

East Penn's Recommended Guide to Battery Maintenance

MOTIVE POWER BULLETIN

Batteries are an important investment to keep a warehouse, manufacturing plant, or distribution center running at peak efficiency. Protecting that investment, maximizing its reliability and performance, and preventing unnecessary downtime should start the day the battery arrives at the facility. The initial inspection and the development of a proper battery maintenance program is essential to all batteries to keep them operating in peak condition and at optimal efficiency.

East Penn has developed recommended battery maintenance guidelines for the lifetime of its Deka Battery product. Following these guidelines will ensure the maximum benefit and value from the battery.

Prior to working on any battery it is important to follow the proper safety instructions found in the Deka Industrial Battery Service Manual (0656).

BASIC RULES FOR BATTERY CARE AND MAINTENANCE

RULE 1: BE CAREFUL! ALWAYS WEAR FACE SHIELD OR SAFETY GLASSES WHEN WORKING ON OR NEAR BATTERIES!

⚠ DANGER			
HIGH VOLTAGE... RISK OF SHOCK. DO NOT TOUCH UNINSULATED TERMINALS OR CONNECTORS.	SHIELD EYES. EXPLOSIVE GASES CAN CAUSE BLIND- NESS OR INJURY.	NO *SPARKS *FLAMES *SMOKING	FLUSH EYES IMMEDIATELY WITH WATER. GET MEDICAL HELP FAST.
KEEP VENT CAPS TIGHTLY IN PLACE.		VENTILATE WELL WHEN IN AN ENCLOSED SPACE AND WHEN CHARGING.	
SEE INSTALLATION, MAINTENANCE AND OPERATION INSTRUCTIONS FOR IMPORTANT SAFETY PRECAUTIONS.		REPAIR SHOULD BE PERFORMED ONLY BY A QUALIFIED SERVICE TECHNICIAN.	

⚡ DANGEROUS SHOCK HAZARD

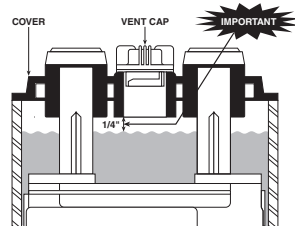
CALIFORNIA PROPOSITION 65 WARNING:

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling!

PROVIDE ADEQUATE VENTILATION WHEN CHARGING

RULE 2: Keep battery tops clean and dry.

RULE 3: Check battery electrolyte level weekly.



KEEP ELECTROLYTE LEVEL BELOW FILLING WELL AS SHOWN

Add approved water to 1/4" below vent well only at the end of charge. Filling to this level before charging will cause acid overflow. Acid attacks external battery parts. Any acid loss from the battery will result in power loss and shortened life.

RULE 4: Make sure charger is OFF before connecting or disconnecting the battery to prevent dangerous sparks.

RULE 5: Use proper size charger and follow charger instructions carefully.

RULE 6: Recharge FULLY after each duty cycle. Avoid partial recharging.

RULE 7: Remove vent caps only when checking or filling. KEEP CAPS ON when battery is in use, on charge and when cleaning battery top.

RULE 8: Batteries with steel covers should be recharged with covers in the open position.

RULE 9: Be careful...first and last.

FOLLOWING A PROPER MAINTENANCE PROGRAM

East Penn understands that today's battery and charger fleets are significant corporate assets. With such an investment, ensuring reliability is paramount. Proper initial inspection and regular preventative maintenance, including monitoring specific gravity, temperatures, discharges/recharges, and voltages will provide benefits in many areas:

- Achieving peak battery capacity
- Experiencing longer life which results in lower cost-per-cycle and AH
- Providing the overall lowest Total Cost of Ownership (TCO)
- Maximizing day-to-day capacity, increasing reliability, and value to the customer

INITIAL INSPECTION - VERIFYING THE BATTERY IS READY FOR INSTALLATION

Verifying the battery is ready for installation before it is placed into service gives assurance the product is getting the best possible start. Upon receiving a new battery, the following steps should be taken:

- Follow all safety instructions found in the Deka Industrial Battery Service Manual (0656)
- Remove the protective plastic bag from the battery
- Place the battery in a well ventilated area
- Visually examine the cables, connectors, and tray for damage or exposed conductors
- Check the battery for leaks
- Equalize charge the battery
- Measure and record every third cell's specific gravity and temperature. Verify this data is consistent with the nameplate
- Verify that the battery weight meets or exceeds the minimum weight requirement of the lift truck where the battery is being utilized

If the battery has a single-point watering system, East Penn strongly recommends OEM inspection ports are installed prior to placing in service.

KEY INTERVALS FOR PRACTICING ROUTINE MAINTENANCE

Once the battery is in service, it is very important to practice a routine and scheduled maintenance program at several key intervals:

Daily Maintenance:

- Follow all safety instructions found in the Deka Industrial Battery Service Manual (0656)
- Visually inspect the battery and lift truck cables, connectors, and tray for damaged or exposed connectors
- Inspect for cleanliness in both the battery and the lift truck. If cleaning is required, do it immediately. (Allowing excess dirt and residue to build up will negatively affect both assets over time.)
- Verify the battery charger is delivering the charge at full output
- Monitor the chargers at end of charge and/or fault conditions

Weekly Maintenance:

- Follow all safety instructions found in the Deka Industrial Battery Service Manual (0656)
- Equalize charge each battery – preferably on an automatic schedule to assure it will be done consistently. This can be programmed to occur on a specific day or number of cycles.
- Distilled or de-ionized water shall be used to water the battery
- If a single-point watering system is used, verify water pressure and flow.
- When watering, verify the watering gun is set properly as shown in *FIGURE 1*.
- Monitor proper pre- and post-charge filling levels as shown in *FIGURE 2*.

Within the First Month of Use:

- Follow all safety instructions found in the Deka Industrial Battery Service Manual (0656)
- Determine and establish equalize settings, and adjust as needed
- Confirm that the battery and charger AH ratings and outputs correspond with one another
- Perform the following with the battery connected to the charger in charge complete mode:
 - Measure and record the specific gravity and temperature in both a corner and inner cell.
 - Verify the data is consistent with the nameplate
- Perform the following with the lift truck's Battery Discharge Indicator (BDI) at lift interrupts:
 - Measure and record the specific gravity and temperature in both a corner and inner cell. This value should be between 1.160 - 1.180 at 77°F. If required use the temperature correction chart in the Deka Industrial Battery Service Manual (0656).
 - Measure and record battery terminal voltage. This value should be about 1.99 to 2.00 volts per cell.

If any of the above measurements do not match nameplate specifications, a properly trained and certified battery technician should determine the root cause. After all repairs are completed, it is important to repeat the above measurement steps again to verify that the repairs were successful.

Quarterly Maintenance:

- Follow all safety instructions found in the Deka Industrial Battery Service Manual (0656)
- Confirm charger outputs and auto-equalize settings. Verify that all single-point watering system components and electrolyte water level indicators, in addition to any other installed components, are operating properly.
- Visually inspect the battery, charger, and lift truck cables as well as connectors and tray for damage or exposed conductors.
- Inspect the battery and truck compartments for cleanliness. (Allowing excess dirt and residue to build up will negatively affect both assets over time.)
- Download and analyze the data from any battery recording devices.
- Measure and record the following with the battery both fully charged and discharged:
 - Specific gravity
 - Temperatures and voltage of all cells
 - Charger start and finish rates
 - Termination algorithms

If any of the above measurements do not match nameplate specifications, a properly trained and certified battery technician should determine the root cause. After all repairs are completed, it is important to repeat the above measurement steps again to verify that the repairs were successful.



FIGURE 1

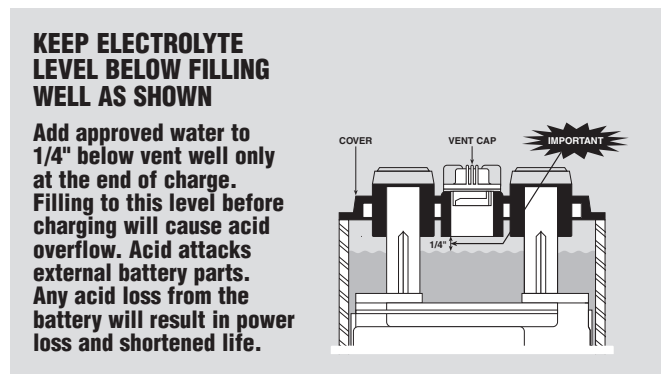


FIGURE 2

Annual Maintenance:

- Follow all safety instructions found in the Deka Industrial Battery Service Manual (0656)
- Confirm battery and charger AH hour ratings correspond with one another.
- Confirm charger outputs and auto-equalize settings. Verify that all single point watering system components and electrolyte water level indicators, in addition to any other installed components, are operating properly.
- Perform a six-hour capacity test
- Contact your Deka sales representative and complete the East Penn Site Survey questionnaire. If the Site Survey reflects changes, a Power Study is highly recommended.
- Measure and record the following with the battery both fully charged and discharged:
 - Specific gravity
 - Temperatures and voltage of all cells
 - Charger start and finish rates
 - Termination algorithms

If any of the above measurements are out of nameplate specification, a properly trained and certified battery technician should determine the root cause. After all repairs are completed, it is important to repeat the above measurement steps again to verify that the repairs were successful.

SUMMARY:

Each step within this program should be considered routine and important for your company. Following each of them carefully will help protect and maximize your lift truck and battery investment and serve as an easy way to help prevent damage to your fleet. If you require more details or have more specific questions, please refer to the Deka Industrial Battery Service Manual (0656) or contact your local Deka representative.



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