

**Super Therm® Test Study  
Passenger Bus Roof Application  
City of Hermosillo, Sonora, México.  
June 2005**

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**Test Study: Results of the Application of Super Therm® on Passenger Bus.  
Company : Econotours, Hermosillo, Sonora, México.**

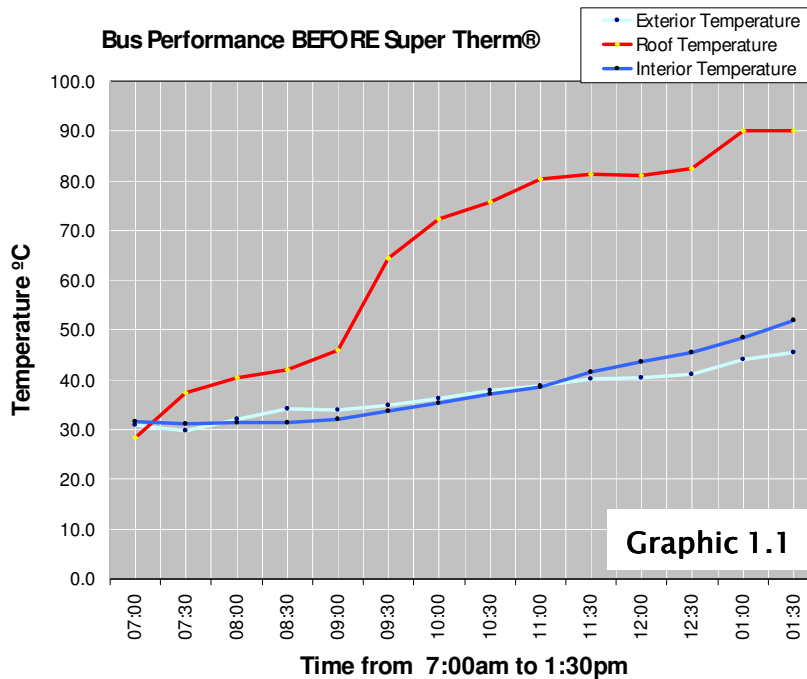
**Record of temperatures on the roof's surface and in the bus interior BEFORE Super Therm®.**

Friday, June 24, the bus remained completely closed from 7:00am until 1:30pm, this with the intention of registering the inside and roof temperatures every 30 minutes, Table 1.1 and Graphic 1.1.

Bus temperature readings BEFORE Super Therm® from 7:00am to 1:30pm Date 06/24/2005			
Hour	Exterior. Temp.	Interior Temp .	Roof Temperature
07:00	30.9	31.7	28.4
07:30	29.8	31.1	37.4
08:00	32.0	31.4	40.4
08:30	34.1	31.4	42.0
09:00	34.0	32.2	45.9
09:30	34.9	33.7	64.4
10:00	36.3	35.3	72.4
10:30	37.8	37.2	75.7
11:00	38.9	38.6	80.4
11:30	40.1	41.5	81.4
12:00	40.4	43.6	81.0
12:30	41.1	45.6	82.5
01:00	44.2	48.5	90.1
01:30	45.6	52.0	90.1

Highest Temperatures  
 \* All temperatures °C

**Table 1.1**



**Graphic 1.1**

## Observations and Temperature Data from the Bus Roof's Surface and Interior BEFORE Super Therm®.

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### Roof Surface Temperature Data

Roof Temperature BEFORE Supertherm® (June 24, 2005)				
Time	Variation °C	Temp. gain C	Time in hrs.	Degrees gained each hour
7:00am to 1:30pm	28.4 to 90.1	61.7	06:30	9.5 C
9:00am to 11:00am	45.9 to 80.4	34.5	02:00	17.2 C

We can see that temperature increased from 28.4 °C to 90.1 °C from 7:00am until 1:30pm. A range of 61.7 °C, 9.5°C each hour.

The temperature rose at a faster pace from 9:00am till 11:00am, from 45.9 °C to 80.4 °C, it increased 34.5 °C in only 2 hours. This is a total of 17.2 °C rise each hour.

### Bus Interior Temperature Data

Bus interior temperature BEFORE Super Therm® (June 24, 2005)				
Time	Variation °C	Temp. gain C	Time in hrs.	Degrees gained each hour
7:00am to 1:30pm	31.7 to 52.0	20.3	06:30	3.1 C
9:30am to 1:30pm	33.7 to 52.0	18.3	04:00	4.5 °C

The inside bus temperature from 7:00am till 1:30pm went from 31.7 °C to 52.0 °C in a lapse of six and half hours. The temperature rose 20.3 °C. At a pace of 3.1 °C each hour. Also we can see the inside bus temperature rose gradually from 31.7 °C until it reached 52.0 °C at 1:00pm.

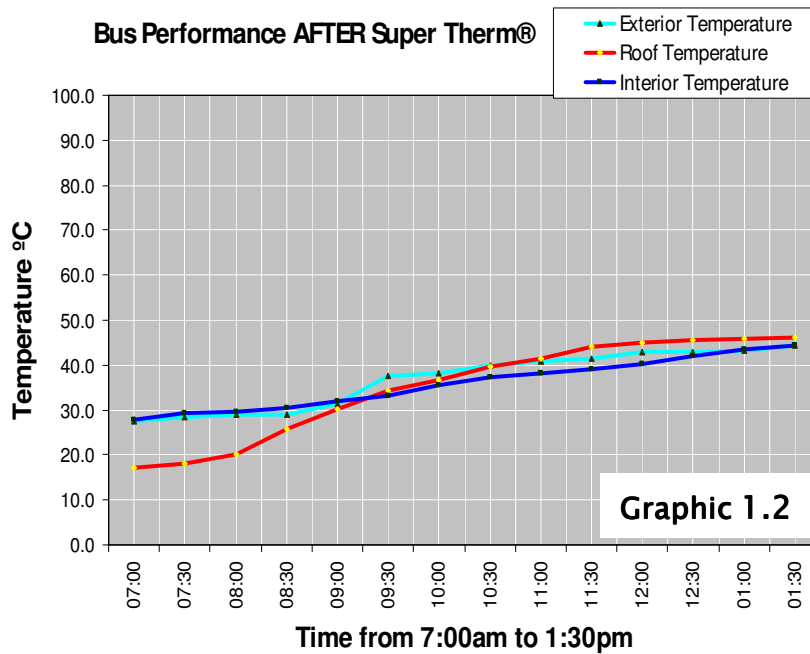
## Record of Temperatures on the Bus Roof's Surface and Interior AFTER Super Therm®.

Saturday, June 25, 2005.  
Table 1.2 and Graphic 1.2

Bus temperature readings AFTER Super Therm® from 7:00am to 1:30pm Date 06/25/2005			
Hour	Exterior Temp.	Interior Temp .	Roof Temperature
07:00	27.4	27.9	17.2
07:30	28.3	29.4	18.0
08:00	28.9	29.7	20.0
08:30	29.1	30.5	25.7
09:00	31.3	32.0	30.1
09:30	37.5	33.0	34.4
10:00	38.3	35.4	36.8
10:30	39.9	37.2	39.7
11:00	40.7	38.1	41.5
11:30	41.5	39.0	44.1
12:00	42.8	40.1	44.9
12:30	43.0	41.9	45.6
01:00	43.3	43.4	46.0
01:30	44.3	44.5	46.2

Highest Temperatures  
 \* All temperatures °C

**Table 1.2**



**Observations about the temperature behavior on the roof's surface and the bus interior AFTER Super Therm.**

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**Roof Surface Temperature Data**

Roof Temperature AFTER Super Therm® (June 25, 2005)				
Time	Variation °C	Temp. gain °C	Time in hrs.	Degrees gained each hour
7:00am to 1:30pm	17.2 to 46.2	29.0	06:30	4.46 °C
8:00am to 11:30am	20.0 to 44.1	24.1	03:30	6.9 °C

We can see in the table 1.2 and graphic 1.2 that at 7:00am the roof temperature was 17.2 °C, while at 1:30pm the recording was of 46.2 °C. The temperature increased 29.0 °C in 6 and half hours, this average 4.46 °C rise each hour.

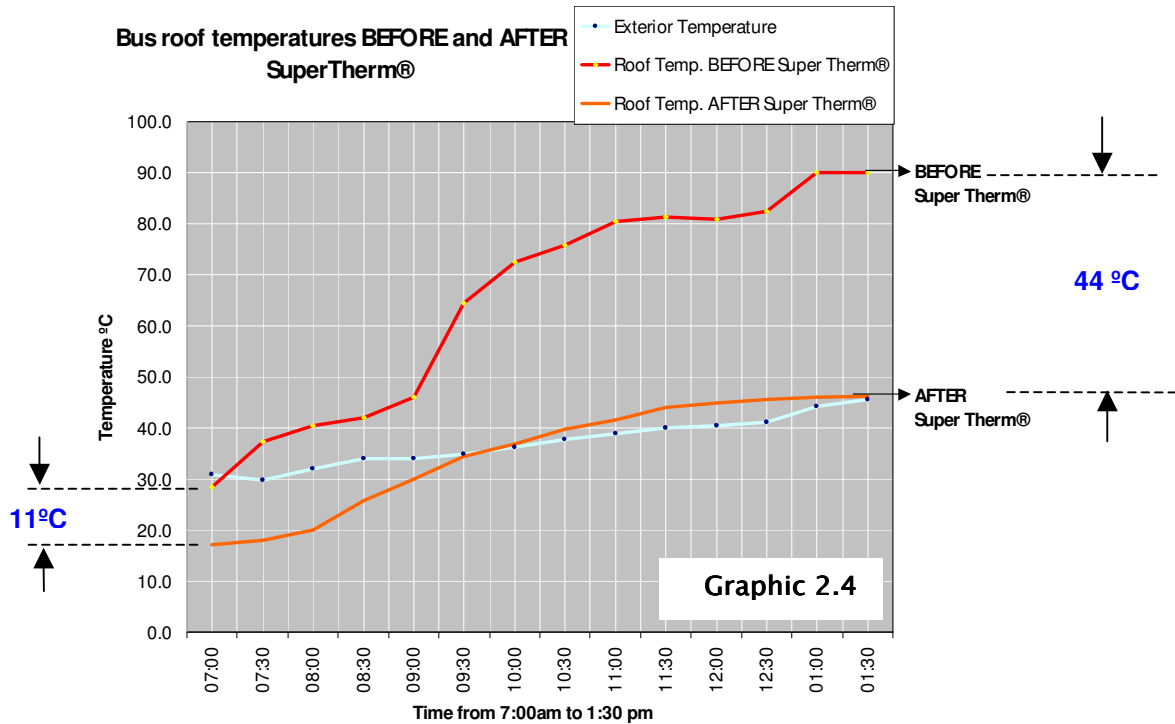
In this period of time the highest increment on the roof's surface was from 8:00am to 11:30am (from 20 °C till 44.1 °C). In a period of 3 and half hours the temperature increased 24.1 °C. After 11:30am the roof's surface temperature remained almost constant with a value of 46 °C (see graphic 1.2).

**Bus Interior Temperature Data**

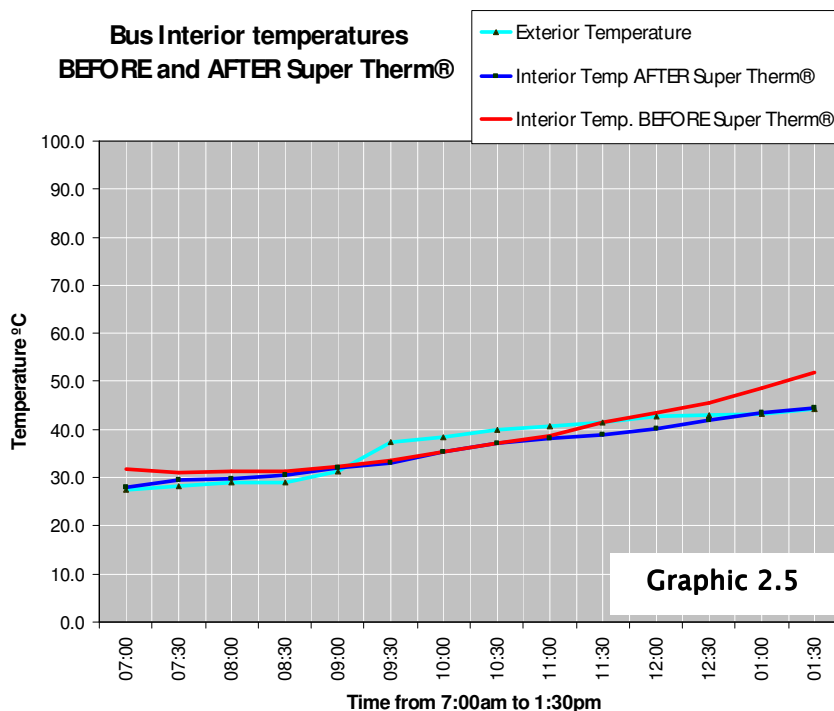
Bus interior temperatures AFTER Supertherm® (June 25, 2005)				
Time	Variation °C	Temp. gain °C	Time in hrs.	Degrees gained each hour
7:00am to 1:30pm	27.8 to 44.5	16.7	06:30	6.56 °C

In the table 1.2 and graphic 1.2 we can observe the temperature record inside the bus, at 7:00am, was 27.8 °C and at 1:30pm the temperature was 44.5 °C. The temperature inside the bus increased, in a lapse of six and half hours, 16.7 °C. Under these new circumstances we can observe the inside temperature and the outside temperature performed similarly from the beginning of the test until the end. (Graphic 1.2) Also we can observe how the roof's temperature was below the outside temperature and inside temperature from 7am to 9am (17.2 °C to 30.1 °C); after 9am the temperature behavior on the roof was very close to the other two temperatures (outside and interior, see table 1.2 and graphic 1.2)

## Graphic Representation of Roof Temperatures Before and After SUPER THERM



In Graphic 2.4 we see the roof temperatures before and after applying SUPER THERM®. We can see the huge differences in temperature values from the time the test began until the end. At 7:00am SUPER THERM® had reduced the temperature by 11 °C, by 1:30pm SUPER THERM® had reduced the roof's temperature by 44 °C. The percentage of heat reduction during the test time was of **46.27 %**, close to half.



## Thermo King Unit Test

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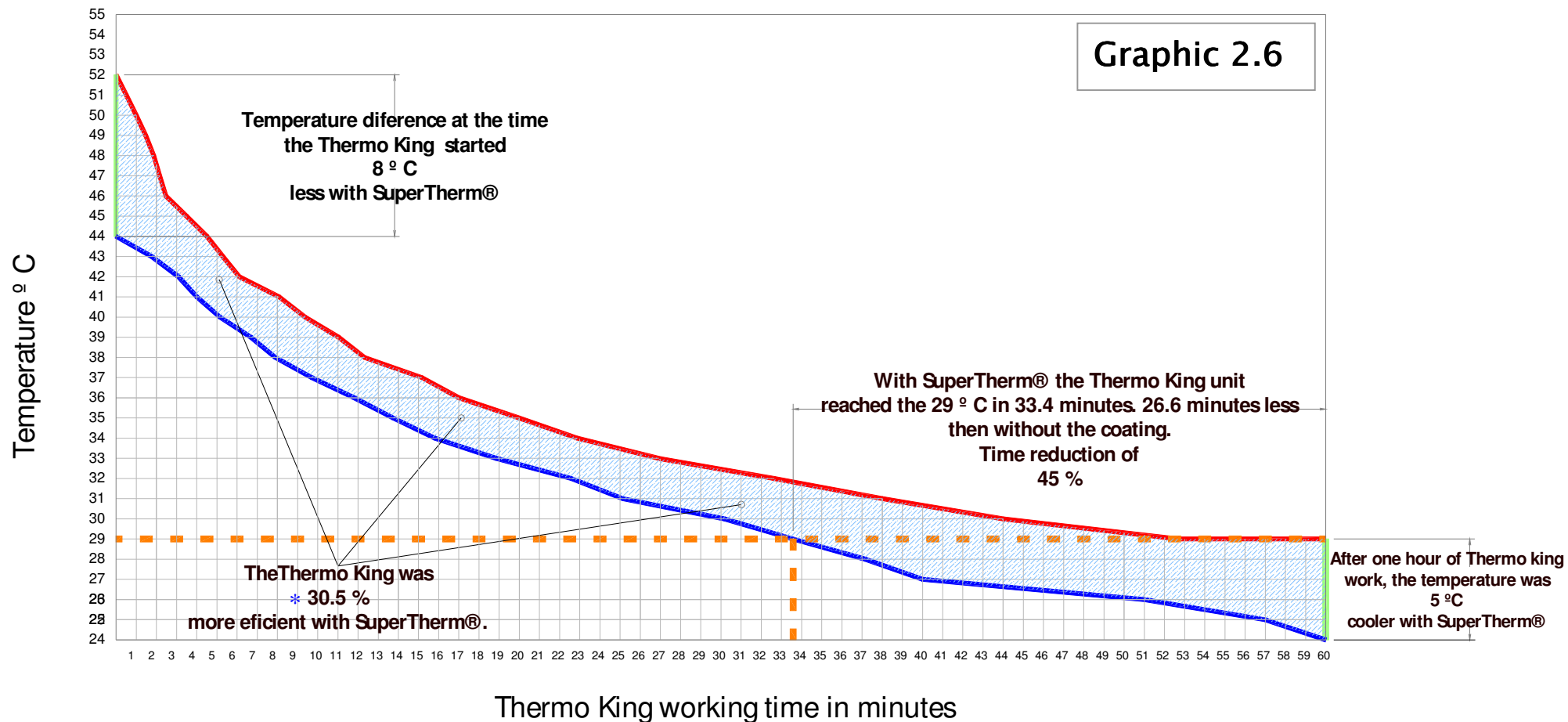
In order to conduct this test the Thermo King unit was turned on for a lapse of time of 60 minutes, after the bus had been closed for 6 and a half hours, from 7:00am to 1:30pm.

When the uncoated Thermo King unit was started the first day, at 2:00pm, the temperature inside the bus was **52 °C**. At that time the outside temperature was 45.6 °C and the roof's temperature was **90.1 °C**. After the Thermo King unit had been on for one hour (60 minutes) the temperature inside the bus was cooled to **29 °C** (From 52°C to 29 °C). This is a reduction of 23°C. (**Refer to Graphic 2.6**).

After the SUPER THERM® application, the same test was conducted to determine how long it would take the Super Therm coated bus to cool down to the same temperature of 29 °C. On the test day, the outside temperature was 44.3 °C, the interior temperature was **44.5°C** and the roof's temperature was only **46.2 °C**.

Once the Thermo King unit started it took **only 33 minutes** to bring the temperature down to 29 °C. This is **27 minutes less** time than the uncoated bus. By the end of the hour the Thermo King Unit brought down the inside temperature to 24 °C. **5 °C** cooler than the bus without SUPER THERM®. (**Refer to Graphic 2.6**)

# Thermo King efficiency BEFORE and AFTER Super Therm® Application



— Bus interior temperature BEFORE SuperTherm®

— Bus interior temperature AFTER SuperTherm®

\* Outside temperature at 2:00 pm 46.5 ° C.  
at the time the Thermo King started running on 06/24/2005

\* Outside temperature at 2:00 pm 44.3 ° C.  
at the time the Thermo King started running on 06/25/2005

\* The 30.5 % efficiency is obtained by comparing areas. The first area which is represented by the graphic without Super Therm® (area formed by the x, y and red line) is taken as 100 %. The second area represented by the graphic with Super Therm® (area formed by the x, y and the blue line). This last area represents 69.5 % of the first area. The efficiency is represented by the blue hatch area and equals 30.5 %.



## Conclusions

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From the observations and remarks we can conclude the following:

1. Before coating with SUPER THERM®, the roof's temperature and the interior temperature were much higher.
2. After application of Super Therm the roof's temperature was significantly lower than before application. Without Super Therm the roof's temperature rose to **90.1 °C**, after SUPER THERM the temperature only reached **46.2 °C**. This proves SUPER THERM's strength in reducing heat transfer (Refer to Graphic 2.4).
3. As a direct result of application of SUPER THERM®, the temperature inside the bus **decreased 8°C**, always tending to equalize itself with the outside temperature during the test (from 7 a.m. to 1:30 p.m.) (Refer to Graphic 2.5).
4. The Super Therm coated roof absorbed **46.27% less heat** than the non-coated roof (Refer to Graphic 2.4).
5. With Super Therm®, the Thermo King unit only needed 33.4 minutes to reach 29 ° C, **45 % less running** time than without using Super Therm®. (Refer to graphic 2.6).
6. Given the need to put the bus back onto its route, the testing and temperature results taken from the SUPER THERM® bus were done within one day of application. Super Therm typically takes 7-10 days to fully cure and thus even more favorable results might be seen after full cure.
7. The Thermo King unit coated with SUPER THERM® became 30.5% more efficient.

**This project demonstrates that using Super Therm® results in a significantly cooler bus/building. This will lead to fuel savings, maintenance savings, a more efficient and comfortable unit, and most importantly, better service and a more comfortable environment for customers.**

Photo Gallery







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