

Southern Cal Transport
1000 Deer Creek Trafficway
Topeka, Kansas 66617

Report of Cold-Plus® Test Administered April 7 – April 15, 2021

Southern Cal Transport is a transport refrigeration company with approximately two hundred refrigerated trailers at the Reeser's Fine Foods facility in Topeka, Kansas. The company is the exclusive transport refrigeration company for Reeser's, servicing local routes and long hauls.

Looking for intelligent ways to trim costs, improve efficiency, prolong the life of equipment, and protect the environment, Mr. Earl Brown, Topeka Operations Supervisor, agreed to test Cold-Plus® in two 53-foot refrigerated trailers. The test was commenced April 7, 2021.

Unit # 97 is a 1999 Thermo King unit with 34,009 hours. It ran in a Start Stop mode and saw a **21.4%** reduction in fuel usage from reduced run time and reduced gallons per hour consumption. **Unit # 123** is a 2004 Thermo King unit with 35,404 hours. It ran in a Start Stop mode and saw a **19.7%** reduction in run time and fuel consumption.

Test Protocol: The test commenced on April 7, 2021 at 9:00 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. Ambient temperature was taken every two hours and averaged over the course of the 24-hour period.

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 # 97: Average fuel consumption per hour for Unit # 97 was .757 Gallons Per Hour before Cold Plus® and .676 Gallons Per Hour after Cold-Plus® was installed, a savings of 10.6%. Run time hours were reduced from 6.25 hours during the baseline period to 5.5 hours during the final four days of the test, a 12% reduction in run time, and therefore a 12% reduction in fuel usage. ***The combined savings of reduced fuel consumption per hour and reduced run time hours equals a total savings of 21.4% following the Cold-Plus treatment.***

Daily Fuel Savings # 97: The cost to operate Unit # 97 *at an ambient temperature of 52 degrees* before the Cold-Plus treatment was \$11.78 per day, calculated as follows:

$$\begin{aligned} 6.25 \text{ Run Time Hours} \times .757 \text{ Gallons Per Hour} &= 4.73 \text{ Gallons Per Day} \\ 4.73 \text{ Gallons Per Day} \times \$2.49 \text{ Per Gallon} &= \$11.78 \text{ Per Day} \end{aligned}$$

The cost to operate Unit # 97 *at an ambient temperature of 52 degrees* after the Cold-Plus treatment was \$9.26 per day, calculated as follows:

$$\begin{aligned} 5.5 \text{ Run Time Hours} \times .676 \text{ Gallons Per Hour} &= 3.72 \text{ Gallons Per Day} \\ 3.72 \text{ Gallons Per Day} \times \$2.49 \text{ Per Gallon} &= \$9.26 \end{aligned}$$

Daily savings *at an ambient temperature of 52 degrees* is \$2.52.

The percentage savings is 21.4% [$\$11.78 - \$9.26 = \$2.52$. $\$2.52$ divided by $\$11.78 = 21.4\%$].

As ambient temperatures increase so will run time hours, increasing the amount of fuel used. The percentage savings will continue at 21.4%, meaning the daily savings will continue to increase with the rise in temperature.

Fuel Consumption # 123: Average fuel consumption for Unit # 123 was .649 Gallons Per Hour before Cold Plus® and .645 Gallons Per Hour after Cold-Plus® was installed. Run time hours were reduced from 6.5 hours during the baseline period to 5.25 hours during the final four days of the test, a 19.2% reduction in run time, and therefore a 19.2% reduction in fuel usage. ***The combined savings of reduced fuel consumption per hour and reduced run time hours equals a total savings of 19.7% following the Cold-Plus treatment.***

Daily Fuel Savings # 97: The cost to operate Unit # 123 *at an ambient temperature of 52 degrees* before the Cold-Plus treatment was \$10.51 per day, calculated as follows:

$$\begin{aligned} 6.5 \text{ Run Time Hours} \times .649 \text{ Gallons Per Hour} &= 4.22 \text{ Gallons Per Day} \\ 4.22 \text{ Gallons Per Day} \times \$2.49 \text{ Per Gallon} &= \$10.51 \text{ Per Day} \end{aligned}$$

The cost to operate Unit # 97 *at an ambient temperature of 52 degrees* after the Cold-Plus treatment was \$8.44 per day, calculated as follows:

$$\begin{aligned} 5.25 \text{ Run Time Hours} \times .645 \text{ Gallons Per Hour} &= 3.39 \text{ Gallons Per Day} \\ 3.39 \text{ Gallons Per Day} \times \$2.49 \text{ Per Gallon} &= \$8.44 \end{aligned}$$

Daily savings *at an ambient temperature of 52 degrees* is \$2.07.

The percentage savings is 19.7% [$\$10.51 - \$8.44 = \$2.07$. $\$2.07$ divided by $\$10.51 = 19.7\%$].

As ambient temperatures increase so will run time hours, increasing the amount of fuel used. The percentage savings will continue at 19.7%, meaning the daily savings will continue to increase with the rise in temperature.

Projected Annual Savings: It is understood the **Southern Cal** units run Continuous Cycle six months a year and Start Stop the other six months. Experience has shown (most recently with the MNT, Inc. June 2021 test) that units operating in Continuous Cycle will save in the range of 10% - 15%, depending on the age of the unit and the number of run time hours. The average reduction in fuel usage for the Southern Cal units operating in Start Stop mode (at the ambient temperature of 52 degrees) was 20.5%. Savings increase as the temperature rises, both for units operating in Continuous Cycle or Start Stop. Given the age of the Southern Cal units and the number of run time hours, the ***projected payback of the original treatment investment is less than six months. Annual savings are projected to be \$2,240 per treated trailer.***

Warranty: As part of the treatment **Southern Cal** 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 **Southern Cal**. 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 consumed.

Adding Cold-Plus® to the refrigeration unit will:

- Permanently remove oil fouling that reduces heat transfer.
- Increase refrigerant flow that will increase efficiency.
- Reduce friction in the compressor that will reduce noise and wear.
- Reach set points faster with improved heat transfer.
- Reduce compressor run time to reduce the fuel required.
- Reduce carbon emissions

Installation is simple and takes an average of 15 minutes per compressor.

**Southern Cal Transport
1000 Deer Creek Trafficway
Topeka, Kansas 66617**

Unit # 97

Background

The test began on April 7, 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 initial 48-hour period. ***It takes a minimum of twelve (12) hours of run time for the effects of Cold-Plus® to be realized.*** For that reason, in this test, the 48-hour period following the Cold-Plus® installation (highlighted below) is also used for calculating the baseline fuel usage period before the effects of Cold-Plus® are evident. No adverse or unusual conditions were noted during the baseline and testing periods. Data was recorded and photographs documenting measurements were taken for each continuous 24-hour period. ***Cold-Plus® is a one-time treatment good for the life of the compressor.***

Summary of Fuel Usage

Cold-Plus® was installed after 48 hours. Daily fuel consumption for the first four days of the test was 4.73 gallons per 6.25 hours, or .757 gallons per hour. Daily fuel consumption for the last four days of the test was 3.72 gallons per 5.5 hours, or .676 gallons per hour, ***a 10.6% reduction in hourly fuel consumption.***

Run time hours were reduced 12% from 6.25 hours during the baseline period to 5.5 hours during the final four days of the test. Reduced run time hours result in reduced fuel consumption. The combined savings of reduced fuel consumption per hour and reduced run time equals a total savings of 21.4% following the Cold-Plus® treatment.

Results for	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	
Date	4/8/21	4/9/21	4/10/21	4/11/21	4/12/21	4/13/21	4/14/21	4/15/21	
Hours Run	6	5	7	7	6	5	5	6	
Avg Hrs/Day	Base			6.25	Test days			5.50	
								Percent Run-time Savings	12.00%
Gal Used	5.3	3.33	5.29	4.99	4.27	3.47	3.15	3.97	
Avg Gal/Day	Base			4.73	Test days			3.72	
Avg DailyTemp	53.5	50.8	54.6	52.3	56.4	51.4	48.8	47.8	
Avg Temp/Period	Base			52.80	Test days			51.10	

Analysis of Data and Cost Savings

The following graph shows the decrease in fuel consumption after the install of Cold-Plus®.



Savings: The base line period shows fuel consumption at the rate of 4.32 gallons per 6.25 hours of run time (.785 gallons per hour). The post install period shows fuel consumption at the rate of 3.72 gallons per 5.5 hours of run time (.676 gallons per hour). **This is a 13.88% reduction in fuel consumption.** The cost of fuel during the test is \$2.49 per gallon. Running **Start-Stop Mode** and maintaining the per gallon fuel cost above results in the following savings when the unit is operating in ambient temperatures of 52 degrees:

Cost per day before Cold-Plus® treatment: 6.25 hrs x .757 GPH = 4.73 Gals x \$2.49 = \$11.78

Cost per day following Cold-Plus® treatment: 5.5 hrs x .676 GPH = 3.72 Gals x \$2.49 = \$9.26

Daily savings: \$2.52

Annual Savings: 350 days x \$2.52 = \$882.00

An increase in ambient temperatures will result in more run time hours, and more fuel savings. Depending on ambient temperatures and run time hours, units treated with Cold-Plus® typically experience savings of \$1,000 - \$3,000 annually.

**Southern Cal Transport
1000 Deer Creek Trafficway
Topeka, Kansas 66617**

Unit # 123

Background

The test began on April 7, 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 initial 48-hour period. ***It takes a minimum of twelve (12) hours of run time for the effects of Cold-Plus® to be realized.*** For that reason, in this test, the 48-hour period following the Cold-Plus® installation (highlighted below) is also used for calculating the baseline fuel usage period before the effects of Cold-Plus® are evident. No adverse or unusual conditions were noted during the baseline and testing periods. Data was recorded and photographs documenting measurements were taken for each continuous 24-hour period. ***Cold-Plus® is a one-time treatment good for the life of the compressor.***

Summary of Fuel Usage

Cold-Plus® was installed after 48 hours. Daily fuel consumption for the first four days of the test was 4.22 gallons per 6.5 hours, or .649 gallons per hour. Daily fuel consumption for the last four days of the test was 3.39 gallons per 5.25 hours, or .645 gallons per hour, a 6/10 of 1% reduction in hourly fuel consumption.

Run time hours were reduced 19.23% from 6.5 hours during the baseline period to 5.25 hours during the final four days of the test. ***Reduced run time hours result in reduced fuel consumption. The combined savings of reduced fuel consumption per hour and reduced run time equals a total savings of 19.7% following the Cold-Plus® treatment.***

Results for	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	
Date	4/8/21	4/9/21	4/10/21	4/11/21	4/12/21	4/13/21	4/14/21	4/15/21	
Hours Run	6	6	7	7	6	5	5	5	
Avg Hrs/Day	Base		6.50				Test days	5.25	
								Percent savings from baseline	19.23%
Gal Used	4.46	3.5	4.46	4.47	3.83	3.07	3.65	3.01	
Avg Gal/Day	Base		4.22				Test days	3.39	
Avg DailyTemp	53.5	50.8	54.6	52.3	56.4	51.4	48.8	47.8	
Avg Temp/Period	Base		52.2				Test days	51.9	

Analysis of Data and Cost Savings

The following graph shows the decrease in run time hours commencing 48-hours after the install of Cold-Plus®. The area in green indicates fuel savings during the testing days.



Savings: The graph on the prior page shows fuel consumption at the rate of .649 gallons per hour during the two-day periods both before and following the installation of Cold-Plus®. Fuel consumption the final four days of the test was at the rate of .645 gallons per hour. Run time hours during the baseline period were 6.5 hours per day. The final four days of the test the run time hours were 5.25 hours per day. **This is a 19.2% reduction in run time hours, and therefore fuel consumption.** The cost of fuel during the test is \$2.49 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: $6.5 \text{ hrs} \times .649 \text{ GPH} = 4.22 \text{ gals} \times \$2.49 = \$10.51$
 Cost per day following Cold-Plus® treatment: $5.25 \text{ hrs} \times .645 \text{ GPH} = 3.39 \text{ gals} \times \$2.49 = \$8.44$
 Daily savings: \$2.07
Annual Savings: 350 days x \$2.07 = \$724.50

An increase in ambient temperatures will result in more run time hours, and more fuel savings. Depending on ambient temperatures and run time hours, units treated with Cold-Plus® typically experience savings of \$1,000 - \$3,000 annually.