



## **SAE J1321 Type 2 Fuel Test April 5, 2007**

Test compares a stock Peterbilt 387 with 53 foot trailer vs. the same, equipped with Slipstream's Showtime 100.

### **Abstract**

The purpose of this testing program was to evaluate the performance of the Showtime 100, an aerodynamic, damage resistant boat-tail. Slipstream's Showtime 100 derives its main benefit from reducing the "pressure" drag created on the back of the semi when going 50mph or faster. In order to facilitate testing, the Showtime 100 was added to one of two identical class 8 rigs. The SAE Type 2 test procedure was used to evaluate the products effectiveness in improving fuel economy and handling characteristics.

Testing was done at Grand Island Express in Grand Island Nebraska on several different occasions from May of 06 thru September of 07. Of all the tests we performed using the same equipment and drivers every time, this test was a good representation of the average.

All of our research was conducted using the SAE Type 2 test procedure. Two 2004 Peterbilt 387 tractors served as the control and test tractors. Two 2004 Wabash Duraplate 53' trailers were used for the control and test trailers. Both tractors have C15, 500hp engines coupled with Eaton 9sp transmissions with shift points at 1,900 rpm. They have Michelin 275/80/R22.5 tires inflated to 90 psi cold. The cooling fans were disabled and air-conditioning off, windows rolled up. Our test speed was 64mph. Two Wabash Duraplate trailers with 5-hinge rear doors were used. They are both 53 feet long and built within 3 months of each other. They both sport Goodyear 314 tires 295/75/R22.5 inflated to 100 psi cold. Our total truck weight was 65,600lbs. These trailers had smooth sides and rounded corners and are 13'6" tall. From back of cab extension rubber to front of trailer was 30" and the slider was set in the 9<sup>th</sup> hole from the front of the trailer.

We had no mechanical issues of any kind during the testing with either vehicle at any time. We noticed an immediate gain in mileage and serendipitously, a greatly improved handling of the vehicle. Over the course of our tests, we noticed over a 6% gain in mileage. Our control truck consistently got between 5.96 and 6.02mpg and the test truck consistently showed almost 6.5 with the Showtime 100. The test truck was also far easier to drive in windy situations versus the control truck. The same drivers remained with both vehicles for the duration of the test.



## Technological Overview

Slipstreams' Showtime 100 is a composite molded, collapsible boat-tail for class 8 dry vans. It uses aluminum hinges, cad plated hardware, stainless steel biasing ropes and polyurethane wheels for years of corrosion and maintenance free usage. For safety measures, each panel has 3 different attachment points to the trailer so as to minimize the risk of fly-off during operation.

When installed on the back of a dry van trailer, the ST100 reduces the pressure drag associated with bluff bodies. This reduction in drag allows the tractor to now have more available horsepower as it now takes 23-35 less horsepower to pull the same load. The natural curve of the panel allows the air to smoothly exit the rear of the vehicle.

This device has several springs to hold the panels in the deployed position. The door chains are used to keep the device closed when not in use or in third party lots.

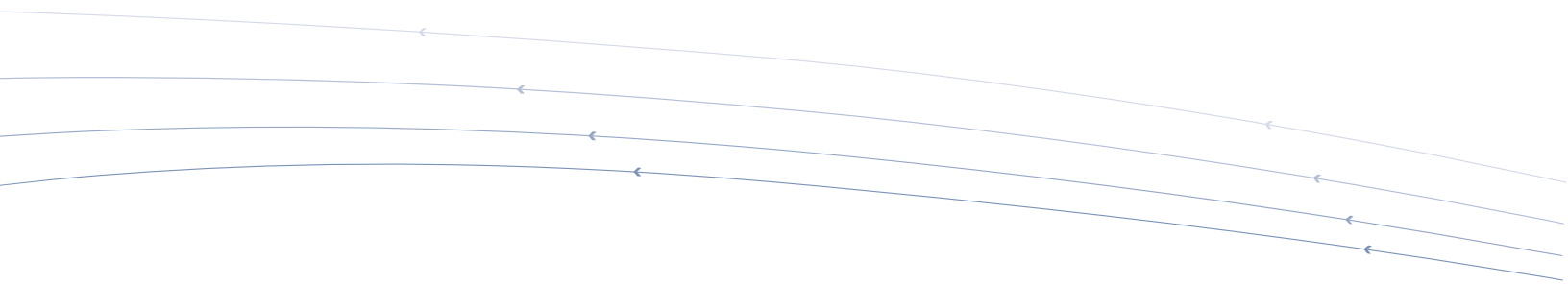
The ST100 could result in extended service life of equipment due to less stress at speed, greater system efficiency, emissions reduction and fossil fuel conservation, not to mention a reduction in driver fatigue.

## Test Procedure

The control and test tractors used during the test were both 2004 Peterbilt 387's. They have the full aerodynamic sleepers and 15" cab extenders including rubber flap. Both units had Cat 15 500hp engines with odometer readings between 450 and 550,000 miles for both vehicles. Both tractors were equipped with Eaton Fuller 9 speed manual transmissions. The cooling fans were disabled and no air conditioning was run, all windows rolled up. The control tractor was #215 and the test tractor was #310.

Each tractor pulled an identical Wabash trailer as described above with identical weights of around 65,000 lbs.

The test consisted of three baseline test segments and one test segment. Each segment consisted of at least three runs and sometimes up to five runs to meet the criteria to pass in the type 2 standard. The type 2 test allows any reasonable weather conditions and we have tested in all winds and rain to boot. This particular test had from 24 to 32 degrees in temperature and a north wind at 10+ mph. Humidity was in the 70% range. In some cases, an extra run was ran just to collect the extra data while all the equipment was ready.





The two drivers were selected on their prior fleet performance and consistency. They were randomly elected to either truck, and stayed with that truck for the duration of the test.

On the route, both tractors were shifted manually at 1900 rpm. The trucks cruised in top gear at 64 mph, maintained by cruise control.

### **Test Route**

Testing was done at Grand Island Nebraska on Interstate 80. I-80 consists of 2 lanes in either direction heading east and west and the surface is concrete. To get to I-80, we leave Grand Island Express lot and enter a 2-lane blacktop heading south for 2 miles. We enter I-80 on exit 310 and head east for 22 miles before exiting up a ramp to a stop sign. We turn left, go over the interstate and enter on exit 332 heading west and we exit at exit 310. We come to a stop sign, turn right and head north on a 2 lane blacktop back to Grand Islands facility. Our entire test route is exactly 48 miles.

We used 30 gallon tanks on each tractor and drained using a drain on the bottom of each tank. Each tractor was “pitted” in exactly the same spot at GIX’s front service lot. The fuel was weighed to the hundredth of a pound going in and coming out. A dedicated supply was used during all testing and bought fresh the day before testing began. All fuel was put in at 50 or 51 degrees and it came out at 115+ degrees. The changing and weighing of fuel took place in Grand Islands service dept under consistent conditions. Grand Island, Nebraska is around 1,850 feet in elevation.

### **Test Methodology**

Fuel consumption measurements in a test vehicle are compared to measurements from a control vehicle before and after the device is installed. The difference between the before and after ratios are used to calculate a fuel savings percentage resulting from the device. Vehicle operation was kept in check by use of a stop watch and controlled departure times. Both tractors were fitted with 30 gallon drainable nurse tanks. The fuel was D2 delivered to GIX the day before the test and was solely used throughout the test. The fuel was weighed before going in, and the fuel temperature taken, and the same coming out. Fuel was weighed to the hundredth of a pound and a 100 lb. check weight was used before each testing day to ensure scale accuracy. In some cases we ran more than the prescribed runs to simply gather more data. Each tractor was ran on the test loop one time prior to any testing to get the tractor temperatures up to running levels.



## Results

After the fuel consumed by each truck had been measured and weighed, the weight of fuel consumed by the test tractor is divided by the weight of the control tractor. This gives us what's called a T/C ratio (test and control). These ratios are then compared against a testing standard to make sure they are within the limits of accountability. These ratios finally are used to compute fuel economy improvement as a percentage and also to compute the percentage of fuel saved.

Several type 2 tests were performed on the Showtime 100 in various winter conditions to rain to the sweltering heat of summer. Over all of these normal to adverse conditions, this device averaged in excess of a 6% gain in fuel economy and over a 6% gain in fuel saved. All of the drivers who have driven the device in the fleet mentioned how stable the trailer was in windy conditions. They noted the rig took considerably less effort to drive.