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

Contract Number: 582-11-13472-2019

Grantee: Transportation Power, Inc. (TransPower)

Report for the Monthly period: August 11, 2012 to September 7, 2012

Date Submitted: 09/10/2012

Section I. Accomplishments

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

- The motive drive subsystem was fully installed into Tractor #1. This includes TransPower's proprietary automated manual transmission, the main traction motor, and TransPower's proprietary inverter charger unit (ICU). Several sub-assembly and sub-system level tests were completed on the motive drive subsystem during the most recent reporting period in preparation for vehicle-level testing. The automated shifting functionality was validated to confirm that the subsystem was correctly moved over from the dynamometer into the tractor. Additionally, the tractor's rear axles were lifted up on jacks and the rear wheels were spun to confirm that the motive drive subsystem was performing as intended prior to drive-testing the tractor. Figure 1 shows the interior of Yard Tractor #1, with the ICU at the top of the picture and the main drive motor and automated manual transmission at the bottom of the shot.

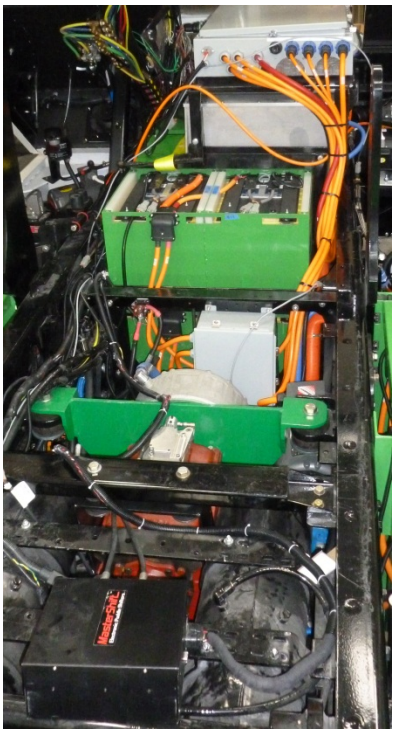

Figure 1: ICU, main drive motor, and automated manual transmission installed in Tractor #1

- The power control and distribution subsystem was fully installed in Tractor #1 and can be seen at the top of Figure 1. The orange cables coming out of the central control module are high voltage cabling, both for the energy storage system and to provide power to the electric accessories. Low and high

voltage wiring was tested and validated to confirm that the control system was successfully transferred into the yard tractor from the dynamometer.

- The electric accessory subsystem was fully installed into Yard Tractor #1 (Figure 2 and Figure 3). This includes physical mounting and all connections including electrical wiring, hydraulic hoses, and air hoses. Before vehicle-level testing could commence, each accessory was tested to ensure that it was functioning as expected.

Figure 2: Air compressor in Tractor #1

Figure 3: Power steering pump and reservoir in Tractor #1

- The energy storage system is fully installed in Tractor #1. There are four Mile Max™ modules mounted on each side of the tractor (Figure 4), and six Mile Max™ modules underneath the cab. These 14 modules represent two full-voltage battery strings. All of the green structures in Figure 6 below are Mile Max™ modules. The sub-system level tests mentioned above were all conducted using the energy storage subsystem as an energy source, confirming that the energy storage subsystem was functioning properly.

Figure 4: Mile Max™ modules on Tractor #1

- TransPower has begun vehicle-level testing of Tractor #1. In addition to spinning the wheels with Tractor #1 on jacks, TransPower has completed basic drive testing of Tractor #1 on level pavement and demonstrated that Tractor #1 can attach to and pull a trailer (Figure 5). TransPower also unveiled Tractor #1 at the PortTech Expo, a public forum on September 5, 2012, through September 6, 2012. The tractor was driven at this event.

Figure 5: Tractor #1 lifting and pulling a trailer

Figure 6: Tractor #1 at PortTech EXPO 2012 in San Pedro, California, on September 5, 2012

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

- The first four accomplishments listed above relate to *Task 2.2.2: Tractor 1 Installation*.
- The last accomplishment relates to *Task 2.3.1: The PERFORMING PARTY will conduct at least 3 weeks of drive testing of Tractor 1 in simulated and/or actual service.*

Section II: Problems/Solutions

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

a) When the sub-system level testing began on the integrated tractor, electrical noise was detected on the CAN communication lines, causing the drive system's control signals to occasionally get lost.
b) When Tractor #1 was initially drive tested, it was determined that moving the steering wheel at a standstill took too much effort on behalf of the driver.

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

a) Since every component connected to CAN can potentially contribute to an electrical noise issue, the team decided to monitor the noise issues as components were deliberately disconnected from the CAN communications network. This allowed the engineers to fully understand the problem.
b) The power steering hydraulic pump has several settings. Since there was no mechanical issue in the power steering system, such as a kinked hydraulic hose, the most probable cause of this problem was determined to be a misconfigured setting on the power steering pump.

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

a) The team decided to modify the grounding strategy in order to make it more robust. Ground straps were added to various sub-assemblies and assemblies to ensure that each component has a clear electrical path to the chassis ground plane.
b) The engineers were able to increase the amount of power steering assist by changing a setting on the power steering pump.

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*

- Complete initial drive testing of Tractor #1.
- Complete optimization of drive system using the results of Tractor #1 drive testing
- Deliver Tractor #1 to H-E-B to initiate in-service testing in San Antonio, TX.
- Complete or nearly complete installation of the electric drive system into Tractor #2.

Date: 9/10/2012

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.*