



Diesel Truck Fuel Cell APUs

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ITS-Davis researchers are engaged in a multi-year, multi-million dollar program to explore truck operations and develop power-assist technologies that reduce diesel fuel consumption and emissions. Currently, they are designing, demonstrating and evaluating fuel cell auxiliary power units (APUs) for big-rig trucks and trailers.

During idling, a modern big-rig truck using air-conditioning burns nearly one gallon of diesel fuel per hour and emits one-third of the NO_x emissions released in freeway driving at 55 m.p.g. Fuel cell APUs can reduce air pollution and save fuel by:

- Powering cab “hotel accessories” thereby eliminating the need to idle the diesel engine
- Replacing the conventional diesel engine that powers trailer refrigeration units
- Reducing the load on the main engine by powering engine accessories (fans, compressors, etc.) during on-road operation

This truck niche market is especially attractive because of high market demand; truck operators could save significantly on fuel consumption and engine wear. The technology also could increase driver comfort and safety by eliminating noise and vibrations during their rest stops. Impending regulations on trailer refrigeration units and truck idling may also drive the market. If successful, the work will accelerate widespread introduction of fuel cells into the transportation arena.

Recently, researchers measured the emissions and fuel economy benefits and demonstrated the feasibility of a hydrogen proton exchange membrane (PEM) fuel cell in a Freightliner Class 8 truck’s sleeper cab. They also surveyed drivers at truck stops around the nation. The economic payback for commercial fuel cell APUs could be as little as 2.6 to 4.5 years, they determined. Researchers have also designed and built a self-contained, hydrogen-fueled PEM fuel cell system and evaluated its performance to identify the most efficient integration designs. They have used the system to simulate its potential use in other applications, such as air conditioning units on buses.

Currently our team is designing and demonstrating a fuel cell-powered truck trailer refrigeration unit, and plans to evaluate a different APU technology, a propane-fueled solid oxide fuel cell system in this application.

Partners

- Freightliner LLC
- California Air Resources Board
- South Coast Air Quality Management District
- Department of Energy
- ChevronTexaco
- Carrier Transicold
- TIAX
- American Trucking Associations
- Neil C. Otto
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