MESILLA VALLEY TRANSPORTATION SOLUTIONS
CERTIFIED
Fuel Economy Experts

Test Report

Eco Flaps

(48-ft Dry Van Trailer)

MVT SOLUTIONS CERTIFIED™ FUEL ECONOMY TEST

June 2021

1.12 gal/1000 miles	0.12 MPG	1.17%

1.0: INTRODUCTION

Mesilla Valley Transportation Solutions (MVTS) certifies the fuel savings from this product are as described in this report. **Note:** this report was designed for carriers and providing information relevant to their needs. Therefore, the format varies from traditional fuel economy and technical reports. The report Summary provides the reader a quick synopsis of the product's fuel savings. Following the Summary is the body of the report and further details on the subjects. This fuel economy test was performed using MVTS proprietary fuel economy test methods. These test methods were developed from race car engineering and advanced vehicle test methods, which the Mesilla Valley Transportation (fleet) has relied on since 2012 to identify substantial fuel savings. The MVTS methods provide highly accurate and reliable answers on real-world fuel savings in comparison to other test methods, which enables carriers to make the best decisions for their company.

Contact MVTS with any questions regarding the product or test. As part of an MVTS Certified™ test, MVTS supports product inquiries, which we encourage carriers to utilize.

Note: blue text indicates a link to the topic. Click to follow. Alt + ← returns the reader to the initial location.

2.0: TEST SUMMARY

Eco Flaps (aerodynamic mud flaps) were tested on a modern Class-8 single axle day cab (SADC) tractor with 48-ft dry van trailer, which resulted in fuel savings of **1.12 gal/1000 miles (1.17%)**.

Testing was conducted on a 9-mile test track at 65 miles per hour and a Gross Vehicle Weight (GVW) of approximately 39,400 lbs. Results are shown below in Table 1.

Table 1: Fuel Economy Test Results

Product	Fuel Economy Improvement		
	Gal/1000 miles	MPG	Percent
Eco Flaps	1.12	0.12	1.17%

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3.0: TEST PROCEDURE

The two (2) vehicles ran simultaneously, at 65 mph, on the 9-mile circle track near Pecos, Texas. The vehicles were 1-minute apart, avoiding any aerodynamic influence on either vehicle during testing. The vehicles were termed “Compare Vehicle” and “Test Vehicle”. The Compare Vehicle remained unchanged throughout testing; it was used solely for comparison. The Test Vehicle had modifications made during the test (*i.e.* Eco Flaps and Eco Caps installed).

The test procedure may appear similar to the SAE J1321 method traditionally used in the trucking industry; however, the MVTS methods are a much more advanced and precise form of on-road and track testing. The vehicles are equipped with sensors and data recording systems that collect data on fuel consumption, aerodynamics, rolling resistance, driver behavior and many other variables that affect fuel consumption. The data is analyzed using MVTS proprietary methods, which provide very accurate answers on fuel savings. Additionally, the test results can be scientifically translated to a carrier’s real-world daily operations and long-term savings, which is a feature unique to these methods. Overall, the MVTS test methods are a much more advanced and reliable tool for predicting fuel savings than the trucking industry has used previously.

3.1: TEST VEHICLES

Test vehicles were 2018 and 2021 International LT single axle day cabs with Cummins X15 15-Liter engines. Trailers were 48-ft Hyundai dry vans. Gross Vehicle Weight (GVW) was approximately 39,400 lbs. Both trucks were equipped with Ex-Guard grill guards, which were previously tested and showed no negative influence on fuel consumption. The Compare vehicle remained unchanged throughout all tests. The Test vehicle configuration was changed between test runs (*i.e.* Eco Flaps installed). Trucks and trailers used dual tires. Tire pressures were set at 110 psi in the morning, prior to incurring any effect of daytime heat. Vehicle info can be found in the Appendix.

Vehicles were thoroughly inspected and received regular maintenance prior to testing. It should also be noted, for the reader’s peace of mind, Mesilla Valley Transportation (MVT) and MVT Solutions are 100% confident in the reliable condition of the test vehicles. MVT fleet uses the same vehicle data and test procedures for their own internal purchase decisions.

Test runs were conducted in the order as shown in Table 2.

Table 2: Test Runs

Run	Test Name/Description	Start	End
2	Eco Flaps	12:44 AM	2:23 AM
3	Baseline	2:38 AM	4:17 AM

Figure 1: Test Vehicle where Eco Flaps were Installed

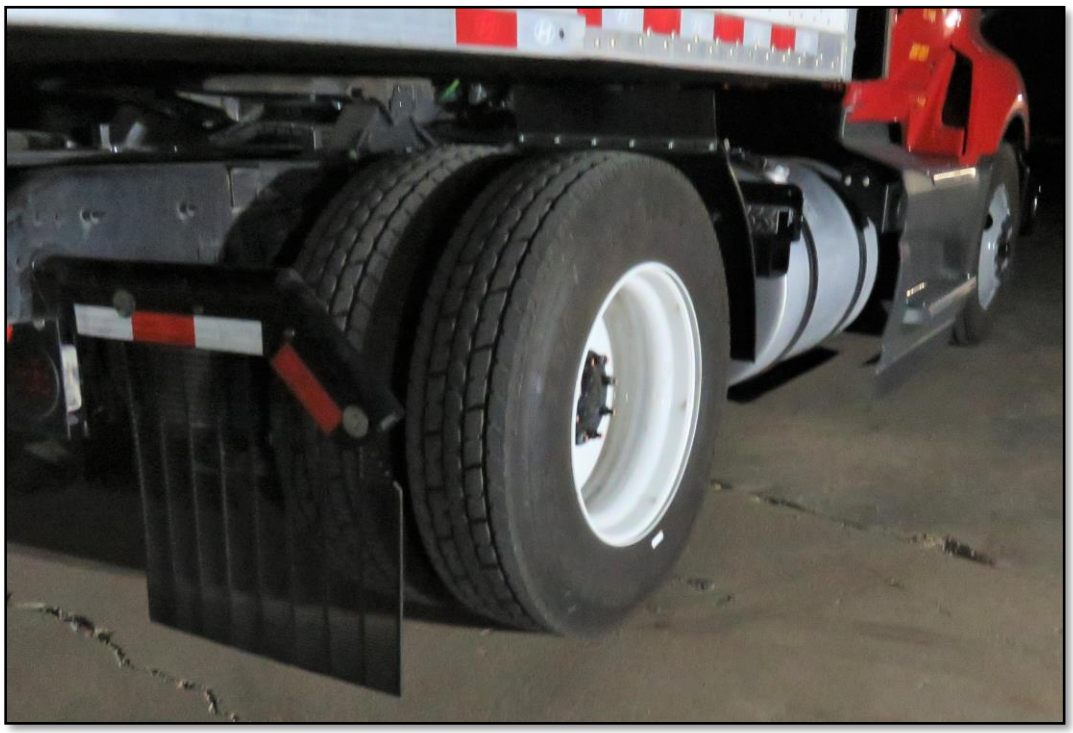
Figure 2: Compare Vehicle (No changes)

3.1a: Run 2: Test Run with Eco Flaps

Run 2 was the first run conducted for this test and Eco Flaps were installed on the tractor and trailer. Run 2 was compared to Run 3 to quantify fuel savings of Eco Flaps.

Figure 3: Test Vehicle Config. (Eco Flaps, Tractor and Trailer)

Figure 4: Tractor with Eco Flaps



3.1b: Run 3: Baseline (Solid Mud Flaps)

Run 3 consisted of removing the Eco Flaps and installing solid mud flaps on the truck and trailer. This served as the Baseline comparison run.

Figure 5: Trailer with Solid Mud Flaps

Figure 6: Tractor with Solid Mud Flaps

3.2: VEHICLE FUEL ECONOMY TEST EQUIPMENT

MVT Solutions fuel economy testing utilizes a data acquisition system and sensors specifically for this testing. This style of testing is derived from race car engineering where reliable sensor data is critical to understanding vehicle modifications.

MVTS test sensors include:

- Data acquisition system (records sensor data)
- Fuel flow meter (accurate to 0.2%)
- Fuel temperature sensor
- Tire temperature sensor (infrared, mounted on left-front drive tire)
- Ground/road temperature sensor (infrared, mounted ahead of left-front drive tire)
- Wind speed air pressure sensor (truck hood)
- Wind direction sensor (truck hood)
- Ambient air temperature sensor (truck hood)
- Ambient air pressure sensor (truck cab)
- High Precision GPS (latitude, longitude, altitude, time)

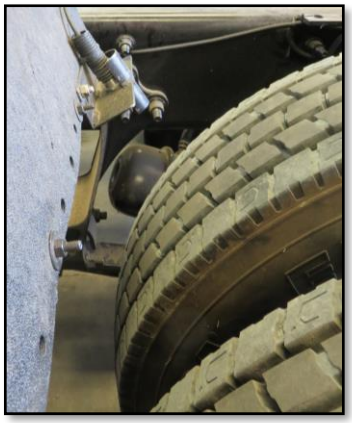
Click this link to see a video of MVTS sensors and testing: How We Test

Figure 7: Aerodynamic Sensors

Figure 8: Data Acquisition System

Figure 9: Fuel Flow Meter

Figure 10: Tire Temp. Sensor



4.0: TEST RESULTS

Eco Flaps resulted in a fuel savings of **1.12 gal/1000 miles (1.17%)** on the tractor and 48-ft dry van trailer combined. Table 3 shows the test results and accuracy.

Table 3: Test Results with Accuracy

Product	Fuel Economy Improvement		
	Gal/1000 miles	MPG	Percent
Eco Flaps	**1.12**	0.12	1.17%
Accuracy	**+/- 0.34**	+/- 0.04	+/- 0.35%

These results are shown graphically in gal/1000 miles below in Figure 11 and as a percent in Figure 12.

Figure 11: Fuel Savings (gal/1000 miles)

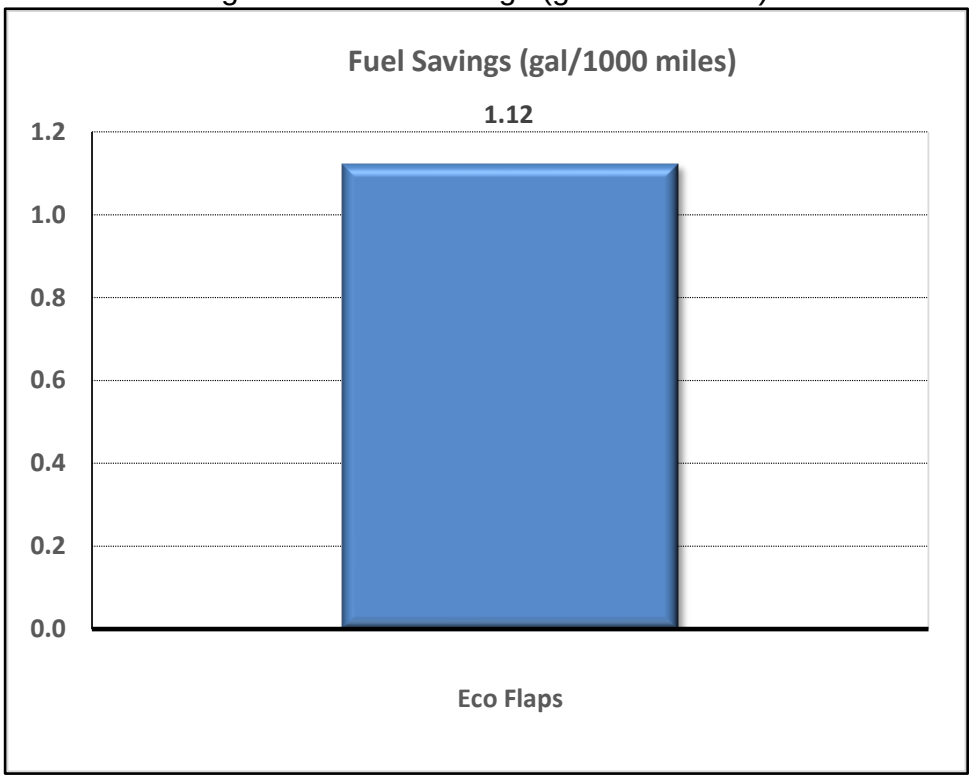
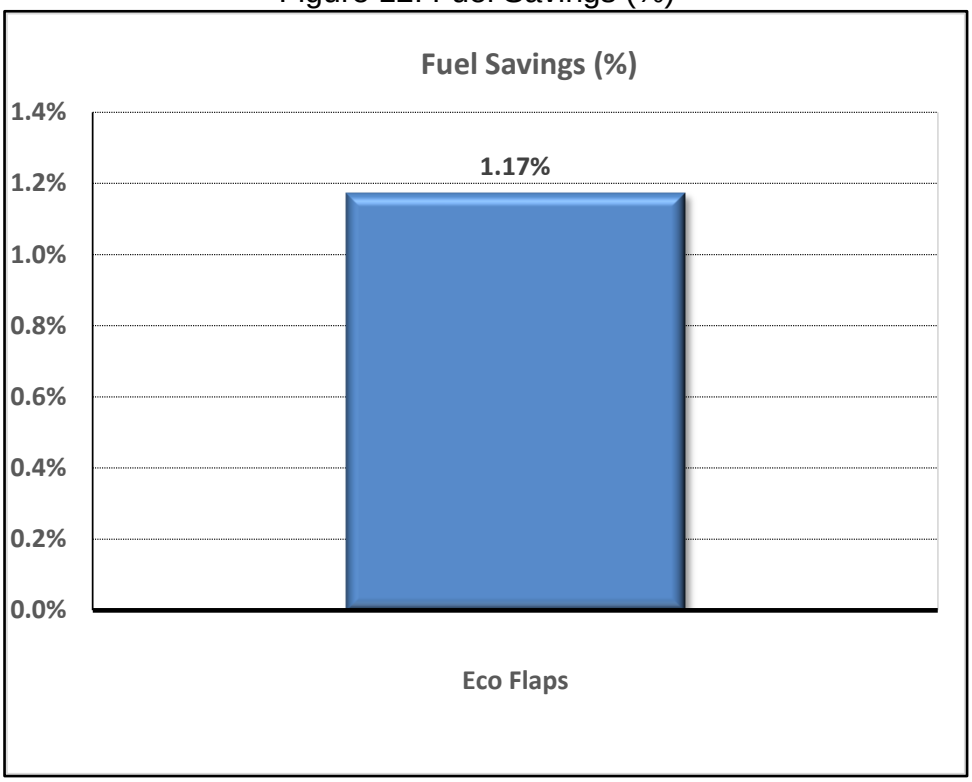


Figure 12: Fuel Savings (%)



4.1: UNITS OF MEASUREMENT

The reader may not be familiar with units of gal/1000 miles (gallons per 1000 miles) since it is not traditionally used in the trucking industry. The following paragraphs briefly explain the reasons for these units and how they help carriers better calculate fuel savings.

Units of gal/1000 miles more reliably calculates fuel savings when compared to other units such as miles-per-gallon (MPG) and percent (%). Those units are prone to error from changing variables such as vehicle baseline fuel economy, load, driver behavior, and duty cycle. For example, gal/1000 miles values are not affected by load for an aerodynamic product. Any empty Class-8 unit at 34,000 lbs. will save the same gal/1000 miles in fuel as one loaded to 80,000 lbs. However, when viewed in percent (%) of MPG the values will change with load. This causes a carrier to experience varied results in real-world operation and difficulty predicting the financial benefits of the product unless units of gal/1000 miles are used.

Units of gal/1000 miles are the most reliable units of measurement for aerodynamic fuel savings due to its scientific and mathematical relationship to fuel consumption. Further detail is beyond the scope of this report and the reader is encouraged to contact MVT Solutions if more information is needed.

4.2: WEATHER CONDITIONS SUMMARY

Temperatures ranged from 71°F to 81°F. Winds were reported from 5-7 mph by a local Weather Underground weather station. It should be noted that the MVTS test methods account for these variables and their effects on fuel savings. Therefore, the range in climate conditions did not impede the test results shown in this report. Complete weather data can be found in the Appendix.

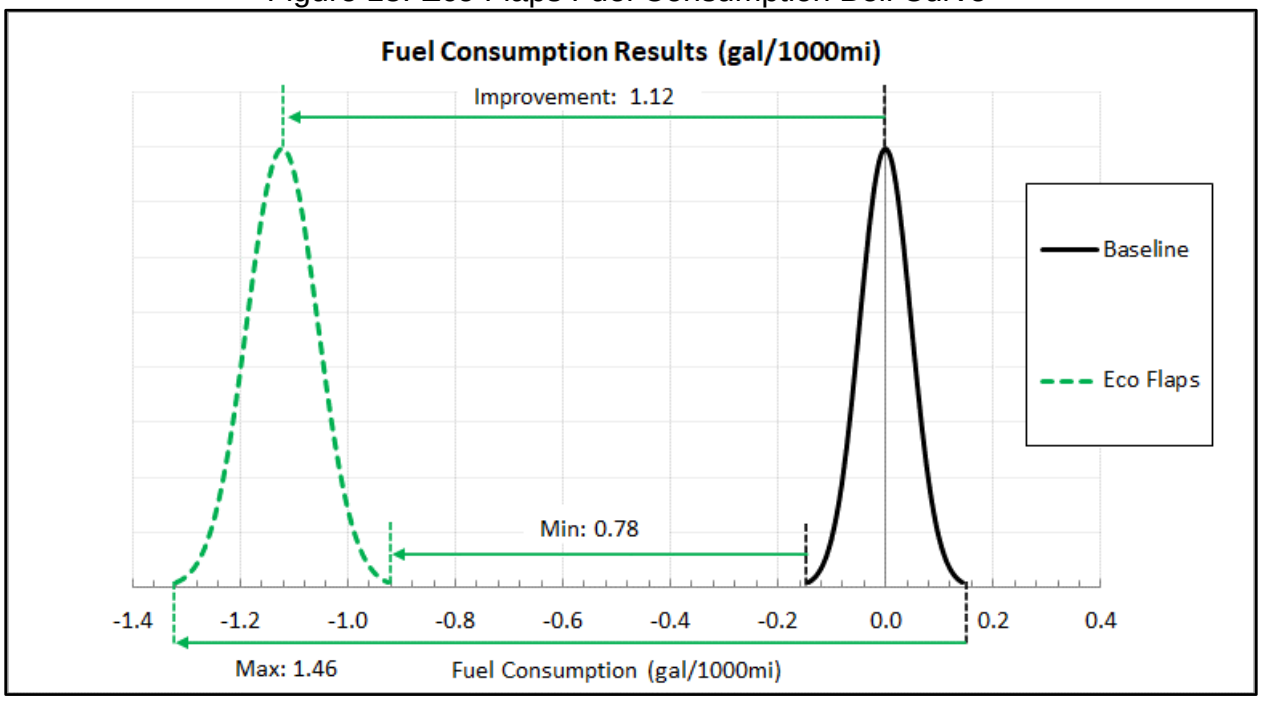
4.3: MEASUREMENT ACCURACY

The accuracy of fuel economy measurements is critical in determining the trustworthiness of test results. Historically, this has been a major difficulty in the trucking industry with fuel economy testing, which has led to confusion and misleading results. The MVTS test methods overcome this issue by achieving better accuracy, which is one of the ways it provides more reliable test results.

Accuracy for all the tests was calculated using a 95% confidence interval, a common standard for testing measurement. 95% confidence interval indicates that if the test were repeated 100 times, values would fall within the range in 95 out of the 100 tests (*i.e.* the reader would be 95% confident the value would be within that range).

Figure 13 below shows the statistical bell curves of Eco Flaps on the tractor and 48-ft dry van trailer. The Baseline run and Eco Flaps run clearly show two separate bell curves, indicating the test had valid accuracy and results were reliable. The graph shows the arrow pointing to the left, illustrating less fuel used (*i.e.* fuel savings). The distance between the peaks of the bell curves is the test result average, which was a fuel savings of 1.12 gal/1000 miles. Minimum and maximum values were calculated as the test result plus or minus the accuracy values (1.12 +/- 0.34), which were 1.46 and 0.78 gal/1000 miles, respectively.

Figure 13: Eco Flaps Fuel Consumption Bell Curve



5.0: SAVINGS CALCULATIONS

Below is a brief outline of how to use the test results to calculate savings. For more detail or assistance contact MVT Solutions.

5.1: FUEL SAVINGS CALCULATIONS (ECO FLAPS (48-FT DRY VAN TRAILERS))

Fuel savings resulting from this test can be calculated as follows:

$$Fuel\ Savings\ (gal/year) = (Test\ result)\ x\ \frac{(Thousands\ of\ miles\ travelled\ per\ year)}{1000}$$

Test result must be in units of gal/1000 miles (*i.e.* not percent or MPG)

Example: Eco Flaps had a fuel savings of 1.12 gal/1000 miles and 125,000 miles travelled annually:

$$Fuel\ Savings = (1.12\ gal/1000\ miles)x\ \frac{(125{,}000\ miles/year)}{1000} = 140\ gal/year$$

Therefore, Eco Flaps on 48-ft dry van trailers would save 140 gallons of fuel per year for this vehicle travelling 125,000 miles.

5.2: FINANCIAL SAVINGS CALCULATIONS (ECO FLAPS (48-FT DRY VAN TRAILERS))

Financial calculations can be made by multiplying the fuel saved by the fuel price:

$$Savings\ (\$/year) = (Fuel\ Savings)\ x\ (Price\ of\ fuel)$$

Example: Using the example above and U.S. average retail price of diesel fuel in 2020, $2.551[1] /gal.

$Savings\ (\$/year) = \left(140\ \frac{gal}{year}\right)\ x\ \left(\frac{\$2.551}{gal}\right) = \$358\ /year$ in fuel savings

Therefore, Eco Flaps would save $358 per year in fuel for the vehicle travelling 125,000 miles.

[1] Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMD_EPD2DXL0_PTE_NUS_DPG&f=W

6.0: CONCLUSION

MVTS testing proved the fuel savings of Eco Flaps on the truck and 48-ft dry van trailer with answers that were clear and precise with fuel savings of **1.12 gal/1000 miles (1.17%)**.

The test values shown can be used to estimate a carrier's savings in real-world operations. More precision can be obtained by using a carrier's vehicle and duty cycle information. Contact MVT Solutions for assistance or more information.

7.0: APPENDIX

7.1: COMPARE TRUCK/TRAILER VEHICLE DETAILS

Figure 14: Vehicle Info, Compare Vehicle

Date	June 15, 2021					
Company	Saia LTL					
Location	Pecos, Texas					
Test Route	Pecos 9-mile Test Track					
TRUCK ID:	**Veh. B**					
Brand	International					
Date of Manufacture	12/2018					
Model	LT Day Cab SA					
Engine	Cummins X15					
VIN	3HSDYAPN7LN806843					
Mileage (miles):	284,576					
Transmission	N/A					
Rear Gear	N/A					
Fuel Load	Full					
Fuel Type & Batch	No. 2 Diesel					
Axle Weights	9,820		13,840		15,700	
Total weight	39,360					
Photo/Video/Audio folder name:						
TRAILER ID:	**D, 487200**					
Model	Hyundai Translead					
VIN	3H3V482C2KT200001					
Year	01/2018					
Model	VC2480152-JRS Dry Van					
Size	48-ft					
Trailer Gap (inches)	21 inches from cab extender to trailer					
Add-ons	Transtex EDGE SKIRTS					

Figure 15: Tire Info, Compare Vehicle

			Truck	Veh. B		
LF:			Front Axle Tires			RF: Same
Bridgestone R284			Type			Bridgestone R284
295/75R22.5			Size			295/75R22.5
17/32			Tread Depth (inches)			18/32
110			Pressure (psi)			110
LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Michelin X Line XDA Energy +	Michelin X Line XDA Energy +		Type		Michelin X Line XDA Energy +	Michelin X Line XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
19/32	19/32		Tread Depth (inches)		19/32	19/32
110	110		Pressure (psi)		110	110
			Trailer	D, 487200		
LF-Outer Trailer:	LF-Inner Trailer:		Tandem Front		RF-Inner Trailer	RF-Outer Trailer
Continental Eco Plus HT3	Continental Eco Plus HT3		Type		Continental Eco Plus HT3	Continental Eco Plus HT3
295/75R22.5	295/75R22.5		Size		295/75R22.5	295/75R22.5
10/32	10/32		Tread Depth (inches)		10/32	10/32
110	110		Pressure (psi)		110	110
LR-Outer Trailer:	LR-Inner Trailer:		Tandem Rear		RR-Inner Trailer	RR-Outer Trailer
Continental Eco Plus HT3	Continental Eco Plus HT3		Type		Continental Eco Plus HT3	Continental Eco Plus HT3
295/75R22.5	295/75R22.5		Size		295/75R22.5	295/75R22.5
9/32	9/32		Tread Depth (inches)		9/32	9/32
110	110		Pressure (psi)		110	110

7.2: TEST TRUCK/TRAILER VEHICLE DETAILS

Figure 16: Vehicle Info, Test Vehicle

Date	June 15, 2021		
Company	Saia LTL		
Location	Pecos, Texas		
Test Route	Pecos 9-mile Test Track		
TRUCK ID:	**VEH. A**		
Brand	International		
Date of Manufacture	02/2021		
Model	LT Day Cab SA		
Engine	Cummins X15		
VIN	3HSDYAPN9NN154620		
Mileage (miles):	2,321		
Transmission	N/A		
Rear Gear	N/A		
Fuel Load	Full		
Fuel Type & Batch	No. 2 Diesel		
Axle Weights	9,820	13,840	15,700
Total weight	39,360		
Photo/Video/Audio folder name:			
TRAILER ID:	**C, 487344**		
Model	Hyundai Translead		
VIN	3H3V482C2KT219144		
Year	03/2018		
Model	VC2480152-JRS Dry Van		
Size	48-ft		
Trailer Gap (inches)	21 inches from cab extender to trailer		
Add-ons	Eco Flaps		
	Michelin Skirts		

Figure 17: Tire Info, Test Vehicle

		Truck	VEH. A		
LF:		Front Axle Tires			RF: Same
Bridgestone R284		Type			Bridgestone R284
295/75R22.5		Size			295/75R22.5
17/32		Tread Depth (inches)			18/32
110		Pressure (psi)			110
LF-Outer Drive:	LF-Inner Drive:	Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Michelin X Line XDA Energy +	Michelin X Line XDA Energy +	Type		Michelin X Line XDA Energy +	Michelin X Line XDA Energy +
275/80R22.5	275/80R22.5	Size		275/80R22.5	275/80R22.5
19/32	19/32	Tread Depth (inches)		19/32	19/32
110	110	Pressure (psi)		110	110
		Trailer	C, 487344		
LF-Outer Trailer:	LF-Inner Trailer:	Tandem Front		RF-Inner Trailer	RF-Outer Trailer
Continental Eco Plus HT3	Continental Eco Plus HT3	Type		Continental Eco Plus HT3	Continental Eco Plus HT3
295/75R22.5	295/75R22.5	Size		295/75R22.5	295/75R22.5
10/32	10/32	Tread Depth (inches)		10/32	10/32
110	110	Pressure (psi)		110	110
LR-Outer Trailer:	LR-Inner Trailer:	Tandem Rear		RR-Inner Trailer	RR-Outer Trailer
Bridgestone R197	Continental Eco Plus HT3	Type		Continental Eco Plus HT3	Continental Eco Plus HT3
295/75R22.5	295/75R22.5	Size		295/75R22.5	295/75R22.5
7/32	9/32	Tread Depth (inches)		10/32	9/32
110	110	Pressure (psi)		110	110

7.3: TEST ROUTE

Pecos, Texas 9-mile circle track. Clockwise direction, middle lane (of 3).

Figure 18: Pecos Test Track

7.4: WEATHER CONDITIONS

Weather during testing was fair with winds from 5-7 mph. Weather data was acquired from a local Weather Underground weather station. Source shown below.

The reader should be aware that MVTS methods include instantaneous and constant weather data acquisition on each vehicle and this testing has minimal dependency on external weather data collection. MVTS test data accounts for changes in wind, temperature, and other pertinent variables instantaneously. **Note:** darkened rows pertain to test times.

Table 4: Weather Data, June 18, 2021

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
11:15 PM	84 °F	48 °F	0.28	ESE	14 mph	0 mph	27.29 in	0.0 in	Fair
12:15 AM	81 °F	49 °F	33%	SE	7 mph	0 mph	27.30 in	0.0 in	Fair
1:15 AM	77 °F	49 °F	37%	SE	6 mph	0 mph	27.30 in	0.0 in	Fair
2:15 AM	74 °F	49 °F	40%	SE	5 mph	0 mph	27.29 in	0.0 in	Fair
3:15 AM	72 °F	48 °F	43%	ESE	5 mph	0 mph	27.27 in	0.0 in	Fair
4:15 AM	71 °F	49 °F	46%	E	6 mph	0 mph	27.26 in	0.0 in	Fair
5:15 AM	70 °F	50 °F	50%	E	9 mph	0 mph	27.26 in	0.0 in	Fair

Source: https://www.wunderground.com/history/daily/us/tx/pecos/KPEQ/date/2021-6-18

7.5: PRODUCT DETAILS

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- Jonathan Ruppert, Test Engineer

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- Allan Dahringer
- Carlos Aragon
- Jack Burchell
- Seth Knight

7.6c: ECO FLAPS

- Asa Hazelwood, President

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