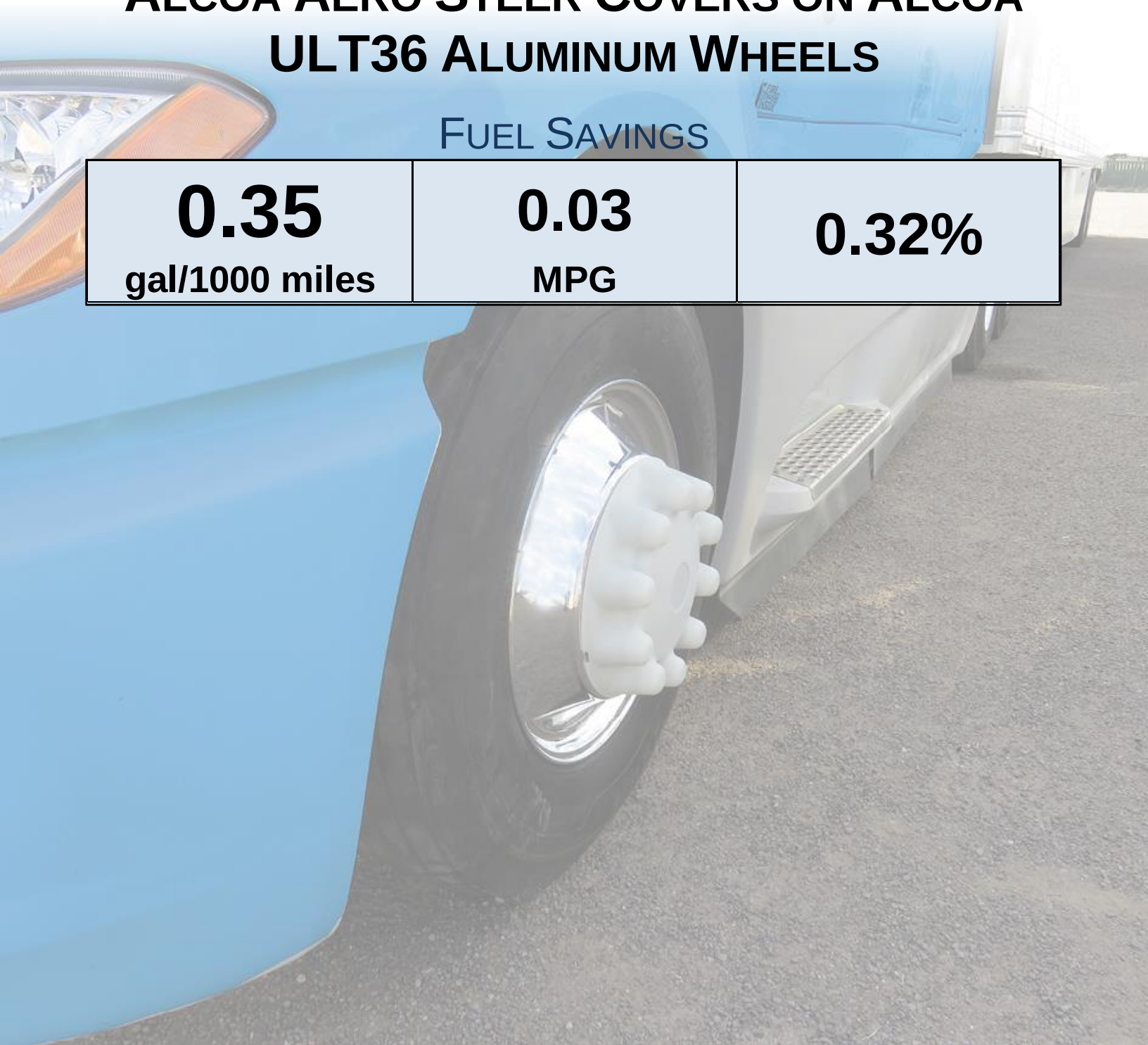
MESILLA VALLEY TRANSPORTATION SOLUTIONS CERTIFIED
Fuel Economy Experts

TEST REPORT

# MVT SOLUTIONS CERTIFIED™ FUEL ECONOMY TEST
## NOVEMBER 2020

# ALCOA AERO STEER COVERS ON ALCOA ULT36 ALUMINUM WHEELS



## FUEL SAVINGS

| 0.35 | 0.03 | 0.32% |
|---|---|---|
| gal/1000 miles | MPG | |

## 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

MVT Solutions tested the **Alcoa Aero Steer Covers on ULT36 Aluminum Wheels** in two separate tests. During Test #1 fuel savings were **0.24 gal/1000 miles (0.22%)** while Test #2 showed **0.46 gal/1000 miles (0.41%). The combined average of the two tests was 0.35 gal/1000 miles (0.32%).** Two tests were conducted to mitigate the effect of remounting the Steer tires on two types of test wheels. MVTS considers Test #1 and #2 to be consistent and repeatable results since the variation was only 0.22 gal/1000 miles. All tests were conducted on a modern Class-8 truck with a 53' van trailer and dual wheel package. Results are shown in Table 1.

Table 1: Fuel Economy Test Results

| Product | Fuel Economy Improvement | | |
|---|---|---|---|
| | **Gal/1000 miles** | MPG | Percent |
| Aero Steer Covers-ULT36 Wheels (Test #1) | 0.24 | 0.02 | 0.22% |
| Aero Steer Covers-ULT36 Wheels (Test #2) | 0.46 | 0.04 | 0.41% |
| **Aero Steer Covers-ULT36 Wheels (Average #1 & #2)** | **0.35** | 0.03 | 0.32% |

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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.* Alcoa Aero Steer Covers 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 2019 International LT 625’s with Cummins X15 15-Liter engines and Eaton Endurant 12-speed AMT transmissions. Trailers were Hyundai Translead 53-ft Dry Vans. Gross Vehicle Weight (GVW) was approximately 45,000 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. Trucks and trailers used dual tires. Tire pressures were set at 110 psi in the morning, prior to incurring any affect of daytime heat. Vehicle info can be found in the Appendix. **Note:** Steer tire pressures were managed individually during the Steer wheel tests and are described in further details further in the report.

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.

Figure 1: Test Vehicle with Standard Steer Wheels

Figure 2: Compare Vehicle with Standard Steer Wheels

## 3.2: WHEEL CHANGES, TIRE INSTALLS AND PRESSURE TESTING PROCEDURE

The Alcoa Aero Steer Covers were installed on ULT36 Aluminum wheels in the Steer position. Since tires affect fuel economy, the Steer tires were changed (Figure 3) from the Baseline Standard Alcoa wheels (Figure 4) to the ULT36 wheels with the Aero Steer Covers (Figure 5). All wheels were balanced prior to testing with adhesive-backed weights (Figure 6). Both Steer tires were marked with an arrow to consistently align the tire on each wheel with the valve stem (Figure 7). This ensured consistency during testing when tires were changed between Baseline Standard and ULT36 wheels. This included ensuring the left and right tires/wheels remained matched and the reinstallation position was consistent, which maintained consistent wheel/tire balance.

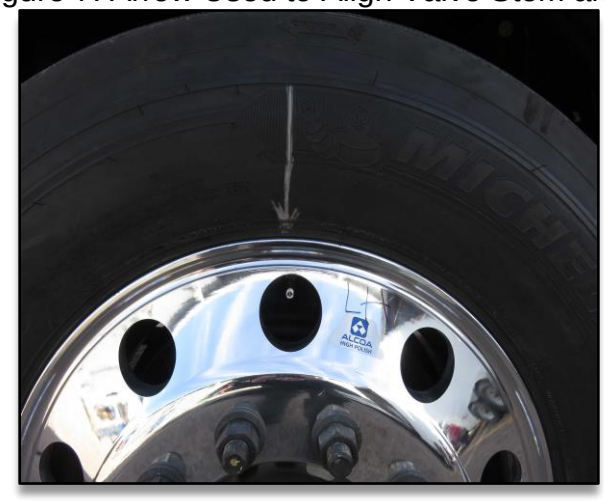
Figure 3: Baseline Steer Tires

Figure 4: Baseline Standard Alcoa

Figure 5: Aero Steer Cover & ULT36

Figure 6: Tires Balanced with Weight

Figure 7: Arrow Used to Align Valve Stem and Tire



To ensure consistent tire pressures, Steer tires were inflated to 110.0 psi cold pressure in the morning prior to testing, as well as after each Steer tire change, which is shown in Figure 8 and Figure 9.

Figure 8: Inflating Tires to 110.0 psi

Figure 9: Steer Tire Change

The vehicles were driven 5 laps (45 miles) on the track as a warmup to allow tire pressures and temperatures to stabilize. After 5 laps, the vehicles were stopped on the track and Steer tire pressures were checked and matched between vehicles. This step was taken to ensure tire pressures did not affect fuel economy results after remounting the Steer tires.

Following the warmup, 13 additional laps were completed. Laps 2-13 provided the data which was analyzed and provided the test results. **Note:** Lap 1 was an acceleration lap to reach the 65-mph test speed and was therefore omitted from the results analysis. Steer tire pressures were recorded at the conclusion of the 13 laps to verify consistent tire pressures, which are shown in Table 2.

Table 2: Steer Tire Pressures

| | Test Veh. | | Compare Veh. | |
|---|---|---|---|---|
| | LH | RH | LH | RH |
| **Run 1** | | | | |
| Start | 110.0 | 110.0 | 110.0 | 110.0 |
| End Warmup (Hot) | 124.5 | 123.5 | 123.5 | 123.5 |
| Bled to | 115.0 | 115.5 | 115.0 | 115.0 |
| End Test Run (Hot) | 120.0 | 121.5 | 120.0 | 120.0 |
| **Run 2** | | | | |
| Start | 110.0 | 110.0 | 110.0 | 110.0 |
| End Warmup (Hot) | 116.5 | 116.0 | 121.0 | 121.0 |
| Bled to | 115.0 | 115.0 | 115.0 | 115.0 |
| End Test Run (Hot) | 118.0 | 118.0 | 118.5 | 118.5 |
| **Run 3** | | | | |
| Start | 110.0 | 110.0 | 110.0 | 110.0 |
| End Warmup (Hot) | 113.5 | 112.5 | 119.0 | 119.0 |
| Bled to | 112.0 | 112.0 | 112.0 | 112.0 |
| End Test Run (Hot) | 108.5 | 108.0 | 109.5 | 109.0 |
| **Run 5** | | | | |
| Start | 110.0 | 110.0 | 110.0 | 110.0 |
| End Warmup (Hot) | 114.5 | 114.0 | 111.5 | 111.5 |
| Bled to | 111.5 | 111.5 | 111.5 | 111.5 |
| End Test Run (Hot) | 112.0 | 111.0 | 109.5 | 109.0 |

Two tests of each wheel type were conducted. This was to avoid potential discrepancies caused by mounting or remounting the tires.

### 3.2a: Run 1: Baseline with Standard Alcoa Steer Wheels

Run 1 was a Baseline run that all other runs were compared to. The Test and Compare trucks both utilized what is referred to in this report as the Alcoa Standard Steer Wheel, which is identified as 102620, Part Number 882677. These Steer wheels were utilized on the Test vehicle and Compare vehicle, the latter of which remained the same throughout all runs.

Figure 10: Baseline Alcoa Standard Steer Wheel

Figure 11: Baseline Steer Wheel Identification Numbers

3.2b: RUN 2: AERO STEER COVERS ON ULT36 WHEELS (TEST #1)

Prior to Run 2, the Steer tires were dismounted from the Test vehicle and mounted on the ULT36 wheels with Alcoa Aero Steer Covers, which were then installed on the Test vehicle. The steps described in section 3.2: above were then followed for the test run. The Aero Steer Cover also included a cover over the wheel nuts and studs (Figure 14).

Figure 12: Aero Steer Covers (Test #1) Configuration

Figure 13: Aero Steer Tire Prior to Mounting

Figure 14: Wheel Stud Cover Installation

### 3.2c: Run 3: Aero Steer Covers on ULT36 Wheels (Test #2)

Run 3 was a repeat of Test #1, the Aero Steer Covers on ULT36 Wheels test, with the objective to nullify any effect of dismounting or mounting of the tires. Therefore, prior to Run 3, the Steer tire beads on the Test vehicle were broken and the tires were remounted as described in section 3.2: Test #2 was then conducted.

### 3.2d: Run 5: Baseline #2 with Alcoa Standard Steer Wheels

Run 4 involved a separate evaluation that was reversed for Run 5 and not included in this report.

Run 5 was a repeat of Baseline #1 (*i.e.* Run 1). This included changing the Test vehicle Steer wheels to the Alcoa Standard Steers. The purpose of this test was to provide a second Baseline and a second run in which to compare Test #1 and Test #2. The procedure described in section 3.2: was again followed. This was the final run of the day and test.

Figure 15: Alcoa Standard Steer Wheels Re-Installed for Baseline #2

## 3.3: 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)

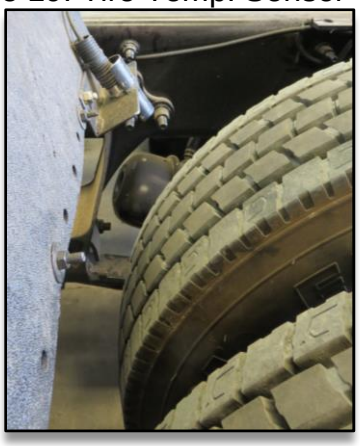
Click this link to see a video of MVTS sensors and testing: How We Test

Figure 16: Aerodynamic Sensors

Figure 17: Data Acquisition System

Figure 18: Fuel Flow Meter

Figure 19: Tire Temp. Sensor



## 4.0: TEST RESULTS

Four (4) runs were completed (Table 3). Aero Steer Covers on Alcoa ULT36 Aluminum wheels (Test #1) Run 2 and (Test #2) Run 3 were compared to Run 1 (Baseline #1). Run 5 (Baseline #2) was intended to act as a second Baseline run and comparison for Test #1 and #2; however, the results of Baseline #2 showed a significant offset and MVTS engineers decided to omit this run on the basis of being incorrect. This occurrence was precisely why two (2) test and baseline runs were conducted; to ensure anomalies did not affect the overall test results. Runs 1 through 3 were considered accurate and reliable. The reason for the inconsistent result of Run 5 was unknown at the time of writing; however, it was believed to be related to the dismounting and remounting of the Steer wheels.

Table 3: Test Runs

| Run | Run Description | Start | End |
|---|---|---|---|
| 1 | Baseline #1: Alcoa Standard Steer Wheels (Set A) | 8:53 AM | 10:40 AM |
| 2 | Test #1: Aero Steer Covers on ULT36 wheels (Set B) | 12:16 PM | 2:04 PM |
| 3 | Test #2: Aero Steer Covers on ULT36 wheels (Set B) | 3:21 PM | 5:08 PM |
| 5 | Baseline #2: Alcoa Standard Steer Wheels (Set A) | 8:57 PM | 10:44 PM |

As listed in the Summary, Aero Steer Covers on ULT36 wheels (Test #1) achieved a fuel savings of **0.24 gal/1000 miles (0.22 %)** and Test #2 achieved **0.46 gal/1000 miles (0.41 %), resulting in an average for the Aero Steer Covers on ULT36 wheels of 0.35 gal/1000 miles (0.32%).**

Table 4: Test Results with Accuracy

| **Product** | **Fuel Economy Improvement** | | |
|---|---|---|---|
| | **Gal/1000 miles** | MPG | Percent |
| Aero Steer Covers-ULT36 Wheels (Test #1) | 0.24 | 0.02 | 0.22% |
| Accuracy | +/- 0.46 | +/- 0.04 | +/- 0.41% |
| Aero Steer Covers-ULT36 Wheels (Test #2) | 0.46 | 0.04 | 0.41% |
| Accuracy | **+/- 0.49** | +/- 0.04 | +/- 0.44% |
| **Aero Steer Covers-ULT36 Wheels (Average #1 & #2)** | **0.35** | 0.03 | 0.32% |
| Accuracy | **+/- 0.47** | +/- 0.04 | +/- 0.42% |

Figure 20: Fuel Savings (gal/1000 miles)

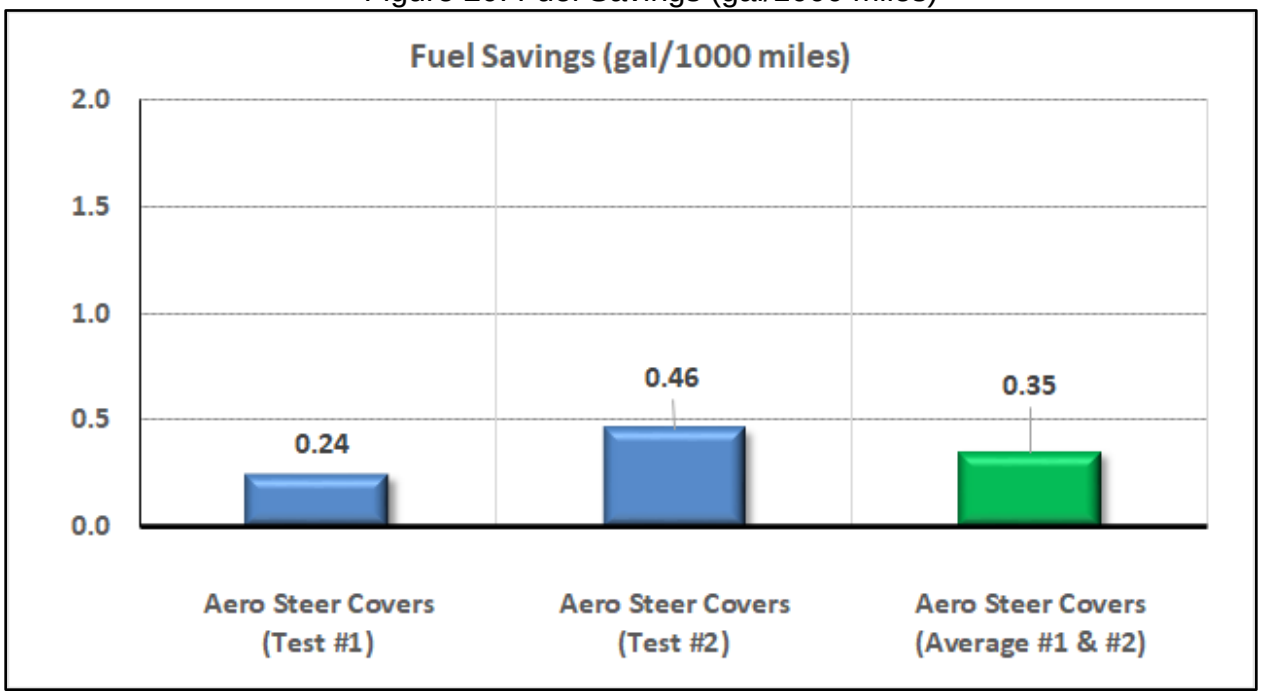
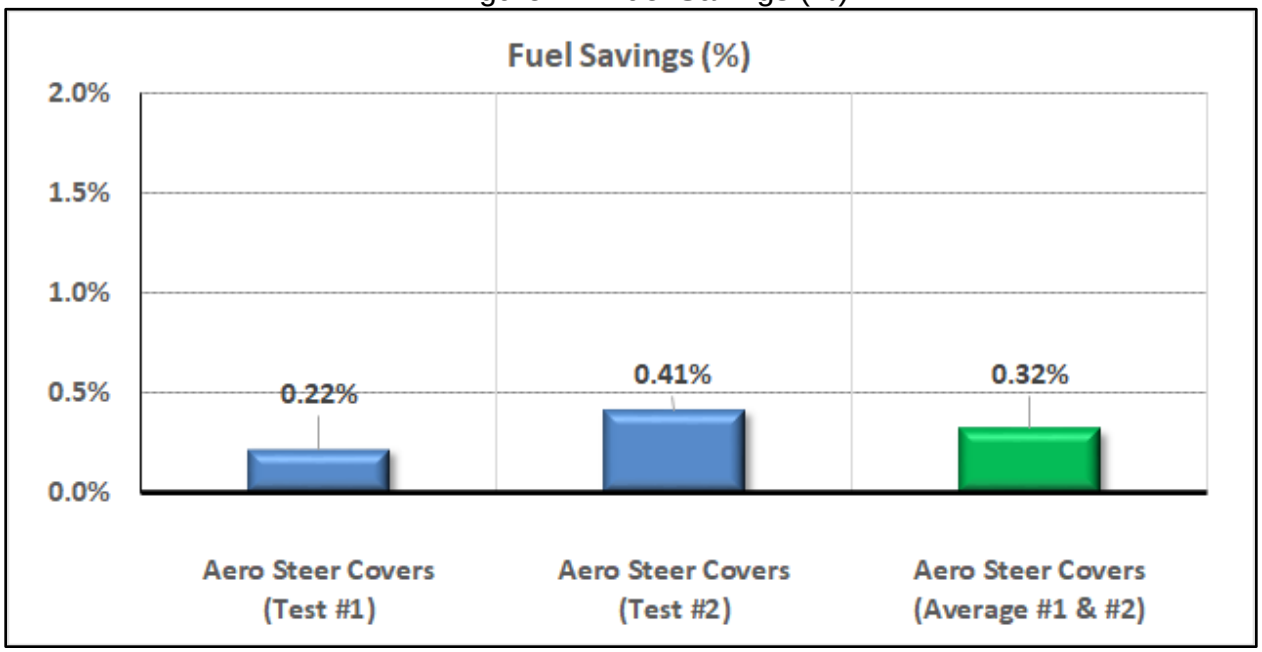



Figure 21: Fuel Savings (%)



## 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 calculate 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 fuel in gal/1000 miles as one loaded to 80,000 lbs. However, when viewed in percent (%) or MPG the values 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 their 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 desired.

## 4.2: WEATHER CONDITIONS SUMMARY

Temperatures ranged from 51.0°F to 73.0°F. Winds ranged from 7 mph to 20 mph and gust conditions were omitted from the test results based on consistency of test data. 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 22 below shows the statistical bell curves of the Aero Steer Covers on ULT36 wheels (Test #1). The Baseline and the Aero Steer Covers on ULT36 wheels (Test #1) bell curves overlap, which can be expected with a fuel savings magnitude that is relatively small. MVTS manually analyzed the data and believes the result to be valid and reliable. The graph shows the arrow pointing to the left, indicating less fuel used (*i.e.* fuel saved). The distance between the peaks of the bell curves is the test result average, which was a fuel savings of **0.24 gal/1000 miles (0.22%)**. Minimum and maximum values were calculated as the test result plus or minus the accuracy values (0.24 +/- 0.46), which were 0.70 and -0.22 gal/1000 miles.

Figure 22: Aero Steer Covers on ULT36 Wheels (Test #1) Bell Curves

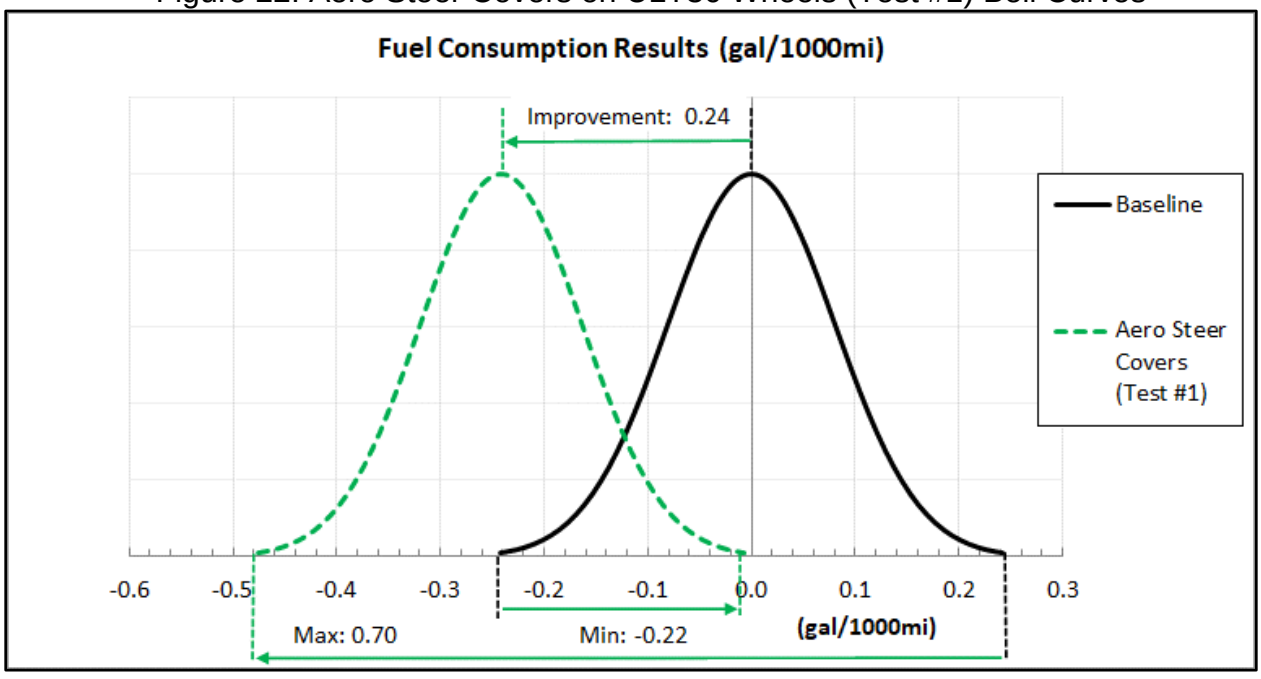
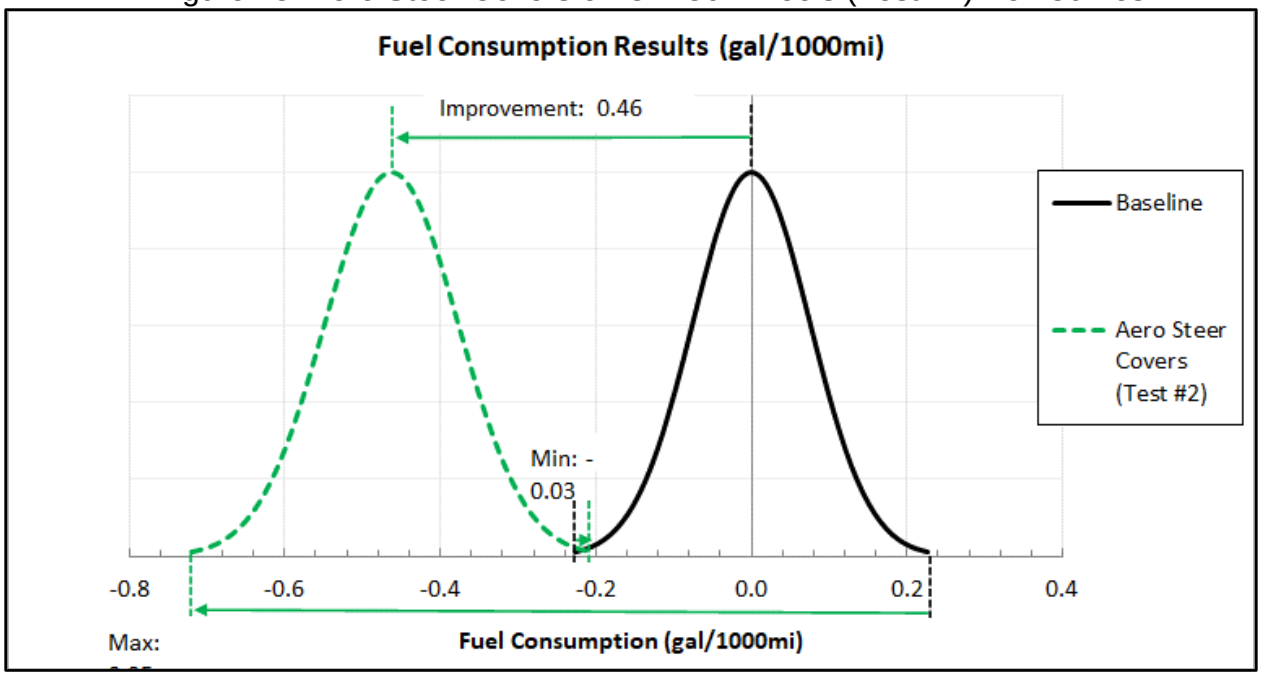


Figure 23 below, shows the statistical bell curves of the Aero Steer Covers on ULT36 wheels (Test #2). The Baseline and the Aero Steer Covers on ULT36 wheels (Test #2) bell curves again have a slight overlap due to the magnitude of the fuel savings and are considered accurate and reliable by MVTS. The graph shows the arrow pointing to the left, indicating less fuel used (*i.e.* fuel saved). The distance between the peaks of the bell curves is the test result average, which was a fuel savings of **0.46 gal/1000 miles (0.41%)**. Minimum and maximum values were calculated as the test result plus or minus the accuracy values (0.46 +/- 0.49), which were 0.95 and -0.03 gal/1000 miles.

Figure 23: Aero Steer Covers on ULT36 Wheels (Test #2) Bell Curves



## 5.0: CONCLUSION

MVTS fuel economy tests were conducted on the Alcoa Aero Steer Covers on Alcoa ULT36 Aluminum wheels with two (2) repeatable tests.

The Aero Steer Covers on ULT36 wheels (Test #1) showed a fuel savings of **0.24 gal/1000 miles (0.22%)** and the repeat Aero Steer Covers on ULT36 wheels test (Test #2) showed a fuel savings of **0.46 gal/1000 miles (0.41 %)**. The **average of the two tests was 0.35 gal/1000 miles (0.32%).** Accuracy of the tests was very reasonable at +/- 0.46 gal/1000 miles and +/- 0.49 gal/1000 miles, respectively. Although the accuracy was good, due to the relatively low magnitude of the Aero Steer Covers fuel savings, the statistical minimums and bell curve results may appear to be reason for question. However, MVTS manually analyzed the results and found them to be valid and reliable. Also, conducting two tests of the Aero Steer Covers on ULT36 wheels, which each showed positive results, and were repeatable within 0.22 gal/1000 miles, further supports the validity of the results and fuel savings of the Aero Steer Covers.

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.

# 6.0: APPENDIX

## 6.1: 'TEST' VEHICLE DETAILS

Figure 24: 'Test' Vehicle Details

| | | | | | | |
|---|---|---|---|---|---|---|
| Date | November 17, 2020 | | | | | |
| Company | Mesilla Valley Transportation Solutions | | | | | |
| Location | Pecos, Texas | | | | | |
| Test Route | Pecos 9-mile Test Track | | | | | |
| | | | | | | |
| **TRUCK ID:** | **Veh. A** | | | | | |
| Brand | International | | | | | |
| Year | 2019 | | | | | |
| Model | LT 625 | | | | | |
| Engine | Cummins X15 | | | | | |
| VIN | 3HSDZAPR4KN562972 | | | | | |
| Mileage (miles): | 5,596 | | | | | |
| Transmission | Eaton Endurant 12-speed AMT | | | | | |
| Rear Gear | 2.79 : 1 | | | | | |
| Fuel Load | 1/2 | | | | | |
| Fuel Type & Batch | No. 2 Diesel | | | | | |
| Axle Weights | 11,180 | | 17,100 | | 16,840 | |
| Total weight | 45,120 | | | | | |
| | | | | | | |
| Photo/Video/Audio folder name: | | | | | | |
| | | | | | | |
| **TRAILER ID:** | **T-1** | | | | | |
| Model | Hyundai Translead | | | | | |
| VIN | 3H3C532C6MR248009 | | | | | |
| Year | 2020 | | | | | |
| Model | Dry Van | | | | | |
| Size | 53-ft | | | | | |
| Trailer Gap (inches) | 35-inches from cab extender to trailer | | | | | |
| Add-ons | | | | | | |
| | | | | | | |
| | | | | | | |

Figure 25: 'Test' Vehicle Tire Info

| | | | | | |
|---|---|---|---|---|---|
| | | **Truck** | **Veh. A** | | |
| LF: | | **Front Axle Tires** | | | RF: Same |
| Michelin X Line Energy Z | | Type | | | Michelin X Line Energy Z |
| 275/80R22.5 | | Size | | | 275/80R22.5 |
| 18/32 | | Tread Depth (32nds) | | | 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 |
| 22/32 | 21/32 | Tread Depth (32nds) | | 22/32 | 21/32 |
| 110 | 110 | Pressure (psi) | | 110 | 110 |
| | | | | | |
| LR-Outer Drive: | LR-Inner Drive: | **Drive Axle Tires** | | RR-Inner Drive: | RR-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 |
| 21/32 | 22/32 | Tread Depth (32nds) | | 21/32 | 21/32 |
| 110 | 110 | Pressure (psi) | | 110 | 110 |
| | | | | | |
| | | **Trailer** | **T-1** | | |
| LF-Outer Trailer: | LF-Inner Trailer: | **Tandem Front** | | RF-Inner Trailer | RF-Outer Trailer |
| Michelin X Line Energy T | Michelin X Line Energy T | Type | | Michelin X Line Energy T | Michelin X Line Energy T |
| 275/80R22.5 | 275/80R22.5 | Size | | 275/80R22.5 | 275/80R22.5 |
| 12/32 | 12/32 | Tread Depth (32nds) | | 12/32 | 12/32 |
| 110 | 110 | Pressure (psi) | | 110 | 110 |
| | | | | | |
| LR-Outer Trailer: | LR-Inner Trailer: | **Tandem Rear** | | RR-Inner Trailer | RR-Outer Trailer |
| Michelin X Line Energy T | Michelin X Line Energy T | Type | | Michelin X Line Energy T | Michelin X Line Energy T |
| 275/80R22.5 | 275/80R22.5 | Size | | 275/80R22.5 | 275/80R22.5 |
| 13/32 | 13/32 | Tread Depth (32nds) | | 13/32 | 13/32 |
| 110 | 110 | Pressure (psi) | | 110 | 110 |

## 6.2: COMPARE TRUCK/TRAILER VEHICLE DETAILS

Figure 26: 'Compare' Vehicle Details

| | | | | | | |
|---|---|---|---|---|---|---|
| Date | November 17, 2020 | | | | | |
| Company | Mesilla Valley Transportation Solutions | | | | | |
| Location | Pecos, Texas | | | | | |
| Test Route | Pecos 9-mile Test Track | | | | | |
| | | | | | | |
| **TRUCK ID:** | **Veh. B** | | | | | |
| Brand | International | | | | | |
| Year | 2019 | | | | | |
| Model | LT 625 | | | | | |
| Engine | Cummins X15 | | | | | |
| VIN | 3HSDZAPR3KN562087 | | | | | |
| Mileage (miles): | 5,586 | | | | | |
| Transmission | Eaton Endurant 12-speed AMT | | | | | |
| Rear Gear | 2.79 : 1 | | | | | |
| Fuel Load | 1/2 | | | | | |
| Fuel Type & Batch | No. 2 Diesel | | | | | |
| Axle Weights | 11,180 | | 17,100 | | 16,840 | |
| Total weight | 45,120 | | | | | |
| | | | | | | |
| Photo/Video/Audio folder name: | | | | | | |
| | | | | | | |
| **TRAILER ID:** | **T-2** | | | | | |
| Model | Hyundai Translead | | | | | |
| VIN | 3H3C532C6MR248009 | | | | | |
| Year | 2020 | | | | | |
| Model | Dry Van | | | | | |
| Size | 53-ft | | | | | |
| Trailer Gap (inches) | 35" from cab extender to trailer | | | | | |
| Add-ons | | | | | | |
| | | | | | | |
| | | | | | | |

Figure 27: 'Compare' Vehicle Tire Info

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **Truck** | **Veh. B** | | |
| LF: | | | **Front Axle Tires** | | | RF: Same |
| Michelin X Line Energy Z | | | Type | | | Michelin X Line Energy Z |
| 275/80R22.5 | | | Size | | | 275/80R22.5 |
| 18/32 | | | Tread Depth (32nds) | | | 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 |
| 22/32 | 22/32 | | Tread Depth (32nds) | | 22/32 | 22/32 |
| 110 | 110 | | Pressure (psi) | | 110 | 110 |
| | | | | | | |
| LR-Outer Drive: | LR-Inner Drive: | | **Drive Axle Tires** | | RR-Inner Drive: | RR-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 |
| 22/32 | 22/32 | | Tread Depth (32nds) | | 22/32 | 22/32 |
| 110 | 110 | | Pressure (psi) | | 110 | 110 |
| | | | | | | |
| | | | **Trailer** | **T-2** | | |
| LF-Outer Trailer: | LF-Inner Trailer: | | **Tandem Front** | | RF-Inner Trailer | RF-Outer Trailer |
| Bridgestone Ecopia R123 | Bridgestone Ecopia R123 | | Type | | Bridgestone Ecopia R123 | Bridgestone Ecopia R123 |
| 295/75R22.5 | 295/75R22.5 | | Size | | 295/75R22.5 | 295/75R22.5 |
| 11/32 | 11/32 | | Tread Depth (32nds) | | 11/32 | 11/32 |
| 110 | 110 | | Pressure (psi) | | 110 | 110 |
| | | | | | | |
| LR-Outer Trailer: | LR-Inner Trailer: | | **Tandem Rear** | | RR-Inner Trailer | RR-Outer Trailer |
| Bridgestone Ecopia R123 | Bridgestone Ecopia R123 | | Type | | Bridgestone Ecopia R123 | Bridgestone Ecopia R123 |
| 295/75R22.5 | 295/75R22.5 | | Size | | 275/80R22.5 | 295/75R22.5 |
| 11/32 | 11/32 | | Tread Depth (32nds) | | 11/32 | 11/32 |
| 110 | 110 | | Pressure (psi) | | 110 | 110 |

## 6.3: TEST ROUTE

Pecos, Texas 9-mile circle track (Figure 28). Counter-clockwise direction, middle lane (of 3).

Figure 28: Pecos Test Track

## 6.4: WEATHER CONDITIONS

Weather during testing was relatively cool with moderate to high winds. 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 5: Weather Data, November 17

| Time | Temperature | Dew Point | Humidity | Wind | Wind Speed | Wind Gust | Pressure | Precip. | Condition |
|---|---|---|---|---|---|---|---|---|---|
| 12:53 AM | 49 F | 20 F | 32% | SSE | 3 mph | 0 mph | 27.33 in | 0.0 in | Fair |
| 1:53 AM | 42 F | 18 F | 38% | CALM | 0 mph | 0 mph | 27.34 in | 0.0 in | Fair |
| 2:53 AM | 42 F | 19 F | 40% | ENE | 8 mph | 0 mph | 27.35 in | 0.0 in | Fair |
| 3:53 AM | 40 F | 19 F | 43% | N | 5 mph | 0 mph | 27.36 in | 0.0 in | Fair |
| 4:53 AM | 38 F | 20 F | 48% | CALM | 0 mph | 0 mph | 27.36 in | 0.0 in | Fair |
| 5:53 AM | 38 F | 20 F | 48% | E | 3 mph | 0 mph | 27.37 in | 0.0 in | Fair |
| 6:53 AM | 39 F | 21 F | 49% | CALM | 0 mph | 0 mph | 27.38 in | 0.0 in | Fair |
| 7:53 AM | 41 F | 20 F | 43% | CALM | 0 mph | 0 mph | 27.40 in | 0.0 in | Fair |
| 8:53 AM | 51 F | 24 F | 35% | SE | 7 mph | 0 mph | 27.41 in | 0.0 in | Fair |
| 9:53 AM | 57 F | 25 F | 29% | S | 9 mph | 0 mph | 27.43 in | 0.0 in | Fair |
| 10:53 AM | 62 F | 31 F | 31% | S | 15 mph | 0 mph | 27.42 in | 0.0 in | Fair |
| 11:53 AM | 67 F | 36 F | 32% | SSE | 13 mph | 21 mph | 27.39 in | 0.0 in | Fair |
| 12:53 PM | 69 F | 41 F | 36% | SSE | 15 mph | 0 mph | 27.37 in | 0.0 in | Fair |
| 1:53 PM | 72 F | 42 F | 34% | S | 15 mph | 23 mph | 27.34 in | 0.0 in | Fair |
| 2:53 PM | 72 F | 42 F | 34% | SSE | 17 mph | 0 mph | 27.32 in | 0.0 in | Fair |
| 3:53 PM | 73 F | 42 F | 33% | SSE | 20 mph | 25 mph | 27.31 in | 0.0 in | Fair |
| 4:53 PM | 71 F | 44 F | 38% | SSE | 20 mph | 0 mph | 27.31 in | 0.0 in | Fair |
| 5:53 PM | 67 F | 44 F | 44% | SSE | 13 mph | 0 mph | 27.31 in | 0.0 in | Fair |
| 6:53 PM | 64 F | 45 F | 50% | SSE | 13 mph | 0 mph | 27.31 in | 0.0 in | Fair |
| 7:53 PM | 60 F | 45 F | 57% | SSE | 9 mph | 0 mph | 27.32 in | 0.0 in | Fair |
| 8:53 PM | 57 F | 43 F | 59% | SSE | 9 mph | 0 mph | 27.32 in | 0.0 in | Fair |
| 9:53 PM | 54 F | 42 F | 64% | SSE | 7 mph | 0 mph | 27.32 in | 0.0 in | Fair |
| 10:53 PM | 53 F | 42 F | 66% | SSE | 8 mph | 0 mph | 27.32 in | 0.0 in | Fair |
| 11:53 PM | 51 F | 42 F | 71% | S | 9 mph | 0 mph | 27.32 in | 0.0 in | Fair |

Source: https://www.wunderground.com/history/daily/us/tx/midland/KMAF/date/2020-11-17

### 6.5: PRODUCT DETAILS

- Alcoa Aero Steer Covers on Alcoa ULT36 Aluminum wheels

## 6.6: TEST PERSONNEL

### 6.6a: MVT SOLUTIONS

- Daryl Bear, Lead Engineer & COO
- Jacob Schwartz, Test Engineer

### 6.6b: DRIVERS

- Carlos Aragon
- Jack Burchell
- Andrew Burnett
- Ray Shult
- Allan Dahringer
- Seth Knight
- John Rintelin

### 6.6c: HOWMET AEROSPACE TECHNOLOGIES (ALCOA)

- Douglas Mason, Ph. D, Global Technical Manager, Global Accessories Manager

### 6.7: MVT SOLUTIONS CONTACT INFO

Daryl Bear, Lead Engineer & COO
Daryl.Bear@m-v-t-s.com
317-603-9325

Jacob Schwartz, Test Engineer
Jacob.Schwartz@m-v-t-s.com
575-288-3342