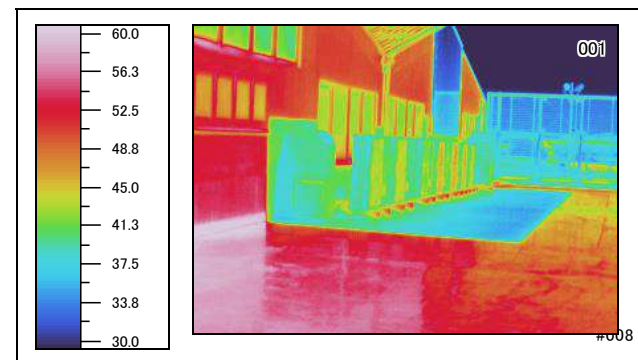


Thermal Insulation Measures・Condensation Suppression Measures  
・UV Rays Measures・Energy Saving Measures



# THERMO ECO SHIELD PLUS

- 1, 「THERMO ECO SHIELD」; Thermal coating for the outdoor unit and the surrounding on the roof of the building
- 2, 「Super Glass Barrier」; Antistatic, Super Hydrophilic Self-Cleaning Coat



# Patent Application method of THERMO ECO SHIELD PLUS

**Excellent cost-effectiveness. It reverses the concept of thermal insulated coating for the roof and the exterior wall so far.**

In Japan, heat reflection paint on roofs and outer walls have been popular for more than 10 years.

However, buildings in urban areas have many window glasses, so customer can not anticipate the effect of reducing air conditioning costs. Customer will not adopt in construction. Suburban warehouses and factories, or the roof of houses were the most popular markets.

It reduces air conditioning costs by over 15% per year by thermal insulated paint (= THERMO ECO SHIELD) only for the rooftop outdoor unit and its surroundings for urban office buildings, commercial facilities, hotels, schools and public buildings.

The paint installation is an easy and you can confirm the air-conditioning cost reduction from the second month after installation.

**1, THERMO ECO SHIELD with thermal insulation, Water-proof function for Surrounding the roof outdoor unit device.** Amortization within 1 year: 5~10pcs of outdoor unit = 40m<sup>2</sup>~100m<sup>2</sup>  
**It can reduce 15% of the air-conditioning cost by the temperature control of the outdoor unit device.**

It can lower the temperature around the outdoor unit by about 20 °C in the summer, and It can raise the ambient temperature by about 10 °C in the winter.

As a result, It can demonstrate a reduction of air conditioning load of 15% or more throughout the year. Heat reflection function is effective for summer, but thermal insulation Performance becomes important so that heat will not escape in winter.

This product enhances not only heat reflection performance but especially heat insulation performance.

**2. Antistatic super-hydrophilic self-cleaning coat on rooftop outdoor unit, outer wall = Super Glass Barrier for maintain thermal insulation performance due to stick dust on the coated surface.**

The rooftop outdoor unit is charged because it is an electrical product. For that reason, a dirt in the air tends to adhere. Therefore, the reflectance of the applied white coating decreases. That means a decrease in heat shielding performance.

Antistatic Super hydrophilic Self-Cleaning Coat = **Super Glass Barrier** is applied as a top coating after applying THERMO ECO SHIELD. It is hard to get dirty, adhered dirt also self-cleaning when it rains.

**2pcs of patents related to the outdoor unit in Japan**



# THERMO ECO SHIELD

About 15% energy saving

By applying this product on outdoor unit surroundings and outdoor unit cover, it shows stable energy saving effect throughout the year without being affected by outside air temperature and Demonstrated energy-saving of 15% or more by comparison of temperature data and electricity bill.

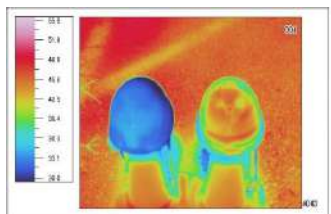
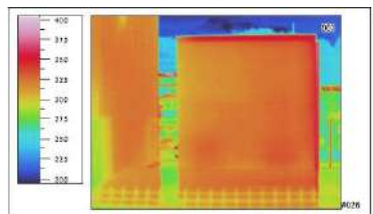
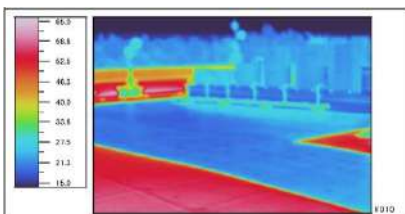
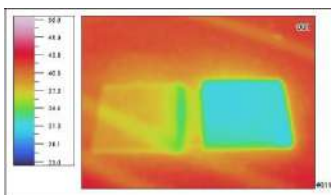
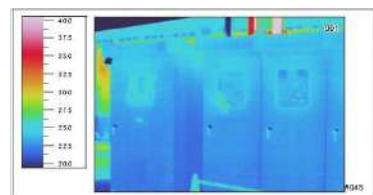
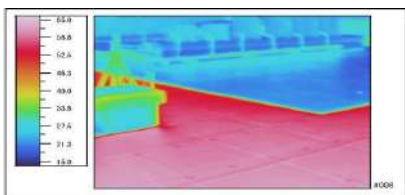
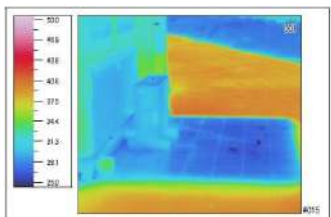
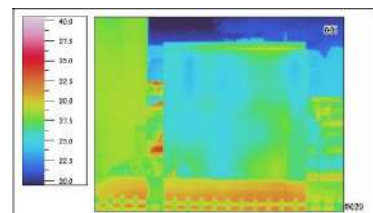
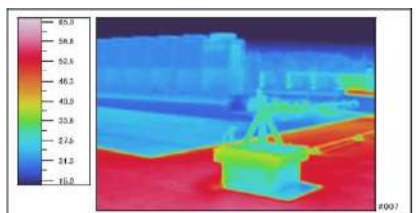
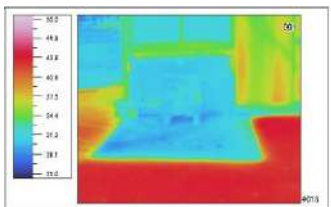
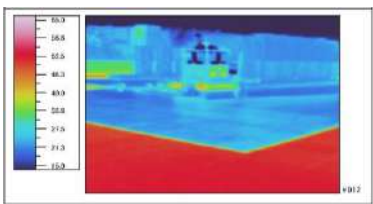
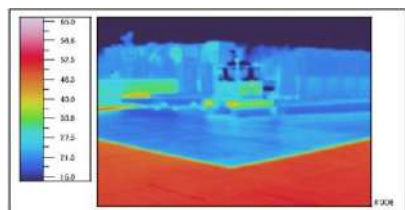
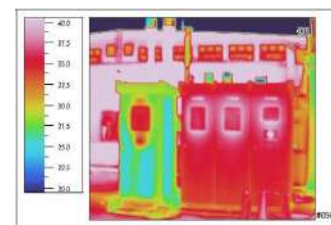
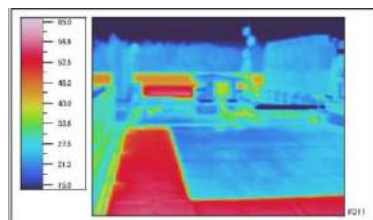
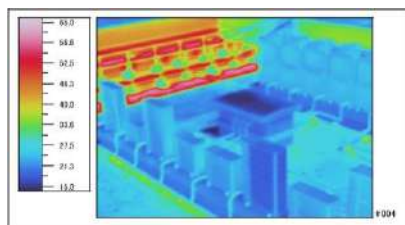


## Super Glass Barrier

Antistatic & Super hydrophilic Self Cleaning Coat  
Antifouling Coat always makes clean

Antifouling measures for outdoor unit

- ① Dirt like carbon, sand dust etc. is hard to stick = Antistatic function
- ② Even if there is no light, Super-hydrophilic self-cleaning effect is demonstrated by rain and dirt is washed away dislike photocatalyst coating.
- ③ Performance keeps long time by only 1 time application without any maintenance work.



※ Certain Amusement hall Heat reflection & Thermal insulation coating infrared photography to the rooftop outdoor unit

Patented No-6038245

Energy saving cover for outdoor unit

Patent Publication 2015-117924

Energy saving coating of outdoor unit and surrounding area

**The great thing of this patent**

General thermal paint will be coated all the roof and the outer wall, but the application cost is very expensive, and it is not adopted easily. On the other hand, In the case of buildings on the left, about 15% of Energy saving throughout the year can be realized by applying Heat reflection & Thermal insulation coating only around the outdoor unit and the outdoor unit with 7 units. It is cost-effectiveness, enables amortization within one year.

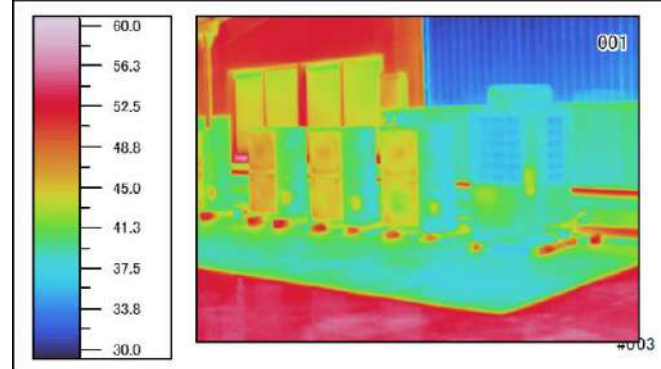
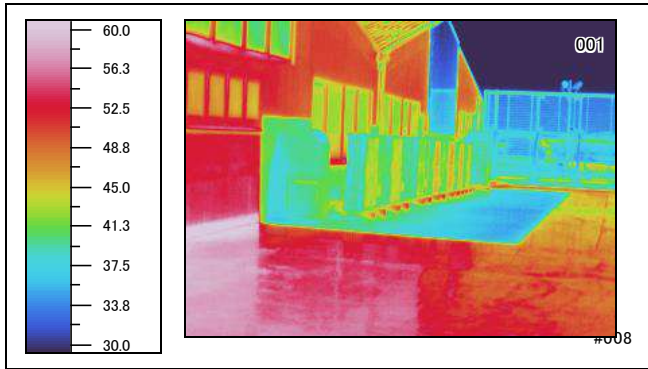
**If there is no Heat insulation function the effect is halved**

Currently, many heat-reflection paints are on sale, but if it will be applied around the outdoor unit on the roof this time, it will have a good heat-reflection performance during the daytime in summer. However, the radiant heat from the heat-absorbed roof and outer wall becomes stronger at night time, so it is necessary to have a thermal insulating function instead of heat reflection. In winter, the temperature of the rooftop coated with heat-reflection paint is cold, but in the case of heat insulated paint, the temperature around the outdoor unit is higher than the outside air temperature and the air conditioning load is reduced, which saves energy is more than 15%.

In particular, raising the air temperature from minus temperature to nearly 25 degrees and raising it from around 10 degrees to 25 degrees makes a big difference in the air conditioning load.

**Antifouling and maintaining reflectance are important**

In this patent, we use heat insulating paint using hollow beads that demonstrate insulation performance and materials that radiate infrared rays. However, as time elapses, it becomes gradually dirty and the reflectance decreases. In order to prevent the Heat reflection performance becomes poor, They can be solved by applying antistatic, super hydrophilic Self-Cleaning coat



**Before and after application of Outdoor unit**

10% to 30% energy saving, It will greatly contribute to CO<sub>2</sub> reduction.

※Due to the coating effect, it shows energy saving effect with stable operation all year round without being affected by outside air temperature.

	Before	After
Energy-Saving in Summer Reduction of cooling cost by Heat Shield function (Expansion of refrigerant)	<ul style="list-style-type: none"> <li>The ambient temperature of the outdoor unit, which is installed on the roof will be <b>about 70 °C</b>.</li> <li>After taking in hot air from the suction port, cool it and then send it indoors and carry out the heat inside the room to the outside.</li> </ul>	<ul style="list-style-type: none"> <li>By painting thermal barrier paint on the outdoor unit and its surroundings, the solar heat is reflected and the ambient temperature drops to <b>about 40 °C</b>.</li> <li>Furthermore, radiant heat stronger than direct sunlight can be suppressed and air conditioning efficiency improves.</li> </ul>
Energy-Saving in Winterr Reduction of Heater cost by Heat insulating function (Compress refrigerant)	<p>The outdoor unit of the air conditioner warms the cold air, sends it to the room, and carries the indoor cold air to the outside.</p>	<p>By painting insulation paint on the outdoor unit and the surrounding area, it is possible to suppress the cold air in the winter and to absorb the warmer air than before application, so the heating efficiency improves.(Expansion of refrigerant)</p>

Problem 1)

In the outdoor unit of the air conditioner, the outdoor unit becomes hot due to the temperature rise in the summer. In winter, on the contrary, the outdoor unit becomes cold. As a result, the air conditioning load increases and the air conditioning cost increases.

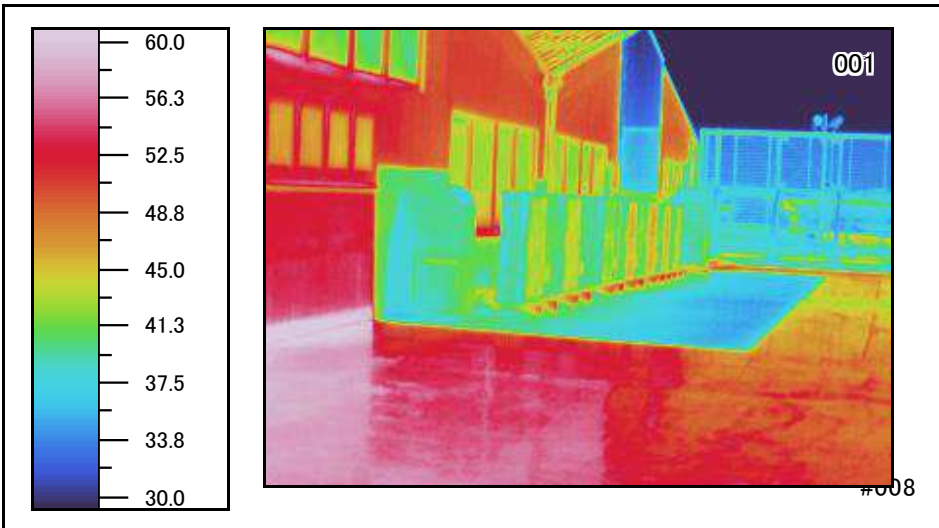
A Solution " THERMO ECO SHIELD" Heat reflection & insulation paint applied. Furthermore, As the final coating , Antistatic, Super hydrophilic Self-Cleaning coat is applied to prevent lowering reflectance by sticking dust. 15% energy-saving effect is demonstrated by Heat reflection effect in summer and thermal insulation effect in winter



After installation

※Certain Amusement hall Comparison of power reduction before and after application.

	Before	After	Reduced power kwh	Reduction amount 21.8JPY /kwh	Reduction rate	CO2 reduction amount Kg-CO2/month
	Power consumption kwh 2013	2014				
						0.375 kwh/co2
Jan	50,466	43,596	6,870	149,766	13.6%	2,576.3
Feb	47,844	41,238	6,606	144,011	13.8%	2,477.3
March	43,608	37,098	6,510	141,918	14.9%	2,441.3
April	43,800	37,865	5,935	129,383	13.6%	2,225.6
May	42,576	36,592	5,984	130,451	14.1%	2,244.0
June	42,510	34,228	8,282	180,548	19.5%	3,105.8
July	44,298	37,590	6,708	146,234	15.1%	2,515.5
Aug	49,350	41,238	8,112	176,842	16.4%	3,042.0
Sep	48,468	40,168	8,300	180,940	17.1%	3,112.5
Oct	40,344	33,491	6,853	149,395	17.0%	2,569.9
Nov	38,736	30,227	8,509	185,496	22.0%	3,190.9
Dec	41,046	32,547	8,499	185,278	20.7%	3,187.1
Total	533,046	445,878	87,168	1,900,262	16.4%	32,688
Amount	11,620,403	9,720,140				
Average	968,367	810,012				



## Problem

In the outdoor unit of the air conditioner, the outdoor unit becomes hot due to the temperature rise in the summer. In winter, on the contrary, the outdoor unit becomes cold. As a result, the air conditioning load increases and the air conditioning cost increases.

A Solution "THERMO ECO SHIELD" Heat reflection & insulation coat applied. Furthermore, As the final coating, Antistatic, Super hydrophilic Self-Cleaning coat is applied to prevent lowering reflectance by sticking dust. 15% energy-saving effect is demonstrated by Heat reflection effect in summer and thermal insulation effect in winter

JAPAN HORSE RACING ASSOCIATION facility,

Status of electricity reduction by painting THERMOR ECO SHIELD to the roof-top outdoor unit and the surrounding.

	Before	After	Reduced power kwh	Reduction amount (yen)	Reduction rate	CO <sub>2</sub> Reduction amount
	Power consumption kwh			20.8yen /kwh		Kg-CO <sub>2</sub> /month
	2014	2015				
January	47,137	35,419	11,718	243,734	24.9%	4,394.3
February	49,373	38,973	10,400	216,320	21.1%	3,900.0
March	44,005	34,865	9,140	190,112	20.8%	3,427.5
April	42,546	35,710	6,836	142,189	16.1%	3,427.5
May	38,126	31,414	6,712	139,610	17.6%	2,517.0
June	37,038	35,341	1,697	35,298	4.6%	636.4
July	39,618	36,449	3,169	65,915	8.0%	1,188.4
August	48,545	40,623	7,922	164,778	16.3%	2,970.8
September	49,152	41,044	8,108	168,646	16.5%	3,040.5
October	42,368	34,248	8,120	168,896	19.2%	3,045.0
November	39,867	32,457	7,410	154,128	18.6%	2,778.8
December	37,645	32,533	5,112	106,330	13.6%	1,917.0
Total	515,420	429,076	86,344	1,795,955	16.8%	33,243
sum	10,720,736	8,924,781		149,663		2,770
average	893,395	743,732				

0.375 kwh/co2

1st floor roof installation situation (end of November, 2014)



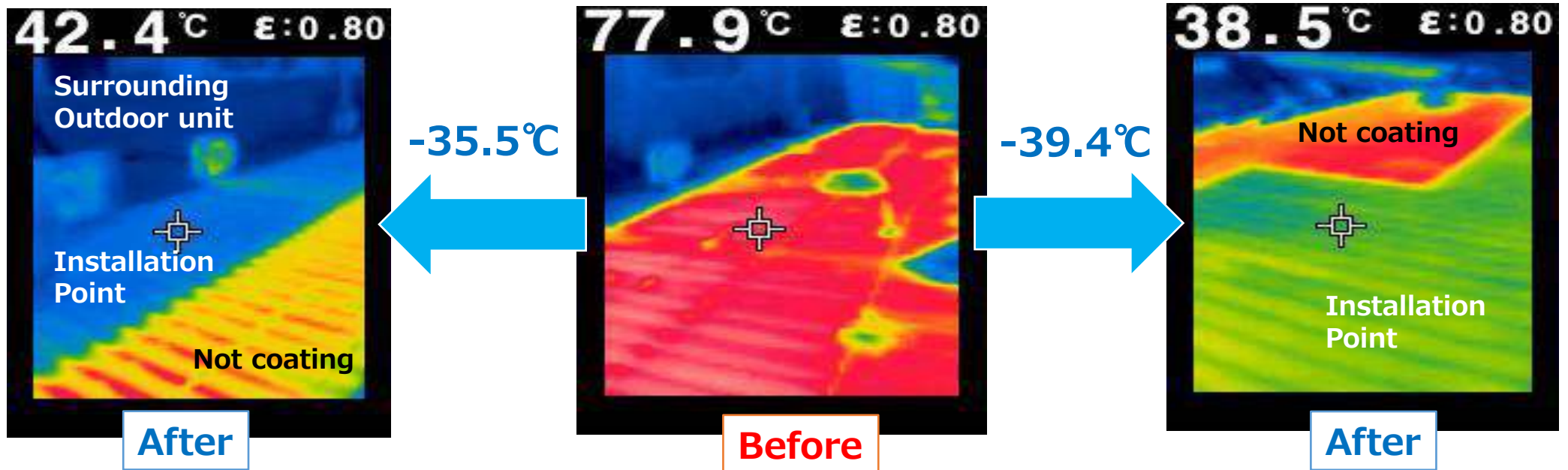
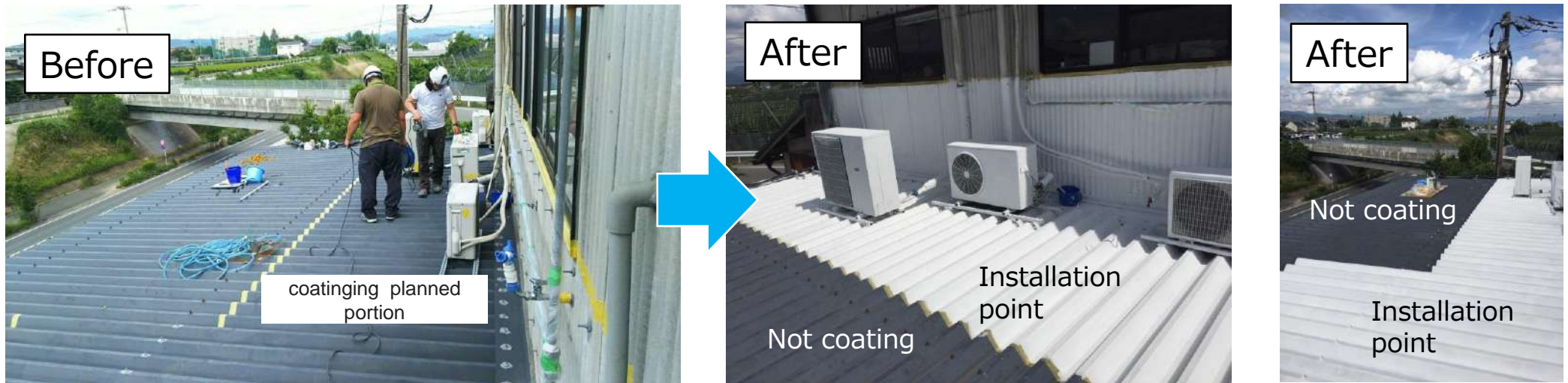
2nd floor (end of November 2015)



# Application report for example

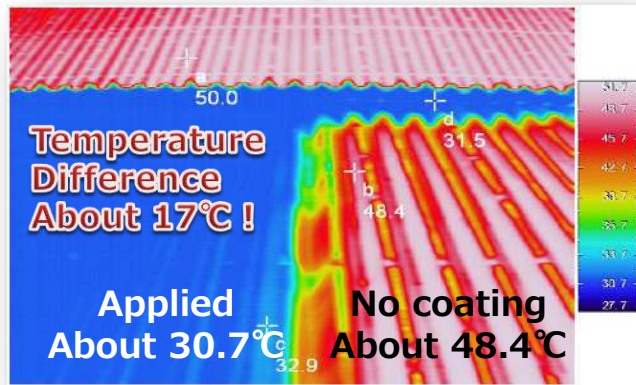
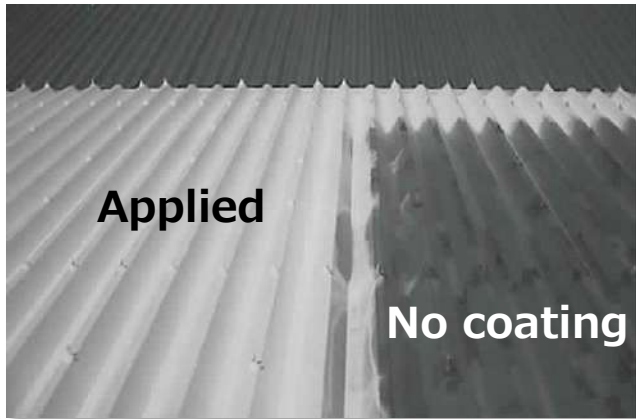
■ Date : July 3~4<sup>th</sup>, 2017

■ Site : the roof of the Office building in Fukuoka-ken, Japan

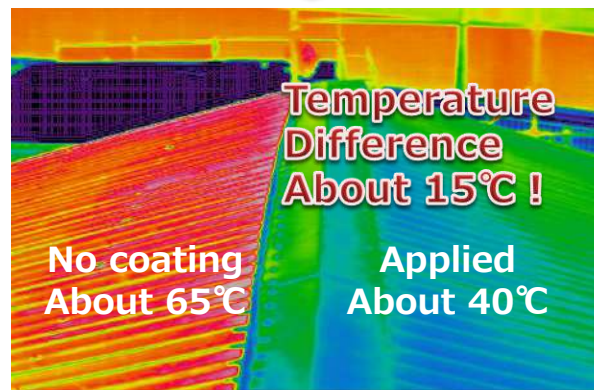
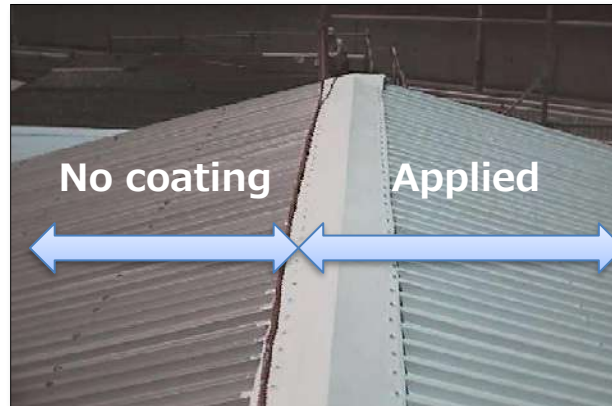


# The temperature difference comparison data for the roof application

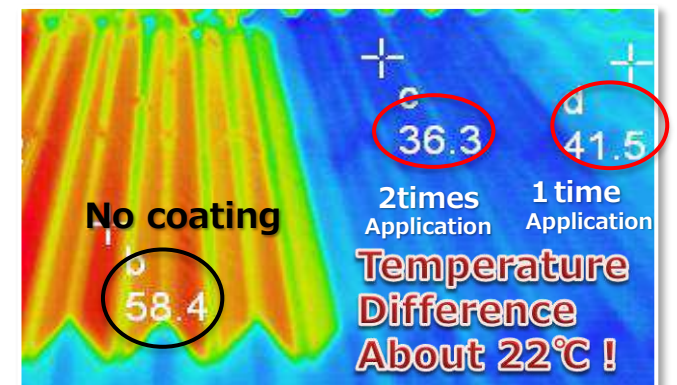
-Application case 1-



-Application case 2-



-Application case 3-



= Infrared thermography =

= Infrared thermography =

= Infrared thermography =





# Installation Record in Japan,2018

Automobile manufacturing factory in Tochigi-ken,Japan



auto parts factory in Tochigi-ken,Japan



Automobile manufacturing factory in Saitama-ken,Japan



Food factory in Kanagawa-ken,Japan



Nursing house in Saitama-ken,Japan



Food factory in Saitama-ken,Japan



## Energy Saving simulation after installation of the THERMO ECO SHIELD

	Fast-food restaurant	Convenience Store	Family Restaurant	Drug Store
Floor Area/m2	140	120	230	350
Electricity bil/Year・Yen	5,170,000	5,230,000	6,430,000	8,100,000
Electricity Bill/ Month・Yen	430,000	435,800	535,800	675,000
the number of outdoor unit	Slim type 5 pcs	Slim type 5 pcs	Slim type 7pcs	Large type 10pcs
Application Area	40㎡	40㎡	56㎡	80㎡
<b>Application Cost (approximation)</b>	<b>400,000</b>	<b>400,000</b>	<b>560,000</b>	<b>800,000</b>
Energy Saving performance 15% year	775,500	784,500	964,500	1,215,000
Energy Saving performance 15% month	64,625	65,375	80,375	101,250
<b>Amortization/month</b>	<b>7~10months</b>	<b>7~10months</b>	<b>7~10months</b>	<b>7~10months</b>

### ※Energy Saving Performance

- The effect depends on the installation environment of the outdoor unit.
- It depends on the amount of solar radiation to the outdoor unit · time and outside air temperature etc
- Energy saving effect will stabilize after 2 ~ 3 months. (Application time · Complete curing of coating film)

### ※Application Cost

- The amount varies depending on the area, installation location, size of the outdoor unit, etc.



# Anti-static, Super Hydrophilic Self-Cleaning Coat always keep clean Rooftop to prevent sticking dust and to keep high reflectance performance of coating.

Function : ①Dirt like carbon, sand dust etc. is hard to stick = Antistatic function

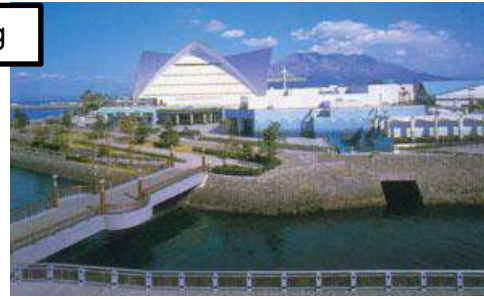
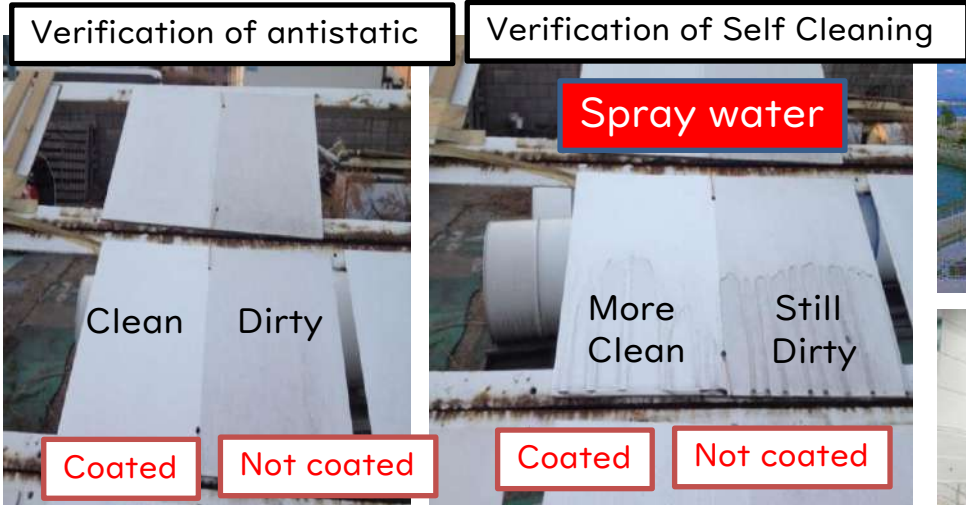
②It is hard to get moldy in shadow area for long period by Nano Silver of coating agency

③ Even if there is no light, Super-hydrophilic self-cleaning effect is demonstrated by rain and dirt is washed away.

④ Performance keeps long time by only 1 time application without any maintenance work..

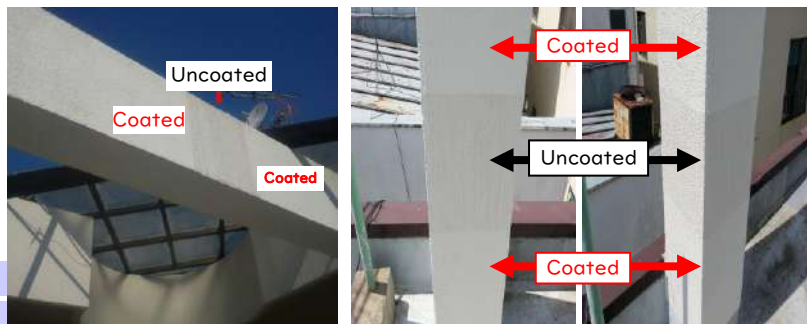
Anti-fouling test by leading Korean paint manufacture **Verification of white coated Panel after 4months**

It applied Heat reflection & thermal insulation coating with antistatic & Super Hydrophilic antifouling coat on the rooftop of a certain aquarium rooftop in Japan



When dirt is terrible like China, Infrared ray reflectance falls by 5% or more due to dirt., it becomes clean when water is sprayed because the coating surface hard to stick dirt

Verification of white coated wall after 2years in Japan



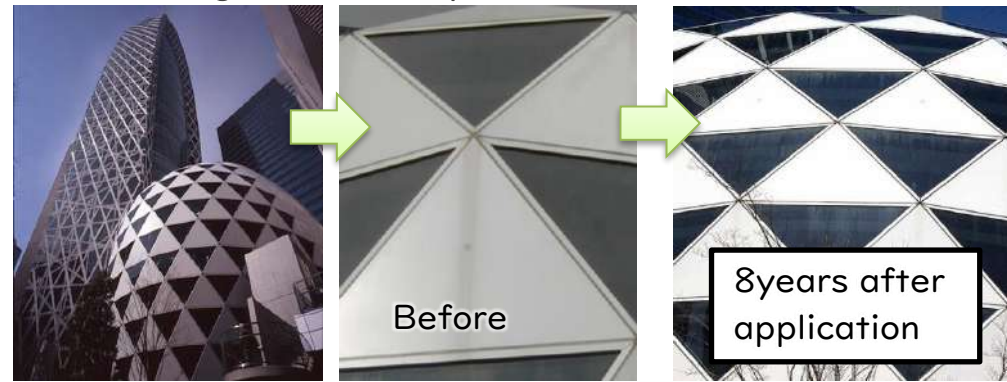
It applied except for some places on the rooftop, verified dirt condition. The difference started to see 6months later.

# Antistatic Antifouling Coat "Super Glass Barrier" Case Study

Prevent of Rain drop  
Maintain long-term  
aesthetic

◆ Tokyo Big Sight West Library Roof  
Highly Reflective Thermal Barrier Coating + Antifouling

◆ Building in Tokyo  
Antifouling of exterior panels



◆ Tianjin International Cruise Terminal  
Application area 550,000 m<sup>2</sup>

◆ In Hong Kong tunnel, coating on concrete



◆ Kagoshima Aquarium / Coat on high reflection thermal barrier coating Volcanic ash measures

