



21st Century Locomotive Technology: Quarterly Technical Status Report 14 DOE/AL68284-TSR14

This is the quarterly status report for the 21st Century Locomotive Technology project, DOE Award DE-FC04-2002AL68284. This report covers activities performed April 2006 to June 2006.

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Task 1: Advanced Fuel Injection

Objective

Develop and demonstrate an advanced fuel injection system to minimize fuel consumption, while meeting Tier 2 emissions levels.

Progress since last report

Over the second quarter, we have completed baseline engine testing with the unit pump fuel system (UPS). The baseline data includes operating conditions representative of the current GE Evolution Locomotive notch definitions. The fuel system components were instrumented to record key fuel injection parameters including needle lift, command current to fuel pump, and fuel line pressure. This information will be helpful in comparing the fuel injection performance of the UPS versus the high pressure common rail (HPCR).

GE Global Research team members met with Program Manager, John Fairbanks, to discuss the status and scope of the advanced fuel injection task. We also met with members of the GE Rail engine development team and the Bosch fuel injection team. GE Global Research presented HPCR data from this program and discussed outstanding challenges with the fuel system. Bosch is committed to supporting our efforts to improve the fuel system functionality and explore new experimental parameters of HPCR.

The activities of the last quarter contribute to the overall goals of the program, which are to explore the advantages of the HPCR for medium speed diesel engines. The single cylinder engine is an effective tool to explore the flexibility and functionality of the HPCR fuel injection system. On the SCE, the fuel system can be precisely tuned to target fuel injection schedules and small performance changes can be measured. This most recent work is necessary to quantify improvements of the HPCR fuel system over the production fuel system and to understand the differences between the functionality of the two fuel systems. With the characterization of more notch conditions, we are able to explore the duty cycle performance of the two fuel systems on the SCE.

Planned activity for next quarter

Over the next quarter, the testing with the CRS system will resume. Performance for N2-N8 will be mapped and a study to explore nozzle variation will begin. Added capability in the single cylinder engine facility will allow us to correlate particulate matter characteristics with different HPCR fuel injection parameters.



Task 3: Hybrid Energy Storage

Management activities

A 30-minute summary of the Locomotive Systems tasks 3 (Hybrid Energy Storage) and 4 (Fuel Optimization) was presented at the DOE EERE Heavy Vehicle Systems Peer Review, held April 18-20, 2006 at Argonne National Laboratory, Argonne, Illinois. The reviewers evaluated the project against 5 criteria: relevance to DOE objectives, technical approach, technical accomplishments, technology transfer, and future research direction; the composite score was an excellent 3.78 out of 4.

Progress since last report

The battery vendor has agreed to manufacture a “mockup” battery module incorporating design modifications for vibrational robustness, and with internal instrumentation. The mockup will be used to validate vibration performance of the design modifications.