**2010 National Agricultural Mechanics CDE team Activity Exercise:**
**Sprayer Calibration and Proper Chemical Mixing**
**Equipment Used:**
**John Deere 4730 Sprayer with 1000 gal tank capacity**

**Task:**

Using the recommendations set forth but the scouting company hired by Company X you will need to select and figure the following:

a. Correct sprayer nozzle tip

b. Correct amount of chemical, spray adjuvant, additive, and water/fertilizer needed for the acreage sprayed

Once the calculations are completed the team will go to the sprayer select and set up the correct nozzle for their specific scenario and collect a sample.

**Allowable Materials to be used:**

1. Chemical labels

2. Tee Jet Catalog

3. Calculator

**Answer the following questions. (Please leave a space between the questions and answers.)**

1. What is the correct Tee Jet® tip to be used for your scenario?

2. What is the recommended speed for the sprayer when using the correct tip?

3. To fill the sprayer tank how much of each given chemical or additive will be needed to make a full batch?

4. How many gallons of water or carrier will be needed for a full batch of mixture?

5. What is the correct sequence to follow when mixing the chemical batch?

6. Collect a sample from the sprayer for the specified amount of time. Using the width of the booms and recommended ground speed calculate the precise amount of product being sprayed per acre.

7. What should be changed to correctly apply the chemical for your given application?

8. Develop a team report using your answers from the questions in a paragraph form paying particular attention to questions 5 and 6. Make sure to look at the FINAL REPORT RUBRIC before completing the report.

**Scenario 1: Soybean Fungicide Application**

The scouting representative has recommended the following:

Application: Foliar

Pressure: 40 psi

Droplet Size: Very Fine

Chemical: Headline® 6 oz per acre

Total mix application rate: 12 gal per acre

Note: Use a Crop Oil Product with this application

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a. Correct sprayer nozzle tip

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Once the calculations are completed the team will go to the sprayer select and set up the correct nozzle for their specific scenario and collect a sample.

**Allowable Materials to be used:**

1. Chemical labels

2. Tee Jet Catalog

3. Calculator

**Answer the following questions. (Please leave a space between the questions and answers.)**

1. What is the correct Tee Jet® tip to be used for your scenario?

2. What is the recommended speed for the sprayer when using the correct tip?

3. To fill the sprayer tank how much of each given chemical or additive will be needed to make a full batch?

4. How many gallons of water or carrier will be needed for a full batch of mixture?

5. What is the correct sequence to follow when mixing the chemical batch?

6. Collect a sample from the sprayer for the specified amount of time. Using the width of the booms and recommended ground speed calculate the precise amount of product being sprayed per acre.

7. What should be changed to correctly apply the chemical for your given application?

8. Develop a team report using your answers from the questions in a paragraph form paying particular attention to questions 5 and 6. Make sure to look at the FINAL REPORT RUBRIC before completing the report.

**Scenario 2: Corn Fertilizer and Burndown Application**

The scouting representative has recommended the following:

Application: Direct/Foliar

Pressure: 40 psi

Droplet Size: Extremely Coarse

Chemical: Gramoxone® 3.5 pints per acre

Fertilizer: 160/60/60 Blend

Total mix application rate: 28 gallons per acre

Note: Use 1 gallon Crop Oil Product per 100 gallons of water and a Non Ionic Surfactant at a rate of 1 qt per 100 gallons of mix.

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**Task:**

Using the recommendations set forth but the scouting company hired by Company X you will need to select and figure the following:

a. Correct sprayer nozzle tip

b. Correct amount of chemical, spray adjuvant, additive, and water/fertilizer needed for the acreage sprayed

Once the calculations are completed the team will go to the sprayer select and set up the correct nozzle for their specific scenario and collect a sample.

**Allowable Materials to be used:**

1. Chemical labels

2. Tee Jet Catalog

3. Calculator

**Answer the following questions. (Please leave a space between the questions and answers.)**

1. What is the correct Tee Jet® tip to be used for your scenario?

2. What is the recommended speed for the sprayer when using the correct tip?

3. To fill the sprayer tank how much of each given chemical or additive will be needed to make a full batch?

4. How many gallons of water or carrier will be needed for a full batch of mixture?

5. What is the correct sequence to follow when mixing the chemical batch?

6. Collect a sample from the sprayer for the specified amount of time. Using the width of the booms and recommended ground speed calculate the precise amount of product being sprayed per acre.

7. What should be changed to correctly apply the chemical for your given application?

8. Develop a team report using your answers from the questions in a paragraph form paying particular attention to questions 5 and 6. Make sure to look at the FINAL REPORT RUBRIC before completing the report.

**Scenario 3: Cotton Defoliant Application**

The scouting representative has recommended the following:

Application: Band Spray

Pressure: 40 psi

Droplet Size: Extremely Coarse

Chemical: Cobra® 12.5 fluid ounces per acre

Total mix application rate: 20 gallons per acre

Note: Use 1.5 pints Crop Oil Product per 100 gallons of water

# TEAM EXERCISE DIRECTION SHEET

**1. Open the <u>2010 Team Activity Exercise</u> file and read thoroughly before starting the activity.**

**2. It is acceptable to have a team member go and look at the sprayer outside the building.**

**3. All chemical and spray additives are in the folder labeled <u>CHEMICALS</u>.**

**4. All need information is included on this CD.**

**5. If needed it is acceptable to print anything from the CD (*Final report and answer MUST be printed and turned to CDE staff for grading*).**

**6. If you need assistance please ask CDE Staff DO NOT TALK TO OTHER TEAMS or COACHES during the event.**

# *Sprayer Calibration*

**Proper calibration is probably the most important part of spraying. Properly calibrated sprayers will save you money and grief.**
**FOR EXAMPLE: How to determine the gallons per minute (per nozzle).**

$$GPM = \frac{GPA \times MPH \times W}{5940}$$

**(PER NOZZLE)**
**GPM - Gallons Per Minute**
**GPA - Gallons Per Acre**
**MPH - Miles Per Hour**
**W - Nozzle spacing (in boom spraying)**

**This formula is useful to determine which tip to use on your boom, especially when your nozzle spacing is different from the standard 20" or 40" nozzle spacing on Precision Products, Inc. Sprayers.**
**For example: You know you want to travel 5 MPH. You want to apply your chemical at a rate of 20 GPA, and your nozzle spacings are 33" on center. By using the formula you will determine how many gallons per minute (GPM) per tip will be required to give you the correct application.**

**20 GPA x 5 MPH = 100 x 33" (nozzle spacing) = 3300**
**now divide 3300 by 5940 - .556 GPM**

**You have now determined that you need a tip with GPM of .556. Now find the type of tip you want to use. For example, maybe an 80-degree flat fan spray tip and then determine what pressure you plan to spray at. Let's say 30 PSI. How do you check this calibration? By using this formula.**

$$GPA = \frac{5940 \times GPM\ (PER\ NOZZLE)}{MPH \times W}$$

**Multiply 5940 x .52 GPM = 3088.8. Now multiply 5 MPH x 33 (nozzle spacing) = 165, then divide 3148.2 by 165 = 19.08 gallons per acre.**
**By simply adjusting your pressure or your tractor speed you will obtain the 20 GPA rate.**

**This second formula is useful to determine whether an old tip (one on which you cannot identify the number) is still spraying the right amount of chemicals. How do you determine how many GPM a tip is spraying? With the use of a catch jar and a stop watch. Hold the catch jar under the tip so you catch the total spray and time for one minute. The amount in the jar indicates the GPM.**

**Calibrate your sprayer carefully. If your tips are worn, replace them. New tips are a fraction of the cost compared to the cost of chemicals and crop damage caused by too little or too much chemical being applied. Also use these formulas to help determine if the pump intended to be used has the volume capacity to meet your spraying needs.**

**Precision Products, Inc.**

**2010 National Agricultural Mechanics Team Activity**

# QUICK TIPS FOR CALCULATIONS

1 gallon = 4 quarts = 8 pints = 16 cups = 128 fluid ounces

1 quart = 2 pints = 4 cups = 32 fluid ounces

1 pint = 2 cups = 16 fluid ounces

1 cup = 8 fluid ounces = 16 tablespoons

1 gill = 1/2 cup = 4 fluid ounces = 8 tablespoons

1 fluid ounce = 2 tablespoons

1 tablespoon = 1/2 fluid ounce = 3 teaspoons

Acreage = 208.7 feet x 208.7 feet

43,560 sq feet per acre

One mile = 5,280 feet

Formula to figure area covered by equipment:

$$\text{Acreage covered per hour} = \frac{\text{MPH x Implement width x 5,280}}{43{,}560}$$

**National FFA Agricultural Mechanics Career Development Event**
**Team Activity Final Report Scoring Rubric**

| CRITERIA | Very strong evidence skill is present (100-90%) | Moderate evidence skill is present (89-60%) | Strong evidence skill is not present (59-0%) | WEIGHT | TOTAL SCORE |
|---|---|---|---|---|---|
| | | | | | |
| ***Cover Page with Title and State Name*** | • Cover page contains both required items. | • Cover page is missing one required item. | • Cover page is missing both required items. | X1 | |
| ***Description of activity*** | • Contains a complete description of the team activity. | • Missing one component of the team activity. | • Missing two or more components of the team activity. | X3 | |
| ***Description of roles of team members to complete activity*** | • Contains a complete description of roles and safety measures used by all team members completing the activity. | • Contains a vague description of roles and safety measures used by team members completing the activity. | • Fails to describe the roles and safety measures used by team members completing the activity. | X3 | |
| ***Section to include calculations, diagrams, tables, figures, etc. related to specific CDE activity theme and identified by instructions*** | • This section of the report includes all required items as specified in activity directions. | • This section of the report is missing one required item. | • This section of the report is missing two or more required items. | X5 | |
| ***Grammar, Punctuation, and Spelling*** | • Spelling, grammar and punctuation are of extremely high quality with less than 2 errors throughout the report. | • Spelling, grammar and punctuation are adequate with 3-5 errors present throughout the report. | • Spelling, grammar and punctuation are less than adequate with 6 or more errors present throughout the report. | X2 | |
| ***Professional Format***<br>• Typed in a 12 point type font,<br>• 1" margins,<br>• Double spaced. | • Report is extremely neat and professional looking with all three required formatting criteria being present. | • Report is reasonably neat and professional looking with two of the required formatting criteria being present. | • Report is very unprofessional in appearance with one or none of the required formatting criteria being present. | X2 | |