



LEAD ACID BATTERIES

HOSTA Task Sheet 4.6.2

NATIONAL SAFE TRACTOR AND MACHINERY OPERATION PROGRAM

Introduction

Lead acid batteries provide a source of electrical current to start an engine and power tractor accessories, such as lights, emergency flashers, instrument panel gauges and meters, computerized digital read-outs, and other machine functions. Tractor electrical power may be used to operate and monitor functions of towed equipment.

Battery electrical current results from a chemical reaction produced by sulfuric acid and water mixture. This chemical solution, called electrolyte, can burn your skin and eyes. The energy produced is stored as positive (+) and negative (-) electrical charges on the battery plates. An explosive gas is produced by this reaction as the battery charges and discharges.

Modern tractors may have one or two batteries to provide current to the starting motor (starter).

Correct battery care and use will provide countless starts of the tractor engine in a safe manner.

This task sheet discusses battery construction, battery hazards, and battery care and safety.

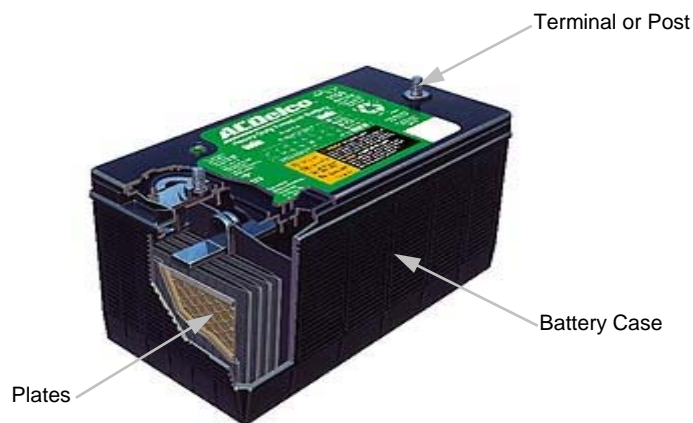


Fig. 4.6.2.a. Battery Construction. Inside the battery case are plates, which hold the electrical charges (+) and (-) and sulfuric acid-water mix. Also in the battery case are the connections to the battery terminals (posts). These terminals also extend outside the battery case. Battery cables connect the posts to the starter motor and a grounding surface.

Parts of a Battery

<u>Battery Part</u>	<u>What it Does</u>
Battery Case	A container to hold the battery acid solution and electrical storage plates
Battery Plate	Holds electrical charges (+) and (-)
Terminals	Connected to the storage plates and become the connecting points for battery cables leading to the starter (+) and the ground (-)

Use of safety goggles and protective clothing is a must when working with a lead acid battery.

Learning Goals

- To identify battery parts and functions
- To become familiar with hazards of lead acid batteries
- To use safe practices in working with and caring for batteries

Related Task Sheets:

Using a Battery Charger	4.6.3
Using Jumper Cables	4.6.4

Battery Hazards

Hazard	Definition	Safety Precautions
EXPLOSIONS	Battery acid produces hydrogen gas, which is explosive. A spark can lead to fire (dust, chaff, etc., around the battery) or explosion of hydrogen gas from the battery itself.	Check fluid level often to prevent gas buildup. Maintenance of fluid levels reduces the space in a battery where gases can accumulate.
CHEMICAL BURNS	The electrolyte solution in a battery is caustic to the skin and eyes and can burn holes through clothing.	Use splashproof safety goggles and rubber gloves. Keep the battery posts clean of corrosion.
ELECTRICAL SHOCK	The electrical charge of a battery may be only 12-26 volts, but with the effects of the ignition coil on spark ignition engines may produce voltages in the range of 100,000 volts. You can receive a severe shock. Wiring and electrical parts can be damaged.	Keep tools and parts away from the positive (+) terminal. It is best to remove the ground cable first when removing a battery or working on any part of the electrical system. When replacing the battery, connect the ground cable last.

Battery Safety Practices

1. Check battery fluid levels often. Low electrolyte levels increase the space where hydrogen gas can accumulate.
2. Prevent electrical sparks by keeping tools and parts away from the positive (+) terminal. The battery cable leading to the starter is usually the positive, or "hot" wire. Cap it with an insulating material when working near it.
3. When removing a battery for replacement or bench work, remove the ground cable first.
4. When replacing a battery, install the ground cable last.
5. Use safety goggles, long sleeves, and rubber gloves when refilling battery liquid. Distilled water is recommended for the refill. Any clean water can be used in an emergency if the battery is nearly dry.
6. Keep battery terminals clean of corrosion for best electrical contact. Prevent the corroded material from getting on your skin or in your eyes.
7. If you spill battery acid on your skin, flush it off with water immediately.
8. If you splash battery acid in your eyes, flush with warm water for at least 15 minutes. Seek medical attention.

Safety Activities

1. Check the fluid (electrolyte) level in your family's car, truck, riding mower, or tractor if it has fluid fill caps. If there are no fill caps, observe how the battery is checked for electrolyte. Use eye and skin protection.
2. With the help of an adult supervisor, clean the battery terminals of a corroded battery by removing the battery cables (ground cable first and positive or "hot" cable last). Use a battery terminal cleaner or mixture of baking soda and water. Re-attach battery cables with the "hot" or positive first and the ground cable last.
3. Search the Internet to learn more about batteries. One source is www.ACDelco.com. You can also use www.ask.com to ask questions about the batteries, their construction and operation.

References

1. www.ACDelco.com
2. Farm and Ranch Safety Management, John Deere Publishing, 1994.
3. www.ask.com

Contact Information

National Safe Tractor and Machinery Operation Program
The Pennsylvania State University
Agricultural and Biological Engineering Department
246 Agricultural Engineering Building
University Park, PA 16802
Phone: 814-865-7685
Fax: 814-863-1031
Email: NSTMOP@psu.edu

Credits

Developed, written and edited by WC Harshman, AM Yoder, JW Hilton and D J Murphy, The Pennsylvania State University. Reviewed by TL Bean and D Jepsen, The Ohio State University and S Steel, National Safety Council. Version 4/2004

This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement No. 2001-41521-01263. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.