

Motor Vehicle Fire Research Institute Awarded Contracts

Title: Electrical Vehicle Battery Abuse Testing

Contractor: Southwest Research Institute

Duration: June 1, 2004 – May 30, 2005

Purpose:

The purpose of this program is to perform abuse research on 36V batteries, in general accordance the SAE J2464 standard. The objective is to investigate the possibility of a 36V battery (for a 42V charging system) igniting itself or providing otherwise hazardous conditions in an accident scenario. The objective will be achieved through a series of abuse testing. The scope of work for this project includes only the four tests outlined in SAE J2464 that are anticipated to be directly affected by conversion of a standard battery to a 36V battery: Penetration Test, Crush Test, Radiant Heat Test, and Short Circuit Test. A comparison will be made using 12V batteries (for a 14V charging system); the 12V battery chosen will be of similar design to the 36V battery, to reduce other variables in the test. Testing will be performed in general accordance with the SAE J2464 standard "Electrical Vehicle Battery Abuse Testing" (March 1999).

All testing includes duplicate tests of a 36V battery with one baseline 12V battery test. Each test will be performed on a new battery. Testing includes the use of Infra-Red Imagery (IR) to document the battery's temperature profile and condition during the test cycle. This is above and beyond the standard, but will prove to be quite useful. Where practical, thermocouples will be placed on the sides of the battery to provide tabular data of the temperature profile. With the exception of hazardous gas analysis, measured data will include all applicable requirements outlined in the corresponding test sections of the SAE J2464 standard.

Task I: Penetration Test – SwRI will obtain two charged 36V units and one 12V unit for testing in general accordance with Section 4.2.3 of SAE J2464. Testing involves the penetration of a battery with a nominal 3-mm conductive rod as observations are taken. The potential and resistance through the battery will be measured before and after testing. The temperature of the cell will be measured as a function of time after the test. An IR camera image along with standard video will be recorded to document the battery's condition throughout the test.

Task II: Crush Test – SwRI will obtain six charged 36V units and three 12V units for testing in general accordance with Section 4.2.6 of SAE J2464. Testing involves the crushing of a cell, in each of its three axes, with a specially designed platen. The potential and resistance through the battery will be measured before and after testing. The temperature of the cell will be measured as a function of time during the test. An IR camera image along with standard video will be recorded to document the battery's condition throughout the test.

Task III: Radiant Heat Test – SwRI will obtain two charged 36V units and one 12V unit for testing in general accordance with Section 4.3.1 of SAE J2464. Testing involves the exposure of a cell to a radiant heat source expected from a nominal 1630°F fuel source for 10 minutes.

Temperature of the environment will be increased from ambient as quickly as possible, as the battery is observed for ignition. This test will not be performed in an explosive environment. The battery voltage and temperature will be monitored through the test. The potential and resistance through the battery will be measured before and after testing. An IR camera image along with standard video will be recorded to document the battery's condition throughout the test.

Task IV: Short Circuit Test – SwRI will obtain two charged 36V units and one 12V unit for testing in general accordance with Section 4.4.1 of SAE J2464. Testing involves the exposure of a cell to a hard short. The battery voltage and current will be monitored throughout the test. The potential and resistance through the battery will be measured before and after testing. An IR camera image along with standard video will be recorded to document the battery's condition throughout the test.

Deliverables:

SwRI will procure all test materials including the 36V and 12V batteries; Japan Storage Battery has already been contacted and is able to sell 36V batteries to SwRI. SwRI will provide MVFRI with final report of all results.