

MNT, Inc.
700 NW Reo Street
Topeka, Kansas 66617

Report of Cold-Plus® Test Administered June 17 – June 25, 2021

MNT, Inc. is a transport refrigeration company with approximately sixty-five refrigerated trailers headquartered in Topeka, Kansas. In business since 1998, the company enjoys a solid reputation in the trucking industry due to their great work ethic and the sound and stable service they bring to the market. Their motto, “Always Be Appreciative”, stands them in good stead with both customers and employees alike.

Always looking for intelligent ways to trim costs, improve efficiency, prolong the life of their equipment, and protect the environment, **MNT, Inc.** management agreed to test Cold-Plus® in two 53-foot refrigerated trailers. The test was commenced on June 17, 2021 on two Carrier units.

Unit # 198 is a 2012 Carrier 2500 Advance unit with 11,199 hours. It ran in a Continuous Cycle mode and saw a 11.6% reduction in fuel usage. Unit # 218 is a 2012 Carrier 2500 Advance unit with 11,690 hours. It ran in a Start Stop mode and saw a 33% reduction in run time and a 33.5% reduction in fuel consumption.

Test Protocol: The test commenced on June 17, 2021 at 10:30 AM. The set point for both trailers was 30 degrees. A small electric heater was placed in the rear of each trailer to simulate a load. The starting box temperature for Unit # 198 was 81.1 degrees. The starting box temperature for Unit # 218 was 77.0 degrees. Throughout the test the box temperature for Unit #198 (Continuous Cycle) remained constant within one degree of the set point. Throughout the test the box temperature for Unit #218 (Start Stop) varied, as one might expect, but still remained within one degree of the set point, with two exceptions: 10 degrees on Day 2, before Cold-Plus was installed; and 4 degrees on Day 7.

At the beginning of the test, the fuel tank was topped off to the point another pint of fuel would cause an overflow. Each morning, at the end of the 24-hour mark, a 55-gallon drum of fuel was weighed, the weight recorded, and the scale photographed. Fuel was then pumped into the fuel tank to the point another pint of fuel would cause an overflow. The weight on the scale was then recorded and photographed to determine the number of pounds of fuel needed to fill the tank for the prior day’s fuel consumption. The number of pounds was divided by 6.91 to determine the number of gallons consumed. At the same time, the engine hours and box temperature were recorded and photographed. The sixteen data sheets and all forty-eight photographs are available for review.

Fuel Consumption Per Hour – Continuous Cycle: Average fuel consumption per hour for Unit # 198 (Continuous Cycle) was .624 Gallons per hour before Cold Plus® and .551 Gallons per hour after Cold-Plus® was installed, a savings of 11.6%. Using the stated price of diesel fuel of \$2.36 per gallon, the daily savings is \$4.10. Running 350 days a year yields annual savings of \$1,435.00. [See following data for Unit #198 for computations of daily savings.]

The reduction in fuel consumption while running in a Continuous Cycle mode is due to reaching the set point sooner and switching from high speed to low speed.

Fuel Consumption Per Day – Start Stop: The average fuel consumption per hour of run time before and after Cold-Plus® was installed is nearly identical. Before Cold-Plus® was installed, Unit # 218 consumed .953 gallons per hour. After Cold-Plus® was installed, the rate of fuel consumption was .951 gallons per hour. The savings when running in Start Stop mode comes from the reduction in run time. In this test, run time before Cold-Plus® was installed averaged 12 hours per day. Following the Cold-Plus® installation, run time was reduced to 8 hours per day, a 33% reduction. This was confirmed in the analysis of gallons of fuel consumed before and after the installation of the Cold-Plus® treatment - a 33.5% savings in fuel costs.

The cost of fuel during the test is \$2.36 per gallon. Assume 350 operating days per year at 12 hours of run time per day, for total annual operating hours of 4,200 hours. Use .95 gallons per hour for fuel consumption and annual usage is 3,990 gallons. Reduce this amount by one-third (1,330 gallons). This is the number of gallons saved annually. Multiply gallons saved by the cost of fuel (\$2.36 per gallon). \$3,138.80 is the annual fuel savings for similar units operating in Start Stop mode.

Annual Savings: It is understood many of the MNT, Inc. units run Continuous Cycle six months a year and Start Stop the other six months. If half the annual savings for each mode of operation were added together, the *combined annual savings is \$2,286.50 per treated trailer.*

The payback of the original treatment investment is less than five months.

Warranty: As part of the treatment MNT, Inc. received a limited warranty for Units treated. The Warranty covers the compressor and is good for One Thousand (1,000) hours from the time Cold-Plus® was installed. Should the compressor fail for any reason during the One Thousand (1,000) hour period, excepting acts of God or vehicle collisions, the compressor will be replaced with a new comparable compressor at no charge to MNT, Inc. All labor, parts, and shipping costs to install the compressor are covered by this limited warranty.

Environmental: Consuming a gallon of diesel fuel produces 22.38 pounds of CO₂ [United States Energy Information Administration]. Mobile refrigeration units consume .75 to 1.0 gallons of diesel fuel per hour of operation. Using .875 gallons per hour as an average, and assuming 3,000 hours of run time annually, annual diesel consumption is 2,625 gallons, or 58,748 pounds of CO₂.

- *A single mobile refrigerated trailer produces nearly 30 tons of CO₂ annually!*

Cold-Plus® reduces carbon emissions in proportion to the decrease in fuel consumption.

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Unit # 198

Background

The test began on June 17, 2021. The set point was 30 degrees and the unit operated in **Continuous Cycle**. Electric heaters were put in the trailer and ran continuously on high to simulate a load. Cold-Plus® was installed at the end of the 48-hour period on June 19. The manufacturer has documented it typically takes twelve (12) run time hours for the effects of Cold-Plus® to be realized, with continued improvement for up to thirty (30) days. No adverse or unusual conditions were noted during the baseline and testing periods.

Summary of Fuel Usage

A 48-hour baseline time period was selected for Days 1 and 2. The amount of fuel used was almost identical for each 24-hour period. Cold-Plus® was installed after 48 hours and data was recorded in continuous 24-hour periods. On Day 3 the engine hour meter rolled over just as the recording photo was being taken, resulting in 25 hours of run time on that day. The following day then resulted in a recording of 23 hours (Day 4). There was a four (4) hour mechanical down time on Day 7, which skews the graph slightly. Had the unit run those four hours the projected gallons used would be 12.61 (* see graph red solid line).

Average ambient temperature is noted on the chart below. During the test period fuel usage continued to decline as temperatures increased.

Average baseline fuel consumption was 14.98 gallons. The average fuel consumption for the testing days, as adjusted for Day 7, was 13.24 gallons per day, a **11.6%** reduction.

Results for	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	
Date	6/18/21	6/19/21	6/20/21	6/21/21	6/22/21	6/23/21	6/24/21	6/25/21	
Hours Run	24	24	25	23	24	24	20	24	
Avg Hours/Day	Base	24.00						Test days	23.33

Data collected for 25 hours on Day 3

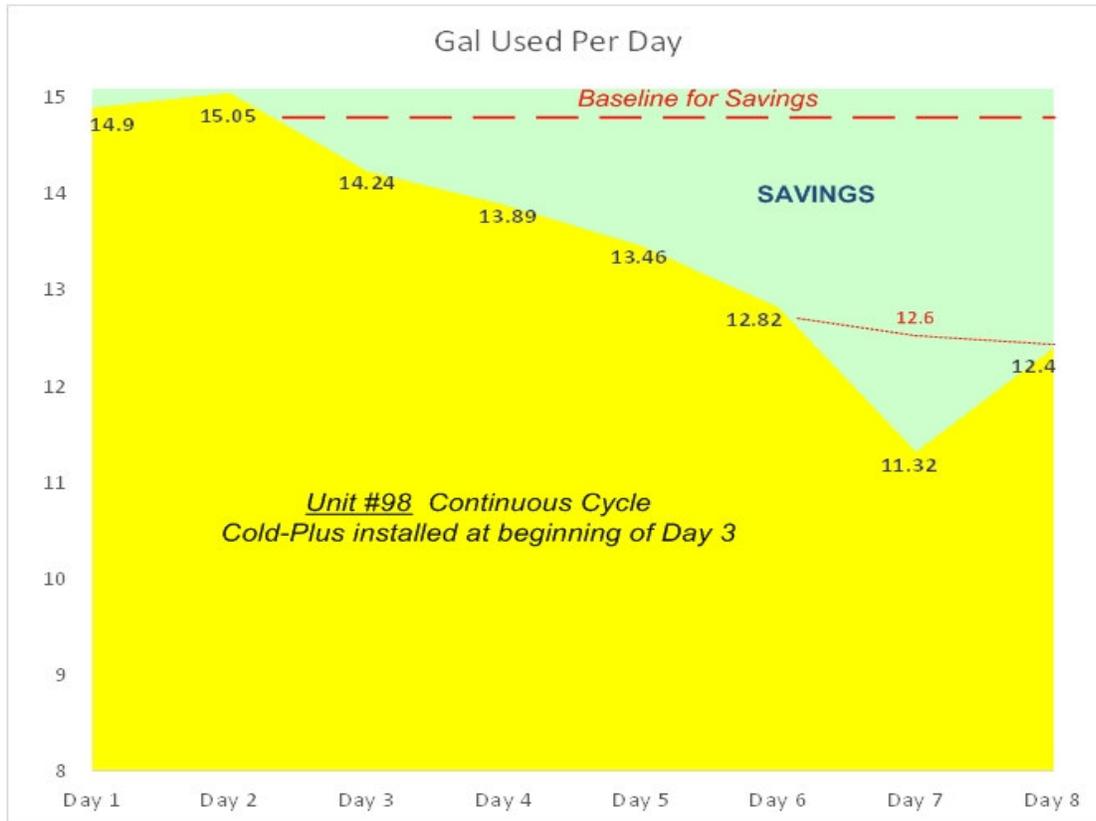
Gal Used	14.9	15.05	14.24	13.89	13.46	12.82	*11.32	12.4	
Avg Gal/Day	Base	14.98						Test days	13.24

Percent savings from baseline **11.6%**

Avg Daily Temp	85.75	88.67	86.17	84.67	71.75	73.67	80.33	82.92	
Avg Temp/Period	Base	87.21						Test days	79.92

Analysis of Data and Cost Savings

The following graph shows the decrease in fuel consumption after the install of Cold-Plus®. The effects of Cold-Plus® are noted the first day of installation with a recorded 5% reduction in fuel consumption; then 7.3% the following day; and 13% by the end of six days as noted in the preceding table, for an average reduction of 11.6%. The area in green indicates fuel savings during the testing days. The dashed redline indicates the baseline consumption of 14.98 gallons per day. The dotted redline indicates the correction for the four hours of downtime.



Savings: The base line period shows fuel consumption at the rate of 14.98 gallons per day. The post install period shows fuel consumption at the rate of 13.24 gallons per day. **This is a 11.6% reduction in fuel consumption.** The cost of fuel during the test is \$2.36 per gallon. Running **Continuous Cycle** and maintaining the per gallon fuel cost above results in the following savings:

Current cost per day: 14.98 gallons x \$2.36 = \$35.35

Cost per day following Cold-Plus® treatment: 13.24 gallons x \$2.36 = \$31.25

Daily savings: \$4.10

Annual Savings: 350 days x \$4.10 = \$1,435.00

Cold-Plus® is a one-time treatment good for the life of the unit. The data above is confirmed through daily documentation and photographs and is available for inspection.

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Unit # 218

Background

The test began on June 17, 2021. The set point was 30 degrees and the unit operated in **Start-Stop Mode**. Electric heaters were put in the trailer and ran continuously on high to simulate a load. Cold-Plus® was installed at the end of the 48-hour period on June 19. The manufacturer has documented it typically takes twelve (12) run time hours for the effects of Cold-Plus® to be realized, with continued improvement for up to thirty (30) days. No adverse or unusual conditions were noted during the baseline and testing periods.

Summary of Fuel Usage

A 48-hour baseline time period was selected for Days 1 and 2. Cold-Plus® was installed after 48 hours and data was recorded in continuous 24-hour periods. Per hour fuel consumption was consistent throughout the test. Prior to the Cold-Plus® install fuel was consumed at the rate of .953 gallons per hour. Following the Cold-Plus® install fuel was consumed at .950 gph. The reduction in fuel consumption for units operating in **Start Stop Mode** occurs because the set point is reached sooner following treatment, resulting in less run time hours. Less run time hours results in less fuel consumption.

Average ambient temperature is noted on the chart below. During the test period fuel usage continued to decline as temperatures increased.

Average baseline fuel consumption was 11.44 gallons per 12 hours of run time. Average fuel consumption for testing days was 7.61 gallons per 8 hours run of time, a **33.5%** reduction.

Results for	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Date	6/18/21	6/19/21	6/20/21	6/21/21	6/22/21	6/23/21	6/24/21	6/25/21
Hours Run	13	11	10	9	7	6	8	8
Avg Hours/Day	Base	12.00					Test days	8.00

Data collected for 25 hours on Day 3

Gal Used	11.81	11.06	10.68	8.48	5.76	4.8	8.22	7.69
Avg Gal/Day	Base	11.44					Test days	7.61

Percent savings from baseline **33.49%**

Avg Daily Temp	85.75	88.67	86.17	84.67	71.75	73.67	80.33	82.92
Avg Temp/Period	Base	87.21					Test days	79.92

Analysis of Data and Cost Savings

The following graph shows the decrease in fuel consumption after the install of Cold-Plus®. The effects of Cold-Plus® are noted the first day following installation with a recorded 6.6% reduction in fuel consumption, increasing each day thereafter for six days for an average reduction of 33.5%. The area in green indicates fuel savings during the testing days. The dashed redline indicates the baseline fuel consumption prior to Cold-Plus® being installed.



Savings: The base line period shows fuel consumption at the rate of 11.44 gallons per 12 hours of run time (.953 gallons per hour). The post install period shows fuel consumption at the rate of 7.61 gallons per 8 hours of run time (.950 gallons per hour). **This is a 33.5% reduction in run time hours, and therefore fuel consumption.** The cost of fuel during the test is \$2.36 per gallon. Running **Start-Stop Mode** and maintaining the per gallon fuel cost above results in the following savings:

Cost per day before Cold-Plus® treatment: 11.44 gallons x \$2.36 = \$26.99

Cost per day following Cold-Plus® treatment: 7.61 gallons x \$2.36 = \$17.96

Daily savings: \$9.03

Annual Savings: 350 days x \$9.03 = \$3,160.50

Cold-Plus® is a one-time treatment good for the life of the unit. The data above is confirmed through daily documentation and photographs.