Mobile Charging System

Joint Service Power Expo

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Custom Manufacturing & Engineering, Inc.
3690 70th Avenue, Pinellas Park, FL 32781
T (727) 547-9799 F (727) 541-8822

www.custom-mfg-eng.com
OUTLINE

PROBLEM
  BACKGROUND
  REQUIREMENTS

DESIGN
  ELECTRICAL
  MECHANICAL

TESTING
  CME TESTING
  ATC TESTING

LUT
LESSONS LEARNED & SUMMARY
In April 2009 CME was approached by PM-Soldier Warrior Ground Soldier (PM-SWAR-GS)

They needed to charge lots of batteries in 10 hours

Charging occurred in the field

Multiple types of non-standard batteries

On some sort of mobile platform (vehicle, trailer)

Carrying about 10kW of DC power generation
CME had developed a mobile power platform several years ago called LPGP Lightweight Power Generation Platform. It was a vehicle carrying 10kW of DC power generation. Club Car diesel 4-wheel drive off road utility vehicle converter to hybrid electric drive with wireless remote controls.
SOLUTION (almost)

LPGP with Ultralife chargers

Club Car with Ultralife chargers
PM-SWAR initially needed to charge Nett Warrior batteries, Ultralife LI-145 and LI-80
Not supported by CECOM
Over the next year requirements solidified slowly
More battery types were added
The numbers of batteries were determined
Additional needs were identified
REQUIREMENTS

• Vehicle; diesel, JP-8 fuel
• Charge 578 batteries in <24 hours
• Battery types, LI-145, Rifleman Radio, MBITR (Harris, Thales (BB-521-like))
• Storage for 578 charged batteries
• Power for 20 charges, 4 for LI-145, 16 for MBITR
• Company level charging with Platoon modularity with each charger removable for Squad use
• Standardized connectorization
REQUIREMENTS

• Auxiliary connectors for standard chargers
• Charge in all weather
• Carry fuel for one day’s operation
• Power distribution with protection
• Safety Assessment Report
• User’s Manual
• Training
Concept
Start with the Club Car, modify only as necessary
Add alternator
Add power distribution
Add safety controls
Add frame, canvas cover
Add removable racks
DESIGN

Work begins.....

by posing for pictures......or taking a joy ride
GFE Battery Chargers

Ultralife CH0012 for charging 12 LI-145 at once

Thales UBC for both MBITR and Rifleman Radio batteries for charging 8 MBITR or 16 Rifleman at once or a mix
ELECTRICAL DESIGN

• Mounted an MRAP 28VDC, 570A alternator under the bed coupled to the transmission
• Mounted and wired 4 NATO Slaves to alternator
• Built 4 intervehicular cables to connect each Platoon rack set (2 racks per Platoon)
• Designed power distribution panels for each rack
Designed a rack with two configurations; 2 and 3 shelf

Telescoping shelves
Racks latch onto rails mounted on bed
Chargers latch or thumbscrew onto shelves
Designed and built a frame with hinged side panels
Covered the frame with canvas
Designed and built three battery bag types for storage
System Verification
Safety Assessment
ATC Evaluation
System Verification

Critical Tilt Angle
CME TEST

System Verification

Braking Distance

Power Distribution & Protection
ATC TESTING

- Inclinometer
- Brakes
- Safety Inspection
- Noise
ATC TESTING

Safety

CAUTION
Loud noise hazard. Ear protection must be worn.

WARNING
Hot surface. Contact may result in serious burns to skin. DO NOT TOUCH.
The Safety Assessment Report and safety testing and inspection were completed.

ATC signed off on the Safety Release allowing soldiers to use the MCS at the LUT.

Without the Safety Release MCS would have been a static display.
LIMITED USER TEST
Ft Riley, KS, November 2010
The Nett Warrior LUT included several sources for battery charging including fuel cells, thin film solar, small JP-8 generator and three vehicle-based charging systems.
Batteries included LI-145, MBITR (Thales and Harris), Rifleman Radio and conformal.
Charging took place in the field
LIMITED USER TEST

The MCS was driven by the team leader who followed behind the observers who followed the soldiers on a mission to take a village.

Travel was through thick brush, rutted open fields, high grass and paved road.

After the village was taken, all the charging systems were exercised, including MCS, for an hour or so and then packed up and returned to base.
LESSONS LEARNED & SUMMARY

Negatives
MCS was noisy, hearing protection required
MCS didn’t look Army
There are materials we could use to reduce noise and we could couple the alternator to lower the rpm
We could have made it look more Army and although it would have been cosmetic there is something to be said for looks
For the limited time and budget....
LESSONS LEARNED & SUMMARY

Positives

MCS provided charging capability for a Company, Platoon or Squad
MCS provided a mule-like function
MCS can provide more power than was used or was made available
MCS did what it was asked to do without issue
Observations

The chargers took a long time to charge batteries, 6 to 7 hours versus 2.5 to 3 hours for C/2. That is 18 to 21 hours to charge a Company’s batteries.

The load of 578 batteries per day every day seems like too much.

There may not be a good answer to this problem except to need fewer batteries.
THANK YOU

QUESTIONS??

[Image of a vehicle parked in front of a building]