Test Report

Mesilla Valley Transportation Solutions CERTIFIED
Fuel Economy Experts

ConMet TruckWings™ Diesel Day Cab

MVT SOLUTIONS CERTIFIED™ FUEL ECONOMY TEST

November 2023

6.61	0.62	6.20%
gal/1000 miles	MPG	Percent

1.0: INTRODUCTION

Mesilla Valley Transportation Solutions (MVTS) certifies the fuel savings 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 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 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.

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

2.0: TEST SUMMARY

ConMet TruckWings™ showed fuel savings of **6.61 gal/1000 miles (6.20%)** on a modern diesel powered Class-8 day cab tractor with a 45.9-inch aerodynamic gap from the tractor cab extenders to the trailer, which was a 53-foot dry van. Results can be found in Table 1 below.

Table 1: Fuel Economy Test Results

Product	Fuel Economy Improvement		
	Gal/1000 miles	MPG	Percent
TruckWings (Deployed)	**6.61**	0.62	6.20%

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3.0: Test Procedure

Two (2) vehicles ran simultaneously at 65 MPH on the 9-mile circle track near Pecos, Texas. The vehicles were one-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.,* ConMet TruckWings™ installed and deployed).

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 2023 Volvo VNL 6x2 diesel-powered day cabs with Volvo D13N-405 engines and ATF2612F 12-speed transmissions. Trailers were 53-foot Strick 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 to have zero influence on fuel economy. Trailers were equipped with side skirts. Tractor to trailer gap was measured from the end of the static side fairings to the front of the trailer. The aerodynamic gap from the cab extender to the trailer on the Test vehicle was 45.9 inches. The Compare vehicle remained unchanged throughout all tests. Trucks and trailers used wide base single (WBS) tires. Tire pressures were set at 100 psi in the morning prior to incurring any effect of daytime heat. Vehicle and tire details 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 MVTS are 100% confident in the reliable condition of the test vehicles. The MVT fleet uses the same test procedures for their own internal purchase decisions.

Figure 1: Compare and Test Vehicles

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

Table 2: Test Run Sequence

Run	Test Name/Description	Start	End
1	TruckWings (Deployed)	5:03 AM	6:58 AM
2	Baseline	7:24 AM	9:03 AM

3.2: RUN 1: CONMET TRUCKWINGS™

The Baseline run consisted of the Test vehicle having the TruckWings™ system installed on the vehicle and deployed (Figure 2 and Figure 4). The Compare vehicle was equipped with the TruckWings™ system and was deployed during both the Baseline and Test runs while the vehicle was in motion (Figure 3). **Note:** TruckWings deploy at highway speed and are therefore in the closed position when the vehicle is static, such as in Figures 2, 3 and 4 below.

Figure 2: Test Vehicle in Test Configuration

Figure 3: Compare Vehicle

Figure 4: ConMet TruckWings™ Deployed at Speed

3.3: Run 2: Baseline

Run 2 consisted of removing the ConMet TruckWings™ panels from the Test vehicle (Figure 5 and Figure 6). This was the Baseline run, which the Test run was compared to for calculating fuel savings. The mounting hardware remained attached to the cab as this was deemed to not affect fuel economy.

Figure 5: Baseline Configuration with TruckWing Panels Removed

Figure 6: Baseline without ConMet TruckWings™

4.0: VEHICLE FUEL ECONOMY TEST EQUIPMENT

MVTS 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)
- Diesel 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)

Figure 7: Aerodynamic Sensors

Figure 8: Data Acquisition System

Figure 9: Diesel Fuel Flow Meter

Figure 10: Tire Temp. Sensor

5.0: Test Results

ConMet TruckWings™ resulted in an improvement of **6.61 gal/1000 miles (6.20%)** when tested on a diesel-powered day cab tractor with an aerodynamic gap of 45.9 inches between the cab extenders and the trailer. Results with accuracy are shown in Table 3. Results are shown graphically in Figure 11 and Figure 12.

Table 3: Fuel Economy Test Results with Accuracy

Product	Fuel Economy Improvement		
	Gal/1000 miles	MPG	Percent
TruckWings (Deployed)	6.61	0.62	6.20%
Accuracy	+/- 0.67	+/- 0.06	+/- 0.63%

Figure 11: Fuel Savings (gal/1000 miles)

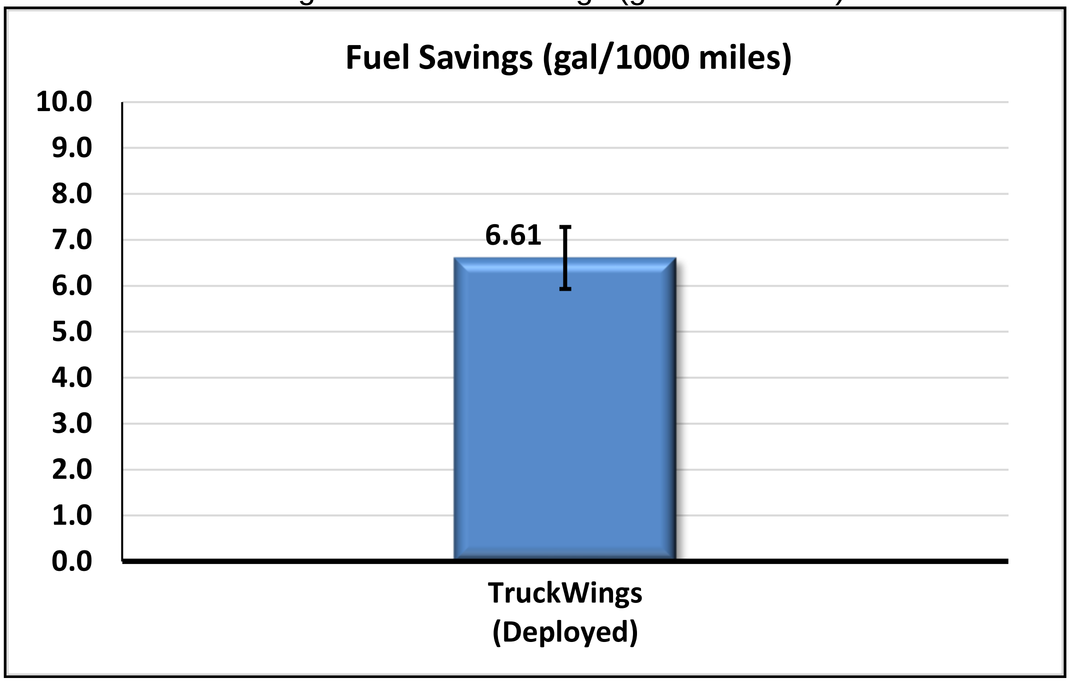
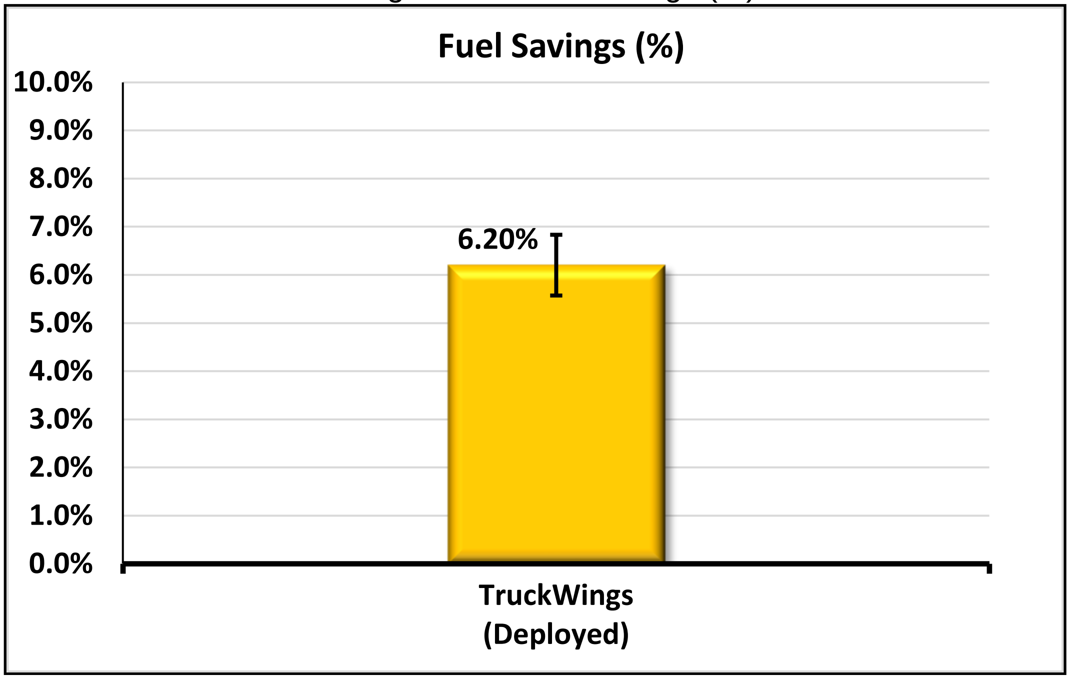


Figure 12: Fuel Savings (%)



5.1: 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 paragraph briefly explains the reasons for these units and how they help carriers better calculate fuel savings.

Units of gal/1000 miles are a more reliable means to calculate fuel savings when compared to other units such as miles-per-gallon (MPG) or percent (%). Those units are prone to error from changing variables such as vehicle baseline fuel economy, load, driver behavior, and duty cycle. For example, a vehicle achieving 9 MPG with a highly aerodynamic configuration will save the same gal/1000 miles as a vehicle achieving 6 MPG. However, the percent fuel savings will be different since percent is based on the baseline fuel economy and the 6 MPG vehicle will use more fuel, which will result in the percent savings value being lower.

5.2: 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. A 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).

Accuracy (*i.e.,* 'margin of error') is shown in multiple locations; tables of 'Test Results with Accuracy' and as 'error bars' in the bar graphs. The error bars are the small solid lines at the top of each bar.

Test accuracy for the ConMet TruckWings™ was +/- 0.67 gal/1000 miles (Table 3) and was represented by an error bar in Figure 11. Accuracy in percent values will not be discussed individually since it is linearly related to gal/1000 miles and follows a very similar pattern and conclusions.

5.3: WEATHER CONDITIONS SUMMARY

Ambient temperature during testing ranged from 40°F to 45°F. Winds ranged from 0 MPH to 10 MPH during testing. Conditions during testing ranged from partly cloudy to foggy. Weather data was acquired from a local Weather Underground weather station and complete data 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 accounts for changes in wind, temperature, and other pertinent variables instantaneously.

6.0: SAVINGS CALCULATIONS

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

6.1: 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: ConMet TruckWings™ with fuel savings of 6.61 gal/1000 miles and 125,000 miles traveled annually:

$$Fuel\ Savings = (6.61\ gal/1000\ miles)x\frac{(125{,}000\ miles/year)}{1000} = 826\ gal/year$$

Therefore, the ConMet TruckWings™ would save 826 gallons of fuel per year for this vehicle traveling 125,000 miles.

6.2: 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 2022 (the year prior to when the test was conducted) of $4.989[1] /gal

$Savings\ (\$/year) = \left(826\,\frac{gal}{year}\right)\ x\ \left(\frac{\$4.989}{gal}\right) = \$4{,}122\ /year$ in fuel savings

Therefore, the ConMet TruckWings™ would save $4,122 per year in fuel for the vehicle traveling 125,000 miles.

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

6.3: CO_2 REDUCTION CALCULATIONS

Carbon Dioxide (CO_2) is directly related to diesel fuel consumption in the amount of 10,180[2] 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 the example financial calculations above and a fuel savings of 826 gallons per year.

$$CO_2\ Reduction\ (metric\ tons) = (826)x(0.01018) = 8.41 \text{ metric tons } CO_2$$

Therefore, the ConMet TruckWings™ would save 8.41 metric tons of CO_2 per year for this vehicle traveling 125,000 miles.

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

7.0: CONCLUSION

The **ConMet TruckWings™** showed a fuel economy improvement of **6.61 gal/1000 miles (6.20%)** on a diesel day cab with an aerodynamic gap of 45.9-inch from the tractor cab extenders to the dry van trailer.

The fuel savings from the TruckWings™ were 826 gallons in diesel, which translates to $4,122 saved annually and 8.41 metric tons CO_2 for a tractor traveling 125,000 miles annually.

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

8.0: Appendix

8.1: Compare Truck/Trailer Vehicle Details

Figure 13: Vehicle Info, Compare Vehicle

Date	November 30, 2023		
Company			
Location	Pecos, Texas		
Test Route	Pecos 9-mile Test Track		
TRUCK ID:	**Veh. A (C23299)**		
Brand	Volvo		
Date of Manufacture (MY)	December 2022 (2023)		
Model	VNL 6x2 (Day Cab)		
Engine	Volvo D13N-405 (405 HP, 439 lb-ft)		
VIN	4V4NB9EG9PN632961		
Mileage (miles):	3,082		
Transmission	ATF2612F 12 SPEED		
Front Axle (Lift Axle)	20K Link Pusher Non-Steerable		
Rear Drive Axle	Meritor HS 17X HE		
Rear Gear	2.17:1		
Fuel Load	Full		
Fuel Type & Batch	Diesel No 2		
Axle Weights (S,D,T) (lbs)	11,003	15,985	17,560
Total weight	44,548		
TRAILER ID:	**T23078**		
Brand	Strick		
VIN	1S12E9532RE549694		
Date of Manufacture (MY)	12/22 (2023)		
Type	Dry Van		
Size	53-ft		
King Pin Location	36-in		
Tandem Setting	40-ft 'California'		
Cab to Trailer Gap	66.9-in		
Aero Trailer Gap	45.9-in		
Add-ons	Trailer skirts, Rear fairings		

Figure 14: Tire Info, Compare Vehicle

Truck — **Veh. A (C23299)**

LF	Front Axle	RF
Michelin X Line Energy Z	Type	Michelin X Line Energy Z
275/80R22.5	Size	275/80R22.5
19	Tread Depth (32nds)	19
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum

LF-Drive	Drive Axle	RF-Drive
Michelin X One LED2	Type	Michelin X One LED2
445/50R22.5	Size	445/50R22.5
18	Tread Depth (32nds)	19
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum

LR-Drive	Drive Axle	RR-Drive
Michelin X One LED2	Type	Michelin X One LED2
445/50R22.5	Size	445/50R22.5
18	Tread Depth (32nds)	19
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum

Trailer — **T23078**

LF-Trailer	Tandem Front	RF-Trailer
Michelin X One Line Energy T2	Type	Michelin X One Line Energy T2
445/50R22.5	Size	445/50R22.5
11	Tread Depth (32nds)	11
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum

LR-Trailer	Tandem Rear	RR-Trailer
Michelin X One Line Energy T2	Type	Michelin X One Line Energy T2
445/50R22.5	Size	445/50R22.5
11	Tread Depth (32nds)	11
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum

8.2: Modified Truck/Trailer Vehicle Details (TruckWings™ Installed)

Figure 15: Vehicle Info, Modified "Test" Vehicle

Date	November 30, 2023		
Company			
Location	Pecos, Texas		
Test Route	Pecos 9-mile Test Track		
TRUCK ID:	**Veh. B (C23800)**		
Brand	Volvo		
Date of Manufacture (MY)	December 2022 (2023)		
Model	VNL 6x2 (Day Cab)		
Engine	Volvo D13N-405 (405 HP, 439 lb-ft)		
VIN	4V4NB9EG0PN632962		
Mileage (miles):	4,170		
Transmission	ATF2612F 12 SPEED		
Front Axle (Lift Axle)	20K Link Pusher Non-Steerable		
Rear Drive Axle	Meritor HS 17X HE		
Rear Gear	2.17:1		
Fuel Load	Full		
Fuel Type & Batch	Diesel No 2		
Axle Weights (S,D,T) (lbs)	11,003	15,985	17,560
Total weight	44,548		
TRAILER ID:	**T23063**		
Brand	Strick		
VIN	1S12E9536RE549679		
Date of Manufacture (MY)	12/22 (2023)		
Type	Dry Van		
Size	53-ft		
King Pin Location	36-in		
Tandem Setting	40-ft 'California'		
Cab to Trailer Gap	66.9-in		
Aero Trailer Gap	45.9-in		
Add-ons	Trailer skirts, Rear fairings		

Figure 16: Tire Info, Modified "Test" Vehicle

	Truck	Veh. B (C23800)
LF	**Front Axle**	RF
Michelin X Line Energy Z	Type	Michelin X Line Energy Z
275/80R22.5	Size	275/80R22.5
19	Tread Depth (32nds)	19
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum
LF-Drive	**Drive Axle**	RF-Drive
Michelin X One LED2	Type	Michelin X One LED2
445/50R22.5	Size	445/50R22.5
18	Tread Depth (32nds)	18
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum
LR-Drive	**Drive Axle**	RR-Drive
Michelin X One LED2	Type	Michelin X One LED2
445/50R22.5	Size	445/50R22.5
17	Tread Depth (32nds)	17
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum
	Trailer	T23063
LF-Trailer	**Tandem Front**	RF-Trailer
Michelin X One Line Energy T2	Type	Michelin X One Line Energy T2
445/50R22.5	Size	445/50R22.5
11	Tread Depth (32nds)	11
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum
LR-Trailer	**Tandem Rear**	RR-Trailer
Michelin X One Line Energy T2	Type	Michelin X One Line Energy T2
445/50R22.5	Size	445/50R22.5
11	Tread Depth (32nds)	10
100	Pressure (psi)	100
Aluminum	Wheel Type	Aluminum

8.3: TEST ROUTE

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

Figure 17: Pecos Test Track

8.4: Weather Conditions

Ambient temperature during testing ranged from 40°F to 45°F. Winds ranged from 0 MPH to 10 MPH during testing. Weather conditions ranged from partly cloudy to foggy during the testing period. This did not affect test results, the conditions were due to a change in temperature.

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, November 30, 2023

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:15 AM	46 °F	43 °F	90 %	E	6 mph	0 mph	27.11 in	0.0 in	Partly Cloudy
1:15 AM	45 °F	43 °F	93 %	ENE	6 mph	0 mph	27.08 in	0.0 in	Fair
2:15 AM	44 °F	43 °F	98 %	CALM	0 mph	0 mph	27.06 in	0.0 in	Fair
3:15 AM	43 °F	43 °F	100 %	CALM	0 mph	0 mph	27.06 in	0.0 in	Fair
4:15 AM	40 °F	40 °F	100 %	NW	6 mph	0 mph	27.06 in	0.0 in	Partly Cloudy
5:15 AM	43 °F	43 °F	100 %	NNW	5 mph	0 mph	27.05 in	0.0 in	Cloudy
6:15 AM	45 °F	45 °F	100 %	CALM	0 mph	0 mph	27.06 in	0.0 in	Cloudy
7:15 AM	44 °F	44 °F	100 %	WNW	10 mph	0 mph	27.07 in	0.0 in	Mist
8:15 AM	43 °F	43 °F	100 %	CALM	0 mph	0 mph	27.08 in	0.0 in	Fog
9:15 AM	44 °F	44 °F	100 %	CALM	0 mph	0 mph	27.10 in	0.0 in	Mist
10:15 AM	49 °F	43 °F	80 %	CALM	0 mph	0 mph	27.12 in	0.0 in	Fair
11:15 AM	65 °F	36 °F	34 %	W	24 mph	30 mph	27.10 in	0.0 in	Fair / Windy
12:15 PM	67 °F	34 °F	29 %	W	23 mph	32 mph	27.08 in	0.0 in	artly Cloudy / Win
1:15 PM	68 °F	31 °F	25 %	W	28 mph	35 mph	27.06 in	0.0 in	artly Cloudy / Win
2:15 PM	68 °F	29 °F	23 %	W	23 mph	38 mph	27.06 in	0.0 in	Fair / Windy
3:15 PM	68 °F	28 °F	22 %	W	26 mph	33 mph	27.06 in	0.0 in	Fair / Windy
4:15 PM	66 °F	27 °F	23 %	W	23 mph	32 mph	27.06 in	0.0 in	Fair / Windy
5:15 PM	64 °F	27 °F	24 %	W	22 mph	28 mph	27.06 in	0.0 in	Fair / Windy
6:15 PM	61 °F	28 °F	28 %	W	12 mph	0 mph	27.08 in	0.0 in	Fair
7:15 PM	58 °F	27 °F	30 %	W	7 mph	0 mph	27.12 in	0.0 in	Fair
8:15 PM	56 °F	28 °F	35 %	WNW	7 mph	0 mph	27.13 in	0.0 in	Fair
9:15 PM	56 °F	28 °F	34 %	W	9 mph	0 mph	27.14 in	0.0 in	Fair
10:15 PM	51 °F	28 °F	41 %	W	9 mph	0 mph	27.15 in	0.0 in	Fair
11:15 PM	49 °F	28 °F	43 %	CALM	0 mph	0 mph	27.17 in	0.0 in	Fair

Source: https://www.wunderground.com/history/daily/us/tx/pecos/KPEQ/date/2023-11-30

8.5: Product Details

- ConMet TruckWings™

8.6: Test Personnel

8.6a: MVT Solutions

- Daryl Bear, Lead Engineer & COO
- Jacob Schwartz, Test Engineer
- Jonathan Ruppert, Test Engineer
- Danny Ortiz, Test Engineer
- Arturo Via, Technician
- John Rintelen, Driver and Technician

8.6b: MVT Solutions Drivers & Technicians

- Carlos Aragon, Driver
- Jack Burchell, Driver
- John Rintelen, Driver and Technician
- Juan Alvarado, Driver

8.6c: ConMet

- Burk Kladde, Chief Engineer

8.7: MVT Solutions Contact Info

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