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United Parcel Service

Heat Reduction Testing Conducted on Package Cars and Trailers

Product Tested: Super Therm®

Manufactured By: Superior Products International, II, Inc.
Tested For: Industrial Coatings Alliance Group, Inc.

Product Tested By: Liberty Mutual

Report Written By:

Super Therm® 04/23/99



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Chronology of Events:

1. Met with Bill Calhoun who represents Bobby Allison Systems on January 7, 1998. He was proposing the use of a highly insulated spark plug wire set for our use in the package car fleet and a rust treatment for our trailer, dolly and package car steel frames. During our conversation, he mentioned the **Super Therm®** product as a way to reduce heat in our buildings by applying to our roofs. I told him I was not in the Plant Engineering group but would pass his product information on to them. Bill left me with the product test data at the end of our meeting.
2. On February 18, 1998, I attended the OSHA Facility Committee meeting as the automotive representative. During the meeting, a discussion was held with several people showing ideas on how to reduce the heat in our trailers. I found many of the ideas to be either cost prohibitive or excessively high in maintenance issues for our use. In place coolant lines which spray water on the trailers, BIG fans, misters for the employees to walk through and high volume air exchangers (vents in our trailer roofs, sides, and front nose) were all reviewed. It was agreed at this time to work with the fans and Steve Harmon would look at the coolant lines to spray on the top of the trailers. Automotive would work with Liberty Mutual on the air exchange concept using an ADA trailer at the Orlando Florida Trailer Conditioning Incorporated (TCI) building.
3. On March 10, 1998, I again met with Bill Calhoun. We reviewed at this time the rust coating product, **Rust Grip®**, and he gave me an updated engineering report for the **Super Therm®** product. An electronics corporation in Japan with excellent results completed the engineering report. The tests indicated a reduction more than 35 degrees Celsius inside the building. Pictures show the product being rolled on to the roof of the building and sprayed with an airless sprayer.
4. I reviewed the engineering report with Kevin Sondrup, Fred Griffith and Don Parkinson. All agreed the report was valid as a third party, not a testimonial letter from the electronic corporation, completed it. I told Kevin I would consider testing the product for our trailer roofs to see if we can lower the heat inside. Kevin agreed to the testing and I contacted Bill Calhoun to provide us with the appropriate MSDS sheets. Larry Chandler was asked to contact Bill and order enough of the product to coat a minimum of three trailer roofs. Liberty Mutual would provide the expertise, test instrumentation required and validating all test results.
5. Liberty Mutual representatives Don Standfield and Richard Newton, **Super Therm®** representatives Bill Calhoun and Dave Phillips, and UPS representatives Larry Chandler, Doug Anderson and Dale Derham met at the TCI location April 29 and 30, 1998 to conduct the air exchange testing and apply **Super Therm®** product to the trailer roofs. Vent holes had been cut into tan ADA trailer with removable covers to test the air exchange inside our trailers. The airflow test indicated the airflow was at the lowest possible readings with the fans currently in use at our hub doors. The air movement was again checked with the trailer loaded with packages and found to be so low the person in the trailer would not gain any improvement in the temperature reduction of the work area. Twelve 12-inch openings had been cut into the trailer sides. Front and roof area. All openings had covers which allowed them to be completely closed, open six inches or completely open. Each test was conducted with a combination of one to all 12 vents set at various openings. The airflow was again checked using larger fans. The test indicated the larger fans did not increase airflow enough to make the vents and a small increase in door fan size a viable option.



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6. The roofs were pressure washed on four UPS trailers. The unit numbers are 283937, 287204, 287249, and 288973. Each unit was placed outside the TCI building and allowed to dry (As a side note, we received rain shortly after moving the units outside. All four units did not have the product wash off or loosen due to the unexpected shower.) The coated units had a noticeable temperature reduction later in the afternoon. As the sun continued to shine on the roofs of the trailers in the yard, a large degree of difference was felt in the coated units as opposed to the units with the plain aluminum roof.
7. It was agreed we would have to return to the Orlando facility to do more testing. Hub door fans were to be changed and a temperature test of the trailers with the **Super Therm®** coating against a non-coated unit and air exchange flow were all to be tested. Don Standfield, Richard Newton, Roger Maddox of the Corporate Plant Engineering, and Larry Chandler from TCI performed the test and recorded the results. The fans in the hub doors again were not capable of pushing an airflow, which would resolve the heat issue.
8. Temperature test of the trailer 283937 (coated with **Super Therm®**) during the same time frame versus a trailer without the roof coating indicated a temperature reduction of 20 degrees. The trailers were moved to another location on the Orlando hub yard and the test performed again. The same results were obtained.
9. The test results for the fans, vents and roof coating were reviewed at the OSHA Facility Committee meeting in June. It was requested to move one of the units with the roof coating, 283937, be located and moved to the Roswell GA center. The unit was located, loaded and moved to Roswell. Liberty Mutual conducted the same heat build up testing with the trailer loaded. The results of the test indicated the loaded trailer with **Super Therm®** coating was 26 degrees cooler than a loaded trailer without any coating.
10. While the test indicated the coating would reduce the heat build up in the trailer, it was agreed a durability test of the product must also be conducted. The four trailers were to be left in normal service. The trailers were not marked with any notice of the test product having been applied to the roofs. The units would be reviewed in January 1999 for the coating durability.
11. The coatings were looked at on the three trailers January 29. All roofs were in excellent condition. The coating had not deteriorated or lifted from the roof. All units were returned to service.
12. A meeting was held in Dallas concerning many building issues. The roof coating was discussed and a question was raised about use for package cars. Don Standfield and Richard Newton requested I test the material on the package car roofs. It was previously agreed we would test the trailer again in March to qualify the coatings ability to retain its heat reduction capability.
13. Two package cars were selected and prepped for the test. One unit had the **Super Therm®** applied to its roof leaving a 12 inch wide opening for light passage. The opening was located in the center of the translucent section of the roof. Attending the test were Don Standfield and Richard Newton from Liberty Mutual, Roger Maddox, Dough Anderson, Paul Bonham, and Dale Derham from UPS, and David Phillips, **Super Therm®** product representative. The test was conducted with the ambient temperature reaching 76 degrees Fahrenheit. The uncoated unit temperature build up exceeded the coated unit by 11 degrees. A question was raised about coating the side panels also (the side panels tested reached and outside temperature of 128 degrees and the inside panels reached a temperature of 138 degrees). The unit with the coated roof had the **Super Therm®** applied to the side panels (from the top of the lower shelf to the roofline).



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Test results the following day were not usable due to high clouds and moderate winds. The conditions were not compatible with the previous day so the test results were deemed non-usable.

14. It was agreed after the review of the package car results the test should be performed again. South Florida was selected as the test site to perform the test in higher temperatures.
15. The South Florida district prepared (washed the roof) three cars for the test. Car one was coated on the outside of the roof, complete cargo compartment inside walls and rear door area. Car two was coated on the outside of the roof only, and car three received only a roof cleaning. The material was applied by roller to the roofs and sprayed with an airless sprayer on the sidewalls and rear door area.
16. The tests were performed on the three cars at the Hialeah hub location. The ambient air temperature reached 84 degrees Fahrenheit on the test day. The test results show the roof coated only package car produced the best reduction in heat reduction. The results were:

Car #	Treatment	Time of Day	Reading	Difference
804009	None	15:57 PM	128	Base
802687*	Cargo Area & Roof	15:57 PM	115	Minus 13
802279	Roof only	15:57 PM	111	Minus 17

* It was determined the product worked as an insulator as it would hold in any heat build up and not allow the heat to dissipate through the aluminum side panels. Liberty Mutual is preparing a complete analysis package of the tests. Liberty Mutual is going to recommend the use of the product on the roof of our package cars and trailers. The product will assist us in keeping the best possible work environment for our employees.



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Instructions for the application of Super Therm® heat reduction coating on Package Cars and Trailers

Product Tested: Super Therm®

**Manufactured By: Superior Products International, II, Inc.
Tested For: Industrial Coatings Alliance Group, Inc. (iCAG)**

Date: June 23, 1999



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Super Therm® Description

Super Therm® is a water-based elastomeric, ceramic industrial coating that provides insulation rather than just reflection to reduce heat. Independent testing has rated Super Therm® an R-19 for its insulation properties or the equivalent of 6 to 8 inches of fiberglass batt insulation. Due to its unique combination of acrylics and urethanes, Super Therm® is extremely tough, durable, non-yellowing, water-proof and weather resistant coating that also provides flexibility and UV-stability. Its ability to insulate is unparalleled in the coatings industry.

Surface Preparation

Make sure the top of the trailer or package car is clean, with no dirt, oil films or residues of any kind. The surface should be completely dry before applying Super Therm®. A cleaning solution of soap powders can be used to remove oils and debris. Household Tide detergent is an effective cleanser. Rinse completely and let the surface dry.

Application Instructions

Super Therm can be brushed, rolled, or sprayed on. In most cases a roller will be used to coat the trailers and package cars.

Rolling Instructions:

- Open the five-gallon bucket and thoroughly stir the product to ensure the ceramics are completely suspended in the coating. Use of a low speed drill with a paint stirrer is the best method of mixing the product. Super Therm® can be thinned (if required) with a small amount of water. Super Therm® is normally thicker than most coatings. When thinning the product add small amounts of water at a time until the desired thickness is achieved.

Caution: Do not thin Super Therm unless it has become extremely thick and unworkable due to prolonged exposure to the atmosphere in an open bucket. If thinning is required, use only small amounts of water (one quart per 5-gallon bucket).

- Use a ¾ inch commercial roller. Use of a roller handle will make the application easier.
- It is best to work out of a 5-gallon bucket with a roller screen inserted into the bucket. Super Therm® is a high-solids coating and it is difficult to evenly dip the roller if a roller tray is used. It is preferable to submerge the roller in the coating in a 5-gallon bucket that is partially filled and remove the excess coating on the roller screen suspended in the 5-gallon bucket.
- The coating can be applied with a roller as any other coating once the surface has been properly prepared. You will notice that one coat will appear to completely cover the surface being coated.

Note: It is extremely important that the coating is applied at a thickness of 14 wet mils to obtain the insulation required.

- When a roller is used to apply Super Therm® a thickness of only 7 wet mils will be applied in one coat.

Note: Two coats are required to achieve the correct thickness.



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- As a general rule, one gallon of **Super Therm®** at a thickness of 14 wet mils will cover 100 square feet on non-porous surfaces. When using a roller to apply **Super Therm®** you will be applying the product at 200 square feet per gallon. The second application will result in coverage of the required 100 square feet per gallon.
- Super Therm®** will dry to the touch in one hour. A second coat can be applied under normal drying conditions within two hours. Once the first coat has dried, apply the second coat in the same manner as the first coat.
- Super Therm®** fully cures in 14 days, however, since it can withstand weather and rain generally within 2 hours the trailers and package cars can be immediately placed back in service. If humidity is high or it rains constantly for 34 days after applying **Super Therm®** (never apply outdoors if it is raining or there is a chance of rain that day), you may notice some bubbling effect on the coating. **DO NOT PUNCTURE** these bubbles. This is normal as the formula is water-based and is absorbing the moisture and, therefore, forming bubbles. When the rain quits, the sun will dry out the coating and allow it to cure down naturally. As the moisture is drawn out by the sun, the bubbles will settle down and allow the coating to adhere in its normal dry down without a problem.
- Clean up is with soap and water. After product dries, acetone can be used to loosen the coating.

Spraying Instructions:

- When applying **Super Therm®** with a sprayer it is best to use a 3,000 psi airless sprayer.
- Spraying requires a steel carbon spray tip of sizes .028-.032.
- All filters must be removed from the sprayer or the ceramic particles will block the filter.

Note: Super Therm® is a high solids coating and the removal of the filters and the use of the appropriate size spray tip is necessary to prevent clogging of the sprayer. In addition, keep the sprayer set at a high pressure setting.

- Super Therm®** can be applied in a single 14 wet mil coat using a sprayer. As with a roller, it is extremely important to achieve the proper thickness to obtain the required insulation. It is recommended that a paint mil gauge be used to ensure the coating is applied at 14 wet mils.
- Clean up of the sprayer is accomplished by running water through the sprayer until all the coating has been flushed from the sprayer.



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General Information

- 52% solid, 14 wet mils/7 dry mil coat
- Dry time: 1 hour-touch, 2 hours re-coat, 14 days full cure
- Spread: 100 sq. ft. / gallon = 7 dry mils
- Flame Spread Test: ASTM E-84-89 UL 723 / Flame: 0 / Smoke: 0
- Viscosity: 105-110 KU / R-19 rating
- Fire test: (Project #8940-89285) ASTM E119: Evaluation of thin coatings for thermal transfer properties at elevated temperatures – 1,600F degrees; Findings: 30 minutes fire rating at 30 mils. Super Therm® has the ability to stabilize thermal conductivity at various temperature levels.
- Elongation: 125% / Hall – resistant to cracking
- Flexibility: 180 degree bend test – ASTM D1737 1/8" mandrels
- Salt Spray: 450+ hours / Fungal/Mildew resistant
- Weathering: Ability to last a minimum of 10 years
- Ability to withstand 500F degrees constant temperature over a long period of time
- Noticeable sound deadening qualities
- U.S. Consumer Product Safety Commission approved as not hazardous
- U.S.D.A. approved for use around foods
- K Factor insulating rating (BTU transfer per hour/foot of heat through a substrate)
K=0.019 W/mK
- VOC (Volatile Organic Compounds) is 67 grams/liter. California environment maximum required upper limit 420 grams/liter, Super Therm® is extremely health-and-environmentally safe
- pH 8.5-9.0
- Density: 12.02 lbs./gallon
- Salt Spray Corrosion Test: ASTM B117 450 hrs evaluation ASTM D1654 over black steel; Rating procedure B:9 (key to rating 0-10; 0=complete failure; 10=excellent)

Important

Do not take internally. Avoid contact with eyes. If solution does come in contact with eyes, flush immediately with water and contact physician for medical advice. Avoid prolonged contact with skin or breathing of spray mist. For quickest removal from skin, wash with water before drying. KEEP OUT OF REACH OF CHILDREN.



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More than 100 years



Super Therm® In the Trucking Industry

Reduces temperatures by up to 30F degrees

Benefit: Reduction in heat damaged goods claims

Additional Benefit: Increased worker productivity and reduction of heat stress related Workman Comp Claims.

In the trucking/package delivery industry, heat related claims are a major cost due to damaged goods and heat stress related employee claims. Worker productivity is reduced due to discomfort both for the drivers and employees that load and unload the trailers

Super Therm® is an industrial coating that insulates the trailers and delivery vans. It is both a reflector of radiant heat and a non-conductor, providing an R-19 insulation rating (Equivalent to 8 to 8 inches of fiberglass insulation) with just a 7 mil coating that can be brushed, rolled or sprayed on. The reflectivity does not rely on the coating being clean, as is the case with other reflective coatings. Because it is a non-conductor of heat, it works effectively when applied to the inside walls, as well as, the exterior roofs of the trailers.

Once the heat is allowed to penetrate into the trailer or van, the packages absorb the heat and it is impossible to reduce heat with ventilation. The key is to stop the heat from being absorbed by the packages by reducing the transmission of heat in the beginning.

Actual Temperature Test Results

- Infrared temperature testing of the inside roof temperatures dropped from 120F degrees to 80F degrees on uncoated versus coated roofs. Ambient temperature was 75F degrees with hazy sunshine. **Super Therm®** was applied to the exterior of the roof
- Interior wall temperatures dropped from 133F degrees to 105F degrees on uncoated versus coated walls. Ambient temperature was 75F degrees with hazy sunshine. **Super Therm®** was applied to the interior of the walls.



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SUPER THERM

IN THE TRUCKING INDUSTRY

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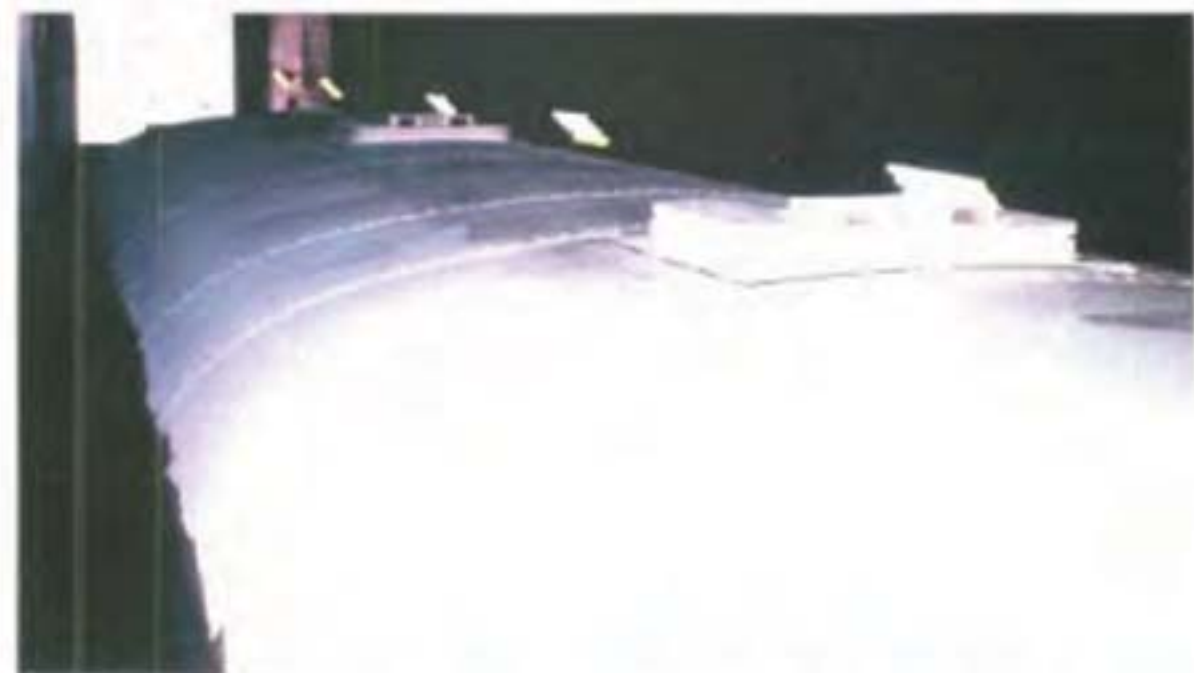
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ACTUAL TEMPERATURE TEST RESULTS

- Infrared temperature testing of the inside roof temperatures dropped from **129 degrees to 89 degrees** on uncoated versus coated roofs. Ambient temperature was 75 degrees with hazy sunshine. **SUPER THERM** was applied to the **exterior of the roof.**
- Interior wall temperatures dropped from **133 degrees to 105 degrees** on uncoated versus coated walls. Ambient temperature was 75 degrees with hazy sunshine. **SUPER THERM** was applied to the **interior of the walls.**



SUPER THERM ON PACKAGE CAR IN MEXICO CITY



SUPER THERM BEING APPLIED TO SCHOOL BUS

**SUPER THERM ON ROOF OF
TRAILERS SHIPPED ON RAILCARS
REDUCE TEMPERATURES 30
DEGREES**



**SUPER THERM CAN BE
EASILY BRUSHED,
ROLLED OR SPRAYED
ON.**



SUPER THERM & ENAMO GRIP ON "WILD MOG"

