

ALUMINUM REDUCES HEAVY-DUTY VEHICLE WEIGHT AND IMPROVES EFFICIENCY



Driven largely by payload considerations, aluminum has experienced more than 30 years of continual growth in commercial applications. Today, the average Class 8 vehicle uses over 1,000 pounds of aluminum; however, weight reduction opportunities up to 3,300 pounds remain for heavy-duty vehicles. To quantify the additional weight savings potential aluminum offers to Class 8 vehicles, the Aluminum Association commissioned Ricardo Inc. to study the fuel efficiency impact of downweighting Class 8 trucks and trailers in the United States.

The study simulated different configurations of vehicles and payload conditions (i.e. unloaded, gross vehicle weight [GVW] and half-GVW load) for the major drive cycles that represent commercial transportation in the U.S. In addition to the impact of weight savings alone, the study analyzed the combination of weight savings and aerodynamic drag reduction. The overall conclusion from this study is that significant freight and fuel efficiency as well as emissions reduction are available today with the appropriate use of lightweight solutions, like aluminum.

KEY TAKEAWAYS

- ▶ The annual return on investment for materials substitution with aluminum on a single vehicle is estimated to be as high as 1,612 gallons of fuel and 17.9 tons of CO₂
- ▶ Average Class 8 vehicle already has 1,000 lbs of aluminum
- ▶ Aluminum can eliminate up to 3,300 lbs from a Class 8 vehicle

KEY FINDINGS FROM THE STUDY

- ▶ Transporters using trucks that are downweighted may be able to carry 6.5 percent more payload per trip, this equates to fewer trips and an “effective” fuel and emissions savings of 6.5 percent. The annual return on investment for materials substitution with aluminum on a single vehicle is estimated to be as high as 1,612 gallons of fuel and 17.9 tons of CO₂.
- ▶ When considering these results for the total U.S. fleet, approximately two million vehicles, the overall economic and ecologic impact of weight savings is estimated at one billion gallons of diesel and 10 million tons of CO₂ per year.
- ▶ When combining the weight reduction potential available with an 8 percent improvement in aerodynamic drag, the overall fuel economy improvement for an aluminum intense vehicle relative to the conventional vehicle was as high as 8.2 percent.

Based on other related studies and data on the benefits of aluminum, the Aluminum Association's Aluminum Transportation Group was able to make calculations related to lifecycle CO₂ emissions and other improvements and benefits.

- ▶ While it is true that aluminum is a relatively energy intensive material to produce, on a full lifecycle analysis basis, aluminum saves CO₂. Ninety-five percent of the CO₂ footprint of a truck occurs during the use phase of the vehicle, where aluminum generates the largest savings. Including the CO₂ generated in production, every pound of aluminum replacing heavier steel saves a net 15 pounds of CO₂ over the lifecycle of the truck.
- ▶ The aluminum industry has worked successfully to reduce its greenhouse gases emissions through voluntary initiatives and continuous technological advances. In the past ten years, CO₂ emissions have been reduced by 10 percent and PFC emissions, when compared to 1990-levels, have been reduced by more than 80 percent.

“The return on investment for downweighting with aluminum is even higher when combined with other improvements like aerodynamics, engine optimization and low rolling resistance.”

Randall Scheps
Chairman, Aluminum Transportation Group

A sample of aluminum solutions available for heavy-duty vehicle use.

