

**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.

**Report for the Monthly period:** 03/10/12 – 04/06/12      **Date Submitted:** 4/09/12

**Section I. Accomplishments**

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

- Control system development has progressed significantly. A complete code set exists and is being vetted and calibrated on the bench. This is a significant milestone in the control development process enabling fine calibration of sensors and actuators with logic.
- The accelerator pedal has been calibrated and a pedal smoothing algorithm is in place to smooth out Pilot Induced Oscillations (PIO) common to responsive powertrains in vehicles that tend to ride roughly. This phenomenon occurs when the vehicle encounters a bump and the driver's foot jerks the pedal, causing the vehicle to lurch and inducing more driver pedal input. Figure 1 shows the accelerator pedal mounted to the bench.

**Figure 1: Accelerator pedal on the bench**



- The fuel gauge has been repurposed to report State of Charge (SOC). The Check Engine, Stop Engine, and Wait To Start lights are now under control of the supervisory controller and repurposed to report accordingly. New temperature gauges (with more appropriate temperature ranges) have been ordered and will report inverter and battery temperatures. Figure 2 shows the yard yuck gauge cluster on the bench during testing.

**Figure 2: Gauge cluster during SOC and warning light tests**



- The gear selector is now under control of the supervisory controller reporting the selected gear and displaying the actual current gear just as it did with the original powertrain. The integrated transmission warning lamp can be used to signal a transmission issue. Figure 3 shows the gear selector on the bench during testing.

**Figure 3: Gear selector during display testing and verification**



- The MasterShift hardware and software have been thoroughly reviewed. Code and input-output (I/O) have been established to operate the hardware. The assembly is being wired up on the bench to fine

tune calibrate the position control actuators. This is another critical step in full powertrain control which will be completed before the powertrain is installed.

- The pre-charge and voltage sensing circuits are nearly complete undergoing some refinement on the part of the contracted engineer. I/O and logic are in the vehicle control code. This is important to establish the state of the vehicle before beginning the start up sequence as well as knowing when to fully enable high voltage.
- TransPower is in the process of fabricating parts for powertrain integration. The new input shaft has arrived and the powertrain unit, comprised of the motor and transmission, has been assembled. It has been placed in the vehicle to verify mount locations and is now slated to be installed on the dynamometer. Figure 4 shows the complete and painted motor-to-transmission adapter in between the motor and transmission.

**Figure 4: Assembled Powertrain Unit**



- Dynamometer assembly continues. Custom shafts have been identified and are being sourced at local manufacturers. Off-the-shelf parts are arriving and the physical structure is being designed.
- Electric accessories have arrived and most are installed or in testing.
  - The air conditioning assembly is ready for installation once the Love-Joy coupler has passed durability testing that is currently underway. The approach has made for a more favorable space claim and is more efficient than a standard V-belt coupling. This assembly is shown in Figure 5.

**Figure 5: AC Compressor and motor mounted to the base and ready for durability testing**



- The power steering assembly is ready to be installed once the paint on the mounting brackets has dried.
- The 5th Wheel pump and motor mounts are being fabricated.
- The air compressor is in the shop and in the queue to be installed.
- The suitcase design was assessed and enhanced to accommodate a less expensive high voltage connector and allocate more room for battery management system (BMS) wiring. An order has been placed for two trucks worth of parts which should arrive within a week. Significant progress has been made in designing the suitcase mounting strategy, but this design has not yet been finalized.

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

- All but the last of the accomplishments listed above relate to Task 2.2.2, “Tractor 1 Installation.”
- The last accomplishment above relates to both Task 2.1.1 “Final Component Selection and Procurement” and Task 2.2.1, “Procure Tractors and Components.”

## **Section II: Problems/Solutions**

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

- a) Several key components for the electric accessory subsystem arrived later than was anticipated in both last month's report and the original quotes for the components. Integration of these components is slightly delayed but will not affect the overall progress of the project.
- b) Last month TransPower estimated that the truck's suitcases would be assembled by early April 2012, though TransPower has not yet received the necessary parts. During the last month TransPower decided to indeed hire an additional technician to help with the welding workload. While this delay will change the dates during which TransPower will utilize the additional labor, it will not affect the overall progress of the project.

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

- a) The best solution would simply be to order components earlier. The largest limit to this solution will be cash flow constraints.

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

- a) At this point in the integration process, the technicians have several independent work paths to choose from. While the delays identified above prevented the TransPower technicians from progressing down individual tasks, these delays have not affected the overall project completion date because the technicians were able to focus their attention on work threads that were ready to go.

**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*

During the next period TransPower expects to fabricate the battery suitcases. All electric accessories will be installed on the first tractor. The electrical distribution subsystem will be completely assembled and vetted with all actuator and sensor I/O verified and most control logic tested. The control development bench will be mostly complete for powertrain testing, possibly awaiting some dynamometer assembly. The powertrain unit will be mounted onto the dynamometer.

Date: 4/9/2012

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*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.*