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September 24, 2007

Mr. Stephan Lemieux
Manager
Mobile Source Control Division
On-Road Heavy Duty Diesel Section
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Proposed Discrete Early Action: Smartway Truck Efficiency, September 17, 2007 Public Hearing

Dear Mr. Lemieux:

We are pleased to submit the following comments concerning the proposed discrete early actions to mitigate climate change in California, specifically in regard to the Smartway truck efficiency measure.

We commend the ARB staff for a thorough and thoughtful investigation that realizes significant potential for reducing green house gases by improving trailer aerodynamic efficiency. We agree that improved energy efficiency in the trucking sector as a whole can make a significant contribution to meeting the State's overall emissions goals.

Trailer aerodynamic solutions, when properly configured, will yield gains in fuel economy, highway safety, and reduction of driver fatigue. Lowering aerodynamic load improves engine operating efficiency especially if the top gear ratio is adjusted to match the engines' operating point to the reduced power requirement. In such case, it can be expected that engine emissions from fuel burned are also decreased.

This letter sets out to offer background on the current stage of tractor trailer design and suggests immediate and long-term optimization opportunities for the tractor-trailer combination vehicle. In overall terms, we feel the barriers to improved aerodynamic efficiency are as much to do with the structure of the industry as with more technical factors. Acknowledgment of these contributing forces will better define appropriate strategy for expediting implementation of these energy saving devices.

Background

The fuel crisis of the 1970's was the beginning of serious interest to improving truck fuel economy with aerodynamics. In 1976 a fleet sponsored study[1] was conducted to evaluate

[1] Kevin R. Cooper. Wind Tunnel Investigations of Eight Commercially Available Devices for the Reduction of the Aerodynamic Drag on Trucks. National Research Council of Canada, 1976.

8 different tractor and trailer aerodynamic technologies. Scientific evaluation showed all the devices to be effective in zero wind conditions and that **only trailer nose modifications were effective in crosswind conditions.**

At that time there were no mandates requiring integration of tractor and trailer aerodynamics to maximize their combined efficiencies.

Market Environment
The following market forces centered the focus on evolving tractor designs to compensate for the boxy trailer design:

1. Tractor owners who contracted to pull trailers, whose design they could not influence, had no other option in pursuing higher efficiency than tractor aerodynamics.
2. The short cycle life of tractors facilitated the rapid introduction of tractor specific aerodynamic improvements, effectively eliminating the cost and inconvenience of retrofitting existing equipment.
3. High number of trailers relative to the number of tractors. Typical large fleets have 3 to 5 times more trailers than tractors. This ratio of trailers to tractors seemed to indicate that tractor modifications alone would be most cost effective.

The factor that has played the largest role in tractor design evolution is the separation of truck and trailer operators. This split in ownership clearly boosts logistical efficiency by increasing utilization rates and enhancing routing flexibility. Yet it also constitutes one of the biggest obstacles to longer term technical improvements in aerodynamic efficiency.

Technical Factors
Aerodynamic performance is highly susceptible to weather related variables. The most reliable method of studying design changes is by wind tunnel evaluation. While this is an obviously accepted method in the aeronautical industry, it faces much skepticism in the trucking industry, likely due to the following factors.

1. The original design concept of tractor applied aerodynamic solutions included a secondary component. Known as the “vortex stabilizer”, wind tunnel analysis showed this component mitigated the detrimental performance directly caused by the tractor portion of the technology when the vehicle encountered a crosswind.
2. Market forces that decidedly omitted this secondary component, because it attached to the trailer, contributed to an environment of only marginal aerodynamic improvement, and in some cases, depending on the occurrences of crosswinds, total inefficiency.
3. Despite citations by product manufacturers wind tunnel performance data, some fleet operators found no improvement with cab mounted deflectors. This is likely due to a high prevalence of crosswinds in their geographic location.

4. Total enclosure of the gap would rectify the crosswind problem; however, doing so effects the maneuverability of the combination vehicle and to date shows no promise of feasibility.

The market forces and technical factors both constitute legitimate apprehension by the truck industry to adopt aerodynamic solutions despite their own financial incentives to do so. The dilemma of unaccountable return on investment by the trailer operator when applying trailer solutions prescribes the necessity for financial incentives in this field.

We urge the ARB to evaluate scientific research both past[2] and recent[3] comparing the performance of tractor versus trailer solutions. Significant data exists to justify trailer aerodynamic treatments, especially nose treatments, as CARB approved technologies eligible for incentives.

Immediate and Long-Term Optimization Opportunity

Trailer applied nose solutions can provide immediate increase in fuel economy in the trucking sector.

1. Trailer nose treatments can enhance the performance of existing tractor aerodynamic designs.
2. Provide significant returns if no aerodynamics are in use by either the tractor or the trailer.
3. Provide increases in fuel economy to a similar or better degree, than gap reducing techniques without interference with maneuverability.
4. Are known to improve trailer stability; an important benefit to mitigating driver fatigue and vehicle safety.

Scientific understanding of aerodynamic design further dictates that lowering the height of the tractor fairing will significantly increase energy efficiency in a number of ways.

1. Lower height tractors allow the trailer nose treatment to better manage air flow against and around the front of the trailer for optimal aerodynamic performance.
2. Shorter height tractors are most versatile to match with a variety of trailer types, eliminating a blatant waste of resources in the case of full height tractors pulling short height trailers.
3. Full height tractor fairings are most effective at specific tractor trailer spacing. For reasons of weight distribution and driver cab comfort, tractor trailers are often spread out beyond the appropriate distance diminishing the tractor fairings overall effectiveness.

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[2] Lawrence C. Montoya and Louis L. Steers. Aerodynamic Drag Reduction Tests on a Full-Scale Tractor-Trailer Combination with Several Add-On Devices. NASA Flight Research Center. Edwards, California. December 1974

[3] Subrata Roy and Pradeep Srinivasan. External Flow Analysis of a Truck for Drag Reduction. Kettering University, Flint MI. Society of Automotive Engineers, Inc., 2000.

Continuing to place the emphasis on large cab deflectors as the baseline for evaluating other modifications ignores significant scientific data. Research, both past and present, proves overwhelmingly, that a complex parabolic curve at the trailer nose is the most efficient method of managing air flow around the trailer, as well as, being a proactive approach to vehicle safety.

Given these factors, we urge ARB to continue careful consideration and evaluation of existing scientific research. We realize that we have brought many complex issues to consider and are open to more in-depth participation. Our 35 years in the business of design and manufacture of trailer aerodynamic solutions should provide valuable in this process of evaluation.

Thank you for your efforts with this measure and your consideration of these comments.

Sincerely,

Kathy Rose
Vice President Sales & Marketing