Reducing Aerodynamic Drag by Closing the Gap

ABSTRACT

This report discloses the results of extensive testing on the AeroWall performed by a FedEx Ground independent contractor in Dallas, TX. The goal of this report was to document the fuel efficiency of the AeroWall and to give greater insights into the performance gains offered by the AeroWall. In addition, it is also of interest to determine how the AeroWall may impact safety and its affect on other vehicles and vulnerable road users in close proximity to the tractor-trailers.

Tests were conducted in real road conditions without negatively affecting the usefulness or profitability of the vehicles while testing. The test protocol used for this report was established to minimize as many of the truck-to-truck, real-world variables as possible, while still allowing for interplay between real-road conditions and the AeroWall. Not all variables can be controlled when conducting on-road testing. The focus for on-road testing is to minimize the variables between the test vehicle and the control vehicle, but not to control what are normal road conditions such as crosswinds.

Industry-wide, differences between performance results as measured in controlled testing and those of real-world performance are frequently downplayed. However, most aerodynamic devices that are tested in controlled track testing fail to deliver greater than 50% of their published results in real life. This is primarily because controlled track testing uses only drive time, not time spent while the engine is on and the vehicle is going less than typical and constant highway speed. In on-road testing, the miles per gallon improvement is a relative value ("as compared to") and not an absolute value. The values expressed in this report would not be the same as "fuel efficiency" reported in controlled track testing.

Fleet owners want to know what kind of performance and fuel efficiency they can expect from a device when it is used on the road, not simply on controlled tracks. Fuel efficiency for the purposes of this report means that a truck can do the same amount of business while spending less on fuel. Performance, on the other hand, is better labeled as "degrees of improvement" when referring to fuel efficiency and other benefits. The degree of improvement related to strictly fuel efficiency is as compared to a baseline of current performance using concurrent and retrospective data. Even though this report establishes a percent improvement (see results), the degree of improvement should never be an absolute number.

In on-road testing we measure fuel efficiency as fuel consumed over the number of miles driven, including all stops, idles, and restarts. In controlled track testing only actual drive time is used and only when it benefits the aerodynamic device. The objective of performing on-road testing is to provide fleet owners with relevant and reliable data that supports claims for how an aerodynamic device will perform on the road. The results from these tests will influence the fleet owner's purchasing decisions based on a variety of factors, including the payback period. The scope of this report focuses on three basic questions that fleet operators will want to know before making a decision to buy the AeroWall.

1. What impact does the AeroWall have on fuel efficiency?

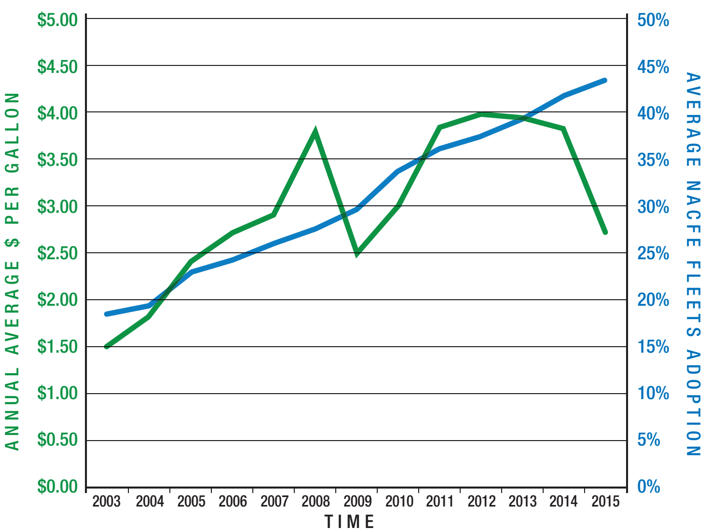
2. What is the payback on the investment made in the AeroWall?

3. What are the other proven test benefits of the AeroWall aside from fuel efficiency and payback?

INTRODUCTION

Tractor aerodynamics increase fuel efficiency by lowering air resistance so that less fuel is needed to move down the road as vehicle speed increases. Fuel prices, have increased steadily over the past decade. It is true that fuel prices are the lowest they have been in over a decade, but the global markets cannot sustain pricing below $70 a barrel for long. The historical increase in fuel prices have done little to dissuade fleet owners from purchasing aerodynamic devices. With increasing fuel prices, there has been brisk adoption of aerodynamic devices and other technologies aimed at improving fuel efficiency and reducing greenhouse gas emissions. The greatest opportunity in terms of miles driven and resulting fuel usage is the on-highway van trailer segment, both day cabs and high roof sleepers. In the graph below, aggregate adoption since 2003 has increased linearly from 13% to 43% in our target market, even after the price of diesel started to decline in 2012. Most fleet owners are betting that diesel prices will rebound.

FUEL COST PER GALLON AND ADOPTION OVER TIME



Fleet operators manage their businesses with 4% margins. With 40% of their operating expenses tied to fuel, any increase in the cost of fuel will squeeze the bottom line. Investments in aerodynamic technologies, even with artificially low prices, will continue in order to protect the bottom line and to build a sustainable competitive advantage. The fleet-wide fuel economy of the trucks in this study averaged 7.35 MPG as compared to an industry average of 7.06 MPG for the other major fleet operations in the U.S in 2015. FedEx Ground pulls closer to 60,000 pounds while others pull closer to 80,000 pounds, which could account for this difference in fuel performance.

TESTING DESCRIPTION

The vehicle used for evaluating the aerodynamic and safety benefits of the AeroWall is referred to as the Test Vehicle (TV). The vehicle that was driving a similar route without the AeroWall is referred to as the Control Vehicle (CV). The Test Vehicle and the Control Vehicle ran very similar routes, separated by approximately two hours of departure and arrival times. Both vehicles travelled from Dallas Fort Worth to Meridian, Mississippi and returned on the same day. The distance was approximately 1,045 miles.

"I've been trucking for 15 years and I've never experienced an aerodynamic system that works like the AeroWall. I'll admit that I was skeptical at first, but after having it installed on the truck, it's like night and day."

—Early Adopting Driver

VEHICLE AND TESTING CHARACTERISTICS

AeroWall Dynamics conducted on-road testing with a very well-established FedEx Ground operation to evaluate the performance of the AeroWall over a statistically significant number of miles with an acceptable level of repeatability. On-road testing measures all of the factors that impact the performance of the entire vehicle as a net total and therefor do not singularly measure the effectiveness of one specific device. Only when comparing the improvements on a single truck (with and without) and as compared to another vehicle (without) can gains in performance be attributed to a single device. On-road testing does not measure an aerodynamic device during continuous and controlled driving conditions as is seen in track testing. Rather, the performance of the device is being measure whenever the engine is running (stops, idles, accidents, congestion, etc.). Therefore, gains in performance do not correlate well to controlled track testing. For this very reason, aerodynamic devices seldom reproduce the performance improvements on the road as they do in controlled track testing where they often fail to deliver greater than 50% of their published results when tested in real life conditions.

The AeroWall test conducted in this discussion document most closely conforms to the protocols for RP-1103A, TMC in-Service Fuel Consumption. This test procedure is designed for comparing the fuel economy of aerodynamic devices which cannot easily be moved from one vehicle to another. The AeroWall, however, has a unique attribute which allows for automated deployment and retraction. As such, the device may measure performance on a single vehicle (n=1), yet not simultaneously. The test data compiled over a one-week period was compared to the historical, retrospective data for the prior five-weeks on the same vehicle. Although the test vehicle was not compared to the control vehicle for the specific purpose of measuring fuel efficiency, the data compiled from the control vehicle was used to determine if fuel consumption was similar over the test period and more specifically, whether it increased, decreased or largely remained unchanged during the week relative to the week in which the AeroWall was being tested.

TESTING METHODOLOGY AND CROSSWINDS

This method was in part selected to measure the effects of crosswinds, in spite of the fact that during this period of testing, there were no appreciable crosswinds.

Based on prior tests, crosswinds affect the performance of both test vehicles and control vehicles, to varying degrees. The AeroWall does not in itself perform better in crosswinds. Even with the AeroWall, fuel efficiency will degrade, if only slightly. However, crosswinds significantly reduce fuel efficiency on vehicles without the AeroWall. This has been well supported using computerized fluid dynamics modeling. "Differential Savings" accounts for the change in the performance of one vehicle with the AeroWall (test) in certain conditions as compared to another vehicle without the AeroWall (control) in the same conditions. In this case, there is an additive affect. The degree of change (improvement or degradation) from the baseline value on the test vehicle versus the degree of change (improvement or degradation) on the control vehicle are additive, the sum of which is the fuel efficiency for the test vehicle.

ON-ROAD TESTING VARIABLES

In this report, the test and the control vehicles infer that the tractors are a single aerodynamic concept. More accurately, the vehicles used to gather data for measuring fuel efficiency (performance) for the AeroWall are actually a system, commonly referred to as a combination truck. These combination trucks have a multitude of aerodynamic devices. Aerodynamic tractor devices are extensively customized as-a-system by each OEM for their specific models and the devices are not interchangeable between manufacturers. The tractor-based aerodynamic device variations that would be seen in an industry-wide test have been neutralized in this test because the vehicles have the same aerodynamic features, one tractor to the next. Trailers generally have non-OEM devices, which create a wide variance due to competing device alternatives and as a result, introduce thousands of different tractor-trailer permutations. These variations were also controlled as FedEx uses purpose-built trailers that are the same for every FedEx fleet operation.

Using dedicated routes to make fuel efficiency comparisons between the trucks eliminates some of the real world variables especially if these trucks run the same routes every day of the week. However, in the real world, it is impractical to compare two trucks simultaneously travelling down the road. Fleets are paid to move freight and they do it in response to customer demands. Fleet operations cannot alter their practices to accommodate road testing for comparative analysis. By way of example in this test, both trucks were butt-heading on a precise schedule with a fleet from Atlanta, Georgia to drop, hook and exchange trailers in Meridian, Mississippi. In spite of all the variables, dedicated routes that are running on the same day minimize the impact of most of the variables one would typically see if the trucks were running different routes on different days. As discussed above, this testing protocol will be even more important as we continue testing in crosswind conditions.

Table 1, above, is an illustration of the many on-road variables that impact performance, whether it is a single vehicle or vehicle-to-vehicle comparatives.

DATA INTEGRITY

AMBIENT AIR: Air becomes denser as temperatures drop, impacting fuel consumption due to increase resistance. For every 10°F drop in temperature, aerodynamic drag increases by 2%, causing fuel efficiency to drop by 1%. This means that fuel economy tends to be 8 to 12% higher in the summer versus the winter. However, cool air can also improve engine performance. Cold dense air has more oxygen than hot air, creating certain combustion advantages, which results in a more efficient fuel burn and greater engine power. Offsetting this is engine friction which increases with cold temperatures, decreasing engine performance as temperatures drop. Running trucks on the same route on the same day helps to neutralize these affects.

> ***"There is no longer any wiggle to the wagons, they hold a straight line behind the tractor."***
>
> ***—Early Adopting Driver***

TABLE 1

VARIABLES	CONTROLLED	NOT CONTROLLED
Ambient Temperature	Controlled Variable	
Wind	Controlled Variable	
Wet surfaces	Somewhat Controlled Variable	
Road Grade	Controlled Variable	
Vehicle Speed	Somewhat Controlled Variable	
Vehicle Configuration	Controlled Variable	
Vehicle Weight		Somewhat Uncontrolled Variable
Vehicle Maintenance Level	Controlled Variable	
Vehicle Age & Mileage	Controlled Variable	
Vehicle Duty Cycle	Controlled Variable	
Driver Behavior		Somewhat Uncontrolled Variable
Traffic		Uncontrolled Variable
Vehicle Routes		Somewhat Uncontrolled Variable
Non-Drive Fuel Use		Uncontrolled Variable
Measurement System Precision		Somewhat Uncontrolled Variable

Controlled Variable · Somewhat Controlled Variable · Somewhat Uncontrolled Variable · Uncontrolled Variable

WINDS: As mentioned previously, the AeroWall creates the largest differential savings when in crosswinds. Based on prior test results, the AeroWall can produce an increase in fuel efficiency of 5 to 10% in crosswinds. It is well documented, a combination truck will lose 13% fuel efficiency for every 10 mph of crosswind.

WET SURFACES: Tractors running on the same day help to eliminate differences in rolling resistance. Wet roads can account for an increase in fuel consumption of 0.2 to 0.3%.

ROAD GRADES: Controlled track testing has no road elevations to deal with whereas in real life the roads are never flat.

VEHICLE CHARACTERISTICS: The test vehicle and the control vehicle were the same year, make and model. Odometer readings were approximately the same, 160,000 miles and the tractor-trailer configurations were identical. The OEM aerodynamics were also identical. The trucks are maintained with the same frequency and both trucks are dedicated to this same Dallas to Meridian route using team drivers. Based on the specific duty cycle, gross weights, although not measured, were uniform between the two vehicles.

In spite of the above controllable variables, these two vehicles varied in some ways. The biggest differences were in idling time due to road conditions, drop and hooks, on the road breaks, restarts, and over-night stays on days where there was no co-driver. Although it could impact both vehicles equally, accidents and road congestion can vary from hour-to-hour and from day-to-day. In the real world, speed varies all of the time as opposed to controlled track

"For the first time ever, I am able to keep the cruise control activated through mountain switchbacks and curves, because the AeroWall allows the truck to hold itself in the lane with minimal effort for the driver. It just glides through the turns now."

—Early Adopting Driver

testing which is set to one speed. The way in which speed changes over time through acceleration, deceleration and stop/starts impacts fuel consumption. In this test period, excessive driver breaks accounted for increased fuel consumption. Fast accelerations to regain highway speed (commonly referred to as tip-ins) consumes as much as 1 gallon of gas for every event, says Freightliner. Idling while not driving claims an additional 0.5 gallons for each hour of idling. One factor that influences the amount of time idling is traffic conditions which change hourly. When added together, net mileage related to the driver's allowable driving time and how much time a truck is stopped affects idling and fuel loss during acceleration. Vehicles not moving have zero freight efficiency, even if their engines are shut off, causing zero loss in fuel.

MEASUREMENT SYSTEM PRECISION

There are many system testing areas that were far beyond our ability to control. The most significant factor was the lack of crosswinds during the test week. In spite of that, most of the factors related to climate were neutralized with the use of the control vehicle. Most of the areas of concern were related to route issues, weather, locations of fill, drop and hook locations, idle time and tip-ins. In essence, the test truck performed the same job every day, but the control truck had slight nuances every day. The fueling data was captured daily and then aggregated weekly. Our test procedures have since been modified. We now augment our results by capturing visual, real time data obtained from the truck's fuel gauges (mpg reported from the trip odometer). This will add greater insight as to how fuel is being consumed on a daily basis, rather than relying exclusively on the digital fuel cards only at fill-up. It will also allow us to use the test vehicle to compare results with and without deployment of the AeroWall. Another variable is weight. Over the long haul, subtle weight differences do not matter, but they can be meaningful in test conditions when measuring results every day even if there are only fractional changes.

RESULTS

Table 2, above, summarizes the test results for the Dallas-Meridian-Dallas FedEx Ground route. Over the course of testing the AeroWall, 48 data points were captured, each data point representing one day. The combined mileage driven over the course of the six-week testing period was nearly 50,000 miles. The data from the AeroWall test week accounted for approximately 9% of the total miles driven and fuel consumed. The Test Vehicle had an average of 7.35 mpg for the five-weeks preceding the test week. The miles per gallon improved to 7.71 with the AeroWall while the control vehicle remained appreciably the same during this same period of time. This translates to a 4.9% improvement in fuel efficiency, without the comparative benefits of crosswinds.

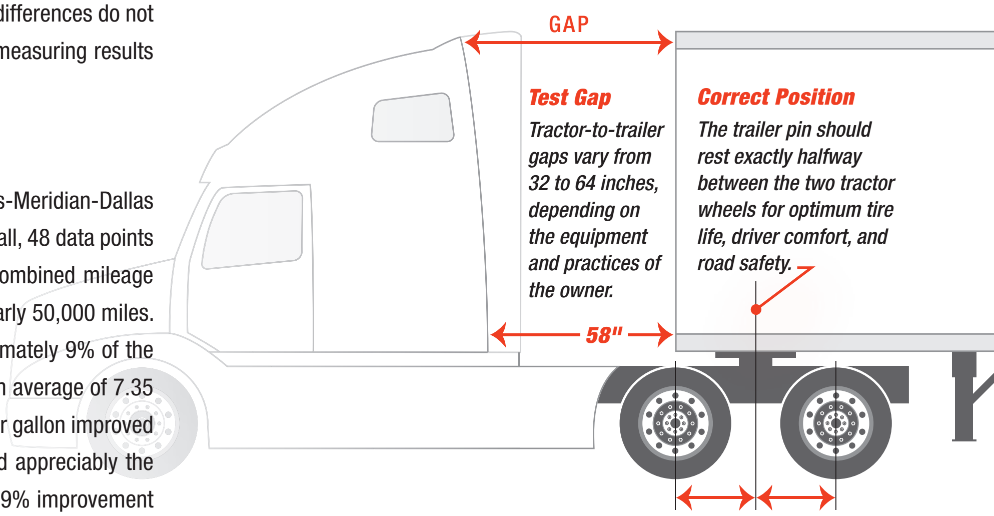
TABLE 2

MEASUREMENTS	TEST VEHICLE (TV)		CONTROL VEHICLES	COMBINED VEHICLES
	AEROWALL	NO AEROWALL		
Data Points (days)	4	20	24	48
Distance (miles)	4,180	20,900	24,618	49,698
Fuel (gallons)	542	2,842	3,402	6,786
Fuel Efficiency (mpg)	7.71	7.35	7.35	N/A
Efficiency Change (%)	4.9%	N/A	0	N/A

DISCUSSION

Most of the test conditions used in this study would apply to every fleet operation in our target market, although FedEx pulls doubles (pups) which is different from carriers that pull 53' dry vans exclusively. The biggest configuration variable is the size (distance) of the gap. Every fleet operation that pulls 28' doubles will have the same or highly similar gap configuration as FedEx. FedEx Ground operations uniformly set their fifth wheel back over mid-point of the rear wheel axels. FedEx Ground which pulls, almost exclusively double 28' trailers (pups), is unable to move the trailer closer to the tractor due to the landing gear on the trailer. In these test conditions the percentage of performance improvement (FE) was evaluated using a 58" gap, measured from the back of the tractor to the front of the trailer. This placement is illustrated in the diagram below. Many other fleet operators set their fifth wheel forward, allowing them to pull the trailer closer to narrow the gap in order minimize drag. This causes many other problems that significantly impact safety, maintenance and driver comfort. The only reason why fleets move their trailers tight to the tractor is to save fuel cost. Without the AeroWall, every fleet owner would move the fifth wheel back to its optimal position, if they did not have to sacrifice fuel efficiency, especially as vehicle speed increases.

The AeroWall improved fuel efficiency by 0.36 mpg or approximately 5% in on-road testing. The test conditions included traffic congestion, road construction, accidents and other factors that would not be encountered in controlled track testing. Most aerodynamic devices that are tested in controlled track testing fail to deliver greater than 50% of their published results because only drive



"It stabilizes the rear trailer with very little movement of the steering wheel, eliminating steering wheel play."

—Early Adopting Driver

> ***"Because the AeroWall gives the driver more control while not having to fight the steering, it is less stressful and makes for an easier day for the driver."***
>
> ***—Early Adopting Driver***

time is considered, not time spent while the engine is on and the vehicle is travelling at typical highway speeds. Track testing also controls other variables such as crosswinds. If the average crosswind is in excess of 12 mph or there are gusts of 15 mph sustained over two seconds, the test is cancelled. However, crosswinds are prevalent over 85% of the time and commonly exceed 15 mph in many geographical areas.

Although crosswinds were not present during the week of testing, AeroWall Dynamics conducted this on-road test to measure and validate previous tests in crosswinds and to assess the impact of other real-world conditions on the AeroWall. The AeroWall does not in itself perform better in crosswinds. Even with the AeroWall, fuel efficiency will degrade, if only slightly. However, crosswinds significantly reduce fuel efficiency on vehicles without the AeroWall. "Differential Savings" accounts for the change in the performance of one vehicle (with the AeroWall) in certain conditions as compared to another vehicle without the AeroWall in the same conditions. In this case there is an additive affect. The degree of change (improvement or degradation) from the baseline value on the test vehicle versus the degree of change (improvement or degradation) on the control vehicle are additive, the sum of which is the fuel efficiency for the test vehicle.

Using the concept of differential savings as discussed in the Testing Methodologies, the anticipated savings as a result of crosswinds will be the combined improvements or degradation of each vehicle, one with the AeroWall and one without the AeroWall. For example, if the AeroWall improved the performance of the test vehicle by 5% from its baseline and this improvement declined to 4% with crosswinds, while the performance of the control vehicle degraded by 5% from its established baseline, the net improvement for the test vehicle would be 9%. It is well documented that a combination truck will lose 13% fuel efficiency for every 10 mph of crosswind. Only a portion of this decrease in fuel efficiency may be attributed to the gap.

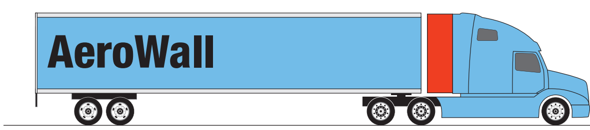
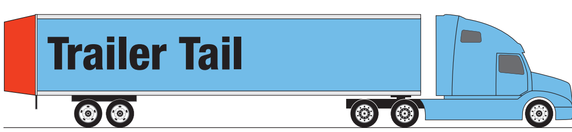
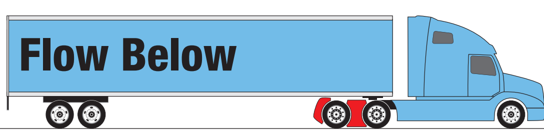
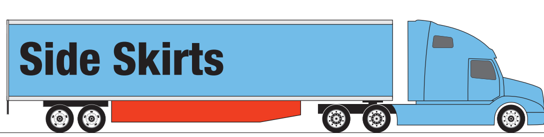
PAYBACK PERIOD

In order to calculate fuel savings, fleets must compile data during various seasons and analyze the average miles per truck each year, the current average annual fuel economy per truck type, and the annual net fuel price after any rebates or adjustments.

When calculating the payback period, it is also important to factor in the number of devices required to create a combination truck or system solution. The graph below, Price to Performance Analysis, shows some commonly deployed non-OEM (after-market) aerodynamic devices for tractors and for trailers. The data compares the performance of each device along with the number of devices required and the associated payback period. Many factors determine whether a fleet owner is maximizing their return on the investment they made in the aerodynamic device, including the percentage of time that the device is deployed and the number of devices required. Since there are 4 trailers for every one tractor a 3:1 ratio of tractors-to-trailers is a conservative number. With a 3:1 ratio either the device effectively returns only 33% of the advertised aerodynamic efficiency or it is essentially three-times as expensive for deployment on three trailers.

Let's assume that the average FedEx Ground fleet averages 250,000 miles per tractor, per year with an annualized fuel expense of $80,000. With a 5% improvement in fuel efficiency, the AeroWall allows fleets to recoup their purchase price in eleven months. With crosswinds, the savings are accelerated, yielding a payback in less than eight months.

RETURN ON INVESTMENT OVER 2-YEARS

	FUEL SAVINGS (PERCENTAGE)	TRAILER MULTIPLE (X)	PAYBACK (MONTHS)	ROI (DOLLARS)
 AeroWall	4.9	1	11	4,250
 Trailer Tail	5	3	16	2,600
 Flow Below	2.3	1	16	1,180
 Side Cab Extenders	1.5	1	15	900
 Side Skirts	3	3	21	600

Assumes 250,000 miles per tractor per year

The return on investment (ROI) is the total amount of savings for the duty cycle of the equipment after the device has been paid for. In this case assuming 250,000 miles per year and a two-year trade-in, the AeroWall yields an ROI of $4,250.

In some cases, the devices are not deployed at all because they require driver (manual) intervention. This too should adjust the aerodynamic efficiency by the percentage of time it is deployed. Automated devices ensure that the device is deployed when it is needed and out of the way when it is not. Another consideration is WIP inventory. For 4 months of the year, trailers are used for excess, yet anticipated inventory (mobile inventory). Using devices on these trailers is an expensive proposition as it represents idle investment dollars.

The cost of fuel must be taken into account when doing payback calculations for investments in fuel efficiency technologies. One of the problems in calculating fuel savings is the volatility in the price of fuel. While it is true that diesel fuel prices are at their lowest levels in five years, if history is any indication, they will not stay low forever. The U.S. Energy Information Administration's Short-term Energy Outlook shows that by 2017 the price of diesel will be back up to $2.71 a gallon and rising steadily though 2020. Regardless of the price of diesel, fleets would be unwise to lose their focus on improving fuel economy. Lower diesel prices make the paybacks for some technologies longer, but the price of diesel is not the only reason fleets should strive to improve their fuel economy. Whether fuel is $4.00 a gallon or $2.00 a gallon, when you improve fuel economy you cut expenses from the bottom line. The bottom line is that fleets will benefit from adopting multiple aerodynamic devices. With fuel prices commanding 40% of the fleet's budget, aerodynamic efficiency creates significant savings for fleet operations while reducing emissions for the sector at large. Adding safety to the equation creates a very compelling argument for purchasing the AeroWall.

SAFETY

In addition to fuel efficiency and a consequential reduction in greenhouse gas emissions, this report substantiated many other safety claims that were reported in previous on road tests.

Driver and vehicle safety are of paramount concern to most fleet operations. With driver shortages now approaching 1 million, driver recruitment and retention has become an essential component of operations. Fleet owners are making investments in technologies that will help them attract and keep drivers including Bose® Seat Systems, DIRECTV,® super-sleepers for team drivers, lane departure devices and many more. Innovations aimed at keeping drivers safe, improving comfort, improving the safety of the truck and other vehicles that share the road with them are real and quantifiable objectives. All combination vehicles are different, but in general terms, at zero yaw, the drag on the tractor accounts for approximately 70% of the total drag and the trailer accounts for the remaining 30% of the drag. However, at yaw angles in excess of 5 degrees, the tractor drag component increases very little, but the trailer drag increases substantially and exceeds that of the tractor. Test results proved that the AeroWall greatly enhanced tractor-trailer stability and visibility by reducing tractor-trailer yaw. Tractor-trailer stability is an important factor in on-road safety and driver fatigue.

Restricted visibility from splash and spray due to wet road conditions is a hazard for truck drivers and for passenger vehicles that share the roads with them. Drivers reported that they could see the entire length of the trailer where previously they could hardly see the trailer. They also reported that they could easily see other vehicles in the mirror.

Most drivers will acknowledge that crosswinds are the most significant challenge that they have to deal with continuously. Although crosswinds are flatter in the late summer months, they are present nearly 85% of the time across all seasons. Fighting the steering wheel to maintain lane control is physically and mentally exhausting. It causes fatigue and lapses in attentiveness.

Team drivers are challenging to recruit and to retain. They spend many hours on the road with a lifestyle that is difficult to manage. In addition to quality of life, driver comfort and safety issues not only impacts the driver behind the wheel, but the driver in the bunk as well. A well-rested team driver is a safer driver.

Most fleet operators recognize that an investment in their drivers is an investment in their business. In a very competitive industry where growth comes primarily through acquisition of drivers, maintaining a competitive edge that benefits the operation and the driver, enhances fleet stability. Life on the road is stressful. The average age of the U.S. driver is 62.5 years old. Our roadways are in need of massive repairs and when combined with traffic congestion, accidents, unfavorable weather conditions and poor visibility, investments in safety and driver comfort will give fleets a competitive advantage. The AeroWall is the only aerodynamic device on the market today with fuel efficiency and safety claims. Our drivers tell the story best.

MORE FROM EARLY ADOPTERS

"The AeroWall holds the truck in the lane so well that it allows my co-driver a more restful sleep. The system is very quiet which is a plus when trying to get a good sleep."

"In wet road conditions, the AeroWall pushes the overspray down, increasing visibility in the mirrors so I can see traffic behind the vehicle as it approaches."

"The AeroWall makes the truck handle unbelievably easy. No more fighting the steering wheel to maintain lane presence."

"Crosswinds coming through the mountains no longer affect the truck, the AeroWall just shrugs them off."

"The AeroWall makes a huge difference when passing and changing lanes by keeping the road spray away from the sides."

"In crosswinds, the tractor and the trailer move as one with no fish tailing."

"With the AeroWall on, the truck is like a rocket sled on rails, giving me phenomenal control and handling."

CONCLUSION

There are many variables to consider when making an investment in aerodynamic technologies that are designed to improve fuel efficiency. On the road testing is used to gauge how a device will actually perform in real-world conditions. The AeroWall is the only tractor-mounted device that intelligently deploys and retracts and has proven aerodynamic capabilities that result in improved fuel efficiency and enhanced safety.

1. In this on-road test, the AeroWall registered approximately 5% improvement in fuel efficiency, even in less than ideal testing conditions, such as the absence of crosswinds.
2. The payback period is influenced by the price of the product, the price of fuel, the percentage improvement, the number of devices necessary, and the percentage of time the device is in use.
3. There has never been a single tractor-based aerodynamic device that exceeds 4% in fuel efficiency.
4. The degree of improvement for any device should be expressed in ranges, rather than absolute values, because testing conditions change, as do the quality of measurements.
5. Differential Savings is the additive effect of the degree of change (improvement or degradation) on the test vehicle with the device versus the degree of change (improvement or degradation) on the control vehicle without the device.
6. On-road testing generally will report performance values much lower than controlled track testing because the vehicles are subject to road conditions and do not benefit from testing only when the vehicle is moving at typical highway speeds.
7. Driver recruitment and retention is improved with a focus on driver safety, comfort and ease of driving.
8. The AeroWall decreases tractor-trailer yaw in straight-on winds and in crosswinds.
9. Aside from saving fuel, there are other benefits to reducing drag with the AeroWall including, improved stability and handling increased visibility by reducing splash and spray.

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