East Penn's Recommended Guide to Lithium Battery Maintenance

MOTIVE POWER BULLETIN

OVERVIEW:

Over the course of the Ready Power's life, a minimum of regularly scheduled maintenance is imperative to achieve peak performance, reliability, life, lowest lifecycle costs, and to optimize the value to the customer. This document has been prepared to illustrate when and what regularly scheduled maintenance is needed, what data should be measured, recorded, and analyzed.

PURPOSE:

By monitoring the battery for proper recharging, proper discharging, and maintaining the battery, should any values be out of specification, corrective actions can be implemented to minimize any negative impact on overall battery life. This will improve customer satisfaction, productivity, and value.

BATTERY MAINTENANCE GUIDELINES

Day 1 - Battery receipt and preparation

- Remove the protective wrap or bag from the battery along with any banding material; place in recycling container(s).
- Visually inspect cables, connectors, tray for damage, exposed conductors
- Inspect the Battery Discharge Indicator (BDI) or User Interface Module (UIM) for any damage to the device or wiring harness.
- Verify the battery weight meets or exceeds truck minimum counterweight requirements
- Using approved lifting devices, lift the battery assembly from the pallet, and install in the truck.
- Connect the wiring harness from the Ready Power to the BDI or UIM (as equipped to the truck) and verify proper operation
  - The BDI or the UIM has a cable that needs to be routed in the truck; installation of these devices are separate from the purchase price of the battery. This routing might be provided by the local forklift truck dealer.
  - If the truck is equipped with the capability of the Battery Management System (BMS) to communicate with the truck's BDI, connect the wiring harness according to the instructions in the Ready Power Installation and Operating Manual. The truck must be compatible with the correct software "Rev" to properly operate; this might be provided by the local forklift dealer.
- Connect the diagnostics harness to the Ready Power communication from the technician's computer and verify the current software revision is installed and operating properly.

Day 1 - Battery receipt and preparation (cont'd)

- Review the charger's setting and validate it is to the customer specifications with the current software package.
- Connect the battery to the charger, measuring the DC amps output, verify it is to specification, and fully charge the battery.

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 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

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

- Visually inspect the Ready Power cables, connectors, wiring harness, and tray for damage, exposed conductors, and cleanliness of the battery and address as needed. Visually inspect the truck connector and battery compartment; cleaning or repairing as necessary.
- Verify the charger output is at specified amperage.
- Monitor chargers for fault conditions at the end of charge.

Weekly Maintenance

- Visually inspect the Ready Power cables, connectors, wiring harness, and tray for damage, exposed conductors, and cleanliness of the battery and address as needed. Visually inspect the truck connector and battery compartment; cleaning or repairing as necessary.
- Verify the charger output is at specified amperage.
- Monitor chargers for fault conditions at the end of charge.
- Verify the battery has received a full charge.

Within one (1) Month of Battery Receipt

- Connect the Ready Power diagnostics communications harness to the technician's computer.
  - – Validate the software and settings are correct.
  - – Validate the battery is getting properly recharged.
- Confirm the Ready Power charger output is to specification and that no fault conditions are present.
- Confirm the Battery Discharge Indicator device is working properly.
  - – Confirm the Ready Power BDI or UIM are communicating and displaying properly.
  - – If the truck is "Ready Power compatible" - verify the device is displaying properly.
- Observe the data presented from the BMS for proper software revisions and fault codes (if present).

Quarterly Maintenance

- Visually inspect the Ready Power cables, connectors, wiring harness, and tray for damage, exposed conductors, and cleanliness of the battery and address as needed. Visually inspect the truck connector and battery compartment; cleaning or repairing as necessary.
- Connect the Ready Power communications harness to the technician's computer.
  - – Validate the software and settings are correct.
  - – Validate the battery is getting properly recharged.
- Confirm the Ready Power charger output is to specification and that no fault conditions are present.
- Confirm the Battery Discharge Indicator device is working properly.
  - – Confirm the Ready Power BDI or UIM are communicating and displaying properly.
  - – If the truck is "Ready Power compatible" - verify the truck's device is displaying properly.
- Connect to the Ready Power communications harness and download the data contained in the BMS. Compare AH throughput to the forecast, observe other batteries' data, move the battery from one truck to another to extend the time between battery replacements (fleet management).
- Observe the data presented from the BMS for proper software revisions and fault codes (if present).

Annual Maintenance

- Visually inspect the Ready Power cables, connectors, wiring harness, and tray for damage, exposed conductors, and cleanliness of the battery and address as needed. Visually inspect the truck connector and battery compartment; cleaning or repairing as necessary.
- Connect the Ready Power communications harness to the technician's computer.
  - – Validate the software and settings are correct.
  - – Validate the battery is getting properly recharged.
- Confirm the Ready Power charger output is to specification and that no fault conditions are present.
- Confirm the Battery Discharge Indicator device is working properly.
  - – Confirm the Ready Power BDI or UIM are communicating and displaying properly.
  - – If the truck is "Ready Power compatible" - verify the device is displaying properly.
- Connect to the Ready Power diagnostics communications harness and download the data contained in the BMS. Compare AH throughput to the forecast, observe other batteries' data, move the battery from one truck to another to extend the time between battery replacements (fleet management).
- Observe the data presented from the BMS for proper software revisions and fault codes (if present).
- Perform Site Survey to learn current customer operating conditions, changes, and future expectations.
  - – If Site Survey indicates changes, we strongly recommend a Power Study be performed.

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 contact your local Deka representative.

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PROPOSITION 65 WARNING: Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Batteries also contain other chemicals known to the State of California to cause cancer. **WASH HANDS AFTER HANDLING.**