2012 Stansbury FFA Agricultural Technology and Mechanical Systems

Career Development Event

Forage Production Theme

February 7, 2012

This contest is neither put on nor sponsored by the Utah FFA Association

Introduction

Technological advances in America continue to influence the way students must prepare for their futures. Students entering the workforce need a strong knowledge base and the ability to comprehend the interaction of complex systems. Employers want productive workers and managers that can access and use a broad range of information. The most sought after employees are those who communicate effectively, continue to stay current with modern technology and work successfully and effectively as individuals and as team members. Students with these skills and abilities are more competitive in the job market, receive financial rewards and are selected for advancement.

Agricultural technology and mechanical systems is comprised of strong technical content and complimented by the development of practical, hands-on skills. The subject matter areas and skill development practices have been grouped into five 'systems' areas, so named because of the complex interaction and synergistic processes common to agriculture. The term 'system' is used to emphasize the interactive relationship between each area of agricultural technology and mechanical systems. These five systems areas are described and examples appear on the pages that follow.

Each agricultural technology and mechanical systems activity is in response to a problem or need encountered in the workplace. The solving of such problems is dependent upon how each decision or solution, imposed on one component, will influence the other system components. Solving one component of a problem without using a "systems approach" can, and often does, result in additional problems. An example of where this has occurred is observed in the many obstacles that agricultural producers currently face regarding environmental pollution, ground water contamination and stricter governmental regulations. Decisions and solutions made earlier in this century have impacted the environment negatively and resulted in a new set of problems.

The intent of this contest is to broaden student knowledge in the agricultural mechanics field, while building student confidence and providing them a completive event in which to demonstrate their skills. Resources will be provided to aid students in each of the skill areas and team activity that will closely emulate the national contest format. In most cases examples will be provided to assist you in gaining confidence in each of the skill areas. This information packet is provided as a guide in preparing you for a successful contest at Stansbury High School.

Contest Location and Contact Information -

Stansbury High School
5300 N. Aberdeen Ln.
Stansbury Park, UT 84074

Steven Babbitt
208-539-1756 (cell)
sbabbitt@tooeleschools.org

Registration Fee- $40 per Team

Contest Registration- 8:00 a.m.

Contest Start Time- 8:30 a.m.

E-mail Steven Babbitt if you wish to enter a team at sbabbitt@tooeleschools.org this contest will be limited to 14 teams on a first come first serve basis. A list will be made of schools wishing to enter a second team, in the event that we do not have 14 schools participating. Second teams from each school will be drawn out of a hat to determine which schools will be allowed to bring an additional team.

2012 National FFA Agricultural Technology and Mechanical Systems Career Development Event Theme

Materials Handling Systems

Stansbury High School Contest Emphasis

Forage Production

Contest Outline-

1. Written Examination
2. Team Activity
3. Five Individual Activities

Schedule-

Group 1	
Orientation	8:30-8:55
Test	9:00-10:00
Team Activity	10:05-12:05
Lunch	12:05-12:45
Individual Activity	12:50-1:15
Individual Activity	1:20-1:45
Individual Activity	1:50-2:15
Individual Activity	2:20-2:45
Individual Activity	2:50-3:15
Awards	3:30

Group 2	
Orientation	8:30-8:55
Individual Activity	9:00-9:25
Individual Activity	9:30-9:55
Individual Activity	10:00-10:25
Individual Activity	10:30-10:55
Individual Activity	11:00-11:25
Lunch	11:25-12:05
Test	12:05-1:05
Team Activity	1:10-3:10
Awards	3:30

Content Areas for the Event-

The career development event will be developed from the following subject matter topics described under the five systems areas listed below.

- **Machinery & Equipment Systems**- repair, maintenance, processing, materials handling, adjustments
- **Electrical Systems**- AC/DC power, electrical safety , electrical standards, sensing devices, electrical wiring, controls, electronics, motors and other electrical loads, operating instructions, and manufacturer's recommendations.
- **Energy Systems**- mechanical power, electrical power, chemical power, wind power, solar power
- **Structural Systems**- storage, handling, disposal, concrete, plumbing, structural material selection, heating, ventilation, air conditioning
- **Environmental/Natural Resource Systems**- water quality, material compatibility, soil and water conservation, disposal of waste

Individual Skills Activities for this Event-

- **Machinery & Equipment Systems**- Planting/Harvesting Equipment Hydraulic Systems (failure and repair)
- **Electrical Systems**- Center Drive Pivots
- **Energy Systems**- Service Automatic Lubrication Systems (installation and repair)
- **Structural Systems**- Building Foundation/Footings (Layout and Forming)
- **Environmental/Natural Resource Systems**- Calibration Calculations (Recommendations and Replacement)

General Rules for the Event-

1. **PERSONAL PROTECTIVE EQUIPMENT-**All team members must wear safety glasses during the entire event.
2. ALL STUDENTS WILL NEED A CALCULATOR AND A TAPE MEASURE FOR THE ENTIRE CONTEST. They will be used in each of the individual activities.
3. **USE OF HAND CALCULATORS-**Each team member will need a calculator to complete the multiple-choice examination and the skill activates. Students will **not** be allowed to share a calculator during the examination. The team activity will also require calculators, but team members may share them during this activity. **Phones are not Calculators.**
4. Computers will be provided for each team.
5. The skills activities, team activity, and test are neither selected by nor associated with the State or National FFA contests. Any similarities are strictly coincidental.

Scoring Information for the Event-

1. Individual Scoring
    a. Written Examination- 50 multiple-choice — 50pts
    b. Individual activities (5 at 30 points each) — 150pts
    c. Team activity (1/3 of total team score) — 133.33pts
    Total Possible Individual Score — **333.33**
2. Team Scoring
    a. Top three written examinations — 150pts
    b. All individual activities for top three — 450pts
    c. Team activity — 400pts
    Total Possible Individual Score — **1000**

3. Tiebreakers- The win will go to the team with the individual or team with the highest written examination score(s). If still tied, the win will go to the highest problem-solving/skill scores. If still tied, the win will go to the highest team problem-solving score.

Written Examination- Materials Handling Systems

The written examination will consist of 50 multiple choice questions completed on a scantron. Students will have 60 minutes to complete this portion of the contest. The test will consist of 10 questions developed from each of the five systems areas listed below. These questions are bases around mathematical calculations in agriculture. Conversions will be a major part of the test including percentages, ounces to gallons, gallons per acre, area and volume, distance in feet yards and miles, flow in gallons per minute and gallons per hour, ect. ect.

- **Machinery and Equipment Systems**: repair and maintenance, materials handling, processing, adjustments, metal fabrication
- **Electrical Systems**: AC/DC power, electrical safety, electrical standards, sensing devices, electrical wiring, controls, electronics, motors and other electrical loads, operating instructions, and manufacturer's recommendations
- **Energy Systems:** mechanical power, chemical power, wind power, solar power, hydraulic power, engine operation, maintenance, trouble-shooting, repair
- **Structural Systems**: structures, storage, concrete, masonry, plumbing, electrical, fabrication, construction, building materials, ventilation, heating, air conditioning
- **Environmental and Natural Resource Systems**: water quality, sustainable agricultural practices, soil and water conservation, biological waste handling

Sample Questions:

1. International Blue Print Standards are written in mm instead of inches. What is the length of pipe in inches that measure 2800 mm?
    a. 110 ¼"
    b. 120 ½"
    c. 128"
    d. 100 ¾"

Answer: **A** **(Solution: 2800/25.4=110.24 ~ there is 25.4mm per inch)**

2. The foundation for a new shop has a total length of 240 linear/ft. Each linear foot will require 1.8 cubic ft of concrete. How many cubic yards will be required for the foundation?
    a. 12 cubic yards
    b. 16 cubic yards
    c. 24 cubic yards
    d. 240 cubic yards

Answer: **B**

(Solution: 240*1.8=432 total cubic ft. 432/27=16 ~ there are 27 cubic feet in a cubic yard)

Individual Skills Activities- Materials Handling Systems

Machine & Equipment Systems Skill Activity- Hydraulic Systems

All students must wear safety glasses during the skill activities. To enter the CDE area, students must have safety glasses in their possession.

Hydraulic systems are a great asset to the agriculture industry; they are found on boom sprayers, loaders, planters, harvesters, and bailers. Neglect to these systems can be a great hazard to you and your equipment.

Students should be prepared to perform routine maintenance, assess failures and make recommendations based off of the attached Lion Hydraulics guide.

Suggested References for Activity:

- http://www.monarchindustries.com/lion-hydraulics/wp-content/uploads/lion_buyers_guide.pdf
- http://www.peterverdone.com/archive/files/hydraulic%20system%20theory.pdf

Electrical Systems Skill Activity- Center Pivot Wiring

All students must wear safety glasses during the skill activities. To enter the CDE area, students must have safety glasses in their possession.

Central pivots are a vital part of today's agricultural production. It is essential that proper maintenance occur regularly to avoid accidents in the field and electrical shock. Pivots use 480 volt electricity to operate and transformers to reduce power to certain parts of the pivots operational system.

Students should be familiar with each of the electrical components from center drive motors to the micro switches that align each of the towers and be able to test and wire each of these components.

Suggested References for Activity:

- http://www.valleyirrigation.com/userfiles/file/ValleyCenterPivots_LR.pdf
- http://catalog.wegelectric.com/img/Wiring_Diagrams.pdf

Energy Systems Skill Activity- Centralized Automatic Lubrication Systems

All students must wear safety glasses during the skill activities. To enter the CDE area, students must have safety glasses in their possession.

Automatic lubrication systems spread lubricant from a central source to the points on a machine at which friction occurs. In this way, wear is minimized and in some cases the heat generated by the friction is dissipated with the help of the lubricant. With technology, automatic grease systems are becoming more popular in the agriculture industry.

Students should be prepared to work on centralized automatic lubrication systems; to include general maintenance and repair as needed.

Suggested References for Activity:

- http://www.lincolnindustrial.com/home.asp
- http://www.flocomponents.com/

Structural Systems Skill Activity- Building Foundation/Footings

All students must wear safety glasses proper during the skill activities. To enter the CDE area students must have safety glasses in their possession.

There are several factors that must be evaluated when constructing a building. Estimating the proper amounts of concrete is one of the most essential skill when bidding and pouring concrete. Footing placement and bolt patterns are crucial to building layout and construction.

Students should be able to read building plans, understand volume of a linear foot foundation and a cylindrical footing. Calculate cubic feet and convert their calculations to cubic yards. (Hint: know the volume formula and conversion from cubic feet to cubic yards. Rectangular volume = lwh, Cylinder volume = $\pi r^2 h$) Students should also be prepared to work with concrete and other materials they would use while forming a foundation/footing for an agriculture building.

Suggested References for Activity:

- http://www.williamsform.com/Concrete_Anchors/Cast_in_Place_Concrete_Anchors/cast-in-place_con_anchors.html - J-Bolt

Environment and Natural Resource Systems Skill Activity- Boom Sprayer

All students must wear safety glasses proper during the skill activities. To enter the CDE area students must have safety glasses in their possession.

Utilizing advancements in technology is what has made America the greatest producer in the world. It is focusing on the little things that produce the biggest results.

Students should be able asses a sprayer system, calculate flow based on pressure and flow, and make nozzle changes as necessary for broadcast and band spraying on a wet boom.

Suggested References for Activity:

- http://www.teejet.com/english/home.aspx
- http://publications.tamu.edu/publications/Pests/sprayercalibration.pdf

Team Activity
Forage Equipment Fabrication

All team members must wear safety glasses during the team event. To enter the CDE area, students must have safety glasses in their possession.

Team members will work together to complete the activity in two hours. This team event is worth 400 points. If a team member exhibits or performs any unsafe practice, points will be deducted from the total team score.

Students will be working in the welding shop throughout the entire team activity and will need all personal protective equipment to measure, cut, weld, and fabricate in this team activity.

This year contestants will be required to read and interpret blueprints, accurately use a tape measure and then utilize a selected metal joining process to fabricate or repair a mild steel part. Reading a basic blue print, reading a tape measure and squaring material will be essential to the success of this skill area. Knowing how to set a Miller XMT 350 cc/cv for wire speed, gas flow and volts will be necessary to perform the required welds. We will be running a .035 wires and C25 gas for this welding activity. Speedglass auto-darkening helmets will be provided for student to use, however, they are welcome to bring their own helmet if they prefer.

Students should also know how to weld A36 mild steel from 16 Gauge to 1/4 inch steel; to include edge, corner, lap, and tee joints to be successful with this team activity.

Equipment Provided: The major equipment and materials will be provided for students to complete the entire team activity, including:

- Material for team activity
- Blueprints
- Grinders
- Welders (GMAW)
- Earplugs
- Faces Shields

Equipment provided by the Team:

- Safety glasses for each team member
- Tape measure
- Pencils
- Calculator
- For the team activity students will need to be capable of reading blueprints.

Suggested References for Activity:

- http://www.engineersedge.com/gauge.htm

Additional Information:

- This is a guideline to the contest changes may be made as needed
- Lunch will be provided at the contest
- An example scoring rubric for the team activity will be provided at a later date.
- Example test questions will be provided at a later date.
- Advisors bring your welding PPE (we will have a Millermatic 350P, a Miller Dynasty 350, and a Miller XMT 350 MPa for you to demo.)

Appendix:

Appendix 1- Separate Excel files (XMT 350 CC/CV Welding Guide)

Short Circuit Transfer *(generally used for thinner metals and out of position welding)*	Spray Arc Transfer *(generally used for thicker metals in the flat or slightly horizontal position)*
Material Thickness	**Material Thickness**
22 Gage	**22 Gage**
Wire Size & Wire Feed Speed:	**Wire Size & Wire Feed Speed:**
.030" (0.8 mm) at 90-100 ipm	**Not Recommended**
Shielding Gas & Voltage Range:	**Shielding Gas & Voltage Range:**
CO_2: 16-17 Volts 75% Argon/25% CO_2: 15-16 Volts	**Not Recommended**
CO_2 gas is economical and has deeper penetration on steel, but may be too hot for thin metal. 75% Argon / 25% CO_2 is better on thin steels, has less spatter and better bead appearance.	**Amperage Range:**
Amperage Range:	**Not Recommended**
40-55	

Steel Welding Wire:

For steel, there are two common wire types. Use an AWS classification ER70S-3 for all purpose, economical welding. Use ER70S-6 wire when more deoxidizers are needed for welding on dirty or rusty steel.

Must be used with CO_2 or 75% Argon/25% (C-25) shielding gas

Indoor use with no wind

For auto body, manufacturing, fabrication

Welds thinner matierals (22 gauge) than flux cored wires