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On July 1, 1965, the new McCulloch MAC-10 Series made every other lightweight chain saw overweight and out-of-date

MAC 1-10: The world's lightest direct drive chain saw: **10½ lbs.***
MAC 2-10: World's lightest automatic oiling chain saw: **10¾ lbs.***

(25% lighter) than most lightweight chain saws

The new McCulloch MAC-10 Series chain saws are ideal for industrial and municipal use, whether it's intermittent emergency cutting or steady day-in, day-out operation. Because of their exceptional light weight and simplicity, personnel can be quickly trained in their use. They require a minimum of space on emergency and service vehicles, yet can prove to be the most valuable tool at hand in many situations. No other lightweight chain saw gives you this combination of features:

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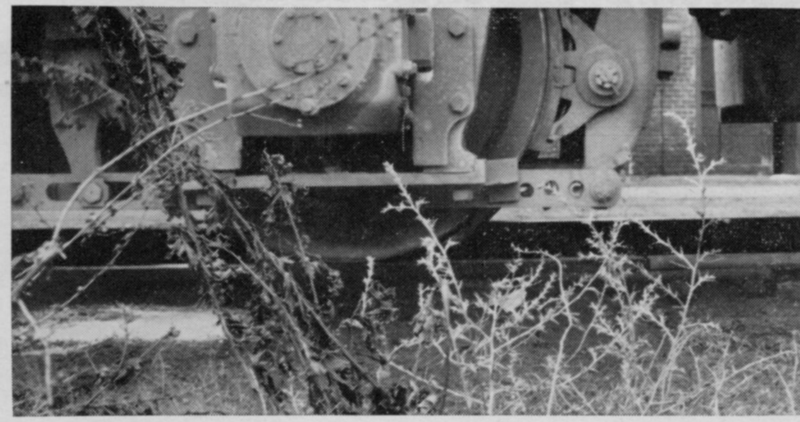

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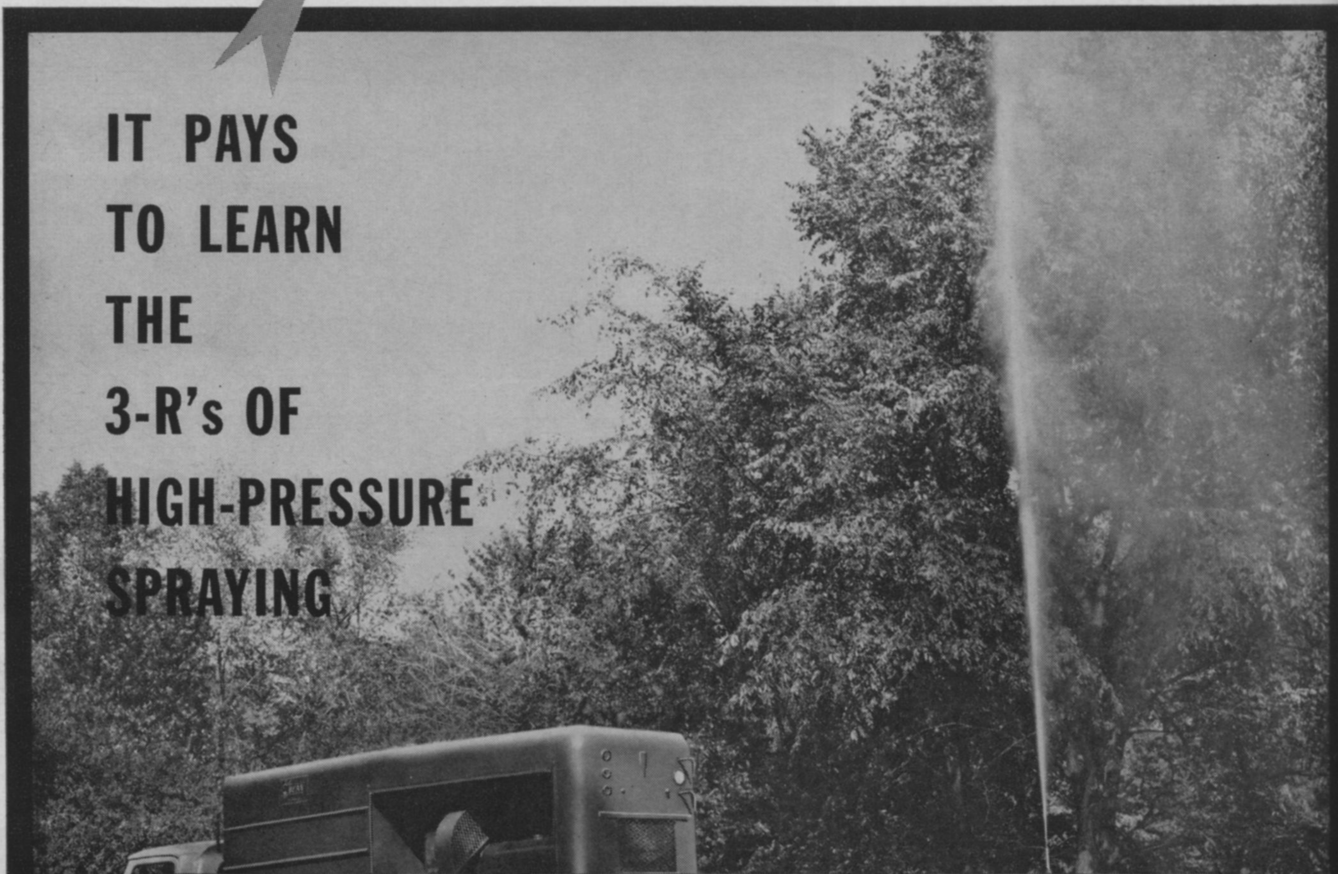

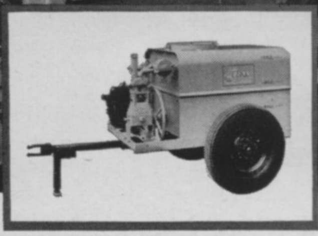

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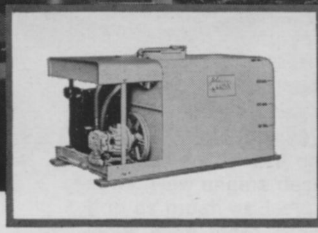

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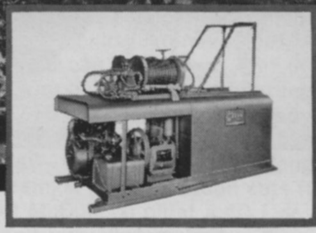

ROYAL the "big daddy" in 25, 35 and 60 GPM capacities @ pressures to 800 psi. Proven by years and years of service. 12 models.

It pays to learn the 3-R's, because the knowledge can help you save time and money, do more profit-making jobs, and help you get your jobs done better and sooner. What jobs? Ah, there's the key! Jobs like shade tree spraying, brush and weed control, dust abatement. Close to the soil tasks like liquid fertilizing, lawn insect and turf disease control, root feeding. Clean-up jobs like sanitation spraying, mosquito and insect control. Fringe benefits like equipment cleaning, water-soluble paint spraying, many more. With John Bean High-Pressure Sprayers, you have the power to do the jobs thoroughly and quick. You have Bean-Bond corrosion-resistant tanks, ceramic pump cylinders, and many other Leadership-Engineered features to insure durability and dependability. Now, go back and add up the models. Forty-one (and we didn't even count several engine options)! That makes it as simple as ABC to look through the 3-R's and pick the one that's exactly right for you. May we help you pick?

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What to do about the "Shopper"

Contract applicators are constantly faced with the problem of giving free inspections to prospective customers who may be just shopping around for the lowest possible price. This is the bane of existence in almost every service industry.

Experts in the vegetation maintenance field take opposite stands on this question. Some feel it's a condition we have to live with; others contend CAs should charge for their surveys.

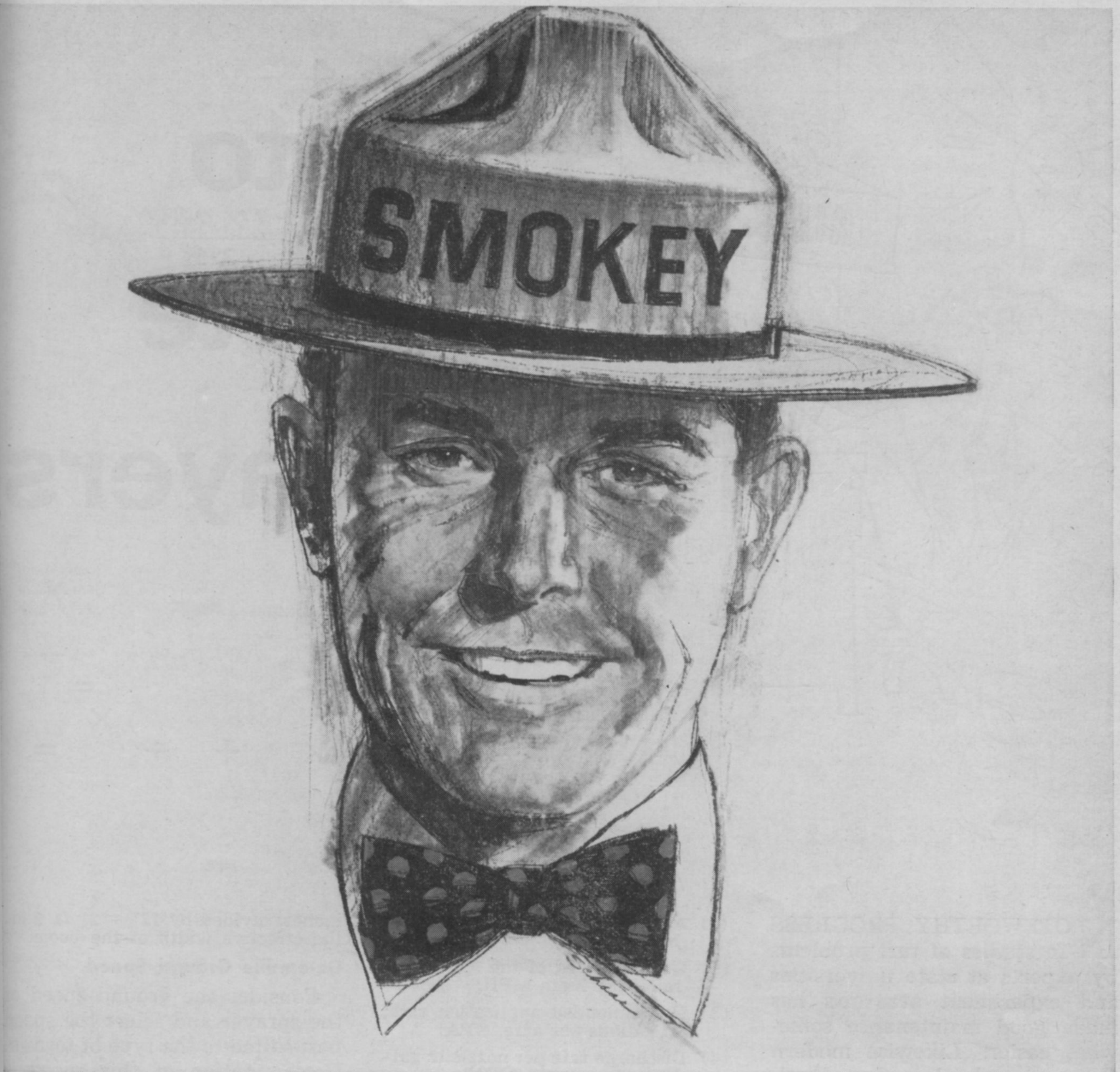
After all, the latter group asserts, it takes the time of their skilled men to properly assess the extent of damage and to prescribe recommended corrective measures. Homeowners who are simply fishing for the cheapest bid aren't really interested in quality anyway, this group feels. If potential buyers of professional services pay for an estimate, they'll have more respect for the expert analysis they receive, and CAs are compensated for having men out on what might turn out to be a wild-goose chase anyway, these industrymen maintain.

Those who favor the "free inspection" say this practice is really just another cost of doing business, not too unlike the money they spend for newspaper and direct mail advertising, salesmen's commissions, etc. These CAs do not consider themselves true professionals, in the sense doctors and lawyers are. Rather they regard themselves as expert tradesmen with a specialized service to offer. They say they write more business by offering free inspections than they do from almost any other form of sales promotion.

There are valid reasons both to support and reject the viewpoints of each group. Their differences in outlook will probably never be resolved. Yet, we can't help but wonder what the most successful contract applicators do. Do they look upon every contact with the public as an opportunity to further their sales aims and to boost their company's reputation for competence? Do they recognize that the buying public has the same right to compare the prices of one service company with those of another, just as they do when they're out looking for a new car?

Our guess is that vegetation service companies which offer free inspections are in the majority and that they just live with the "shopper". Even if the sale is lost to a lower bidder, the reputation of the loser can be strengthened if his salesmen conduct themselves to properly reflect the proficiency of the firm they represent.

WEEDS TREES AND TURF is the national monthly magazine of urban/industrial vegetation maintenance, including turf management, weed and brush control, and tree care. Readers include "contract applicators," arborists, nurserymen, and supervisory personnel with highway departments, railways, utilities, golf courses, and similar areas where vegetation must be enhanced or controlled. While the editors welcome contributions by qualified freelance writers, unsolicited manuscripts, unaccompanied by stamped, self-addressed envelopes, cannot be returned.


SMOKEY

$$GPAPN = \frac{5940 \times .067}{4 \times 20}$$

How to

$$\frac{Y \times MPH}{325} = APH$$

Calibrate

$$\frac{GPAPN \times MPH \times W}{5940}$$

Turf Sprayers

By HERB P. HILL

FMC Corporation John Bean Division

San Jose, California

NOTEWORTHY PROGRESS in studies of turf problems by experts at state universities and experiment stations has made good maintenance somewhat easier. Likewise modern chemical technology has developed new chemical sprays which assure good control of both animal and plant pests. Higher costs of modern day chemicals, and critical rates at which they must be applied for best results, make close attention to sprayer calibration important.

Current information, formulas and procedures can help the somewhat perplexing and complicated-appearing task of calibrating sprayers. Correct sprayer and boom calibration are important to the success of a control program.

Consider Four Factors

There are four major factors to consider in the calibration of a turf sprayer:

(1) Nozzle spacing on the boom and boom width;

(2) Ground speed of the sprayer in miles per hour, MPH;

(3) Recommended application rate; in gallons per acre, GPA;

(4) Discharge rate per nozzle in gallons per minute, GPM.

Discharge rate of the nozzle depends on the size of the nozzle orifice and the operating pressure of the pump. Consider all of these factors and how you may utilize them to arrive at the recommended rate of application.

Nozzle Spacing

Nozzle spacing is a known factor, as is the width of the boom. To determine the spray swath, or effective width of your boom, simply measure the distance between nozzles and multiply by the number of nozzles on the boom.

For example, assume you have a boom with 13 nozzles, spaced 20 inches apart. Thus, 13 × 20 = 260 inches, divided by 12" = 21 ft. 9 in., the effective width of the boom.

Determine Ground Speed

Consider the ground speed of the sprayer and select the speed best suited to the type of terrain. Determination of this speed is made with the tractor and sprayer in motion. When the desired speed is found, drop a marker, a stick or a wrench. Exactly one minute later, drop another marker. Measure the distance between markers to find the number of feet traveled in one minute (60 seconds). With this information, compute the speed of travel, in MPH, with this formula:

$$\frac{\text{Distance in feet}}{\text{Time in seconds} \times 1.47} = \text{MPH}$$

Example: If 360 feet is the distance traveled in one minute, or 60 seconds, the speed of travel is 4 MPH.

$$\frac{360}{60 \times 1.47} = 4 \text{ MPH}$$

In this example, 360 represents the

distance traveled and, according to our formula, is divided by 60, representing the time, in seconds, during which the distance was traveled. This is multiplied by the constant 1.47. Thus; $60 \times 1.47 = 88.2$ which now becomes our divisor:

$$\frac{360}{88.2} = 4 \text{ MPH}$$

Determination of the speed of travel is the *most important step* in the calibration of a turf sprayer. The method described above is easy to follow. If your vehicle has a speedometer, this step, of course, can be eliminated.

Know Proper Rate

The third factor to decide on is the recommended application rate. This is almost always a known factor and should be the gallons-per-acre (GPA) rate recommended by your turf advisor or experiment station. Such turf specialists should be consulted for recommended application rates for various types of spray materials and control programs. They are best qualified to advise you on these subjects.

Figure Nozzle Output

A fourth factor to consider is the rate of discharge per nozzle in GPM, or the nozzle output. This can be obtained from sprayer manufacturers, manufacturers of nozzle tips, or from spec sheets that accompanied the equipment when it was purchased.

If such data are not available, or you suspect the nozzle orifices (holes) are worn enough to lose their original output rate, you can determine their actual output yourself.

The following formula is used to determine the GPM per nozzle for a blanket type spray, such as is used in overall fairway spraying operations, when the rate of travel in MPH, the *desired* application rate in gallons per acre (GPA), and the nozzle spacing, are known:

$$\frac{\text{GPAPN} \times \text{MPH} \times \text{W}}{5940} = \text{GPM per nozzle}$$

First then, the GPA per nozzle (GPAPN) must be determined. Assume for example, that we are using a boom with 13 nozzles, spaced 14 inches apart (W). From previous calculations, we know ground speed is 4 MPH. In this instance, your turf advisor has recommended 65 gallons per acre (GPA) as the dosage. The recommended 65 gallons per acre is divided by the number of nozzles on the boom (13) giving 5 GPA per nozzle (GPAPN). Next, multiply GPAPN (5) by MPH (4) and then by the nozzle spacing (W) in inches (14). Divide by the constant 5940 and the answer is .047 GPM per nozzle. Here are the calculations:

$$\text{GPM per nozzle} = \frac{\text{GPAPN} \times \text{MPH} \times \text{W}}{5940} = \frac{5 \times 4 \times 14}{5940} = \frac{280}{5940}$$

$$\text{GPM per nozzle} = .047$$

To apply 65 GPA, using a boom with 13 nozzles spaced 14 inches apart when the ground speed is 4 MPH, each nozzle must discharge .047 GPM.

If the nozzle spacing is 20 inches, which is standard spacing on most booms sold today, use 20 as the value of W.

To determine if your nozzles discharge the correct amount,

With nozzles set to spray at 65 degrees, this boom spray system delivers even coverage with little drifting caused by wind. Boom is 22 inches from the ground.

Eighty degree spray patterns assure adequate overlap by this boom sprayer system. Conical discharge patterns of the spray marks this boom as well maintained.

check the discharge of one nozzle in a calibrated container for one minute, while the sprayer is operating at 40 p.s.i. If the output from the nozzle is supposed to be .067 gallons per minute, 8.5 fluid ounces should have been collected during the one-minute discharge time.

To convert ounces to gallons, use the following formula (128 oz. = 1 gal):

$$\frac{128 \text{ oz.}}{1 \text{ gal.}} = \frac{8.5 \text{ oz.}}{Z}$$

$$128 \times Z = 1 \times 8.5$$

$$Z = .067 \text{ GPMPN}$$

If, for example, more than 8.5 oz. are collected in one minute, substitute the number of ounces you collect for the 8.5 in the above formula to get the nozzle output.

These calculations may not appear to be important, but remember that 3/100ths of a gallon excess output per nozzle, multiplied by the number of nozzles on your boom and the number of minutes of use in the field, will total many gallons of wasted chemical.

Determine GPA from Worn Nozzle

If the nozzle being calibrated turns out to be the proper size, things are fine. However, in case the calibration does not come out as required, don't throw away the nozzles. Here is another formula which reveals what gallons per acre application they *will* give.

$$\text{GPAPN} = \frac{5940 \times \text{GPMPN}}{\text{MPH} \times \text{W}}$$

For example, multiply the constant 5940 by the actual GPM measured from each nozzle during one minute at 40 p.s.i. This product is divided by MPH × W, and the answer will give you the gallons per acre per nozzle (GPAPN).

Let us say that nozzle discharge was measured to be .067 gal. (8.5 oz.) per minute, that MPH is 4, and the nozzles are spaced 20 inches apart. Putting these values into the formula, we have:

$$\text{GPAPN} = \frac{5940 \times .067}{4 \times 20}$$

$$= \frac{397.98}{80}$$

$$= 4.9 \text{ gallons per acre your nozzle will discharge.}$$

Total GPA is thus found by multiplying the number of nozzles (13) by GPAPN (4.9). The answer is 65 gallons per acre which, in this case, was the recommended rate.

Suppose that the nozzles are worn, the orifice sizes are enlarged, and the discharge rate is greater but to an unknown degree. This same formula will tell you their exact capacity, as well as the gallons per acre they will apply.

Suppose your one-minute measurement revealed a discharge rate of 12.5 fluid ounces. Convert this to gallons (12.5 fl. oz. ÷ 128 fl. oz. = .097) and you will come up with a figure very close to 0.10 gal. per minute per nozzle. Use this known result in the above formula to obtain the exact gallons per acre you can expect to obtain from worn nozzles. In this example, the calculations look like this:

$$\frac{5940 \times .10}{4 \times 20} = 7.4 \text{ gallons per acre per nozzle}$$

Multiplying this result by your 13 nozzles, 13 × 7.4 = 96.2 GPA, the output these 13 nozzles produce. This higher rate per acre results directly from the worn orifices in the old nozzles. If the rate per acre is satisfactory for your program there is no reason why they cannot still be used. But, if the rate is too high, discard the nozzle tips, and buy new ones of correct size. Depending on the abrasives in your water supply, nozzle wear is not uncommon, even within a short time.

It is possible to reduce the GPA rate even with worn nozzles by increasing the ground speed. However, for most courses a speed much more than 4 MPH is not too practical.

Abbreviations Used in This Article

GPA	= Total gallons per acre
GPAPN	= Gallons per acre per nozzle
GPM	= Gallons per minute
GPMPN	= Gallons per minute per nozzle
MPH	= Miles per hour
W	= Nozzle spacing in inches
APH	= Acres per hour
Y	= Boom width in feet
8.25	= Constant for APH
5940	= Constant for GPMPN

What Nozzle Numbers Mean

When you see a nozzle tip which reads 650067 or 65015 or 73039 or 800067 or 8002, have you ever wondered just what these numbers mean to you? Actually nozzle numbering systems are easy to understand once they have been explained.

First thing to remember is that the first two numbers *always* indicate the angle of spray discharge. Thus any nozzle beginning with 65, such as 650067, has a 65 degree spray angle; any nozzle beginning with 80, such as 8002, has an 80 degree spray pattern. The reason for these different angles is to provide a 25% overlap in spray pattern for even coverage when the nozzles are used at various heights from the ground.

For example, when spraying height is 17 to 19 inches from the ground, the wider angle, 80 degree nozzles are recommended. When spraying heights are 19 to 21 inches, an intermediate nozzle, 73 degree series, is recommended. When spraying heights are from 21 to 23 inches, the 65 degree series is recommended. This last series is most widely used today.

Risk of drift is greater at wider angles. Narrower, 65 degree nozzles, provide a coarser droplet size and reduce the risk of drift.

What do the rest of the numbers mean? They indicate the GPM of that particular nozzle at 40 PSI (which is the standard from which all other calculations are made).

Take, as an example, nozzle tip No. 650067, which happens to be the same nozzle used in our previous examples. To know the GPM of this nozzle at 40 PSI, simply count three decimal points from the left and place a decimal point. We find we have the decimal .067, which is the GPM of this nozzle at 40 PSI.

If you had a nozzle numbered 65015, you would count over three places from the left and place the decimal point between the zero and the 1. You would then have the decimal .15, which represents the GPM at 40 PSI of this nozzle. If you had a nozzle carrying the number 73039, you'd place the decimal point three places from the left between zero and three; the nozzle would have an output of .39 GPM at 40 PSI. Now let us say you have some nozzles marked 800067. Counting three places from the left, you'd place the decimal point