



Calibrating the Hose Reel Lawn Care Sprayer



Front cover photo courtesy of Joe Becovitz

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Calibrating the Hose Reel Lawn Care Sprayer

How is it possible that two technicians using the same truck, the same equipment, and the same herbicide achieve completely different results? They performed the applications by the book, but the weeds in some lawns appear as if they haven't been touched; those in other lawns are completely gone, but the turf looks stressed. The spray records reveal that one of the technicians used too little herbicide, allowing the weeds to survive; the other used more herbicide, killing the weeds but

stressing the grass. Both applications generated customer complaints. Could the application equipment need calibrating? Could the technicians have done something wrong? Or could it be both?

Most turf managers purchase the best truck they can afford, recruit the best employees, and get their technicians certified. But, ultimately, good herbicide application also depends on proper calibration of the equipment



on the truck and of the technician. Those two factors determine the difference between a beautiful lawn and one with more weeds than grass. Under-application of herbicides results in weeds left standing and customer complaints — even loss of business. Over-application wastes product, effectively decreasing your profit. The loss in dollars might seem insignificant on one lawn, but multiply that by the number of lawns you service and the number of rounds you make to each one, and you're talking about a significant sum of money. Worse yet, if you drastically overspray, irreparable turf damage could require that the lawn be resodded — at your expense!

Over-application can do more than harm the turf and your pocketbook. Using too much herbicide is a violation of the label, brown and damaged turf may be seen viewed as an environmental problem, and you could be held liable for the damage or destruction of nearby ornamental plants.

If you are one of the many turf managers who use hose and reel application equipment with a walk-along technician carrying a spray gun to apply turf herbicides, you'll want to read these tips to make sure you apply the optimum amount of chemical — no more, no less.

The Science of Calibration and the Art of Application

The proper application of herbicides and fertilizers to lawns with hose and reel equipment is science intermingled with art. The science is the calibration of lawn application equipment, such as setting the correct pump pressure and selecting the right nozzle. While equipment calibration is fairly straightforward, it still requires a watchful eye during the season to make sure chemicals are being applied at the correct rate.

The art of lawn application involves the technician, his or her walking speed, and other application techniques. It requires practice and experience. Walk too fast and not enough chemical goes down, resulting in ineffective weed control. Walk too slow, and product and time are wasted. Inconsistent herbicide application can flaw even the best efforts to eradicate turf weeds. Accurate equipment calibration as well as the applicator's precise walking speed and his technique are necessary to achieve the proper application rate.

Calibrating the Truck Sprayer: Working on Output

You may presume that your first step is to determine the amount of pesticide to add to your tank, but save that for later. The first thing you must do is to choose the volume of water you want your sprayer to apply. Your target rate for this example is two gallons of water per minute, which is a common rate for hose-reel operation in the lawn care industry. You can choose to use more water, or less, but the two-gallon rate works well for most.

The next step is to choose the proper nozzle tip. Outwardly, nozzles appear similar; but the pattern and size of the holes determine how much flow is allowed through the nozzle tip. In some cases, the nozzle manufacturer indicates the flow rate on the plastic nozzle, and/or it may be color-coded. Match the nozzle tip to your desired flow rate. In this example, choose the nozzle that produces a flow rate of two gallons per minute.

Choose the nozzle that is closest to your desired flow rate.



The spray gun is a simple application tool, but still it has to be calibrated.



Next, perform a bucket check to determine the flow rate of your pump and nozzle combination. Place one gallon of water into a common five-gallon bucket, and mark the water line on the outside. Add water in one-gallon increments, marking the two-, three-, and four-gallon water lines on the outside of the bucket; dump the water and you have a marked bucket that may be reused indefinitely. As an alternative, you can purchase a pre-marked bucket.

Now, run the sprayer. Spray water out of the tank and into the bucket for one minute. If you collect more than your two-gallon target rate, reduce the operating pressure. If you collect less, increase the pressure. Continue to measure and adjust the output of the sprayer until you achieve your target rate. Now you can rest assured that your application equipment is calibrated to apply two gallons per minute. Be aware that there are practical lim-

its to changing the flow rate by altering the pressure. You may actually have to change the nozzle, first, and then adjust the pressure as needed.

Be sure to note the reading on the pressure gauge. Always set the throttle so that the pump runs at this pressure. As long as you don't change spray tips, change the hose diameter or length, or make any other modifications to your equipment, the truck sprayer should remain calibrated for the desired rate.

Some companies calibrate the truck sprayer at the beginning of each day. But if daily calibration is impractical, use the bucket check each day for a week to check for variation in the amount of water delivered. If it doesn't, then checking once a week throughout the season should suffice. Some companies require applicators to keep a daily chemical worksheet, showing calculations of the actual

amount of spray mixture used and the square footage treated. Numbers that don't calculate correctly indicate the need to recalibrate.

If there is a lot of variation in the amount of water delivered, the problem is that the pressure is not remaining constant. Check for the following situations that can impact nozzle pressure:

- partially blocked nozzle
- worn or soft hoses
- kinked hose
- blocked strainer
- worn pump pressure regulator

Once you rule these out, troubleshoot the pump.



Top: Measure the output of your application equipment for one minute.

Middle: The initial measurement yields half of the two gallons needed.

Bottom: Adjust the pressure to produce your goal rate of two gallons of water per minute.

Calibrating the Walking Speed: Working on Coverage

It may sound odd, but your next step is to train or “calibrate” your technician to cover 1000 square feet in approximately one minute. Since the equipment was just calibrated to spray 2 gallons per minute, the technician will be putting out two gallons per minute on each 1000 square feet. Mark a 1,000-square-foot area, preferably a 50 feet by 20 feet area of pavement. Start by having the technician pull the hose to the farthest point of that area. Then have him make parallel passes (often the most efficient way to make an application), working his way back to the sprayer while you time him.

If it takes the applicator two minutes to walk the area, he is applying four gallons of water instead of two (remember, you’ve set the truck sprayer at two gallons per minute). The goal is to have your technician walk the 1000 square foot area in one minute, so he will need to increase his walking speed until he can be timed consis-

tently to finish the area in approximately one minute while properly overlapping the spray and trimming the edges.

Be aware that new technicians will either walk very fast or very slow when they first begin this exercise. Those going too slow think they need to apply the material as if they were watering the lawn. Conversely, those that nearly run over the area are more worried about getting the area sprayed quickly. In fact, the goal blends both thoughts: complete the lawn in a timely manner, but walk slowly enough to achieve even coverage.



Using pavement for your practice runs allows you to easily detect bad application techniques, which can be corrected.

Calibrating Arm Motion: Working on Uniform Coverage

Just covering the 1000-square-foot area in one minute is not enough to guarantee success. Uniform coverage using a spray gun with a hose reel is almost totally dependent on the person at the end of the hose.

Start by putting water in the tank — no pesticides — and spray on level dry pavement so it will be easy to see the pattern as it dries. Watch, with the technician, as the pavement dries. Areas that dry more quickly than others indicate that too little water was applied; if a herbicide had been used, the result would be poor weed control. Areas that remain wet longer indicate over-application, which means wasted money and potential turf damage. Repeat the process until the technician gets uniform coverage.

Many new technicians have a tendency to drop their arm, spraying at their feet instead of spraying forward. When this happens, the hands and arms move too slowly as the applicator walks across the turf. During test spraying with water you may detect a “Z” pattern, which typically signals improper arm swing.



The technician has achieved uniform coverage when the pavement dries at an even rate.



Spraying at your feet and moving your arm too slowly (above) will produce uneven coverage (left).

Now it's time to put all of this to the test. Walk about two steps into the turf. That's about four feet; that measurement is used because generally a technician using a spray gun throws an eight-foot pattern (four feet on either side). In order to walk a straight line, the technician needs to focus on a point in the distance; this helps to keep the person from veering off to the right or left as they walk across the lawn.

Keep the arms up and out, and make sure to use a brisk, back-and-forth arm motion. Your goal is to swing the arm — not the wrist — fast enough to spray the weeds three times as you walk by: once with the front end of the spray, once with the middle, and once with the trailing edge. At the end of the first pass, turn off the spray gun. Walk over about two steps to get a fifty percent overlap of the previous pass. The edges of the eight-foot swath of herbicide are feathered; therefore, the overlap is necessary to ensure that the entire lawn gets the full application rate. Continue until the job is finished.

As the delivery rate decreases, you must increase arm motion across the front of the body to maintain adequate coverage (e.g., two arm swings per step are adequate when spraying at four gallons per 1000 square feet, but three swings per step are necessary when the delivery rate is lowered to 2 gallons per 1000 square feet).

The last thing to do is make the trim pass. You have overlapped everything except the edges that are parallel to the application. As you swung your arms toward those edges, the edges only received half rates. It is important that a full rate be applied because this is where weeds thrive and are easily observed by the customer. Go over the edges very quickly (approximately twice the normal application speed) so that another half rate is applied. Some companies make the trim pass first and then the remainder of the yard, but the steps and procedures remain the same.

The correct application begins by holding the application gun perpendicular to your body and focusing on a point in the distance. Only then do you pull the trigger and start walking toward that point, which helps you to keep walking straight.





The trim pass is vital to good weed control because the edges receive only a half-rate application without it.



Putting Product in the Spray Tank: Working on the Concentration

Now that your applicator is trained to walk 1,000 square feet per minute and your truck is calibrated to spray two gallons per minute, your spray volume is two gallons per 1000 square feet based on walking speed and lawn gun output.

Read the herbicide label and you'll see the manufacturer's recommended dosage normally is expressed in ounces per thousand square feet. A few labels list minimum and maximum spray volumes. Most manufacturers do not indicate the volume of water you

want to put in your spray tank; you will need to decide for yourself, based on personal experience. However, using more water also means the technician will have to fill the tank more often.

Example: the herbicide label says to apply two ounces of product per 1,000 square feet. It is important to notice that the label does not state the amount of product to add per gallon of water. Therefore, before adding anything to the tank we must first determine how many square feet we can spray with our tank.

Assume that you have a truck with a 500-gallon tank and an output of two gallons per 1000 square feet. How many square feet will the tank cover if the pump is calibrated to deliver two gallons of water per 1000 square feet? The answer is 250,000 square feet:

$$\text{Total sq. ft. covered by spray tank} = \frac{\text{500-gal. spray tank}}{2 \text{ gal.}} \times 1000 \text{ sq. ft.}$$

Because the herbicide label requires X ounces of product to be applied per 1,000 square feet, you'll need to figure out just how many 1,000 square-foot areas exist within your larger 250,000-square-foot area. The answer is 250 (250,000 square feet divided by 1,000 square feet).

For our example, two ounces of product are needed per 1000 square-foot area. Since you have 250 of those 1000-square-foot areas, you will need to mix 500 ounces of product (multiply 250 by two ounces) with your 500 gallons of water. In case you think you'll get tired measuring all 500 ounces by hand, just divide those 500 ounces by 128 ounces (there are 128 ounces in 1 gallon), and you'll come up with about four gallons of herbicide as the proper mix for 500 gallons of water.

Understanding how we arrived at the final number allows us to use this formula to calculate how many gallons of product are needed based on tank size, gallons of water per thousand square feet, and labeled rate.

$$\text{Ounces of product needed} = \frac{\text{Your tank size}}{\text{Your calibration rate (gallons water/1000 sq. ft.)}} \times \text{Label rate (per 1000 sq. ft.)}$$

Many believe that applying more water per thousand square feet will dilute the product, or that putting on less water will result in a very concentrated product. At first glance, this would seem logical. However, whether I apply two ounces of product per thousand square feet mixed in a practical application range of two, three, or four gallons doesn't make a difference. When the application is over and the water has evaporated, two ounces of product are left behind.

Let's change the previous example to three gallons of water (instead of two) per thousand square feet. Some may think we have diluted the concentration by adding more water, but have we? How much product do I need to mix in the tank to get 2 ounces per thousand square feet? The answer is about 333 ounces of product.

$$\frac{500\text{-gal. spray tank}}{3 \text{ gal./1000 sq. ft.}} \times 2 \text{ oz./1000 sq. ft.}$$

This is logical since the tank using three gallons per thousand square feet will cover less area than the tank using two gallons per square feet; therefore it should require less product added to the tank. So the adjustment is made at the end so that the amount of product put in the tank equals the amount listed on the label. The water has nothing directly to do with product rates, but the amount of water applied per 1,000 square feet is very important in determining how much area (i.e., how many 1,000-square-foot sections) a tank will cover and therefore how many ounces of product should go into the tank. While many herbicides work well under a wide range of water volumes, be sure to read each herbicide label carefully for exceptions.

In reading the instructions for application rates on most herbicide containers, you'll note that suggested rates vary significantly. For example, it is common for the manufacturer to suggest a rate of 1.5-3.0 ounces per 1,000 square feet. Experience and professional recommendations will help you determine the proper rate for your situation.



Double-Checking Calibration

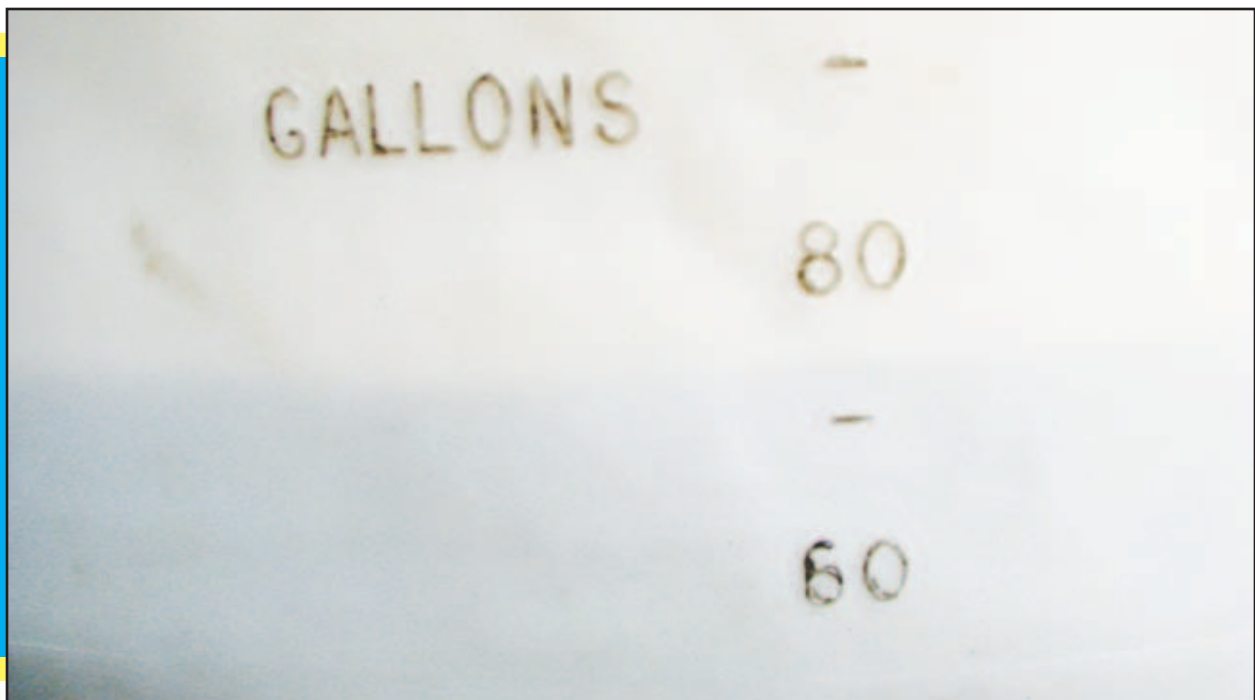
Calibrate periodically to ensure accuracy, and always recalibrate if sprayer equipment is replaced or repaired. Technicians and management should check sprayer calibration frequently. At a minimum, the truck equipment and the technician should be calibrated at the beginning of each spray season.

Technicians and management should make periodical checks to see that both the equipment and the technician stay calibrated. Consider the following suggestions.

Confirm the number of square feet treated by a technician on a given day; determine the amount of spray mix (based on number of times the tank was filled) used by the technician

on that day and compare actual rates versus calculated use rates. Large (more than 10–15 percent) discrepancies may indicate that the spray equipment needs a calibration check, that the technician needs to readjust their walking speed, or that the lawns are not being measured correctly.

Also remember turf weed control failure may not be the fault of the technician or faulty application equipment. Other factors, including the customer's cultural practices, the weather, and the season can cause poor weed, disease, and insect control. The cause of poor control may be determined only after a careful investigation of the affected turf areas.



Test Your Knowledge

Let's say that you plan to spray herbicides with a full 200-gallon tank that's calibrated with a lawn gun to apply 3 gallons of water per 1,000 square feet. The herbicide label says to apply 4 ounces of chemical per 1,000 square feet. How many gallons of herbicide should you mix with your 200 gallons of water, and how large an area will the mix cover?

Answer: You should mix 268 ounces (2.1 gallons) in your 200-gallon tank, and it will cover 67,000 square feet. (Divide 200 gallons by three gallons of water per 1000 square feet. This equals 67 units of 1000 square-foot blocks of grass, which is equal to 67,000 square feet of total area. Take 67 units and multiply by four ounces of chemical, and you get 268 total ounces of herbicide needed, or 2.1 gallons (268 ounces divided by 128 ounces per gallon.)

$$\frac{200\text{-gal. spray tank}}{3 \text{ gal.}} \times 4 \text{ ounces} = 268 \text{ ounces}$$

Instead of using three gallons of water, you decide you want to apply two gallons of water per 1,000 square feet under the same scenario. How much product would be needed?

Answer: You should mix 400 ounces or 3.1 gallons with your 200-gallon tank and it will cover 100,000 square feet. By reducing the amount of water, the tank will cover more square footage. By covering more lawns, the technician must adjust the herbicide rates to cover that increased area. In the end, both technicians are applying the same 4 ounces per 1,000 square feet.

Conclusion

The lawn care and landscape industry provides a service that allows customers to attain maximum enjoyment from their properties. Beautiful turf bordered by flowers, trees, and shrubs adds beauty and value to a home. Customers will walk through their property, appreciating the plants in their landscape and enjoying their outdoor living space. When a company does a great job, the beautiful lawn not only stands out but it is an example of the environmental benefits of turf that the entire community can enjoy. When a company fails to control the weeds, insects, or diseases, the turf can become an annoying eyesore.

The goal is to apply the proper amount of product on your customer's lawn to control insects, disease, and weeds. If it's too little or too much, you may get a call-back. An unhappy customer may rightly argue that your service didn't give her what she paid for. Service calls to correct such situations are conducted at no additional charge to the customer, which means that you absorb the cost and decrease your profit: product, time, fuel, and salaries are costly. More importantly, as you are losing money on the service call, you are also losing money that could have been made servicing a new customer. Put down the right amount of product to achieve a lawn that meets the customer's expectations and you will have fewer call-backs, more satisfied customers, and greater profits.



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