

DOE-Funded Research Leads to Quick Commercialization of Advanced Fuel Saving Control System for Freight Locomotives

Background

North American freight trains consume more than 3.5 billion gallons of diesel fuel per year, representing approximately 7% of all energy use by heavy duty vehicles. The 21st Century Locomotive Technology program, funded by GE Transportation's Rail Division and the U.S. Department of Energy, seeks to develop and demonstrate hybrid and non-hybrid advanced technologies to reduce emissions and fuel consumption in freight locomotives. As one of four components of 21st Century Locomotive Technology, GE developed, demonstrated, and is now commercializing the first of several planned advanced control systems called "Consist Manager." The product can be installed on new and existing GE locomotives and is transparent to the engineer and today's operations, yet can achieve fuel savings of 1–2%.

The Technology

Heavy-haul rail freight is pulled by ensembles of two or more locomotives called consists. In a conventional freight train, all units in the consist operate at the same throttle setting as set in the lead unit by



Consist Manager™ is offered as an option on GE's new Evolution™ Series Locomotives

the engineer. When full power of the consist is not required, more efficient operation is possible by running the locomotives at different (higher or lower) throttle settings, given the better specific fuel consumption (lbs fuel/hp-hr) of most locomotives at higher power. GE's control system takes care of the on-line optimization to determine how to configure each locomotive and manage the required power transitions. The control system of the Consist Manager is transparent to the engineer in terms of power response to a throttle change, but has a side benefit of

providing a quieter ride when the lead cab is idled. Projected maximum fuel savings in a notch are in the range of 3–6%, and average out to 1–2% savings overall in typical freight hauling duty cycles.

The GE team built a prototype of the Consist Manager controller and installed it on a Class 1 railroad, where it operated in high priority revenue service between Kansas City and Los Angeles during January 2004. Over 6 days and 3,400 miles, the system ran flawlessly and achieved the expected 1.5% fuel savings with a range of 1



to 3% in different parts of the route. With typical fuel consumption around 350,000 gallons per year, 1.5% average savings translate to 15,750 gallons per year per 3-locomotive consist, with a potential to save over 60 million gallons per year if implemented on freight locomotives across the United States. Railroad management who sponsored and participated in the demonstration reported that the ten different train crews had little or no difficulty adapting to the operation of the Consist Manager™ over a variety of territories and weather conditions.

Commercialization

GE Transportation has commercialized the technology, which can be installed new or retrofit on GE Dash9 (DC) and AC-4400 class locomotives in service today. Two Class 1 U.S. railroads are in the process of field evaluation for wider deployment.

Benefits

- 1–2% or greater fuel savings potential over typical AAR freight duty cycles
- New or retrofit application to Dash 9 and AC-4400 class locomotives
- Quiet operation of lead unit at part power operation

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