

Testing underway at PEEI for Turbo Fuel Cell Engine Power

Last month, PEEI's fuel cell bundle test was shut down after over 7,000 hours of loaded operation to prepare for operating a power electronic drive demonstration. The power electronic drive unit is a DC-DC converter that takes low-voltage DC at a nominal voltage of 4 Volts and converts it to 36 Volts which was found to be the most appropriate input voltage for small electric vehicle drives.

As we connect larger numbers of bundles together the overall fuel cell output voltage will increase. However, the initial test was only a single bundle and the output voltage was nominally 4 Volts. The DC-DC converter needed for making this conversion was not readily available and therefore we developed and produced our own converter.

Before being shut down, PEEI's bundle was tested using a resistive load unit that included process gas flow controls and data acquisition. The DC-DC converter and drive were combined with the resistive load unit to allow the load to be gradually changed from resistive to powering a motor for driving a water pump. The bundle test was re-started, the DC-DC converter was turned on, and the water pump was run at different



The bundle test was run at different operating conditions to provide our first operational control of an integrated system as will be required for a vehicle drive system. This demonstration maintains focus on the target application: direct (clean) replacement for diesel engines in heavy highway trucks. PEEI has manufactured and tested individual cells and is now testing a bundle which will be the standardized building blocks for fuel cell engines.

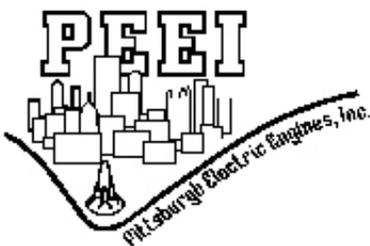
PEEI is currently working on the design of a 3-bundle stack for demonstrating the third and final building block which is simply referred to as the stack. The US Department of Defense (DoD) has recognized that involvement is important not only because of the dramatic impact the new engine promises to have on national economic security, but also because of its impact on the future battlefield and other similar crisis situations.

operating conditions to provide our first glimpse into how to control an integrated system as will be required for a vehicle drive system.

PEEI is planning another test

for demonstrating the bottom end stack design. "Stack" is the term used to describe an assembly of multiple bundles. In this case, the stack consists of three bundles

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402 E. Main Street
Mount Pleasant, PA 15666
in the
Mount Pleasant
Glass Centre, Ste. 800

724.547.9170
Fax: 724.547.9171

Innovative Energy Research using Turbo Fuel Cell Engine, with 40% fuel savings over diesel usage for heavy trucks, transportation vehicles and it is **environmentally clean.**

PEEI

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primarily for the purpose of demonstrating the complicated electrical connections. The bottom end stack test is an intermediate setup for testing the high-temperature gasket seals with regard to controlled leakage.

PEEI is currently in the process of designing and ordering parts for this test setup and preparing the design for the three bundle test. One critical component of the test setup is the ACR boxes (air-combust-recirc boxes); the ACR box can be compared to the Turbo Fuel Cell Engine as an engine block is to an internal combustion engine. In the current bundle test, this ACR box was made from over 50 pieces cemented and fired together. For the upcoming three bundle test, each ACR box is one single piece, a substantial improvement in design and cost.

The purpose of these demonstration efforts is for maintaining focus on the target application: direct (clean) replacement for diesel engines in heavy highway trucks. We have manufactured and tested individual cells and are now testing a bundle of 36 cells, both will be standardized building blocks. We are currently working on the design of a 3-bundle stack for demonstrating the third and final building block which is simply referred to as the stack.

PEEI's new engine could

very well revolutionize the transportation industry. The US Department of Defense (DoD) has recognized that involvement is important not only because of the dramatic impact the new engine promises to have on national economic security, but also because of its impact on the future battlefield and other similar crisis situations. After hauling its payload to the desired destination, the new engine can immediately become a quiet essentially pollution-free electric power source. It can be used to supply the payload or provide clean electric power anywhere at costs competitive with large central power stations. Multiple units could easily be connected together to provide distributed base power requirements in military or disaster situations. PEEI is funded by DoD/TACOM and PA DEP.



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