J. Portfolio Analysis for Lightweight Materials

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Subcontractor: Taratec Corporation
Subcontract No.: 4000033939 under Contract No. DE-AC05-OR22725

Objectives

- To evaluate the impact of High Strength Weight Reduction (HSWR) projects on the fuel efficiency of the heavy vehicle fleet as well as commercial and technical risk factors associated with the HSWR project portfolio.
- To develop project clusters to assist in the evaluation of various groups of related HSWR projects.

Approach

- The project approach builds on Taratec's previous work for Oak Ridge National Laboratory (ORNL) for risk and impact analysis. Estimated weight reductions are translated to fuel savings through the NREL ADVISOR model and the Taratec-developed fleet drive cycle. Risk is determined through a combination of analysis and interviews with developers and commercializers.
- Penetration rates were determined using various market-driven factors for OEMs and end-users taking into account regulatory requirements.

Accomplishments

- In FY 05, Taratec analyzed the HSWR project portfolio to estimate project impact as measured by heavy vehicle fleet fuel savings and project technical and commercial risk factors. In addition, Taratec developed a cluster analysis which allows the user to examine the impact of project clusters on heavy vehicle fuel savings as well as the impact of individual projects on the cluster as a whole. The project cluster analysis results were used to display impact in the HSWR project peer review conducted at ORNL in September, 2005.

Introduction

The FY 2005 activities updated prior Taratec work on the risks and benefits of the heavy vehicles lightweight materials research portfolio. In addition, the technology penetration rates into the fleet were estimated and technology clusters were created.

Key Findings

There is a wide variance of impacts on fuel savings for the heavy vehicle fleet that depends on both the technology and the vehicle component to which it is applied. The maximum benefits are in the range of a million gallons of diesel fuel saved per year. More than half of the projects reviewed are enabling technology projects, which are focused on developing basic technology or knowledge, while the remainder are focused on developing specific vehicle components built from lightweight materials.

Ultimate deployment of the technologies is driven by a combination of cost, performance and regulations. The OEMs each have their own market data showing what they perceive to be the customer willingness to pay for weight reduction. This varies from no premium to a relatively small ($1-2/lb.) premium. Of course recent increases in fuel prices may change that perception. There is a significant concern that new materials must perform as well as older materials under the harsh conditions faced by Class 8 trucks. These factors impact the technology adoption rate. Even with these factors considered, Taratec's estimated penetration rates are faster than previous estimates made by DOE.

The penetration of the technology into the full heavy vehicle fleet must be weighted by miles driven. Approximately 80% of the new trucks enter the long-haul market and are driven 400-500,000 miles in about 3 years and then are traded in or re-sold. Thus, newer technology deployed in new trucks is driven a disproportionately higher fraction of the total vehicle miles driven than the rest of the heavy truck fleet.

Additionally, Taratec developed materials clusters both by class of material and by major materials applications (drive train, body panels, major structure, etc.) in both cases the impact of the cluster is driven by a few high-end applications. However, the role of enabling projects and low-criticality applications to help the OEMs to develop design comfort with new materials is illustrated by use of clusters.

Conclusions

Methodologies for evaluation of the impact of HSWR materials projects have been demonstrated.