

PROJECT “NANSULATE”

SAVING ELECTRICITY BY COATING WITH AIR CONDITIONING
"NANSULATE" COMPARED WITH A LOCAL MATCH WITHOUT
COATING

Report

Made By:

COMISIÓN FEDERAL DE ELECTRICIDAD
Programa de Ahorro de Energía del Sector Eléctrico

(Federal Electricity Commission)
(Energy Saving Program of the Electric Sector)

PROJECT NANSULATE

OBJECTIVES

The objective of this project is to determine whether the coating material called NANSULATE, distributed by Distribuidora Nano de America, SA de CV, applied to the exterior of the roof, is a thermal barrier to heat, so it may be regarded as an insulation coating, during the summer season.

According to the results, according to the policy of PAESE customer service, it will define whether the material can be considered adequate to achieve substantial energy savings in the summer season .

Introduction

Two modules of 4 x 4 m. and 2.40 m high, and roofed with galvanized sheet, with a door and window to the east and concrete block walls. In each was placed and air conditioner 1 ton of cooling.

In one of them was placed the product called NANSULATE, this product in coating form as a liquid paint is applied to roof surfaces, requiring a curing time of 60 days to reach its full potential. NANSULATE is coated with an acrylic base and nanoparticles (Hydro-NM-Oxide) that reduces heat transfer by reducing conduction, avoiding the dispersion of heat and thus creating an insulating barrier

Procedures

To perform the test readings were taken during a period of two weeks, and measurements were taken outside ambient temperature, surface and ceiling interior environment, and consumption of electricity.

The interior is placed a thermometer to take the value interior environment, one on the roof of the inside and the outside thermometer was placed to record the temperature outside, so that did not receive direct sunlight.

The temperature control was adjusted to a value of 25 degrees centigrade.

The readings are measured in meters were installed by the CFE, which are electromechanical meters FD type 2A.

The readings were taken from 4 to 18 May 2009 to have sufficient information, and select those that reads these follow the same curve of reasonable temperatures and therefore energy consumption were similar in the trial period, for what was reported five days and the average night.

Were eliminated in those days it was cloudy or intense rainfall, to avoid inconsistencies in those days were not taken into account.

Results

The summary of results is attached

According to the results, it appears that the material called NANSULATE shows that their characteristics are adequate to achieve energy savings.

The savings found during the day is about 12.67% and the night is about 8.51%, resulting in a daily savings of 10.76% for the summer.

Conclusions

According to the results obtained with the NANSULATE material was found to have adequate characteristics to be considered as an insulation, which when applied to the exterior of the roof to achieve energy savings in electrical equipment for air conditioning in the summer season .

NOTES: It is considered that on metal roofs, the savings are smaller than could be obtained with a concrete roof.

Reducing roof surface temperature is significant considering that the coating is a layer similar to a painting.

TEMPERATURE DEGREES CENTIGRADE

Time	WITHOUT NANSULATE				WITH NANSULATE			
	Ambiente	INTERIOR		Consumo	Ambiente	INTERIOR		Consumo
	Exterior	Ambiente	Techo	kWh	Exterior	Ambiente	Techo	kWh
09:00	25.0	24.7	25.0	0.0	25.0	24.8	25.0	0.0
10:00	26.3	24.8	33.0	0.5	26.3	24.8	32.5	0.5
11:00	27.9	25.6	41.3	0.5	27.9	25.4	40.0	0.5
12:00	32.0	26.1	49.8	0.6	32.0	25.5	49.8	0.5
13:00	35.0	26.5	52.3	0.7	35.0	25.6	50.2	0.6
14:00	38.6	26.8	54.2	0.8	38.6	25.9	50.0	0.7
15:00	41.7	26.3	56.8	0.9	41.7	25.8	49.8	0.7
16:00	42.4	26.8	56.2	1.0	42.4	25.5	46.3	0.9
17:00	42.5	27.2	48.2	1.0	42.5	25.6	45.1	0.9
18:00	40.1	27.5	45.4	0.8	40.1	25.4	39.0	0.7
19:00	37.9	27.5	40.0	0.6	37.9	25.0	37.0	0.5
	35.4	26.3	45.7	7.4	35.4	25.4	42.2	6.5
consumo nocturno				6.5				6.1
09:00	27.4	25.1	41.8	0.0	27.4	25.6	36.1	0.0
10:00	28.5	25.6	47.8	0.5	28.5	25.4	41.6	0.5
11:00	31.7	25.8	55.1	0.6	31.7	25.6	48.3	0.5
12:00	35.4	25.8	63.2	0.7	35.4	25.6	54.0	0.6
13:00	39.3	26.5	64.8	0.8	39.3	25.6	56.2	0.7
14:00	43.3	26.5	65.5	1.0	43.3	25.4	55.3	0.9
15:00	46.0	27.1	63.2	1.2	46.0	25.5	54.0	1.0
16:00	46.8	27.5	63.0	1.4	46.8	25.6	52.4	1.3
17:00	46.9	27.3	54.5	1.2	46.9	25.6	46.4	1.1
18:00	44.6	27.5	47.2	1.2	44.6	25.7	41.8	1.0
19:00	41.9	27.5	45.5	1.0	41.9	25.6	39.3	0.8
	39.3	26.6	55.6	9.6	39.3	25.6	47.8	8.4
				7.8				7.2
09:00	28.2	25.9	41.8	0.0	28.2	25.6	33.6	0.0
10:00	30.0	26.2	43.5	0.5	30.0	25.8	38.1	0.5
11:00	32.6	26.5	48.3	0.6	32.6	25.6	43.5	0.5
12:00	36.6	27.3	54.0	0.7	36.6	25.8	47.2	0.6
13:00	41.1	27.3	56.2	0.8	41.1	25.7	49.3	0.6
14:00	44.7	27.5	56.0	1.0	44.7	25.9	51.4	1.0
15:00	45.8	27.8	54.0	1.1	45.8	26.1	54.0	0.8
16:00	45.1	28.3	51.4	1.2	45.1	25.8	48.8	1.0
17:00	45.7	28.3	49.1	1.1	45.7	25.6	44.5	1.1
18:00	44.3	28.1	47.2	1.0	44.3	25.7	41.8	0.9
19:00	41.7	27.5	46.0	0.8	41.7	25.6	39.1	0.7
	39.6	27.3	49.8	8.8	39.6	25.7	44.7	7.7
				7.5				6.9

09:00	27.3	25.4	37.3	0.0	27.3	25.4	33.6	0.0
10:00	29.6	26.7	42.4	0.5	29.6	25.5	37.3	0.4
11:00	31.9	27.2	48.5	0.6	31.9	25.5	41.5	0.5
12:00	35.7	27.3	54.0	0.7	35.7	25.8	47.2	0.6
13:00	40.2	27.6	55.2	0.8	40.2	25.7	48.5	0.6
14:00	43.4	27.4	54.8	1.0	43.4	25.9	47.7	0.9
15:00	46.4	27.8	54.0	1.2	46.4	26.3	47.0	1.2
16:00	47.4	27.4	54.3	1.2	47.4	26.5	46.1	1.1
17:00	46.7	27.3	55.0	1.2	46.7	26.4	45.0	1.0
18:00	45.2	27.2	54.0	1.0	45.2	25.7	44.0	0.9
19:00	40.5	27.1	52.0	1.0	40.5	25.4	42.2	0.8
	39.5	27.1	51.0	9.2	39.5	25.8	43.6	8.0
				7.8				7.0

09:00	27.0	24.5	36.1	0.0	27.0	24.8	32.8	0.0
10:00	28.0	24.9	41.4	0.5	28.0	25.0	38.5	0.4
11:00	29.7	24.8	48.6	0.6	29.7	25.3	44.2	0.5
12:00	33.3	25.8	56.8	0.7	33.3	25.6	47.2	0.6
13:00	36.9	25.9	57.3	0.8	36.9	25.8	48.3	0.7
14:00	40.4	25.9	55.2	1.0	40.4	25.9	47.5	0.9
15:00	41.9	26.1	54.0	1.2	41.9	25.9	47.2	1.1
16:00	40.2	26.3	50.1	1.2	40.2	25.8	43.2	1.1
17:00	39.8	26.3	46.4	1.2	39.8	25.6	39.8	1.0
18:00	37.4	26.5	37.3	1.0	37.4	25.5	36.1	0.9
19:00	37.0	26.5	37.0	1.0	37.0	25.6	36.0	0.8
	35.6	25.8	47.3	9.2	35.6	25.5	41.9	8.0
				8.0				7.2

PROMEDIOS

SIN RECUBRIMIENTO

CON NANSULATE

hora	kWh				kWh			
	exter	sin	tsin	C sin	exter	con	tcon	C con
09:00	27.0	25.1	36.4	0.0	27.0	25.2	32.2	0.0
10:00	28.5	25.6	41.6	0.5	28.5	25.3	37.6	0.5
11:00	30.8	26.0	48.4	0.6	30.8	25.5	43.5	0.5
12:00	34.6	26.5	55.6	0.7	34.6	25.7	49.1	0.6
13:00	38.5	26.8	57.2	0.8	38.5	25.7	50.5	0.6
14:00	42.1	26.8	57.1	1.0	42.1	25.8	50.4	0.9
15:00	44.4	27.0	56.4	1.1	44.4	25.9	50.4	1.0
16:00	44.4	27.3	55.0	1.2	44.4	25.8	47.4	1.1
17:00	44.3	27.3	50.6	1.1	44.3	25.8	44.2	1.0
18:00	42.3	27.4	46.2	1.0	42.3	25.6	40.5	0.9
19:00	39.8	27.2	44.1	0.9	39.8	25.4	38.7	0.7
Consumo diario				8.8				7.7
Promedio	37.9	26.6	49.9	0.8	37.9	25.6	44.0	0.7

Consumo nocturno	7.5	6.9
Consumo diario	16.4	14.6

PORCENTAJE DE AHORRO

Consumo diurno	12.67%
Consumo nocturno	8.51%
Consumo diario	10.76%

SIN RECUBRIMIENTO

CON NANSULATE

Exter	Exterior ambient temperature
Sin	Indoor temperature without Nansulate coating
Tsin	Surface temperature of roof without Nansulate coating
C sin	Consumption in kWh without coating
Con	Indoor temperature with NANSULATE coating
Tcon	Surface temperature of roof coated with NANSULATE
C con	Consumption in kWh coated with NANSULATE

Proyecto NANASULATE

ETA-EOS-08-08

Ahorro Promedio Nocturno		
	Sin	Con
	NANASULATE	NANASULATE
Consumo Promedio [kWh]	7.52	6.88
Ahorro ¹ [kWh]		0.64
Ahorro ¹ en %		8.5

Temperaturas Promedio [°C]			
	Exterior	Interior sin	Interior con
		NANASULATE	NANASULATE
Promedio	37.88	26.62	25.60
Diferencia en temp. amb interior			1.02

Ahorro Promedio Diurno		
	Consumo [kWh]	
	Sin	Con
	NANASULATE	NANASULATE
Consumo Promedio [kWh]	8.84	7.72
Ahorro ¹ [kWh]		1.12
Ahorro ¹ en %		12.7

Ahorro Combinado		
	Sin	Con
	NANASULATE	NANASULATE
Consumo Promedio [kWh]	8.18	7.30
Ahorro ¹ [kWh]		0.88
Ahorro ¹ en %		10.8

¹Estos ahorros corresponden a equipos de 1 TR instalados en recintos iguales en ubicación, orientación y tamaño de 4x4x2.4 m (largo x ancho x altura) y con techumbre de concreto con lámina galvanizada encima. Las mediciones se hicieron del 4 al 18 de mayo del 2009.