Calibrating Application Equipment

David Gerken
Oklahoma State University – Oklahoma City
Turfgrass Management

OKLAHOMA CITY America's Brightest ORANGE

Calculations

- Simple calculations are the key to many day-to-day activities of a turf manager.
- Fertilizers, pesticides, irrigation, topdressing
- Budgeting, ordering and application

- *Requires the ability to relate math principles to real-world situations.*

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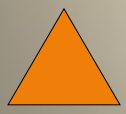
Area Calculations



- 1 Acre = 43,560 sqft.
- *Area of a square/rectangle* = Length x Width.
  - Example: and lawn area is 60 ft. long and 25ft. wide.
    - 60 ft. x 25 = 1500 sqft.
- Area of a Circle = 3.14(radius)^2
  - Example: a circle has a diameter or 80 ft.
    - 3.14(40ft) ^{2} = 5024 sqft.
- Area of a Triangle = Base x Height / 2
  - Example: base is 30 ft. long and height is 26 ft. high
    - 30 x 26 / 2 = 390 sqft.

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Conversion Factors

- 1 gallon = 4 quarts = 8 pints = 128 ounces
- 1 quart = 2 pints = 32 fl.oz.
- 1 pint = 16 oz.

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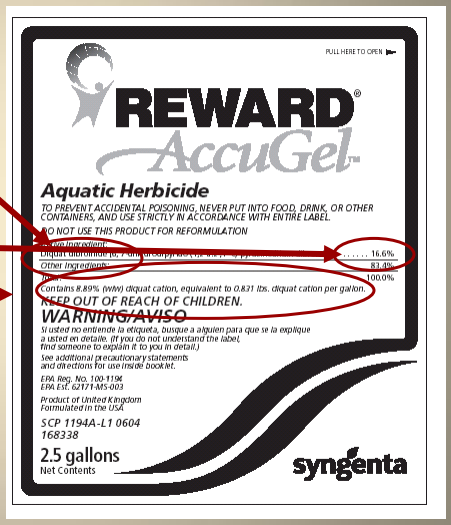
A Pesticide Label:

- **Common name** - a generic term assigned to the chemical and often is simpler version of the chemical name.
- **Active Ingredient** – Amount of actual chemical in the product.
- **Pounds of AI per Gallon for liquid formulations**
- **% AI for dry formulations**



PENDulum®
3.3 EC herbicide

FOR USE IN TURFGRASSES, ORNAMENTALS, LANDSCAPE OR GROUNDS MAINTENANCE, AND NONCROPLAND AREAS

ACTIVE INGREDIENT:
pendimethalin, N-(1-ethylpropyl)-3,4-dimethyl-2, 6-dinitrobenzenamine 37.4%
INERT INGREDIENTS* 62.6%
TOTAL 100.0%

(1 gallon contains 3.3 lbs. of pendimethalin)
*Contains Petroleum Distillates

EPA Reg. No. 241-341 EPA Est. No.

KEEP OUT OF REACH OF CHILDREN

CAUTION!/¡PRECAUCION!

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand this label, find someone to explain it to you in detail.)

Pendulum® 3.3 EC herbicide

MIXING INSTRUCTIONS FOR PENDULUM 3.3 EC (*continued*)

Ground Driven Sprayer:

1. Fill tank one-half to three-quarters full with clean water.
2. Add **Pendulum 3.3 EC** to the partially filled tank while agitating and then fill the remainder of the tank with water.
3. MAINTAIN CONTINUOUS AGITATION WHILE ADDING **Pendulum 3.3 EC** AND UNTIL SPRAYING IS COMPLETED. If the spray mixture is allowed to settle for any period of time, thorough agitation is essential before spraying is resumed. Continue agitation while spraying.
4. If **Pendulum 3.3 EC** is to be used in tank mixtures with other registered herbi-cides, then follow directions on the labels of those products which recommend tank mixing.

Backpack Sprayer: Begin with a clean spray tank. Fill the spray tank 1/2 full with clean water and add the required amount of **Pendulum 3.3 EC** to the sprayer. Cap sprayer and agitate to ensure mixing. Uncap sprayer and finish filling tank to desired level. Cap sprayer and agitate once again. During application it is desirable to agitate the mixture on occasion to ensure mixing. If the spray mixture is allowed to settle for any period of time, thorough agitation is essential before spraying is resumed.

Liquid Fertilizers: Prior to mixing, small quantities should always be tested using a simple jar test. Add the required amount of **Pendulum 3.3 EC** to half filled spray tank while agitating then add the fertilizer product. Complete filling spray tank to desired level.

Dry Bulk Fertilizers: **Pendulum 3.3 EC** may be impregnated on dry bulk fertilizers. When applied as directed, **Pendulum 3.3 EC**/Dry Bulk Fertilizer mixtures provide weed control equal to that provided by the same rates of **Pendulum 3.3 EC** applied in water.

SPRAYING INSTRUCTIONS FOR PENDULUM 3.3 EC

Apply with properly calibrated ground equipment in sufficient water per acre to provide uniform spray distribution (at least 40 gallons of water per acre). Low pressure (e.g. 20-40 psi) sprayers are recommended. Maintain continuous agitation during spraying with good mechanical or bypass agitation. Check sprayer routinely to determine proper calibration. Avoid overlaps that will increase rates above those recommended. Avoid application when winds may cause drift.

Avoid unintentional contact of spray solution with driveways, stone, wood or other porous surfaces. Rinse immediately to avoid staining.

$$\frac{40 \text{ gallons/ac}}{43{,}560 \text{ sqft/ac}} \times 1{,}000 = 0.92 \text{ gal/1,000 sqft}$$

TURFGRASSES

APPLICATION RATES FOR WEED CONTROL[1]

Turfgrass Species	Weeds Controlled	Rates of Pendulum 3.3 EC	Comments
WARM SEASON GRASSES			
Bahiagrass Bermudagrass Buffalograss Centipedegrass Fescue, tall St. Augustinegrass Zoysiagrass	crabgrass foxtail *Poa annua* barnyardgrass fall panicum oxalis prostrate spurge purslane knotweed evening primrose hop clover	**Residential[2] Turf Uses Only**: 3.6 to 4.8 pts./Acre or 1.3 to 1.8 oz./1,000 sq. ft. Initial application prior to weed germination in spring.	Apply a repeat application of 2.5 to 3.6 pts./Acre (1 to 1.3 oz/1000 sq. ft.) after 5-8 weeks if necessary.
	cudweed *Poa annua* chickweed lawn burweed henbit corn speedwell	2.6 to 4.8 pts./Acre or 1.3 to 1.8 oz./1,000 sq. ft.	Apply in late summer or early fall prior to weed germination.

$$\frac{3.6 \text{ pints}}{\text{Acre}} \quad \frac{\text{Acre}}{43{,}560 \text{sqft.}} \quad \frac{16 \text{ oz}}{\text{pint}} \times 1{,}000 = 1.3 \text{ oz/1,000sqft}$$

How much Product to Order?

- Rate is 3.6 pints per acre
- You take care of 25 acres of lawn turf.
- How much do I order?

$$\frac{3.6 \text{ pts}}{\text{acre}} \times \frac{25 \text{ acre}}{} \times \frac{\text{Gallon}}{8 \text{ pts}} = 11.25 \text{ gallons}$$

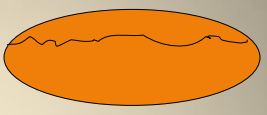
Hand Held Spray Gun Calibration

- Sprayer Volume Output
  - At least 40 gpa.
- Product Rate
  - 3.6 pts/acre
- For every 40 gallons of water in the tank, you add 3.6 pts.
- *That is assuming your sprayer output is 40 gallons per acre.*

Hand Held Spray Gun Calibration

- Fill the sprayer with a known amount of water. *A turf colorant could also be added to insure uniformity.*
- Mark off 1,000 sqft. Area.
- At a *consistent* walking *speed* and *pressure*, uniformly spray the marked area.
- Determine the amount of water it takes to re-fill the tank to the known mark.
- You sprayed out:
  - 1.5 gallons per 1,000 sqft.

or 65 gal./ac (1.5 x 43,560)
1,000



1, 000 sqft.
25 ft. x 40 ft.

We sprayed out 1.5 gallons of water

Hand Held Spray Gun Calibration

- The spray volume:
  - 1.5 gallons per 1,000 sqft.
- The pesticide rate:
  - 3.6 pts/ac or 1.3 oz/1,000sqft.

$$\frac{\text{Label Rate per 1,000 sqft.}}{\text{Spray Volume in gallons/1,000 sqft.}} = \text{Amount of pesticide added to 1 gallon of water}$$

$$\frac{\text{1.3 ounces per 1,000 sqft.}}{\text{1.5 in gallons/1,000 sqft.}} = \text{0.87 oz. product to 1 gallon of water}$$

Calibrating a Lawn Gun

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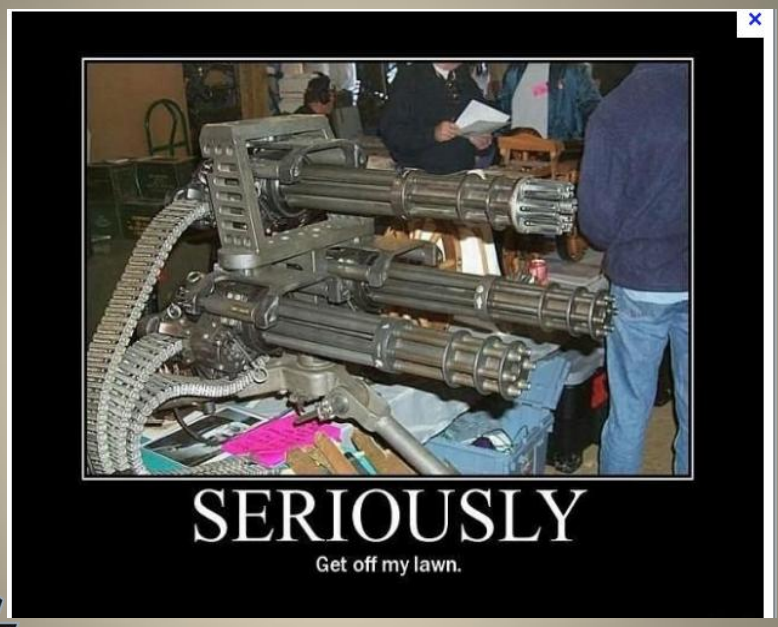

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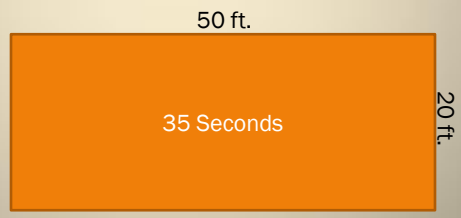
Lawn gun

- Lay out a rectangular area 50 ft long by 20 ft wide (1,000 ft2).
- Record the amount of time it takes for an applicator to uniformly apply water to this area.



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- Spray into a five-gallon bucket for the same amount of time. (35 Seconds)
- Measure the amount of water collected in the bucket in fluid ounces. (64 oz)
- Divide the amount of water collected by 128 *(1 gallon = 128 fluid ounces)* to calculate spray volume in gal/1,000 ft2.

64 oz. ÷ 128 oz./gal = 0.5 gal/1,000 ft2

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- For every 0.5 gallons of water in spray tank, add 1.3 oz. of product.

200 gallon water x $\frac{1}{0.5 \text{ gal water}}$ x 1.3 oz. = 520 oz. or 4 gal product

- To calculate the area that can be covered with one tank:
- Divide the gallonage in the spray tank by the spray volume

200 gallon spray tank ÷ 0.5 gallons/1,000 ft2 = 400 ft2/tank

Boom Sprayer Calibration

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Sprayer Calibration

The amount of chemical solution depends upon

- speed of travel
- nozzle pressure
- size of the nozzles
- spacing of nozzles

- **speed:**

$$\text{speed (mph)} = \frac{\text{distance traveled (ft) X 60}}{\text{time (sec) to travel distance X 88}}$$

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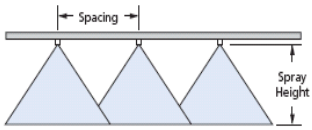
	PSI	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	40° GPA 4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH	20° GALLONS PER 1000 SQ. FT. 2 MPH	3 MPH	4 MPH	5 MPH
TF-†2 (50)	10	0.20	26	7.4	5.9	5.0	3.7	3.0	2.5	2.0	1.5	0.68	0.45	0.34	0.27
	20	0.28	36	10.4	8.3	6.9	5.2	4.2	3.5	2.8	2.1	0.95	0.63	0.48	0.38
	30	0.35	45	13.0	10.4	8.7	6.5	5.2	4.3	3.5	2.6	1.2	0.79	0.60	0.48
	40	0.40	51	14.9	11.9	9.9	7.4	5.9	5.0	4.0	3.0	1.4	0.91	0.68	0.54
TF-†2.5 (50)	10	0.25	32	9.3	7.4	6.2	4.6	3.7	3.1	2.5	1.9	0.85	0.57	0.43	0.34
	20	0.35	45	13.0	10.4	8.7	6.5	5.2	4.3	3.5	2.6	1.2	0.79	0.60	0.48
	30	0.43	55	16.0	12.8	10.6	8.0	6.4	5.3	4.3	3.2	1.5	0.97	0.73	0.58
	40	0.50	64	18.6	14.9	12.4	9.3	7.4	6.2	5.0	3.7	1.7	1.1	0.85	0.68
TF-†3 (50)	10	0.30	38	11.1	8.9	7.4	5.6	4.5	3.7	3.0	2.2	1.0	0.68	0.51	0.41
	20	0.42	54	15.6	12.5	10.4	7.8	6.2	5.2	4.2	3.1	1.4	0.95	0.71	0.57
	30	0.52	67	19.3	15.4	12.9	9.7	7.7	6.4	5.1	3.9	1.8	1.2	0.88	0.71
	40	0.60	77	22	17.8	14.9	11.1	8.9	7.4	5.9	4.5	2.0	1.4	1.0	0.82
TF-†4 (50)	10	0.40	51	14.9	11.9	9.9	7.4	5.9	5.0	4.0	3.0	1.4	0.91	0.68	0.54
	20	0.57	73	21	16.9	14.1	10.6	8.5	7.1	5.6	4.2	1.9	1.3	0.97	0.78
	30	0.69	88	26	20	17.1	12.8	10.2	8.5	6.8	5.1	2.3	1.6	1.2	0.94
	40	0.80	102	30	24	19.8	14.9	11.9	9.9	7.9	5.9	2.7	1.8	1.4	1.1
TF-†5 (50)	10	0.50	64	18.6	14.9	12.4	9.3	7.4	6.2	5.0	3.7	1.7	1.1	0.85	0.68
	20	0.71	91	26	21	17.6	13.2	10.5	8.8	7.0	5.3	2.4	1.6	1.2	0.97
	30	0.87	111	32	26	22	16.1	12.9	10.8	8.6	6.5	3.0	2.0	1.5	1.2
	40	1.00	128	37	30	25	18.6	14.9	12.4	9.9	7.4	3.4	2.3	1.7	1.4
TF-†7.5 (50)	10	0.75	96	28	22	18.6	13.9	11.1	9.3	7.4	5.6	2.6	1.7	1.3	1.0
	20	1.06	136	39	31	26	19.7	15.7	13.1	10.5	7.9	3.6	2.4	1.8	1.4
	30	1.30	166	48	39	32	24	19.3	16.1	12.9	9.7	4.4	2.9	2.2	1.8
	40	1.50	192	56	45	37	28	22	18.6	14.9	11.1	5.1	3.4	2.6	2.0
TF-†10 (50)	10	1.00	128	37	30	25	18.6	14.9	12.4	9.9	7.4	3.4	2.3	1.7	1.4
	20	1.41	180	52	42	35	26	21	17.4	14.0	10.5	4.8	3.2	2.4	1.9
	30	1.73	221	64	51	43	32	26	21	17.1	12.8	5.9	3.9	2.9	2.4
	40	2.00	256	74	59	50	37	30	25	19.8	14.9	6.8	4.5	3.4	2.7

Note: Always double check your application rates.
See pages 153-157 for useful formulas and information.

†Specify material.



Optimum Spray Height

20"	24"*
30"	30"*
40"	39"*

**Wide angle spray nozzle height is influenced by nozzle orientation. The critical factor is to achieve a minimum 30% overlap.*

See page 153 for more information.

How to order:
Specify tip number.
Examples:
TF-VS4 – Stainless Steel with VisiFlo color-coding
TF-VP4 – Polymer with VisiFlo color-coding

Things we Know!

- speed of travel = 4 mph
- nozzle pressure = between 20 & 30
- size of the nozzles = TF-7.5
- spacing of nozzles = 20 inches
- Spray Volume = 40 gallons per acre

Useful Formulas

$$\text{GPM (Per Nozzle)} = \frac{\text{GPA} \times \text{MPH} \times \text{W}}{5{,}940}$$

$$\text{GPA} = \frac{5{,}940 \times \text{GPM (Per Nozzle)}}{\text{MPH} \times \text{W}}$$

$$\text{GPM (Per Nozzle)} = \frac{\text{GAL/1000FT}^2 \times \text{MPH} \times \text{W}}{136}$$

$$\text{GAL/1000FT}^2 = \frac{136 \times \text{GPM (Per Nozzle)}}{\text{MPH} \times \text{W}}$$

$$\text{GPM (Per Nozzle)} = \frac{\text{GPA} \times \text{MPH} \times \text{W}}{5{,}940}$$

- speed of travel = 4 mph
- nozzle pressure = btwn 20 & 30
- size of the nozzles = TF-7.5
- spacing of nozzles = 20 inches
- Spray Volume = 40 gallons per acre (minimum.)

$$\text{GPM} = \frac{40 \text{ gpa} \times 4 \text{ mph} \times 20 \text{ in.}}{5{,}940} = 0.54 \text{ gpm}$$

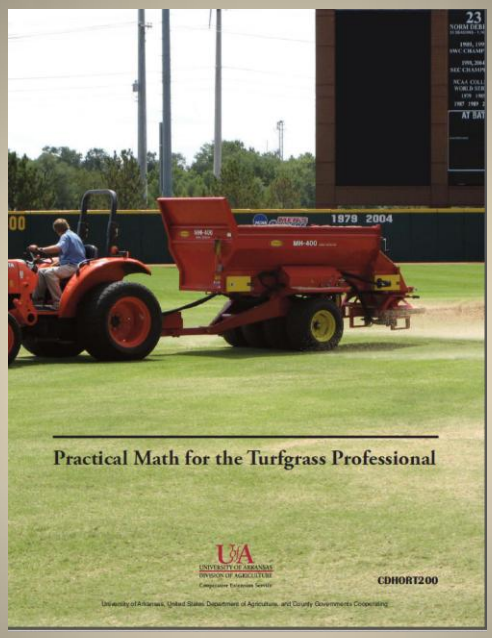
$$\frac{0.54 \text{ gallons}}{\text{Min.}} \times \frac{128 \text{ oz.}}{\text{Gal.}} = 69 \text{ oz. per minute}$$

- Adjust pressure to achieve desired output.
- Modify other factors, ie. Speed, nozzle size, etc.

$$\text{GPM (Per Nozzle)} = \frac{\text{GPA} \times \text{MPH} \times \text{W}}{5{,}940}$$

$$\frac{0.54 \text{ gallons}}{\text{Min.}} \times \frac{128 \text{ oz.}}{\text{Gal.}} = 69 \text{ oz. per minute}$$

- You have determined sprayer output is 40 gallons per acre.
- Pesticide rate is 3.6 pints/ac.
- For every 40 gpa of water add 3.6 pts/ac.
- Example:
  - 300 gallon tank / 40 gallons = 7.5 x 3.6 = 27 pints



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