

U.S. Transformational Trucking Environment and Efficiency in Freight Mobility

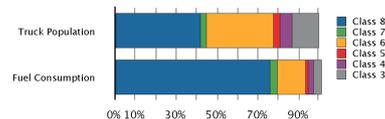
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ABSTRACT

The American trucking industry moves 60 percent¹ of America's goods using 3.5 million tractors and 5.3 million trailers.² Yet despite their ubiquity, tractor-trailer designs have remained fundamentally unchanged for fifty years. They remain, in the words of Andrew Smith, CEO of ATDynamics "the worst shape to move down the highway at 55 miles per hour...a big rectangular box." Within the trucking industry, long-haul heavy-duty (Class 7 and 8) trucks offer particularly great efficiency potential. Despite accounting for less than half of the nation's trucks, Class 7 and 8 trucks account for almost 80 percent of trucks' fuel consumption. (Figure 1) Their size, speed, and poor aerodynamics mean Class 7 and 8 trucks are laden with "low-hanging fruit" (cost-effective efficiency and retrofitting opportunities). The complexity of the industry and its culture have been the primary barriers to realizing this efficiency. The industry has found efficiency improvements difficult to invest in, and when OEMs (original equipment manufacturers), fleets, and owner-operators have been able to, they've been reluctant because they don't trust efficiency data (nor projected payback). Regulations have also discouraged the greater use of high productivity vehicles (HPVs,³ due primarily to concerns about safety and infrastructure) and diverted resources from efficiency. The time is ripe for change. According to a recent analysis by Rocky Mountain Institute (RMI), the technology already exists to double trucking efficiency.⁴ Furthermore, the trucking industry would benefit from increased efficiency through reduced and more predictable fuel costs as well as from reduced regulatory pressure.

Figure 1: Fuel Economy and Mileage Outweigh Population (RMI 2009)



¹ Hoover's, Inc. 2009

² Transport Topics 2009

³ HPVs are commonly referred to as long-combination vehicles (LCVs) within the industry; however, at the University of Michigan MagicTrucks conference (June 15-17, 2009), industry participants discussed using more accurate terminology. Other terms discussed included high efficiency vehicles and high capacity vehicles. This report will use the term high productivity vehicles as it conveys capacity and efficiency factors.

⁴ Ogburn et. al. 2008; RMI 2009

The Trucking Industry: A Fragmented Value Chain

The trucking industry is neither concentrated nor cohesive (the top fifty companies account for only 30 percent of the market)⁵. The market is also fragmented, with many stakeholder types involved in portions of production or operations as well as poor communications and collaboration between stakeholder groups and specific companies (Figure 2, stakeholder map). The market's fragmentation has embedded system-wide inefficiencies—inefficiencies such as empty backhauls, fleets and owner-operators who decide against efficiency improvements, and drivers idling their trucks overnight to stay warm. Doubling trucking efficiency will require an in-depth understanding of the trucking industry and its stakeholders as they form the basis for many efficiency drivers and barriers.

Tractor and Trailer Production

More than a dozen key stakeholder groups are involved in the design, manufacture, operation, logistics, and maintenance needed to get freight from Point A to Point B. A new tractor-trailer is designed with input from component suppliers; engine, tractor, and trailer OEMs; technology entrants and design firms; dealerships; and bodybuilders. In the North American market, many of the equipment purchasers are involved; typically mega-fleets⁶ specify their truck configurations, and have influence even during the OEM's product development phase. Owner-operators typically buy their tractors second-hand from large fleets after 3–6 years.

Research and Development OEMs have traditionally been the ones to undertake new research and development (R&D). They develop new equipment with input from component suppliers and key end customers, and in response to regulatory requirements. However, in recent years, more and more technology entrants and design firms have become the source of efficiency improvements. The fragmentation of R&D has meant some efficiency technologies have come from OEMs and been integrated into new vehicles while other technologies have been used more for customization and aftermarket

retrofits. New, whole-system efficiency improvements will require collaboration between design firms, OEMs, component suppliers, outside influencers, and customers.

Orders and Manufacturing. Due to their size, mega-fleets exert considerable influence on the industry. They are able to order their vehicles directly from OEMs,⁷ often during or even before production, rather than going through an intermediary dealership. Most mega-fleets special order their vehicles to match operational requirements, such as duty cycle. While most OEMs are beginning to vertically integrate engine and highly engineered component manufacturing, mega-fleets still have the power to influence truck specifications. These orders—and orders from dealerships—go to tractor and trailer OEMs who in turn order their components from component suppliers and engine OEMs.

Customization. When a small- or medium-sized fleet purchases new equipment, it will typically purchase basic equipment from a dealership and then, through that dealership, have a bodybuilder customize the new equipment. This customization ranges from chrome lighting and satellite television to more efficient tires. At this stage in production, a new tractor-trailer⁸ can be retrofitted for efficiency using commercialized products from an after-market supplier and/or products from a technology entrant or design firm. Fleets can also purchase more efficient models directly from OEMs or dealerships.

Retrofits Through a process similar to customization, tractor and trailer owners can retrofit their equipment later in life. Here, external stakeholders have stepped in to encourage efficiency improvements. Particularly notable are the U.S. Environmental Protection Agency's (EPA) SmartWay program,⁹ which tests and certifies efficiency equipment, and

⁵ Hoover's, Inc. 2009

⁶ For the purpose of this report, mega-fleets are fleets with greater than 1,000 vehicles

⁷ There are four main OEMs in the U.S.: Paccar, International Navistar, Volvo NA, and Daimler Truck NA.

⁸ While this discussion describes the lifetime of tractors and trailers in tandem, most tractors and trailers are purchased separately and trailers have a significantly longer lifetime than most tractors.

⁹ SmartWay testing methodologies are currently being updated to better reflect duty cycles and include greenhouse gas information.

www.epa.gov/smartway/

Cascade Sierra Solutions,¹⁰ a non-profit that helps owner-operators understand, choose, and finance efficiency improvements.

The retrofit process is simpler for mega-fleets, which once again sidestep dealerships and go directly to the source. (Mega-fleets handle almost all maintenance internally, eliminating any regular interactions with dealerships.) Should they choose to retrofit their equipment, mega-fleets prefer to interact with the primary equipment source.

External Regulatory Influence. Throughout this production process, outside stakeholders yield influence. The U.S. Department of Energy (DOE) influences certain research and development efforts through grants, while EPA sets tractor emissions standards. Air resource boards (ARBs), particularly California's, play a key role in setting state emissions requirements, thus influencing fleets' equipment purchases and logistics.

Operations and Maintenance

During operations, mega-fleets prefer in-house fueling and logistics over third-party options. Owner-operators and small- to medium-sized fleets, on the other hand, regularly use public truck stops and maintenance shops for fueling and maintenance. Many also turn to third-party logistics companies. These companies, thanks to their size and specialization, can typically reduce empty backhauls ("deadheads") and thus increase efficiency for their customers. Some logistics companies also provide group benefits—such as group insurance and discounted fuel prices—to owner-operators and small fleets.

External Influence. Throughout tractors' and trailers' lifetimes, external influencers—such as truck stops, the EPA, the U.S. Department of Transportation (DOT), state departments of transportation (DOTs), and non-governmental organizations (NGOs)—are never far from operators' thoughts and decisions. Infrastructure (roads, bridges, truck stops, etc.); future emissions and efficiency regulations; and size, weight, and length limits all impact decisions made during equipment development and production. The influence of road and bridge conditions, maintained by DOT and state DOTs, have a significant, but often-overlooked role.

Road conditions influence traffic conditions, wear and tear on vehicles, and ultimately the decision to invest (or not) in efficiency technologies.

Government funding decisions also play a role. Indiana DOT, for example, is leading a \$5 million USDOT-funded effort to conduct an economic feasibility study on creating dedicated truck-only lanes on Interstate 70 through Missouri, Illinois, Indiana, and Ohio. When completed, this project will encourage more fuel-efficient vehicle combinations, illustrating how government funding decisions can influence infrastructure investments, allowable vehicle combinations, and their resulting fuel use. Anticipation of future regulations also weighs heavy on the minds of OEMs and fleets. The role of regulations and regulatory agencies in driving and discouraging efficiency will be examined in greater depth later in this report.

Conclusion:

The Transformational Trucking Initiative has gotten off to a good start towards its goal of doubling trucking efficiency. This Initiative will help advance RMI's mission of reducing fossil-fuel use by engaging the trucking industry—a key fossil-fuel user. Using RMI's three approaches to reducing fossil-fuel use—efficiency, substitution, and reduced demand—the Initiative and the three proposed projects will transform the trucking industry and the way freight moves to, from, and throughout the United States. To reach the goal of doubled efficiency in trucking, our approaches are three-pronged: truck's platform efficiency, operational efficiency, and regulatory/infrastructure efficiency. An in-depth analysis on those three categories of opportunities to impact the much-needed efficiency improvements in the heavy trucking is presented in the RMI Transformational Trucking Initiative Report.

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Figure 2: U.S. Trucking Industry Stakeholders

Boxes' vertical position indicates those stages of production and/or operations in which the stakeholder is involved. Box area represents influence.

