Hydrogen powertrains

The Hydrogen Engine Center is helping reduce emissions and improve fuel consumption for bus fleet operators in the US

A decade ago, fuel cell developers predicted that an affordable fuel cell would come to market within 10 years.

Today, most fuel cell developers say it will take at least another 10 years before an affordable fuel cell is launched. The problem, however, is the world needs a solution now, even if it is not a perfect one.

The Kyoto Treaty timetable is so short that tomorrow's solutions could not be put into production soon enough to sufficiently impact future emissions levels. It seems that the technology we have today is what must be used.

Buses wil use early hydrogen engines

Fortunately, there has been progress in technologies other than fuel cells. Gasoline hybrids do a creditable job in lowering emissions when designed for that purpose. By using an electric motor for the initial acceleration, the engine can be operated in its lowest emissions configuration, therefore avoiding sudden transients.

Development of gasoline hybrids and fuel cells have helped mature the electric side of such solutions. Many of the motor and drivetrain designs have gone through testing, and low-volume production.

But to achieve Kyoto targets, the industry will need more than just demonstration projects and low-volume production of fuel cell and hybrid technology. Kyoto demands mass production of such systems.

One system that ticks most of Kyoto's requirements is a near zero-emissions internal combustion engine that is ready to mate with electric drive systems. It uses hydrogen as a fuel.

One of the engine's early markets is expected to be powering buses. The challenge of storing hydrogen remains, and this limits the types of vehicles that can initially be powered. The vehicles must have sufficient room for hydrogen tanks, which tend to be bulky. The vehicles also need a central fueling point, as there are few hydrogen fueling stations; despite its bulky design, the tanks give a range of only 320-480km (199-298 miles) between fueling. All these factors mandate a local fleet operation – specifically hybrid buses.

A suitable engine for this application is a 4.9-liter inline six. It is sufficient for the average power requirements of a large bus, but perhaps not the peak power needed for acceleration. The powertrain is a redesign of the discontinued Ford F300 engine. The only part of the engine surviving nearly unchanged is the block. Everything else has been modified to handle the hydrogen power spike. Yet even with these changes, engine cost is still reasonable and well below fuel cell range. Any competent mechanic will be able to maintain the engines.

Recognizing that hydrogen availability is a variable that is hard to corral, a decision was made to offer a hydrogen-ready, gasoline engine to prepare for hydrogen availability. By taking this step, equipment can be delivered to the field with low emissions gasoline, natural gas, or liquid propane fuel systems – when hydrogen becomes available, users can simply replace the fuel systems with hydrogen.

The company that makes the engine, which was first introduced in August 2004, is the Hydrogen Engine Center in Iowa, US.

The success of the re-worked F300 engine has meant that the Hydrogen Engine Center is now planning to launch two larger-displacement, hydrogen-fueled engines in the near future. ***E&H***

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