



MACHINERY & EQUIPMENT SYSTEMS

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ASSOCIATE SUPERINTENDENT CONTACT INFORMATION

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PURPOSE

This skill activity evaluates students' knowledge and ability to maintain, repair and troubleshoot machine and equipment systems used in modern agriculture operations. Students should be familiar with the fundamentals of machine operation, safety, maintenance, system operations, and best management practices.

MACHINERY

One of the largest aspects of the world's agricultural industry is crop production. This year, the Machinery and Equipment Systems Skill will emphasize the integration of machinery in agricultural production, particularly focusing on the movement of agricultural commodities. To effectively carry out these tasks, agricultural professionals must be knowledgeable about machinery management, selection, and maintenance. In 2025, students will be required to complete activities involving a round baler, specifically a John Deere 461M model.

- The machine will be a John Deere 461M round baler.

Note:

- All students must wear safety glasses during the skill activities and must have them in their possession to enter the CDE area.
- Students should be familiar with the following concepts found in the current Agricultural Technology & Mechanical Systems CDE Handbook at <https://ffa.box.com/v/2025-Ag-Tech-Mech-Sys-Handbook>.

****Teachers and Students, due to the size of the machinery that will be used in this year's Machinery and Equipment Skill Activity, the machine could be positioned outside. Therefore, please be ready for inclement weather and low temperatures. ****

Possible activities for the 2025 event

- Identify parts of the machine
- Calibrate ground speed of the machine
- Calculate land area
- Calculate land, seed populations, and harvest loss, harvests, and capacities
- Identify maintenance requirements for the machinery
- Perform maintenance on the machinery
- Adjust components on the machinery
- Select lubricants for the machinery
- Identify functions of the machinery
- Prepare machinery for storage
- Explain principles of machinery management
- Identify repair procedures and techniques for machinery

- Check and adjust drive-line components on machinery
- Adjust equipment hitches and drives for machinery
- Select and use test equipment including meters, tachometers, and timing devices to determine proper machine operation for machinery
- Adjust equipment for field and crop conditions for machinery
- Select and use appropriate safety equipment for machinery
- Identify safe machinery operation practices for field and highway conditions for machinery
- Select fuels, lubricants, and hydraulic fluids and coolants for proper operation for machinery
- Operation and interpretation of circuit diagrams and flowcharts for: electrical, hydraulic, fuel, oil, cooling, intake, and exhaust systems for machinery

Event-Related Competencies

- Identify safe machinery operational practices.
- Identify the recommended service and maintenance operations from the operator's manual.
- Select lubricants for machinery and equipment.
- Identify functions of machinery components.
- Identify safe adjustment [level] on power equipment.
- Identify repair procedures, techniques and materials.
- Install, adjust and service belt and chain drives.
- Inflate tires to proper air pressure (e.g., load inflation tables).
- Select tools and materials for specific repair jobs.
- Select and use appropriate safety equipment.
- Identify the recommended service and maintenance operations from the operator's manual.

Agriculture, Food, and Natural Resources Content Standards

- CST.01.02.01.b.
- CST.01.02.01.c.
- CST.01.02.02.b.
- CST.01.02.02.c.
- PST.01.02. Performance Indicator: Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations.
- PST.01.02.01.b.
- PST.01.02.03.b.
- PST.01.02.03.c.
- PST.02.01.02.c.
- PST.02.02.01.c.
- PST.02.02.02.b.
- PST.02.02.02.c.
- PST.03.02.01.b.
- PST.03.02.02.b.
- PST.03.02.02.c.
- PST.03.03. Performance Indicator: Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).

RESOURCES

Books

- Field, H. L., & Solie, J. B. (2007). *Introduction to Agricultural Engineering Technology, A problem Solving Approach* (3rd ed.), American Society of Agricultural and Biological Engineers. ISBN # 978-0-387-36915-0
- Herren, R.V. (2015). *Agricultural mechanics: Fundamentals and applications* (7th ed.), Cengage Learning. Stamford, CT. ISBN # 978-1-285-05895-5
- Hunt, D. (2016). *Farm power and machinery management* (11th ed.), Waveland Press, Inc. Long Grove, IL.

Fundamentals of Service Series,

John Deere Publishing (2015), John Deere Publishing. Davenport, IA.

- *Preventative maintenance.*
- *Bearings and seals.*
- *Electronic and electrical systems.*
- *Engines.* John Deere Publishing. Davenport, IA.
- *Fuels, lubricants, coolants, and filters.* John Deere Publishing. Davenport, IA.
- *Hydraulics.*
- *Hydraulic systems diagnostics.*
- *Powertrains.*
- *Belts and chains.*
- *Fasteners.*
- *Hoses, tubing, and connectors.*
- *Tires and tracks.*

Fundamentals of Machine Operation,

John Deere Publishing (2015), John Deere Publishing. Davenport, IA.

- *Preventative maintenance.*

Online References

Field Capacity

- <http://www.caes.uga.edu/departments/bae/extension/handbook/documents/capacity.pdf>
- <https://www.extension.iastate.edu/agdm/crops/html/a3-24.html>
- <http://ag.arizona.edu/crop/equipment/agmgtable3.pdf>

Machinery Management and Economics

- <https://www.extension.iastate.edu/agdm/crops/html/a3-29.html>
- <https://www.extension.iastate.edu/agdm/crops/html/a3-27.html>