Test Report

MESILLA VALLEY TRANSPORTATION SOLUTIONS
CERTIFIED
Fuel Economy Experts

MVT SOLUTIONS CERTIFIED™ FUEL ECONOMY TEST

October 2024

MICHELIN Savings vs. Competitor

Goodyear	Bridgestone
7.73 gal/1000 miles	4.61 gal/1000 miles
0.44 MPG	0.25 MPG
5.65% Percent	3.37% Percent

Regional Trucking MICHELIN Tire Report

1.0: INTRODUCTION

Mesilla Valley Transportation Solutions ("MVTS" or "MVT Solutions") certifies the fuel savings described in this report. **Note:** this report was designed for carriers and provides information relevant to their needs. Therefore, the format varies from traditional fuel economy and technical reports. The Report Summary provides the reader with a quick synopsis of the fuel savings. Following the Summary is the body of the report and further details on the subject. 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 Mesilla Valley Transportation ("fleet" or "MVT") 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.

Contact MVTS with any questions regarding the test.

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

2.0: TEST SUMMARY

The purpose of this test was to quantify the differences in fuel economy across three (3) regional, fuel-efficient tire configurations from Michelin, Bridgestone and Goodyear. The baseline tire configuration consisted of **Michelin's X Multi Z2 steer tires (XMZ2)**, **X Line Multi Energy Drive (XMED) tires**, and new **X Line Multi Energy Trailer (XMET2) tires**. The Michelin **XMZ2|XMED|XMET2** configuration was compared to the Bridgestone configuration of **R268 Ecopia steer tires**, **M760 Ecopia drive tires**, and **R196A trailer tires** and with Goodyear configuration of Endurance **RSA steer tires**, **G572 1AD Fuel Max drive tires**, and Endurance **RST trailer tires**.

Testing indicated the Michelin **XMZ2|XMED|XMET2** baseline configuration achieved the best fuel economy with a reduction of **4.61 gal/1000 miles (3.37%)** compared to the Bridgestone **R268|M760|R196A** configuration and **7.73 gal/1000 miles (5.65%)** better than the Goodyear **RSA|G572|RST** configuration.

Testing was conducted at 65 MPH, with approximately 79,000 lbs. gross vehicle weight (GVW) on a private track in Texas. The tires were dual configuration, 11R/22.5 in new condition with 500 miles break-in.

Table 1: Results Summary

Product	Fuel Economy Improvement			Annual Savings per Vehicle	
	Gal/1000 miles	MPG	Percent	Money in Fuel ($)	CO_2 (Metric Tons)
Michelin (XMZ2|XMED|XMET2)	**Base**	Base	Base	Base	Base
Bridgestone (R268|M760|R196A)	**4.61**	0.25	3.37%	$2,431	5.87
Goodyear (RSA|G572|RST)	**7.73**	0.44	5.65%	$4,075	9.84

The fuel usage of the Bridgestone (R268|M760|R196A) tire configuration of **4.61 gal/1000 miles** would result in an additional fuel cost of $2,431 and 5.87 metric tons CO_2 as shown in Table 1 compared to the Michelin (XMZ2|XMED|XMET2) configuration base comparison tire set.

The additional fuel usage of the Goodyear (RSA|G572|RST) tire configuration of **7.73 gal/1000 miles** would result in an additional fuel cost of $4,075 and 9.84 metric tons CO_2 as shown in Table 1 compared to the Michelin (XMZ2|XMED|XMET2) configuration.

Financial and CO_2 values are based on an annual distance of 125,000 miles traveled and a fuel cost of $4.214 per gallon, reflecting the average retail price of diesel fuel in the United States in 2023.[1]

[1] Using the U.S. average retail price of diesel fuel in 2023, $4.214/gal.

Table 2: Tested Tire Test Sets

Set #	Type	Brand	Size / Tire	Report Nomenclature
B	Steer	Michelin	11R/22.5 X Multi Z2	XMZ2
A	Drives	Michelin	11R/22.5 X Line Multi Energy Drive LRG	XMED
B	Trailer	Michelin	11R/22.5 X Line Multi Energy T2	XMET2
C	Steer	Bridgestone	11R/22.5 R268 Ecopia LRH	R268
C	Drives	Bridgestone	11R/22.5 M760 Ecopia LRG	M760
C	Trailer	Bridgestone	11R/22.5 R196A Ecopia LRG	R196A
D	Steer	Goodyear	11R/22.5 Fuel Max RSA LRH	RSA
D	Drives	Goodyear	11R/22.5 G572 1AD LRG	G572
D	Trailer	Goodyear	11R/22.5 Endurance RST LRH	RST

Tests were conducted on behalf of Michelin North America, Inc, however, all work was conducted independently by MVTS, including tire mounting, break-in miles and testing. Tires were purchased by MVTS independently of Michelin.

Note: GVW versus fuel savings: fuel savings from tires are dependent on axle weight and increase as GVW increases. This report includes a guide on how to calculate savings for a fleet's specific GVW along with cost savings. These can be found in the Savings Calculations section.

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3.0: PROCEDURE

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.

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

The test vehicles were 2019 International LT 625s with Cummins X15 15-Liter engines and Eaton Endurant 12-speed Automated Manual Transmissions (AMT). The trailers were 53-foot Hyundai dry vans with Michelin Energy Guard skirts installed. Gross Vehicle Weight (GVW) was approximately 79,000 lbs. Both trucks were equipped with grill guards, which were previously tested and showed to have no influence on fuel economy. The tires on the Compare vehicle remained unchanged. Vehicle information 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, MVT and MVTS are 100% confident in the reliable condition of the test vehicles. The MVT fleet uses the same vehicle data and test procedures for their own internal purchase decisions.

4.0: PROCEDURE

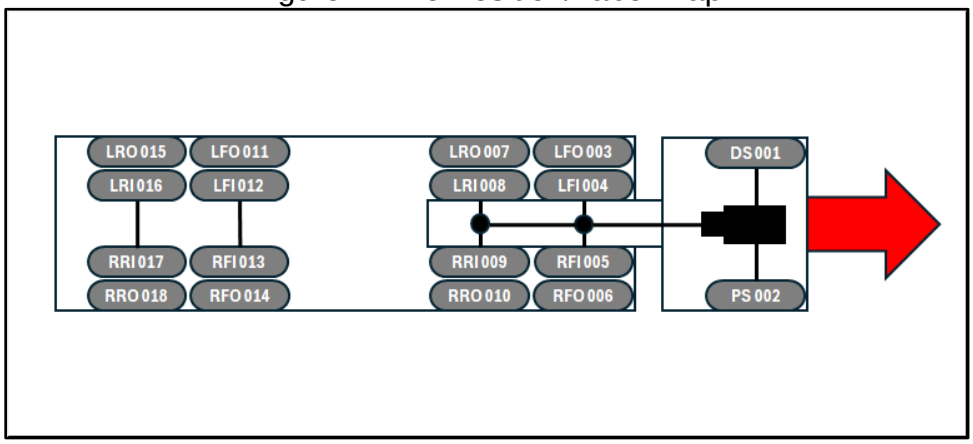
Fuel economy testing of tires varies compared to other technologies since tire performance changes over time, both long term and short term. During a fuel economy test, fuel economy can change based on tire temperature and pressure. Many extra steps were taken during these tire tests to ensure accuracy and consistency including tire preparation, tire pressure management and monitoring.

4.1: TIRES TESTED

All tires were acquired in new condition for this test and received 500 break-in miles prior to testing. Test tire information is shown above in Table 2. Tires tested were considered direct and fair competitors from Michelin, Bridgestone and Goodyear.

Tires were installed in the same positions for the break-in miles and the fuel economy tests, as labeled in Figure 1.

Figure 1: Tire Position/Label Map



Note: Tire images shown may include footprints and/or dirt. The tires were not cleaned with any chemicals prior to testing. Footprints were caused by MVTS technicians walking on the tires while checking pressures and dirt was contracted during break-in miles as the vehicle was parked in a secure dirt yard during break-in mile operations.

4.2: TIRE SOURCING & MOUNTING

Michelin tires were purchased through regular supply chains, which MVTS sourced independently in Las Cruces, NM. An exception was the Michelin XMZ2 steer tires and XMET2 tires, which were provided by Michelin since the test occurred prior to those tires being available on the market.

All tires were mounted in the MVTS shop on aluminum wheels prior to break-in and remained mounted until testing was completed. Drive and trailer tires were not balanced, following common industry practice, whereas the steer tires were balanced since that is also common practice. Trailer tires remained constant throughout testing and were not changed.

Table 3: Wheels and Balancing

Position	Wheels	Balanced?
Steer	Aluminum	Yes
Drive	Aluminum	No
Trailer	Aluminum	No

4.3: TIRE BREAK-IN

All tires received a break-in distance of 500 miles in the weeks prior to testing on public highway near Las Cruces, NM. A distance of 500 miles was chosen due to the industry standard expectations for tire consistency[3] and break-in. Break-in miles were conducted using the same two (2) vehicles used in testing, where were identically spec'd and ballasted to ensure consistency.

All tires were inflated to 100.0 psi cold pressure during break-in. Each set remained in the shop overnight prior to running break-in miles the following day. After installation, tire pressures were again verified to be at 100 psi. All tires were labeled as to their position on the vehicle to ensure consistency when reinstalled during the actual fuel economy test.

4.4: TEST RUN TIRE PREPARATION

Tire pressures were set to 100.0 psi cold pressure at the test track in the early morning of the test day and prior to sunrise. One calibrated digital tire pressure gauge was used for all initial tire pressure checks. The pressures were not adjusted after the morning pressure adjustment. Pressures were only checked to verify and record pressure values.

4.5: FUEL ECONOMY TEST PROCEDURE

Testing was conducted in Pecos, TX on a 9-mile test track. The test speed was 65 MPH. Wheel revolution counts were changed in accordance with the drive tire revolutions per mile specification for the tires tested.

The test procedure was as follows:

1) Complete four (4) warm-up laps to allow tire pressures and temperatures to stabilize.
2) Stop in pits to record tire pressures.
3) Complete 12 laps (108 miles).
4) End test run. Record tire pressures (16 total laps).
5) Change tires for the next test run.
6) Repeat steps 1 – 5.

Table 4: Warm-up and Test Laps

Lap #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Check Pressures	Warm-up Laps				Stop. Check Pressures. Accelerate.	Test Laps											End Test. Pit. Check Pressures.

To calculate fuel economy changes, laps 6 through 16 were analyzed. The warm-up lap values were not included in the fuel economy calculations, nor was lap 5, which was an acceleration lap after warm-up tire pressure checks. Tire pressure values are shown here and the comparisons are summarized in the Test Results section.

5.0: VEHICLE FUEL ECONOMY TEST EQUIPMENT

MVTS fuel economy testing uses a data acquisition system and sensors specifically for its 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 2: Aerodynamic Sensors

Figure 3: Data Acquisition System

Figure 4: Fuel Flow Meter

Figure 5: Tire Temp. Sensor

6.0: TEST RUNS AND RESULTS

Three (3) runs were conducted to complete this fuel economy test in the sequence shown below. The Michelin (XMZ2| XMED|XMET2) set achieved the best fuel economy with savings of **4.61 gal/1000 miles (3.37%)** over the Bridgestone (R268|M760|R196A) configuration, **and 7.73 gal/1000 miles (5.65%)** over the Goodyear (RSA|G572|RST) configuration (Table 6).

Table 5: Test Run Sequence

Run	Test Name	Start	End
1	Goodyear (RSA|G572|RST)	7:20 AM	9:40 AM
2	Bridgestone (R268|M760|R196A)	10:33 AM	12:53 PM
4	Michelin (XMZ2|XMED|XMET2)	4:42 PM	7:03 PM

Table 6: Test Results with Accuracy

Product	Fuel Economy Improvement						Annual Savings per Vehicle	
	Gal/1000 miles		MPG		Percent		Money in Fuel ($)	CO_2 (Metric Tons)
	Test Results	Accuracy	Test Results	Accuracy	Test Results	Accuracy		
Michelin (XMZ2|XMED|XMET2)	**Base**	Base	Base	Base	Base	Base	Base	Base
Bridgestone (R268|M760|R196A)	**4.61**	+/- 0.73	0.25	+/- 0.04	3.37%	+/- 0.53%	$2,431	5.87
Goodyear (RSA|G572|RST)	**7.73**	+/- 0.56	0.44	+/- 0.03	5.65%	+/- 0.41%	$4,075	9.84

Figure 6: Test Results Graph (gal/1000 miles)

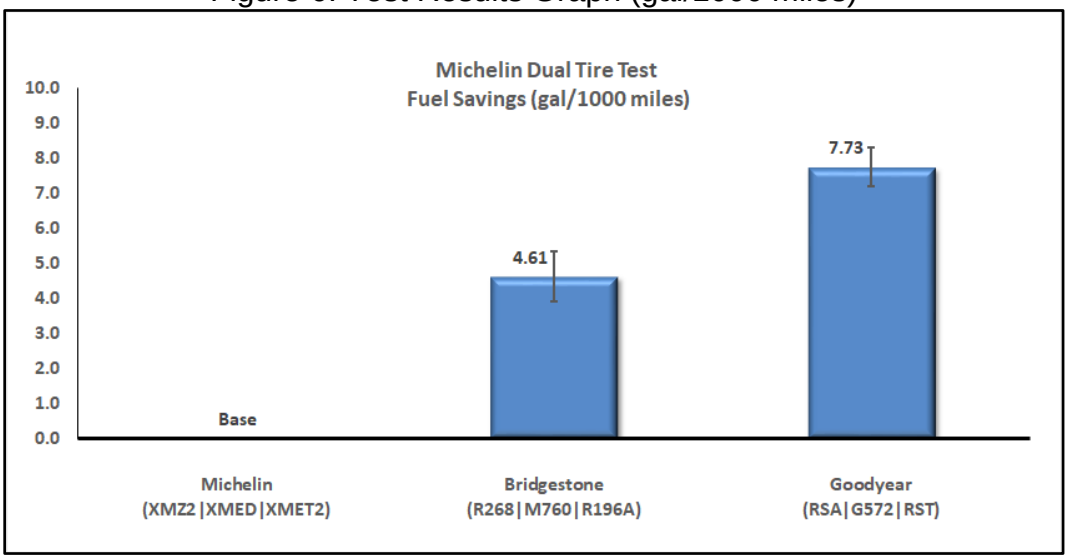
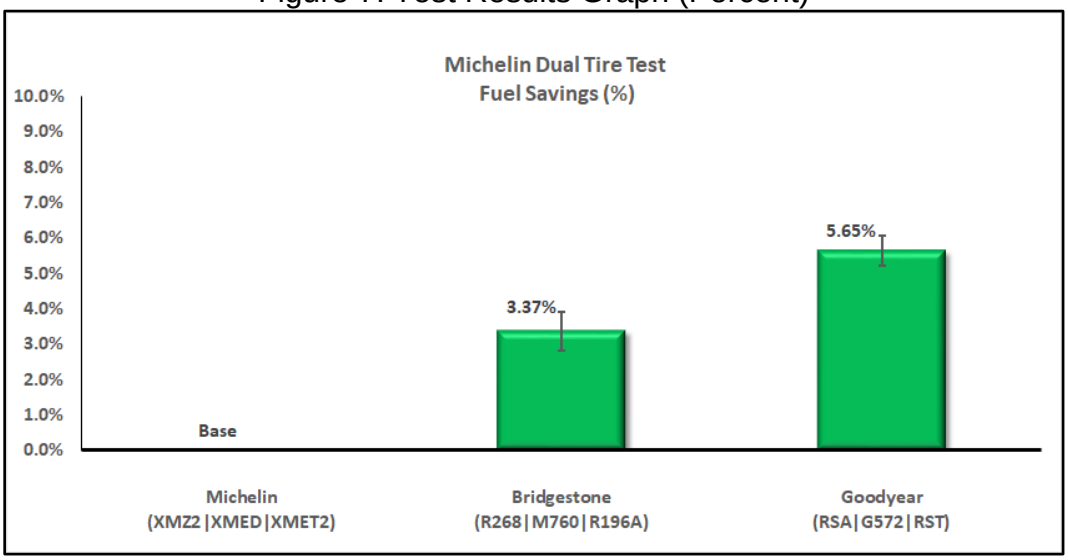


Figure 7: Test Results Graph (Percent)



6.1: Run 1: Goodyear (RSA|G572|RST)

The Goodyear tire package (RSA|G572|RST) was installed in the steer, drive and trailer positions respectively for evaluation. The fuel consumption performance of this tire setup was compared to the baseline Michelin package (XMZ2|XMED|XMET2). These findings are detailed in Table 6.

Figure 8: Goodyear RSA Steer Tire (Position 001)

Figure 9: Goodyear G572 1AD Fuel Max Drive Tire (Position 003)

Figure 10: Goodyear RST Trailer Tire (Position 011)

Figure 11: Tire Changes

Figure 12: Steer Tire Installation

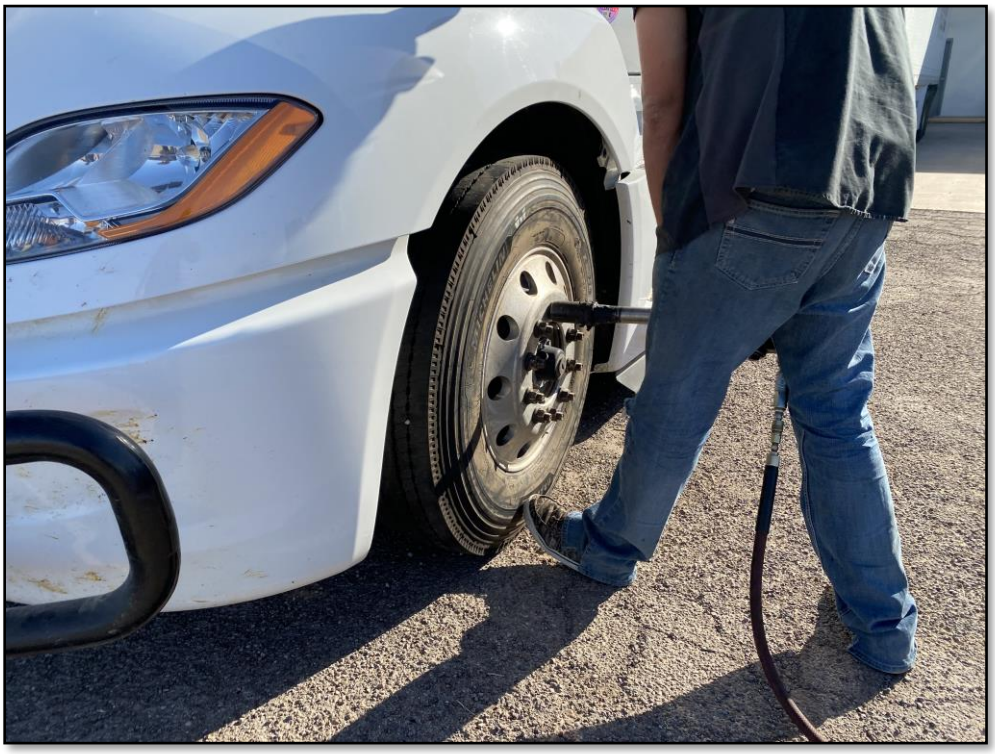


Table 7 shows the Average Tire Pressure Comparison and Table 8 shows the Tire Pressure Growth Comparison indicating that the Test vehicle generally showed higher pressures than the Compare vehicle, with an average variance of 6.3 psi, a minimum of 3.5 psi, and a maximum of 10.3 psi. This suggests a slightly higher pressure in the Test vehicle's tires while remaining consistent overall. Higher tire temperatures are often a result of fuel economy loss, which was the case in the Goodyear configuration.

The Tire Pressure Growth Comparison showed an average growth variance of -0.3 psi, with a minimum of -1.3 psi and a maximum of 0.5 psi, indicating that the Test vehicle experienced slightly lower pressure growth than the Compare vehicle. Despite these differences, the tire pressures and growth rates are stable and consistent between the two vehicles. Therefore, the Goodyear tires increased in temperature during the warmup laps (laps 1-4) and remained in that temperature and pressure range, which provided consistency to the Compare vehicle for the measured fuel savings laps (laps 5-16). This was the purpose of conducting warmup laps and this pattern was consistent for all tested tire sets.

Table 7: Run 1 Average Tire Pressure Comparison (RSA|G572|RST)

Average Tire Pressure Comparison				
(Test Vehicle - Compare Vehicle)				
6.0		Steers (psi)		5.8
6.5		Drives-Front (psi)		3.5
10.3		Drives-Rear (psi)		5.3
7.8		Trailer-Front (psi)		6.5
6.0		Trailer-Rear (psi)		5.3
6.3		Average Pressure Variance (psi)		
3.5		Minimum Pressure Variance (psi)		
10.3		Maximum Pressure Variance (psi)		

Table 8: Run 1 Tire Pressure Comparison (RSA|G572|RST)

Tire Pressure Growth Comparison				
(End Pressure - Start Pressure) of (Test Veh - Compare Veh)				
0.0		Steers (psi)		-0.5
-1.3		Drives-Front (psi)		0.0
0.5		Drives-Rear (psi)		-0.5
-0.8		Trailer-Front (psi)		0.3
0.0		Trailer-Rear (psi)		-0.5
-0.3		Average Pressure Variance (psi)		
-1.3		Minimum Pressure Variance (psi)		
0.5		Maximum Pressure Variance (psi)		

6.2: RUN 2: BRIDGESTONE (R268|M760|R196A)

The Bridgestone tire package (R268|M760|R196A) was installed in the steer, drive and trailer positions respectively for evaluation. The fuel consumption performance of this tire setup was compared to the baseline Michelin package (XMZ2|XMED|XMET2). These findings are detailed in Table 6.

Figure 13: Bridgestone R268 Ecopia Steer Tire (Position 001)

Figure 14: Bridgestone M760 Ecopia Drive Tires (Position 007)

Figure 15: Bridgestone R196A Trailer Tire (Position 015)

Table 9 shows the Average Tire Pressure Comparison, and Table 10 presents the Tire Pressure Growth Comparison. The data indicates that the Test vehicle maintained higher pressures than the Compare vehicle, with an average variance of 4.1 psi, a minimum of 2.9 psi, and a maximum of 5.0 psi.

For tire pressure growth, the Test vehicle exhibited an average growth variance of 1.5 psi, with a minimum of 0.0 psi and a maximum of 2.8 psi, reflecting greater pressure growth than the Compare vehicle. These values demonstrate the pressure differences and growth rates observed between the two vehicles throughout the test.

Table 9: Run 2 Tire Pressures Comparison (R268|M760|R196A)

Average Tire Pressure Comparison				
(Test Vehicle - Compare Vehicle)				
4.3		Steers (psi)		3.8
2.9		Drives-Front (psi)		4.3
4.3		Drives-Rear (psi)		4.6
3.9		Trailer-Front (psi)		4.1
5.0		Trailer-Rear (psi)		4.4
4.1		Average Pressure Variance (psi)		
2.9		Minimum Pressure Variance (psi)		
5.0		Maximum Pressure Variance (psi)		

Table 10: Run 2 Tire Test Pressure Growth (R268|M760|R196A)

Tire Pressure Growth Comparison				
(End Pressure - Start Pressure) of (Test Veh - Compare Veh)				
0.5		Steers (psi)		1.5
1.3		Drives-Front (psi)		2.0
2.0		Drives-Rear (psi)		2.3
0.0		Trailer-Front (psi)		1.0
2.8		Trailer-Rear (psi)		1.5
1.5		Average Pressure Variance (psi)		
0.0		Minimum Pressure Variance (psi)		
2.8		Maximum Pressure Variance (psi)		

6.3: RUN 3: MICHELIN (XMZ2|XMED|XMET2)

The Michelin tire package (XMZ2|XMED|XMET2) was installed on a vehicle in the steer, drive, and trailer positions for evaluation, serving as the baseline for comparing fuel economy against Goodyear and Bridgestone.

The Michelin (XMZ2|XMED|XMET2) configuration measured the best fuel economy with an advantage of **4.61 gal/1000 miles (3.37%)** to the Bridgestone (R268|M760|R196A) configuration, **7.73 gal/1000 miles (5.65%)** to the Goodyear (RSA|G572|RST) tire configuration. These findings are detailed in Table 6.

Figure 16: Michelin XMZ2 Steer Tire (Position 001)

Figure 17: Michelin XMED Drive Tire (Position 007)

Figure 18: Michelin XMET2 Trailer Tire (Position 015)

Table 11 shows the Average Tire Pressure Comparison, and Table 12 presents the Tire Pressure Growth Comparison. The data indicates that the Test vehicle generally displayed higher pressures than the Compare vehicle, with an average variance of 3.7 psi, a minimum variance of 2.3 psi, and a maximum variance of 5.0 psi.

The Tire Pressure Growth Comparison reveals an average growth variance of 0.4 psi, with a minimum variance of -1.0 psi and a maximum variance of 2.3 psi. These measurements demonstrate the pressure differences and growth rates observed between the Test and Compare vehicles throughout the test.

Table 11: Run 3 Tire Pressures Comparison (XMZ2|XMED|XMET2)

Average Tire Pressure Comparison				
(Test Vehicle - Compare Vehicle)				
4.3		Steers (psi)		4.3
4.5		Drives-Front (psi)		3.5
4.6		Drives-Rear (psi)		5.0
2.3		Trailer-Front (psi)		3.0
2.9		Trailer-Rear (psi)		3.1
3.7		Average Pressure Variance (psi)		
2.3		Minimum Pressure Variance (psi)		
5.0		Maximum Pressure Variance (psi)		

Table 12: Run 3 Tire Test Pressure Growth (XMZ2|XMED|XMET2)

Tire Pressure Growth Comparison				
(End Pressure - Start Pressure) of (Test Veh - Compare Veh)				
0.5		Steers (psi)		0.5
0.0		Drives-Front (psi)		0.3
-0.5		Drives-Rear (psi)		0.0
-1.0		Trailer-Front (psi)		-0.3
1.8		Trailer-Rear (psi)		2.3
0.4		Average Pressure Variance (psi)		
-1.0		Minimum Pressure Variance (psi)		
2.3		Maximum Pressure Variance (psi)		

6.4: 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 to have difficulty predicting the financial benefits of the product unless units of gal/1000 miles are used.

Units of gal/1000 miles are also more reliable for a fleet's real-world savings since this unit is not affected by vehicle speed. The fuel savings from tires are nearly the same at 20 MPH as they are at 65 MPH (*i.e.,* savings are nearly linear with speed). Therefore, it is important to use units of gal/1000 miles. To convert from MPG to gal/1000 miles, simply use 1000 divided by MPG (ex. 1000 / 7.15 MPG = 139.9 gal/1000 miles).

6.5: WEATHER CONDITIONS SUMMARY

During testing, ambient temperatures ranged from 65°F to 80°F, with wind speeds between 17 MPH and 25 MPH. Although conditions were relatively windy, the vehicles were identically spec'd and experienced the same conditions, which was evident with the high degree of accuracy in the tests. Conditions were mostly fair and windy throughout the day. Weather data was acquired from a local Weather Underground weather station, and complete weather details can be found in the Appendix.

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 instantaneously accounts for changes in wind, temperature, and other pertinent variables.

7.0: SAVINGS CALCULATIONS

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

7.1: FUEL SAVINGS CALCULATIONS

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: Michelin (XMZ2|XMED|XMET2) fuel savings over the Bridgestone (RSA|G572|RST) configuration of 4.61 gal/1000 miles and 125,000 miles traveled annually:

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$$Fuel\ Savings = (4.61\ gal/1000\ miles)x\frac{(125{,}000\ miles/year)}{1000} = 577\ gal/year$$

Therefore, the Michelin (XMZ2|XMED|XMET2) configuration would save 577 gallons of fuel per year for this vehicle traveling 125,000 miles compared to the Bridgestone (R268|M760|R196A) configuration.

The Michelin (XMZ2|XMED|XMET2) configuration would save 967 gallons in the same conditions over the Goodyear (RSA|G572|RST) configuration (calculations not shown).

7.2: FINANCIAL SAVINGS CALCULATIONS

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 2023, $ 4.214 /gal. **Note**: MVTS uses average retail fuel prices from the year prior to the test being conducted. Fleets can use the formula below with an alternate fuel price if preferred.

$$Savings\ (\$/year) = \left(577\ \frac{gal}{year}\right)\ x\ \left(\frac{\$4.214}{gal}\right) = \$2{,}431/year$$ in fuel savings

The Michelin (XMZ2|XMED|XMET2) configuration would save $2,431 per year in fuel for this vehicle traveling 125,000 miles over the Bridgestone (R268|M760|R196A) configuration.

The Michelin (XMZ2|XMED|XMET2) configuration would save $4,075 per year in fuel for this vehicle traveling 125,000 miles over the Goodyear (RSA|G572|RST) configuration (calculations not shown).

7.3: TECHNOLOGY PAYBACK AND RETURN-ON-INVESTMENT

Buyers of fuel economy technologies are highly interested in saving money. For a technology supplier to be successful, their technology must save their potential customers money. Many fleets consider the number of months required for the technology to pay for itself as a buying qualification, which is referred to as 'payback' in trucking or sometimes ROI.

$$Payback\ (aka\ ROI)\ (months) = \frac{(Product\ cost)}{(Savings\ (\$/year)}\ x\ (12\ months/year)$$

Where the 'Product cost' in the case of tires is the difference between two (2) tire configurations. MVTS advises fleets to ensure they are comparing prices based on fleet size and not retail or a mixture of both.

Example @$1,245 Bridgestone 'Price cost' (*i.e.,* reduction to base tires): 'Product Cost': was calculated using a 10% initial purchase price reduction for the Bridgestone tires and 20% reduction for Goodyear tires when compared to the Michelin tire set that MVTS purchased at retail prices. Using these calculations, the Bridgestone (R268|M760|R196A) tire set had an initial purchase cost reduction of $1,245 for the truck and trailer combined and the Goodyear (RSA|G572|RST) set had a cost reduction of $2,710. **Note**: This pricing is for example purposes only, contact a Michelin representative for actual pricing.

$$Payback\ (months) = \frac{(\$1{,}245)}{(\$2{,}431\ /year)}\ x\ \left(12\ \frac{months}{year}\right) = 6.1\ months$$

Therefore, the Michelin (XMZ2|XMED|XMET2) configuration would provide an ROI of 6.1 months compared to the Bridgestone (R268|M760|R196A) configuration with a cost difference of $1,245.

Example @$2,710 Goodyear 'Price cost' (*i.e.,* reduction to base tires): Using the same formula as above for the Goodyear (RSA|G572|RST) tire set of $4,075 in fuel savings annually and an initial purchase cost reduction of $2,710, the ROI compared to the Michelin (XMZ2|XMED|XMET2) tire set was 8.0 months, which again indicated a positive ROI for the Michelin tire set.

7.4: TECHNOLOGY PROFIT

Since saving money is the end goal, calculating profit is another important factor.

$$Profit\ (\$) = (Savings) - (Cost)$$

Example @$1,245 Bridgestone 'Product cost' (*i.e.,* reduction to base tires): Using annual values from above.

$$Profit\ (\$) = (\$2{,}431) - (\$1{,}245) = \$1{,}186$$ saved per year, per vehicle.

If this were translated to a 1000-truck fleet, the profits would be $1.186M annual.

Therefore, the Michelin (XMZ2|XMED|XMET2) tire configuration would save $1,186 in profit per vehicle with 125,000 miles traveled compared to the Bridgestone (R268|M760|R196A) configuration. For a fleet of 1000 vehicles, this would equate to $1.186M in profit with the Michelin (XMZ2|XMED|XMET2) configuration.

The Michelin (XMZ2|XMED|XMET2) tire configuration would add $1,365 in profit per vehicle with 125,000 miles traveled compared to the Goodyear (RSA|G572|RST) configuration. For a fleet of 1000 vehicles, this would equate to $1.365M (calculations not shown).

7.5: CO_2 REDUCTION CALCULATIONS

Carbon Dioxide (CO_2) is directly related to diesel fuel consumption in the amount of 10,180[4] grams CO_2 per gallon of diesel consumed (0.01018 metric tons CO_2 per gallon of diesel). Therefore, the same value applies to the amount of fuel saved and correlates to a reduction in CO_2.

$$CO_2\ Reduction\ (metric\ tons) = (Fuel\ Savings)\ x\ (0.01018\ metric\ tons)$$

Where:

- Fuel Savings must be measured in gallons.
- 0.01018 metric tons is the amount of CO_2 resulting from one gallon of diesel fuel.

Example: Using the values from above and a fuel savings of 577 gallons per year for the Michelin (XMZ2|XMED|XMET2) compared to the Bridgestone (R268|M760|R196A) configuration.

$$CO_2\ Reduction\ (metric\ tons) = (577)\ x\ (0.01018\ metric\ tons)$$ = 5.87 metric tons CO_2

Therefore, the Michelin (XMZ2|XMED|XMET2) configuration would save 5.87 metric tons of CO_2 per year for this vehicle traveling 125,000 miles compared to the Bridgestone (R268|M760|R196A) configuration.

[4] https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

The Michelin (XMZ2|XMED|XMET2) configuration would save 9.84 metric tons of CO_2 per year under the same conditions compared to the Goodyear (RSA|G572|RST) configuration (calculations not shown).

7.6: Fuel Savings for Alternate GVW

A fleet that operates at a GVW other than the 78,880 lbs. at which this test was conducted can still calculate their fuel savings from MVTS test results. Units of gal/1000 miles must be used.

$$Fleet\ Fuel\ Savings = \frac{(Fleet\ GVW)}{(Test\ GVW)}\ x\ (MVTS\ Test\ Result)$$

Example: Fleet GVW = 45,000 lbs., comparing (R268|M760|R196A) tries to (XMZ2|XMED|XMET2)

$$Fleet\ Fuel\ Savings = \frac{(45{,}000)}{(78{,}880)}\ x\ \left(4.61\ \frac{gal}{1000} miles\right) = \mathbf{2.63}\ \frac{\boldsymbol{gal}}{\mathbf{1000}}\boldsymbol{miles}$$

Therefore, the fleet with an average 45,000 lbs. GVW would experience fuel savings of 2.63 gal/1000 miles with Michelin (XMZ2|XMED|XMET2) configuration compared to the Bridgestone (R268|M760|R196A) tire configuration.

Note: greater accuracy can be achieved by calculating individual axle weights as opposed to full vehicle weight.

8.0: CONCLUSION

The testing provided a comprehensive analysis of the fuel economy performance of various regional, fuel-efficient semi-tractor and trailer tire configurations, focusing on Michelin and its competitors. Three (3) tire configurations were tested on a 9-mile track where each configuration was evaluated for fuel consumption against a baseline Michelin tire configuration (XMZ2|XMED|XMET2).

Key findings include:

1. **Fuel Economy Performance**:
    - The baseline Michelin (XMZ2|XMED|XMET2) setup demonstrated the best fuel economy among the configurations tested.
    - The Michelin (XMZ2|XMED|XMET2) configuration showed a fuel economy advantage of **4.61 gal/1000 miles (3.37%)** over the Bridgestone (R268|M760|R196A) configuration, **7.73 gal/1000 miles (5.65%)** over the Goodyear (RSA|G572|RST) configuration.

2. **Tire Pressure Management**:
    - Tire pressures were carefully monitored and consistently managed from a cold pressure of 100.0 psi to ensure accuracy. Pressure comparisons indicated that the Test vehicle (with varying tire setups) maintained higher average pressures than the Compare vehicle across multiple runs, with an average variance ranging from 3.7 to 6.3 psi.

3. **Tire Pressure Growth**:
    - The Test vehicle displayed controlled pressure growth, with variances ranging from -0.3 to 1.5 psi compared to the baseline. This suggests consistent performance with minor differences in pressure stability among the tires tested, which further ensured consistency in testing.

4. **Environmental and Operational Conditions**:
    - Testing was conducted at a constant speed of 65 MPH with a GVW of 79,000 lbs. All tires had a 500-mile break-in period prior to testing. Weather conditions were monitored and accounted for, ensuring minimal impact on test accuracy.

5. **Potential Fuel Savings and ROI**:
    - The fuel economy calculations showed that the Michelin (XMZ2|XMED|XMET2) configuration achieved fuel savings of **4.61 gal/1000 miles** compared to the Bridgestone (R268|M760|R196A) configuration, which translated to an annual fuel savings of 577 gallons for a vehicle traveling 125,000 miles per year. At a fuel cost of $4.214 per gallon, this corresponded to an annual cost savings of $2,432. The reduction in fuel consumption also resulted in a CO_2 emissions reduction of 5.87 metric tons annually.

- The Michelin (XMZ2|XMED|XMET2) configuration showed fuel savings of **7.73 gal/1000** miles over the Goodyear (RSA|G572|RST) configuration. This equated to an annual fuel savings of 967 gallons for a vehicle traveling 125,000 miles per year. At a fuel cost of $4.214 per gallon, this resulted in an annual cost savings of $4,069. The reduced fuel consumption led to a CO_2 emissions reduction of 9.83 metric tons annually. These calculations presented the differences in fuel consumption, cost savings, and CO_2 emissions reductions between the tested configurations.

In conclusion, the Michelin (XMZ2|XMED|XMET2) tire configuration was shown to be the most fuel-efficient option and provided advantages in profit and CO_2 reductions compared to competitor tires from Bridgestone and Goodyear.

9.0: APPENDIX

9.1: TEST VEHICLE DETAILS

Note: tire details for each test run can be found in the Tire Details and Pressures section.

Figure 19: Vehicle Info, Test Vehicle

Test Date	October 29, 2024		
Vehicle Provider	MVTS		
Test Location	Pecos, TX		
Test Route	9-mile track		
TRUCK ID:	**Veh. B**		
Brand	International		
Date of Manufacture (MY)	2019		
Model	LT 625		
Engine	Cummins X15		
VIN	3HSDZAPR3KN562087		
Mileage (miles):	66,890		
Transmission	Eaton Endurant 12-Speed AMT		
Front Drive Axle	Meritor MT-40-14X-3CFR		
Rear Drive Axle	Meritor MT-40-14X-3CFR		
Rear Gear	2.79:1		
Wheelbase (inches)	228		
Fifth Wheel Location	24.25 / 0.00		
Fuel Load	Full		
Fuel Type & Batch	No. 2 diesel		
Axle Weights (S,D,T) (lbs)	11,260	33,600	33,700
Total weight	78,560		
Photo/Video/Audio folder name:			
TRAILER ID:	**Trailer B**		
Brand	Hyundai		
VIN	3H3V532C6LR282006		
Date of Manufacture (MY)	2020		
Type	dry van		
Size	53-ft		
King Pin Location	36 inches		
Tandem Setting	40-feet California spec		
Cab to Trailer Gap (inches)	57 inches		
Aero Trailer Gap (inches)	35 inches		
Add-ons	Michelin Energy Guard Skirts		

9.2: COMPARE VEHICLE DETAILS

Figure 20: Vehicle Info, Compare Vehicle

Test Date	October 29, 2024		
Vehicle Provider	MVTS		
Test Location	Pecos, TX		
Test Venue/Route	9-mile track		
TRUCK ID:	**Veh. A**		
Brand	International		
Date of Manufacture (MY)	2019		
Model	LT 625		
Engine	Cummins X15		
VIN	3HSDZAPR4KN562972		
Mileage (miles):	63,482		
Transmission	Eaton Endurant 12-Speed AMT		
Front Drive Axle	Meritor MT-40-14X-3CFR		
Rear Drive Axle	Meritor MT-40-14X-3CFR		
Rear Gear	2.79:1		
Wheelbase (inches)	228		
Fifth Wheel Location	24.25 / 0.00		
Fuel Load	Full		
Fuel Type & Batch	No. 2 diesel		
Axle Weights (S,D,T) (lbs)	11,240	33,800	33,840
Total weight	78,880		
Photo/Video/Audio folder name:			
TRAILER ID:	**Trailer A**		
Brand	Hyundai		
VIN	3H3C532C6MR248009		
Date of Manufacture (MY)	2021		
Type	dry van		
Size	53-ft		
King Pin Location	36 inches		
Tandem Setting	40-feet California spec		
Cab to Trailer Gap (inches)	57 inches		
Aero Trailer Gap (inches)	35 inches		
Add-ons	Michelin Energy Guard Skirts		

9.3: TEST ROUTE

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

Figure 21: Pecos Test Track

9.4: TIRE DETAILS AND PRESSURES – TIRE TEST

Note: tire pressure values shown below were used to calculate the Pressure Comparison and Pressure Growth tables in the Test Results section.

9.4a: RUN 1: GOODYEAR (RSA|G572|RST)

Figure 22: Run 1 Tire Details (Test Vehicle)

D1R1

VehB: (Test Vehicle)

Truck

LF:		Wheel	Front Axle Tires	Wheel		RF:
Goodyear Fuel Max RSA			Type			Goodyear Fuel Max RSA
11R22.5			Size			11R22.5
22		Aluminum	Tread Depth (32nds)	Aluminum		22
117.0			Measured Warm-up (psi)			117.0
117.0			Pressure (psi) Bled to			117.0
118.5			Pressure (psi) End			118.0
117.8			**Pressure (psi) Avg.**			**117.5**

LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Goodyear G572 1AD	Goodyear G572 1AD		Type		Goodyear G572 1AD	Goodyear G572 1AD
11R22.5	11R22.5		Size		11R22.5	11R22.5
24	24	Aluminum	Tread Depth (32nds)	Aluminum	24	24
116.5	115.5		Measured Warm-up (psi)		114.5	111.5
116.5	115.5		Pressure (psi) Bled to		114.5	111.5
118.0	116.5		Pressure (psi) End		115.5	112.5
116.6			**Pressure (psi) Avg.**		**113.5**	

LR-Outer Drive:	LR-Inner Drive:		Drive Axle Tires		RR-Inner Drive:	RR-Outer Drive
Goodyear G572 1AD	Goodyear G572 1AD		Type		Goodyear G572 1AD	Goodyear G572 1AD
11R22.5	11R22.5		Size		11R22.5	11R22.5
24	24	Aluminum	Tread Depth (32nds)	Aluminum	24	24
119.5	120.5		Measured Warm-up (psi)		115.5	113.5
119.5	120.5		Pressure (psi) Bled to		115.5	113.5
121.0	122.0		Pressure (psi) End		116.5	114.5
120.8			**Pressure (psi) Avg.**		**115.0**	

Trailer

LF-Outer Trailer:	LF-Inner Trailer:		Tandem Front		RF-Inner Trailer:	RF-Outer Trailer
Goodyear Endurance RST	Goodyear Endurance RST		Type		Goodyear Endurance RST	Goodyear Endurance RST
11R22.5	11R22.5		Size		11R22.5	11R22.5
18	18	Aluminum	Tread Depth (32nds)	Aluminum	18	18
114.5	120.0		Measured Warm-up (psi)		117.0	114.0
114.5	120.0		Pressure (psi) Bled to		117.0	114.0
115.0	121.0		Pressure (psi) End		118.5	115.0
117.6			**Pressure (psi) Avg.**		**116.1**	

LR-Outer Trailer:	LR-Inner Trailer:		Tandem Rear		RR-Inner Trailer:	RR-Outer Trailer
Goodyear Endurance RST	Goodyear Endurance RST		Type		Goodyear Endurance RST	Goodyear Endurance RST
11R22.5	11R22.5		Size		11R22.5	11R22.5
18	18	Aluminum	Tread Depth (32nds)	Aluminum	18	18
115.0	116.5		Measured Warm-up (psi)		115.5	114.5
115.0	116.5		Pressure (psi) Bled to		115.5	114.5
116.0	117.5		Pressure (psi) End		116.0	116.0
116.3			**Pressure (psi) Avg.**		**115.5**	

Figure 23: Run 1 Tire Details (Compare)

D1R1

VehA: (Compare Vehicle)

Truck

LF:		Wheel	Front Axle Tires	Wheel		RF:
Michelin X Line Energy Z			Type			Michelin X Line Energy Z
275/80R22.5			Size			275/80R22.5
12		Aluminum	Tread Depth (32nds)	Aluminum		13
111.0			Measured Warm-up (psi)			111.0
111.0			Pressure (psi) Bled to			111.0
112.5			Pressure (psi) End			112.5
111.8			**Pressure (psi) Avg.**			**111.8**

LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Michelin XDA Energy +	Michelin XDA Energy +		Type		Michelin XDA Energy +	Michelin XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
14	16	Aluminum	Tread Depth (32nds)	Aluminum	15	17
109.0	110.5		Measured Warm-up (psi)		110.0	109.0
108.0	110.5		Pressure (psi) Bled to		110.0	109.0
110.5	111.5		Pressure (psi) End		111.0	110.0
110.1			**Pressure (psi) Avg.**		**110.0**	

LR-Outer Drive:	LR-Inner Drive:		Drive Axle Tires		RR-Inner Drive:	RR-Outer Drive
Michelin XDA Energy +	Michelin XDA Energy +		Type		Michelin XDA Energy +	Michelin XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
15	15	Aluminum	Tread Depth (32nds)	Aluminum	15	15
109.0	111.0		Measured Warm-up (psi)		110.0	108.0
109.0	111.0		Pressure (psi) Bled to		110.0	108.0
110.0	112.0		Pressure (psi) End		111.5	109.5
110.5			**Pressure (psi) Avg.**		**109.8**	

Trailer

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
10	10	Steel	Tread Depth (32nds)	Steel	11	11
108.5	110.0		Measured Warm-up (psi)		109.5	108.5
108.5	110.0		Pressure (psi) Bled to		109.5	108.5
110.0	111.0		Pressure (psi) End		110.5	110.0
109.9			**Pressure (psi) Avg.**		**109.6**	

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
11	11	Steel	Tread Depth (32nds)	Steel	11	11
109.0	110.5		Measured Warm-up (psi)		110.0	109.0
109.0	110.5		Pressure (psi) Bled to		110.0	109.0
110.0	111.5		Pressure (psi) End		111.5	110.5
110.3			**Pressure (psi) Avg.**		**110.3**	

9.4b: RUN 2: BRIDGESTONE (R268|M760|R196A)

Figure 24: Run 2 Tire Details (Test Vehicle)

D1R2

VehB: (Test Vehicle)

Truck

LF:		Wheel	Front Axle Tires	Wheel		RF:
Bridgestone R268 Ecopia		Aluminum	Type	Aluminum		Bridgestone R268 Ecopia
11R22.5			Size			11R22.5
21			Tread Depth (32nds)			21
118.0			Measured Warm-up (psi)			117.5
118.0			Pressure (psi) Bled to			117.5
120.5			Pressure (psi) End			120.5
119.3			**Pressure (psi) Avg.**			**119.0**

LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Bridgestone M760 Ecopia	Bridgestone M760 Ecopia	Aluminum	Type	Aluminum	Bridgestone M760 Ecopia	Bridgestone M760 Ecopia
11R22.5	11R22.5		Size		11R22.5	11R22.5
28	28		Tread Depth (32nds)		28	28
115.0	114.5		Measured Warm-up (psi)		116.0	115.5
115.0	114.5		Pressure (psi) Bled to		116.0	115.5
117.5	117.5		Pressure (psi) End		120.0	118.5
116.1			**Pressure (psi) Avg.**		**117.5**	

LR-Outer Drive:	LR-Inner Drive:		Drive Axle Tires		RR-Inner Drive:	RR-Outer Drive
Bridgestone M760 Ecopia	Bridgestone M760 Ecopia	Aluminum	Type	Aluminum	Bridgestone M760 Ecopia	Bridgestone M760 Ecopia
11R22.5	11R22.5		Size		11R22.5	11R22.5
28	28		Tread Depth (32nds)		28	28
115.0	117.0		Measured Warm-up (psi)		116.5	114.5
115.0	117.0		Pressure (psi) Bled to		116.5	114.5
118.0	121.0		Pressure (psi) End		121.5	118.0
117.8			**Pressure (psi) Avg.**		**117.6**	

Trailer

LF-Outer Trailer:	LF-Inner Trailer:		Tandem Front		RF-Inner Trailer:	RF-Outer Trailer
Bridgestone R196A Ecopia	Bridgestone R196A Ecopia	Aluminum	Type	Aluminum	Bridgestone R196A Ecopia	Bridgestone R196A Ecopia
11R22.5	11R22.5		Size		11R22.5	11R22.5
17	17		Tread Depth (32nds)		17	17
115.0	117.0		Measured Warm-up (psi)		116.0	115.0
115.0	117.0		Pressure (psi) Bled to		116.0	115.0
115.0	121.0		Pressure (psi) End		119.0	118.0
117.0			**Pressure (psi) Avg.**		**117.0**	

LR-Outer Trailer:	LR-Inner Trailer:		Tandem Rear		RR-Inner Trailer:	RR-Outer Trailer
Bridgestone R196A Ecopia	Bridgestone R196A Ecopia	Aluminum	Type	Aluminum	Bridgestone R196A Ecopia	Bridgestone R196A Ecopia
11R22.5	11R22.5		Size		11R22.5	11R22.5
17	17		Tread Depth (32nds)		17	17
115.5	117.5		Measured Warm-up (psi)		117.5	115.0
115.5	117.5		Pressure (psi) Bled to		117.5	115.0
119.0	121.5		Pressure (psi) End		121.5	118.0
118.4			**Pressure (psi) Avg.**		**118.0**	

Figure 25: Run 2 Tire Details (Compare Vehicle)

D1R2

VehA: (Compare Vehicle)

Truck

LF:		Wheel	Front Axle Tires	Wheel		RF:
Michelin X Line Energy Z			Type			Michelin X Line Energy Z
275/80R22.5			Size			275/80R22.5
12		Aluminum	Tread Depth (32nds)	Aluminum		13
114.0			Measured Warm-up (psi)			114.5
114.0			Pressure (psi) Bled to			114.5
116.0			Pressure (psi) End			116.0
115.0			**Pressure (psi) Avg.**			**115.3**

LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Michelin XDA Energy +	Michelin XDA Energy +		Type		Michelin XDA Energy +	Michelin XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
14	16	Aluminum	Tread Depth (32nds)	Aluminum	15	17
112.0	113.0		Measured Warm-up (psi)		113.0	112.0
112.0	113.0		Pressure (psi) Bled to		113.0	112.0
113.5	114.5		Pressure (psi) End		114.5	113.5
113.3			**Pressure (psi) Avg.**		**113.3**	

LR-Outer Drive:	LR-Inner Drive:		Drive Axle Tires		RR-Inner Drive:	RR-Outer Drive
Michelin XDA Energy +	Michelin XDA Energy +		Type		Michelin XDA Energy +	Michelin XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
15	15	Aluminum	Tread Depth (32nds)	Aluminum	15	15
112.0	113.0		Measured Warm-up (psi)		113.0	111.0
112.0	113.0		Pressure (psi) Bled to		113.0	111.0
113.5	115.5		Pressure (psi) End		115.0	113.0
113.5			**Pressure (psi) Avg.**		**113.0**	

Trailer

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
10	10	Steel	Tread Depth (32nds)	Steel	11	11
112.0	112.5		Measured Warm-up (psi)		112.0	111.5
112.0	112.5		Pressure (psi) Bled to		112.0	111.5
114.0	114.0		Pressure (psi) End		114.0	114.0
113.1			**Pressure (psi) Avg.**		**112.9**	

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
11	11	Steel	Tread Depth (32nds)	Steel	11	11
112.5	113.0		Measured Warm-up (psi)		113.0	112.0
112.5	113.0		Pressure (psi) Bled to		113.0	112.0
113.5	114.5		Pressure (psi) End		115.0	114.5
113.4			**Pressure (psi) Avg.**		**113.6**	

9.4c: RUN 3: MICHELIN (XMZ2|XMED|XMET2)

Figure 26: Run 3 Tire Details (Test Vehicle)

D1R3

VehB: (Test Vehicle)

Truck

LF:		Wheel	Front Axle Tires	Wheel		RF:
Michelin X Line Multi Z2		Aluminum	Type	Aluminum		Michelin X Line Multi Z2
11R22.5			Size			11R22.5
22			Tread Depth (32nds)			22
120.0			Measured Warm-up (psi)			120.5
120.0			Pressure (psi) Bled to			120.5
119.0			Pressure (psi) End			118.5
119.5			**Pressure (psi) Avg.**			**119.5**

LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Michelin X Line Multi Energy Drive	Michelin X Line Multi Energy Drive	Aluminum	Type	Aluminum	Michelin X Line Multi Energy Drive	Michelin X Line Multi Energy Drive
11R22.5	11R22.5		Size		11R22.5	11R22.5
24	24		Tread Depth (32nds)		24	24
118.0	120.5		Measured Warm-up (psi)		118.5	118.0
118.0	120.5		Pressure (psi) Bled to		118.5	118.0
116.0	118.5		Pressure (psi) End		116.0	115.0
118.3			**Pressure (psi) Avg.**		**116.9**	

LR-Outer Drive:	LR-Inner Drive:		Drive Axle Tires		RR-Inner Drive:	RR-Outer Drive
Michelin X Line Multi Energy Drive	Michelin X Line Multi Energy Drive	Aluminum	Type	Aluminum	Michelin X Line Multi Energy Drive	Michelin X Line Multi Energy Drive
11R22.5	11R22.5		Size		11R22.5	11R22.5
24	24		Tread Depth (32nds)		24	24
118.5	120.5		Measured Warm-up (psi)		121.5	117.5
118.5	120.5		Pressure (psi) Bled to		121.5	117.5
117.0	118.0		Pressure (psi) End		119.0	114.0
118.5			**Pressure (psi) Avg.**		**118.0**	

Trailer

LF-Outer Trailer:	LF-Inner Trailer:		Tandem Front		RF-Inner Trailer:	RF-Outer Trailer
Michelin X Multi Energy T2	Michelin X Multi Energy T2	Aluminum	Type	Aluminum	Michelin X Multi Energy T2	Michelin X Multi Energy T2
11R22.5	11R22.5		Size		11R22.5	11R22.5
11	11		Tread Depth (32nds)		11	11
116.5	117.5		Measured Warm-up (psi)		117.5	116.5
116.5	117.5		Pressure (psi) Bled to		117.5	116.5
114.0	114.0		Pressure (psi) End		115.5	114.0
115.5			**Pressure (psi) Avg.**		**115.9**	

LR-Outer Trailer:	LR-Inner Trailer:		Tandem Rear		RR-Inner Trailer:	RR-Outer Trailer
Michelin X Multi Energy T2	Michelin X Multi Energy T2	Aluminum	Type	Aluminum	Michelin X Multi Energy T2	Michelin X Multi Energy T2
11R22.5	11R22.5		Size		11R22.5	11R22.5
11	11		Tread Depth (32nds)		11	11
116.0	117.5		Measured Warm-up (psi)		117.5	116.0
116.0	117.5		Pressure (psi) Bled to		117.5	116.0
116.0	116.0		Pressure (psi) End		116.0	114.0
116.4			**Pressure (psi) Avg.**		**115.9**	

Figure 27: Run 3 Tire Details (Compare Vehicle)

D1R3

VehA: (Compare Vehicle)

Truck

LF:		Wheel	Front Axle Tires	Wheel		RF:
Michelin X Line Energy Z			Type			Michelin X Line Energy Z
275/80R22.5			Size			275/80R22.5
12		Aluminum	Tread Depth (32nds)	Aluminum		13
116.0			Measured Warm-up (psi)			116.5
116.0			Pressure (psi) Bled to			116.5
114.5			Pressure (psi) End			114.0
115.3			**Pressure (psi) Avg.**			**115.3**

LF-Outer Drive:	LF-Inner Drive:		Drive Axle Tires		RF-Inner Drive:	RF-Outer Drive
Michelin XDA Energy +	Michelin XDA Energy +		Type		Michelin XDA Energy +	Michelin XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
14	16	Aluminum	Tread Depth (32nds)	Aluminum	15	17
114.5	114.5		Measured Warm-up (psi)		115.5	114.0
114.5	114.5		Pressure (psi) Bled to		115.5	114.0
112.5	113.5		Pressure (psi) End		112.5	111.5
113.8			**Pressure (psi) Avg.**		**113.4**	

LR-Outer Drive:	LR-Inner Drive:		Drive Axle Tires		RR-Inner Drive:	RR-Outer Drive
Michelin XDA Energy +	Michelin XDA Energy +		Type		Michelin XDA Energy +	Michelin XDA Energy +
275/80R22.5	275/80R22.5		Size		275/80R22.5	275/80R22.5
15	15	Aluminum	Tread Depth (32nds)	Aluminum	15	15
114.0	115.5		Measured Warm-up (psi)		115.5	113.5
114.0	115.5		Pressure (psi) Bled to		115.5	113.5
112.5	113.5		Pressure (psi) End		112.5	110.5
113.9			**Pressure (psi) Avg.**		**113.0**	

Trailer

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
10	10	Steel	Tread Depth (32nds)	Steel	11	11
114.5	114.0		Measured Warm-up (psi)		114.5	113.5
114.5	114.0		Pressure (psi) Bled to		114.5	113.5
112.5	112.0		Pressure (psi) End		112.5	111.0
113.3			**Pressure (psi) Avg.**		**112.9**	

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
11	11	Steel	Tread Depth (32nds)	Steel	11	11
114.5	115.0		Measured Warm-up (psi)		115.0	114.5
114.5	115.0		Pressure (psi) Bled to		115.0	114.5
112.0	112.5		Pressure (psi) End		111.0	110.5
113.5			**Pressure (psi) Avg.**		**112.8**	

9.5: WEATHER CONDITIONS

Weather during testing was fair with varying wind speeds throughout most of the period. Maximum wind was 25 MPH. Temperatures ranged from 64°F to 80°F. Weather data was acquired from a local Weather Underground weather station, as shown in Table 13.

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 13: Weather Data, October 29, 2024

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:53 AM	70.0 °F	47 °F	44 %	S	17.0 mph	0 mph	26.93 in	0.0 in	Fair
1:53 AM	69.0 °F	51 °F	53 %	S	21.0 mph	0 mph	26.92 in	0.0 in	Fair / Windy
2:53 AM	68.0 °F	54 °F	61 %	S	21.0 mph	29 mph	26.92 in	0.0 in	Fair / Windy
3:53 AM	68.0 °F	55 °F	63 %	S	21.0 mph	0 mph	26.91 in	0.0 in	Fair / Windy
4:53 AM	67.0 °F	57 °F	70 %	S	17.0 mph	29 mph	26.91 in	0.0 in	Fair
5:53 AM	67.0 °F	57 °F	70 %	S	21.0 mph	28 mph	26.91 in	0.0 in	Fair / Windy
6:53 AM	65.0 °F	57 °F	75 %	S	22.0 mph	30 mph	26.92 in	0.0 in	Fair / Windy
7:53 AM	64.0 °F	57 °F	78 %	S	17.0 mph	0 mph	26.92 in	0.0 in	Fair
8:53 AM	65.0 °F	58 °F	78 %	S	18.0 mph	29 mph	26.92 in	0.0 in	Fair
9:53 AM	68.0 °F	59 °F	73 %	S	23.0 mph	33 mph	26.93 in	0.0 in	Fair / Windy
10:53 AM	71.0 °F	59 °F	66 %	S	24.0 mph	33 mph	26.93 in	0.0 in	Fair / Windy
11:53 AM	74.0 °F	59 °F	59 %	S	25.0 mph	33 mph	26.92 in	0.0 in	Fair / Windy
12:53 PM	77.0 °F	58 °F	52 %	S	25.0 mph	35 mph	26.92 in	0.0 in	Fair / Windy
1:53 PM	78.0 °F	57 °F	48 %	S	23.0 mph	37 mph	26.88 in	0.0 in	Fair / Windy
2:53 PM	80.0 °F	56 °F	43 %	SSW	23.0 mph	37 mph	26.84 in	0.0 in	Fair / Windy
3:53 PM	80.0 °F	57 °F	45 %	S	25.0 mph	36 mph	26.83 in	0.0 in	Fair / Windy
4:53 PM	80.0 °F	56 °F	43 %	S	22.0 mph	32 mph	26.83 in	0.0 in	Fair / Windy
5:53 PM	79.0 °F	56 °F	45 %	S	23.0 mph	35 mph	26.82 in	0.0 in	Fair / Windy
6:53 PM	77.0 °F	56 °F	48 %	S	24.0 mph	31 mph	26.82 in	0.0 in	Fair / Windy
7:53 PM	75.0 °F	57 °F	53 %	S	24.0 mph	33 mph	26.83 in	0.0 in	Fair / Windy
8:53 PM	74.0 °F	55 °F	52 %	S	22.0 mph	32 mph	26.85 in	0.0 in	Fair / Windy
9:53 PM	73.0 °F	55 °F	53 %	S	22.0 mph	35 mph	26.86 in	0.0 in	Fair / Windy
10:53 PM	73.0 °F	56 °F	55 %	S	25.0 mph	36 mph	26.85 in	0.0 in	Fair / Windy
11:53 PM	73.0 °F	58 °F	59 %	S	28.0 mph	39 mph	26.85 in	0.0 in	Fair / Windy
12:53 AM	73.0 °F	59 °F	61 %	S	30.0 mph	45 mph	26.83 in	0.0 in	Haze / Windy
1:53 AM	73.0 °F	59 °F	61 %	S	30.0 mph	44 mph	26.84 in	0.0 in	Haze / Windy
2:53 AM	72.0 °F	59 °F	64 %	SSW	24.0 mph	35 mph	26.87 in	0.0 in	Cloudy / Windy
3:53 AM	70.0 °F	58 °F	65 %	SSW	18.0 mph	29 mph	26.88 in	0.0 in	Fair

Source: https://www.wunderground.com/history/daily/us/tx/pecos/KPEQ/date/2024-10-29

9.6: TECHNOLOGY PROVIDER INFORMATION

- Michelin North America
  One Parkway South, Greenville, SC 29615 USA
  www.michelintruck.com

9.7: TEST PERSONNEL

9.7a: MVT SOLUTIONS ENGINEERING

- Daryl Bear, Lead Engineer & COO
- Danny Ortiz, Test Engineer
- Arturo Via, Test Engineer

9.7b: MVT SOLUTIONS DRIVERS & TECHNICIANS

- John Rintelen, Driver and Shop Technician
- Gene McGarey, Driver and Shop Technician
- Arturo Via, Shop Technician
- Allan Dahringer, Director of Maintenance (MVT)
- Jack Burchell, Driver (MVT)
- Carlos Aragon, Driver (MVT)

9.7c: TECHNOLOGY PROVIDER

- Jim Garrett, Product Category Manager (TLD)
  Long Haul and Regional Trucking
- Kamal Adhikari, Product Category Manager
  Trucking Long Distance – AMN/AMC

9.8: MVT SOLUTIONS CONTACT INFO

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317-603-9325

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