

**Texas Commission on Environmental Quality
New Technology Research & Development (NTRD) Program
Monthly Project Status Report**

Contract Number: 582-11-12630-3264

Grantee: EcoPower Hybrid Systems

Report for the **Date** December
Monthly period: November 2012 **Submitted:** 10,2012

Section I. Accomplishments

Provide a bulleted list of project accomplishments as well as a description of their importance to the project.

Electrical design:

- New programmable logic control (PLC) programming with actual lead acid technology is done and will be verified next week.

BMS:

- 30 battery management system (BMS) slave modules were received; components are under testing.
- PLC clock output signal has been implemented as watchdog for controller area network bus (CANBus) communication between PLC and BMS master. This allows to have access CANBus signal quality between PLC and BMS master.
- First test with two modules in series has been performed, and shows error in electrical design due to isolation technology of the BMS.
- In order to fix the communication problems detected with modules in serial configuration, we are now using a new cell group module. This module isolates the communication circuit from the high voltage of the batteries. This new group cell module is communicating over the same CANBus network as the PLC-BMS network, contrary to previous design which isolated cell boards were communicating in a proprietary communication.
- We performed a new batch of electromagnetic interference (EMI) immunity test on a network of two new cell group modules, comparison of immunity with additional ferrite were made. This shows clear improvements.
- PLC communication has been reworked and extended to 16 cells (two modules in series or one module with two parallel cell boards)

Battery:

- First batch of cells was received and quality control (QC) for alternating current (AC) impedance and open cell voltage measurement is completed. Part of the cells is followed to evaluate and characterize self-discharge. It was observed that part of the cells show higher self-discharge than expected. The supplier is replacing cells considered as off specifications.

Thermal and mechanic:

- Detail mechanical arrangement for dual BMS configuration: arrangement has been determined. New standoff had to be designed and ordered.
- Modified battery rack drawings for internal pressure requirement and detailed vent panels are completed.

- Test done for Module high potential (Hi-Pot) testing. Insulating blankets to put around the batteries to prevent arc was tested with success.
- Test lab selected for module transport certification
- Vibration test with updated design was completed without failures.
- Impact test on the module cover was done. Cover is able to withstand an impact of 20 pounds from a height of 24 inches safely.
- Tests were done with electronic torque wrench to catch potential assembly risks: tool was programmed to count number of bolts to avoid forgetting one, tool was programmed to catch if assembler uses a too long bolt.
- Short circuit test plan defined
- Quality control plan was defined
- Gauge repeatability and reproducibility studies were conducted for the measurement of voltage and impedance on cells and 5P

Indicate which part of the Grant Activities as defined in the grant agreement, the above accomplishments are related to:

All realizations are related to Task 2 of the project.

Section II: Problems/Solutions

Problem(s) Identified: Report anticipated or unanticipated problem(s) encountered and its effect on the progress of the project

- Some battery cells show higher self-discharge than expected.
- Schedule remains very tight.

Proposed Solution(s): Report any possible solution(s) to the problem(s) that were considered/encountered

- See below

Action(s) Conducted and Results: Describe the action(s) taken to resolve the problem(s) and its effect

- All cells will be replaced by the manufacturer, by new cells built with thicker separator. These cells are expected to be more robust.
- We are still following carefully all activities to mitigate any potential delay on schedule.

Section III. Goals and Issues for Succeeding Period:

Provide a brief description of the goal(s) you hope to realize in the coming period and identify any notable challenges that can be foreseen

Electrical design:

- New PLC programming validation will be performed on current lead-acid design to test bench test modification required for the current project.
- PLC programming to control the generator should be completed.
- Adaptation of PLC programming for lithium technology will be started.
- Second version of final electrical drawings including parallel slave BMS for redundancy completed.

BMS:

- Discussions with BMS supplier are on-going to improve functionality of cell group module.
- Further EMI test will be done with different cabling configurations.

Thermal and mechanic:

- Perform immersion test
- Genset enclosure and module drawing updates will be completed
- Battery rack assembly checks will be completed
- Intermodule cable routing will be verified
- Communication wiring routing will be evaluated to fit the new electrical configuration.

Date: December10, 2012

Authorized Project Representative's Signature

NOTE:*Please attach any additional information that you feel should be a part of your report or that may be required to meet the deliverable requirements for tasks completed during this reporting period.*