplication and drift lead to waste and possible damage. Underapplication prevents chemicals from doing their job and wastes time and money in reapplication or touch-up.

You may be doing everything right as far as mixing, calculation and application, but your equipment may need adjustment.

The introduction of foam and dye marking agents is helpful and may reveal problems with spray equipment. However, it's very important to check spraying equipment regularly for accuracy.

A basic understanding of spray equipment, spray nozzle patterns, and flow rates can help you keep your spraying equipment accurate and reliable.

Nozzle selection

With a regular flat fan nozzle, commonly used in agriculture, you have to overlap to get even coverage of a chemical.

A hollow cone nozzle is used where thorough coverage is needed, such as for fungicide applications. This nozzle is effective in drenching leaves during application.

The two nozzles used most often in turf are the flooding flat fan and the raindrop nozzle.

The flooding flat fan is not a very uniform pattern and must be used with large gallonages of water. It is used in turf for applying fertilzers and fungicides applied in large amounts of water.

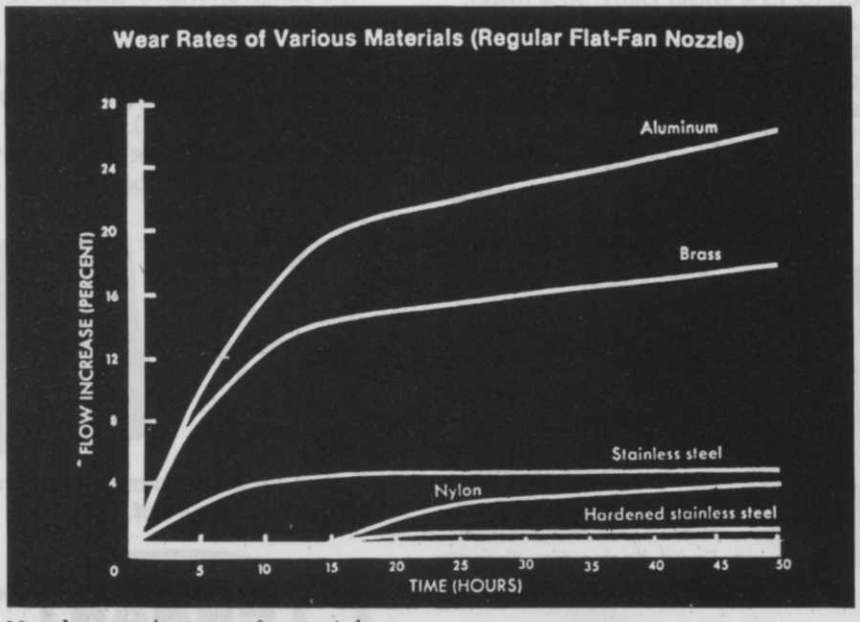
The raindrop, a new type of nozzle, is like a hollow cone but modifications allow you to spray at a reduced pressure and still provide a very good pattern. This nozzle will reduce drift compared to a normal flooding flat fan nozzle since it can be used at lower pressure. It is good for applying herbicides.

For example, the regular flat fan is made to operate at 20 to 40 pounds per square inch(psi). At 40 psi the nozzle produces a fair amount of very fine particles which are subject to drift. The new raindrop nozzle is designed to provide the same distribution at 15 psi as the flat fan nozzle at 40 psi. The result is larger particles and reduced potential for drift.

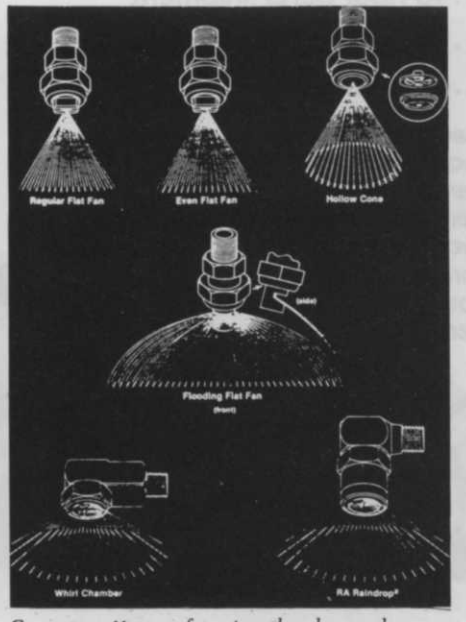
Tests performed at Michigan State University have shown that the pattern of a flooding flat fan nozzle is not very uniform and requires a 100 percent overlap with a boom sprayer.

A flat fan nozzle has a bell-shaped distribution which provides a nice straight uniform pattern with a boom sprayer. Overlap with a flat fan nozzle should be 30 to 50 percent.

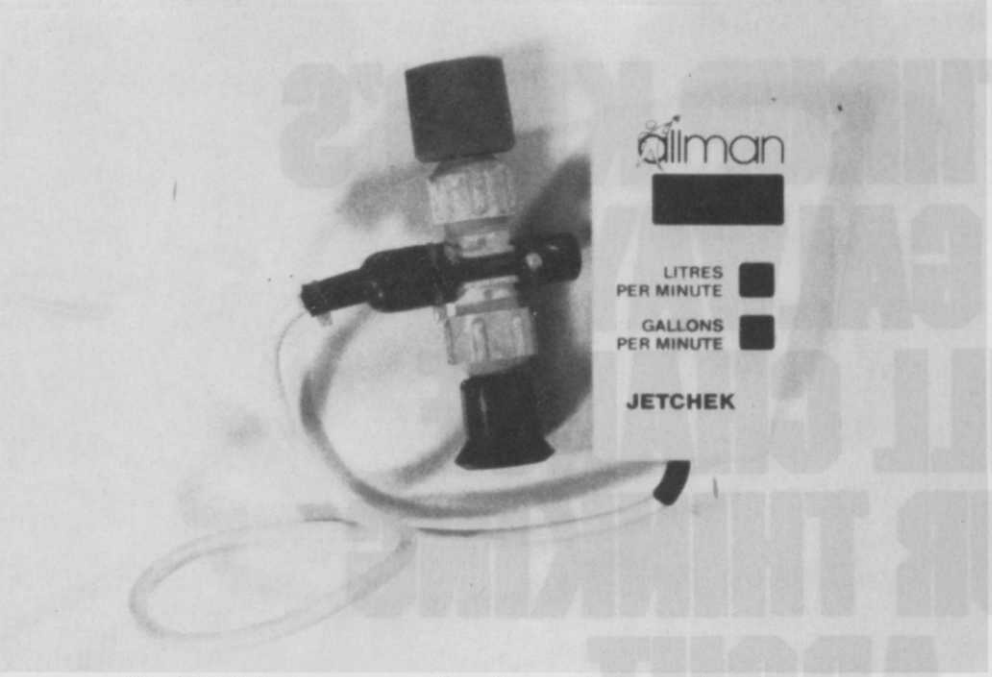
Overlap is determined by comparing the distance nozzles are apart on the boom with the width of the pattern on the ground. One hundred percent overlap means the the width of the pattern on the



Nozzle wear *by type of material.*



Spray patterns *for standard nozzles used in turf and agriculture.*



Hand-held device *measures flow from a single nozzle instantaneously.*

ground is twice the distance the nozzles are apart on the spray boom. You can determine this by closing all the nozzles but one on the boom and checking the width of the spray on the ground.

When you don't have proper overlap there will be strips between nozzles where the dose isn't high enough to provide control.

The output of a brass nozzle changes in less than 20 hours of spraying.

The height of the boom is just as important. By lowering the boom you decrease the width of the spray pattern and reduce the amount of overlap. Reducing the overlap will cause the same lack of control as using the wrong nozzle or the wrong spacing of nozzles on a boom.

Nozzles will wear down with time and allow more material through. This depends on the material the nozzles are made of. The flow of material will increase from the nozzle as it is used. If you spray a great deal you will be changing the gallonage you put down.

Standard nozzles are made of brass. Studies show that flow increases about 16 percent after 20 hours of spraying. After 50 hours the flow increases 20 percent from its original rate.

Wettable powders will wear open the nozzle orifice faster than other materials.

Stainless steel nozzles last longer than other nozzles, but they are more expensive. Nylon works well and lasts a long time, but sometimes nylon will swell if you have certain solvents in the spray tank.

When you start getting wear, it is first exhibited on the outside of the pattern. This changes the overlap and the pattern. You will be getting more spray in the middle and less on the outside of the pattern.

It's important to remember that you need to overlap at the end of the boom the same as you do between nozzles to get a uniform pattern.

Calibration

To calibrate a boom sprayer you need to determine the output from each nozzle.

One way is to put a container under each nozzle, turn the sprayer on for 30 seconds, and measure what is in each container. The output of each nozzle should be within five percent of the average output of all the nozzles. Nozzles that don't meet this requirement should be removed and cleaned or replaced. Never use a metal object to clean out a nozzle orifice. Use a soft wooden toothpick. Once a nozzle is cleaned, test it again.

A device is now available which quickly measures the output from each nozzle, one at a time. It is placed under the nozzle and reads the flow rate in seconds. It's like a hand-held calculator with a tube.

The device shows output in gallons per minute. It is accurate to one hundreth of a gallon and costs about $70 dollars. It's much faster to use than the standard method.

A simple, hand-held meter makes sprayer calibration much simpler.

There are many ways to determine the output per thousand square feet to check application rates. The easiest way is first to figure how much water is coming out of one nozzle per unit time (in gallons per minute). Multiply the output of this nozzle by the number of nozzles on the boom. This produces the total output of the boom in one minute.

Now you have to determine how much area you cover in one minute of spraying. First determine your width of spray and travel speed. You know how wide the boom is. If you know rate of speed you can figure 88 ft. per minute for each one mile per hour speed. At three miles per hour you cover three times 88, or 264 feet in one minute. Multiply this by the width of your boom, say 15 feet. So each minute you are covering 3,960 square feet.

You want to determine gallons per thousand square feet of spray applied, so divide the output in gallons per minute by 3.96 (thousands of square feet). Since you know the volume of solution applied and the amount of chemical per gallon in the tank, you can determine the amount of chemical applied per thousand square feet.

You should check your sprayer output peridically to see if it has changed. Remember, nozzles wear down in just hours of spray time. **WT&T**