Heat Exchange Paint

Arbar Corporation

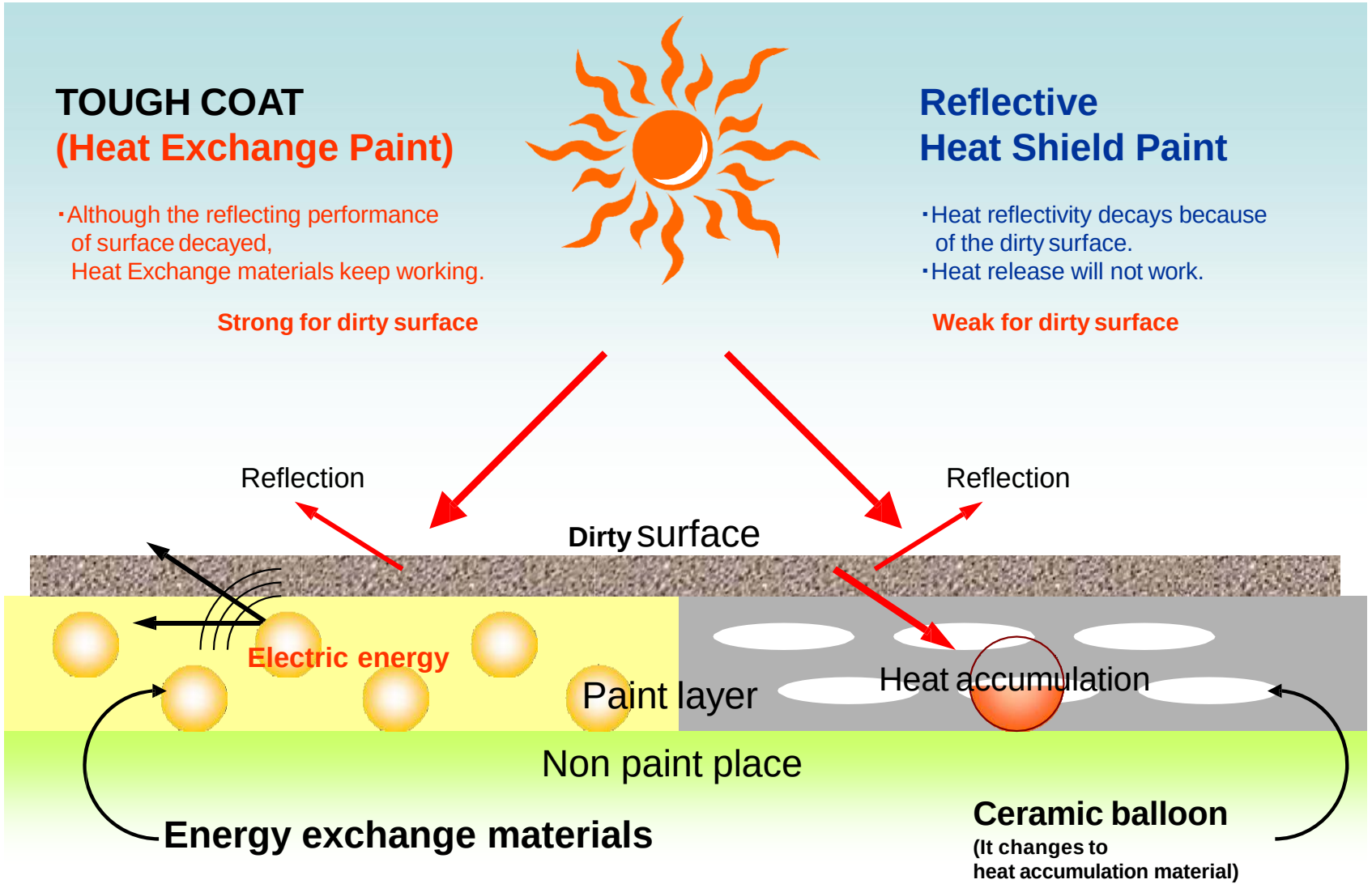
Tough CoatD42 D47

The Heat Exchange Paint can achieve **energy saving** whole year.

The Heat Exchange Paint is certified as carbon offset.

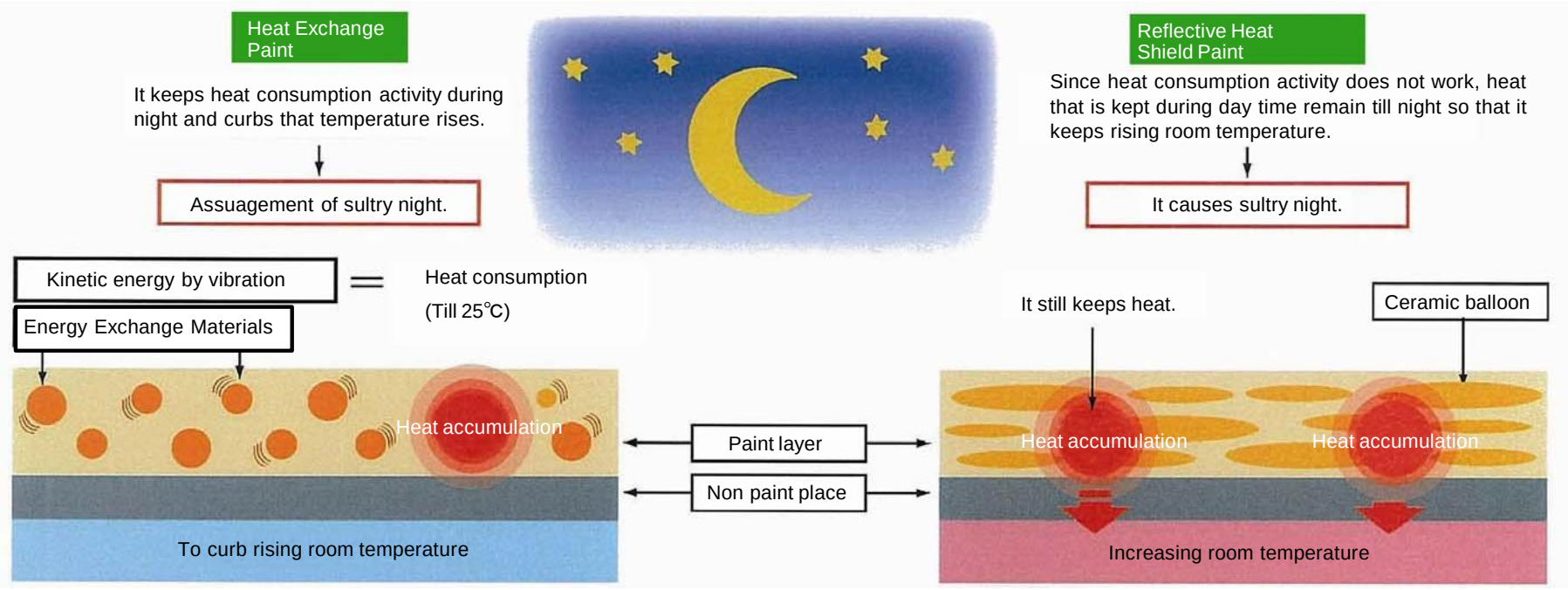
Contents

Feature No.1
TOUGH COAT that prevent aged deterioration keeps continuing effect.



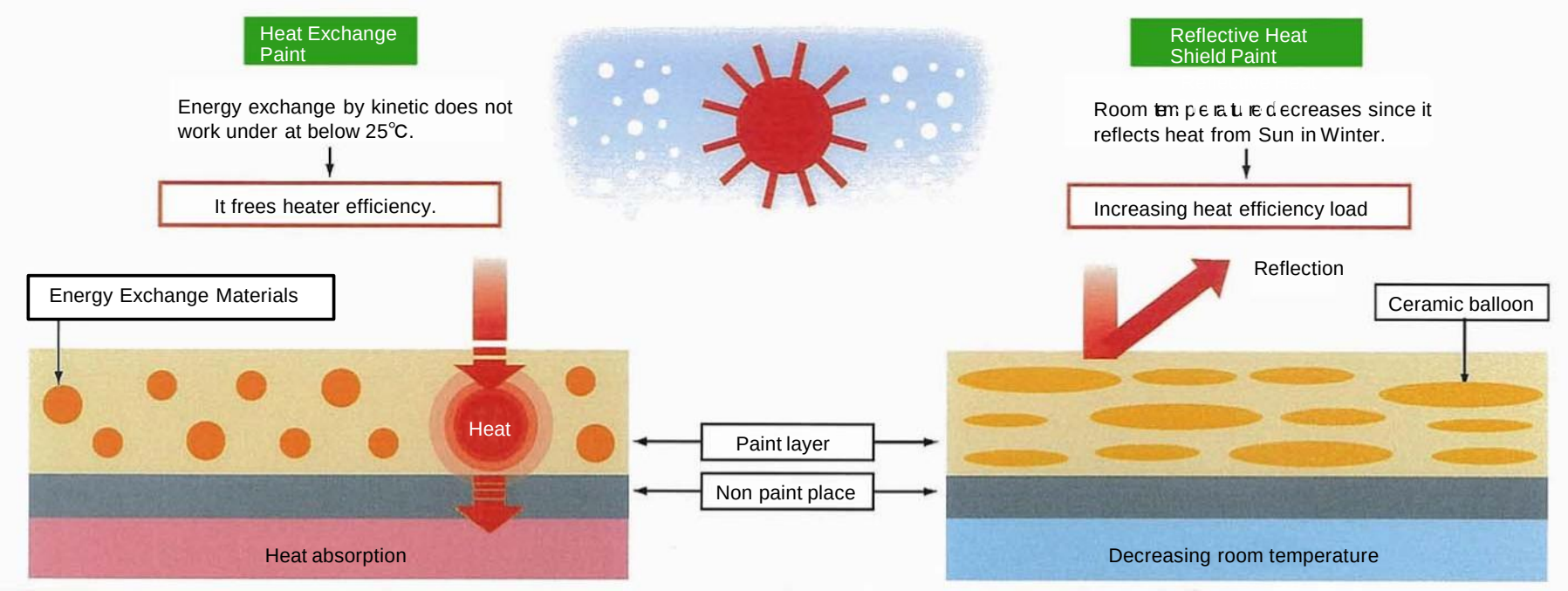
Feature No.2

Heat consumption activity works for 24 hours. It also performs heat consumption effect after sunset.



Feature No.3

It does not work at heat in Winter. (The temperature is below 25℃) It frees load of heater.



Validation of saving energy ① Bid room at Kanzaki general government building in Saga Prefecture

Roof surface temperature dropped drastically at prefab so that the room temperature decreased.

Before painting

After painting

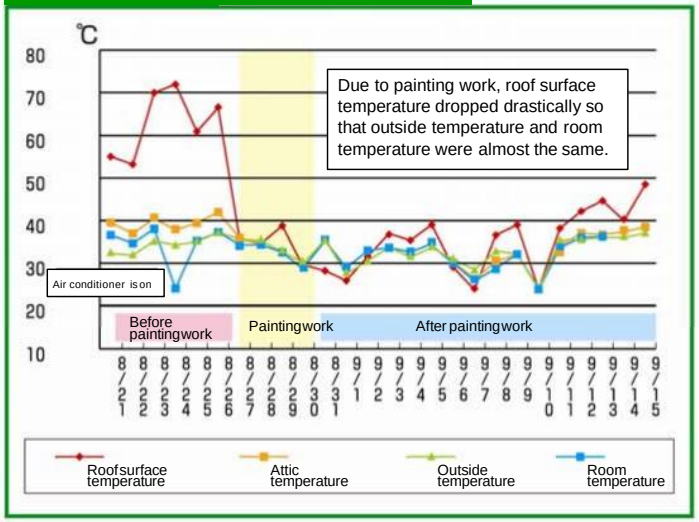
Paint place	Prefab roof at meeting room at Kanzaki general government building in Saga Prefecture
Paint area	118㎡
Heat insulation on roof surface	No heat insulation
TOUGH COAT	D-42 0.15kg/㎡ × paint twice

Comparison validation result

We paint Prefab roof at meeting room at Kanzaki general government building in Saga Prefecture with Heat Exchange Paint. We gave temperature exploration between 21st/August/2004 and 15th/September/2004, and we compared and analysed the temperature before painting and after painting under the same condition.

	Outside air temperature	Roof surface temperature	Attic temperature	Room temperature
Before painting	32.8℃	55.0℃	39.4℃	36.8℃
After painting	32.7℃	36.4℃	32.4℃	33.5℃
Temperature difference	-	-18.6℃	-7.0℃	-3.3℃

Temperature curve



Outside temperature: 32.8℃

The difference of temperature between before painting and after painting is fulfilled.

Roof surface temperature	more than 18℃
Room temperature	more than 3.0℃
Attic surface temperature	more than 7.0℃

- Cut of air conditioning cost!
- Improvement of room environment!
- Curb of building deterioration!
- Heat island countermeasure

Validation of saving energy ②　Experimental result at prefab house

Saving energy in Summer, it does not chill room inside in Winter just like ordinary paint

Heating load in Winter

We confirmed that Heat Exchange Paint was the same heating load as ordinary paint so that environment load was also the same.

Air conditioning load in Summer

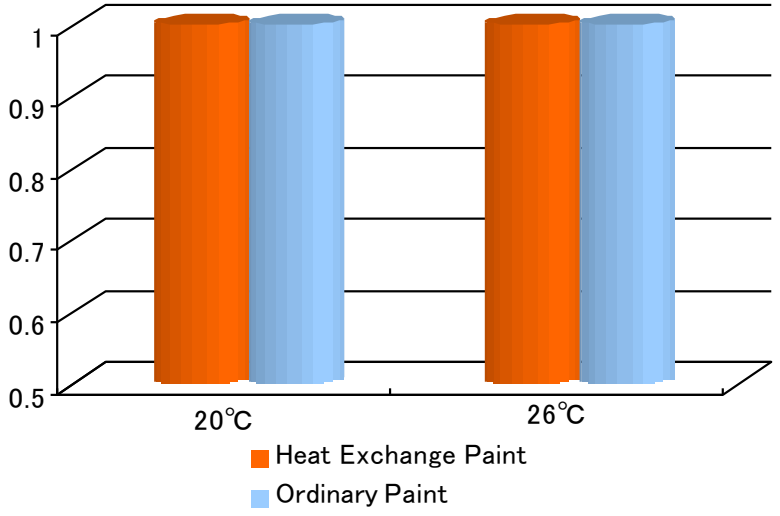
①Heat Exchange paint took saving energy effect.
②When operating saving energy by rising preset temperature, the difference of air conditioning load was widen more.

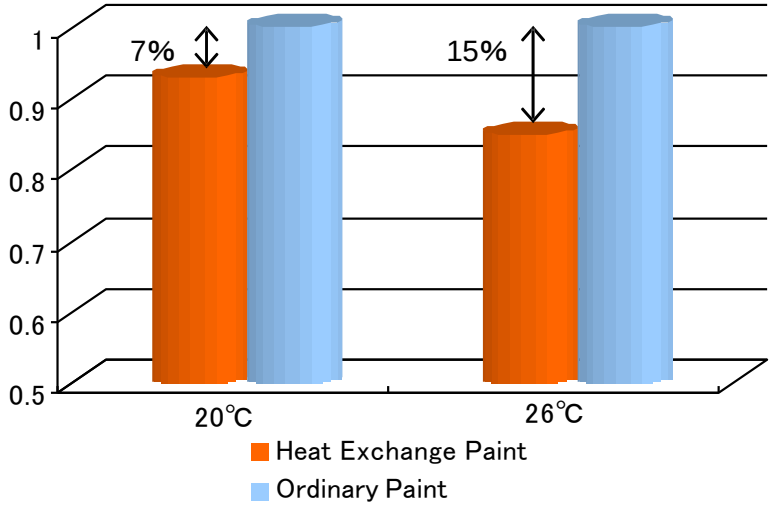
(Unit KW)

Preset temperature	Period	East wing Heat Exchange Paint	West wing Ordinary paint
20℃	09 1/15-1/16	20.66	20.68
26℃	09 1/23-1/28	85.19	84.35

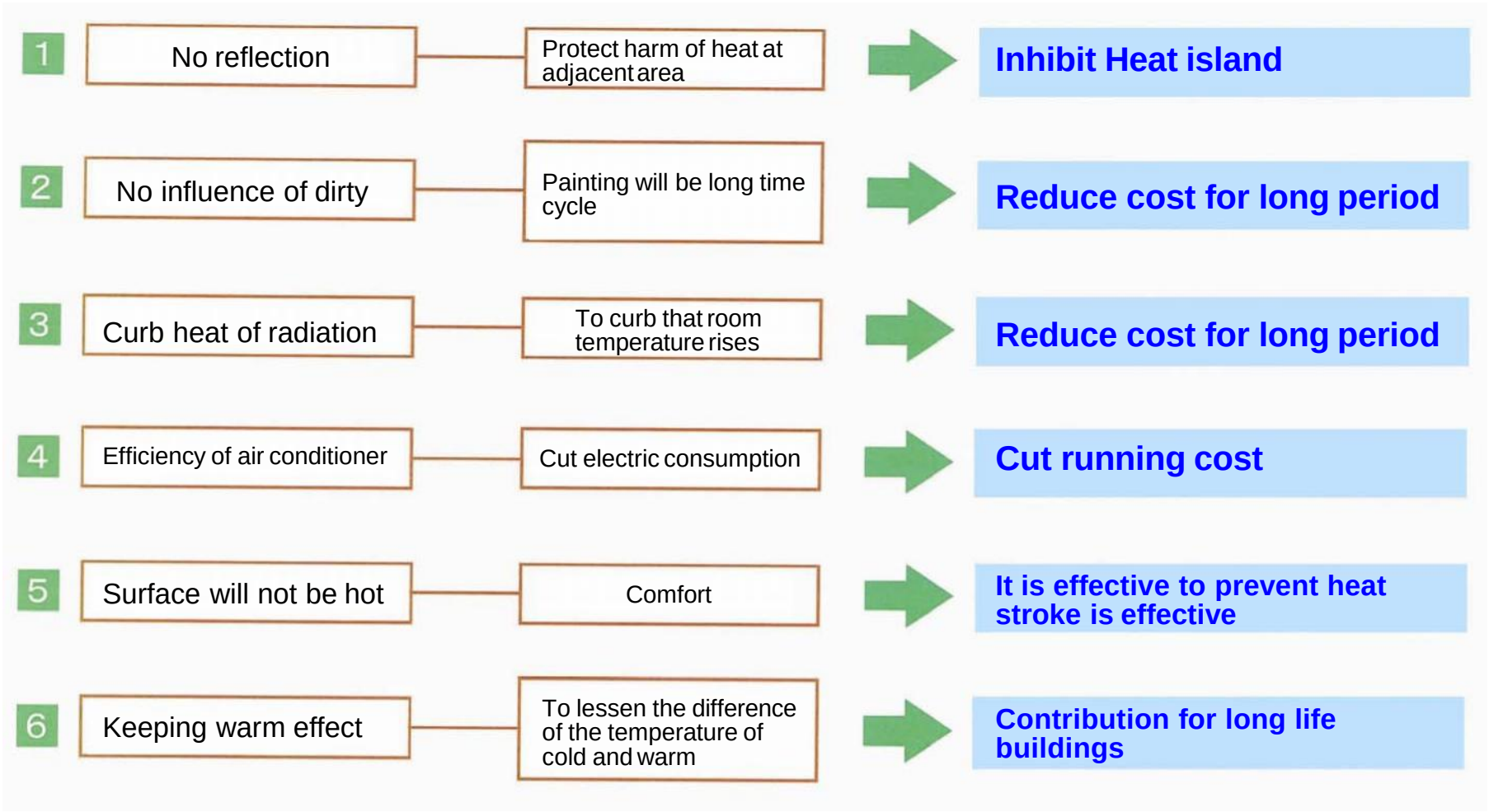
(Unit KW)

Preset temperature	Period	East wing Heat Exchange Paint	West wing Ordinary paint
20℃	08 7/17-8/21	219.35	235.15
27℃	08 9/2 -9/16	20	23.88





Advantages of Heat Exchange Paint



Disadvantages of Heat Exchange Paint

Of course there are some disadvantages

1	Not good for roadway.	Do not use it for the place where cars pass through frequently.
2	Delitescence of coated film is low.	Coated film painted with certain colour is transparent, so that lower layer can be seen.
3	Adhension of coating is not tight.	Primer might be need.
4	It might spoil aesthetic.	We do not recommend that it is used for aesthetic because it is eggshell paint.
5	It does not paint anything in black.	It is applied for all colours of Japan Paint Manufactures, yet it does not pain anything in black, which is its characteristic.
6	It is unique.	No choice for the price range, since there are no paint which is the same function as Heat Exchange Paint.
7	Pay attention to bluish colours and greenish colours.	Because of characteristic of pigment, the colours fade away quickly, so that please pay attention when choosing colours.

Registration/Approval by civil service

Name of organisation	Name	Description
Tokyo	New technology registration	No.0701028
Research Institute of Environment, Agriculture and Fisheries, Osaka Prefectural Government	Heat exchange function	Effect approval
Tokyo Sumidaku	Induction aid institution of equipment of prevention of Global warming	"Heat Exchange Paint" business approval
Saitama	New technology approval	Adoption of flat plate block painted with heat Exchange Paint
Ministry of Land, Infrastructure, Transport and Tourism	New Technology Information Delivery System"NETIS" registration No.HR-100011-A	"Heat barrier application colour paint construction method" "Heat barrier colour paint method"
UN environment institution	Carbon offset	Carbon offset approval with CO2 eco right

Effect validation case 1 Double folded plate Performance with steel sheet roofing
Reduction effect of consumed power maintain after 5 years (with dirt).

Heat Exchange paint was applied to roof of product warehouse of M confectionery production in Amagazaki city in February 2006.

○Roof figure: Galvalume copper plate wavy roof
○Application area: Approx. 1500㎡

We found that continuous reduction effect remained in spite of dirty as a result of comparing the data which is before application, in 2004 and 2005, under investigation electric energy and electricity charges between April and September every year for 5 years after application.

Application effect continues after application for 5 years.

Reduction of electric energy by approx.13%

Reduction of electricity charges by approx.8%

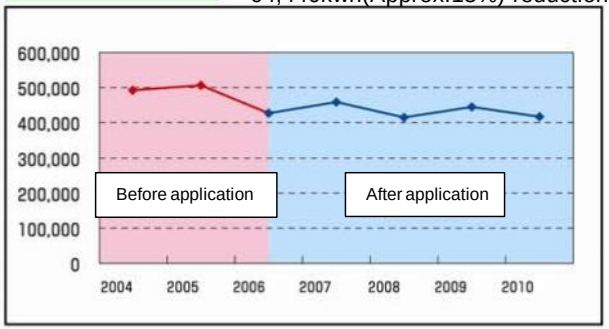
Comparison before application with after application

	Before application (Average value 04-05)	After application (Average value 06-10)	Difference	Rate of reduction
Electric energy	500,000kwh	435,560kwh	64,440kwh	Approx. 13%
Electricity charges	¥6,828.256	¥6,290.039	¥538.217	Approx. 8%

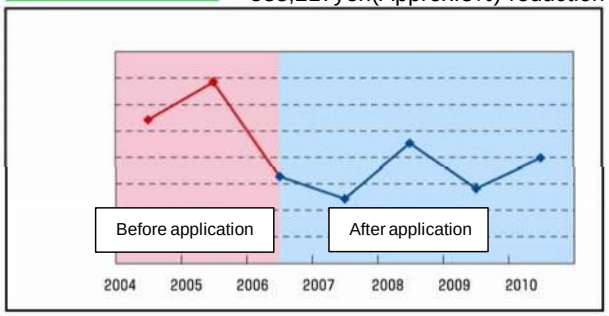
Energy bill per annual

	Electric energy							Price	Charges
	4	5	6	7	8	9	Total	(¥/kwh)	YEN
2004	43,200	56,000	81,600	109,200	113,900	90,500	494,400	13.52	6,684,288
2005	40,900	56,300	88,200	93,100	126,900	100,200	505,600	13.79	6,972,224
2006	27,300	55,400	79,200	89,700	105,900	70,900	428,400	14.62	6,263,208
2007	28,800	52,200	74,600	100,300	106,700	97,500	460,100	13.25	6,096,325
2008	27,400	52,900	69,600	96,200	95,300	76,400	417,800	15.59	6,513,502
2009	27,800	48,100	82,500	107,800	106,100	77,500	449,800	13.73	6,175,754
2010	21,000	38,800	65,300	89,900	116,800	89,900	421,700	15.18	6,401,406

Electric energy process ▸ Average(Half year) 64,440kwh(Approx.13%) reduction



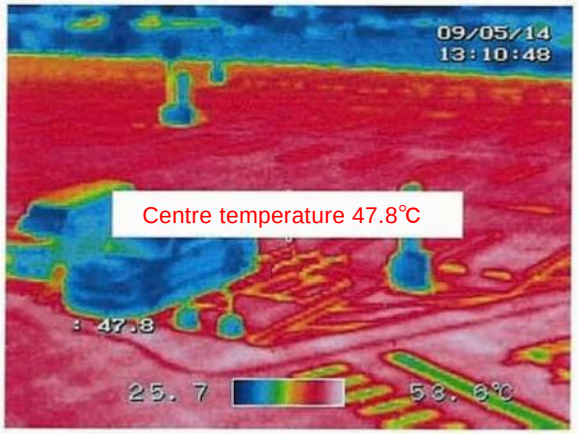
Electric charges process ▸ Average(Halfyear) 538,217yen(Approx.8%) reduction



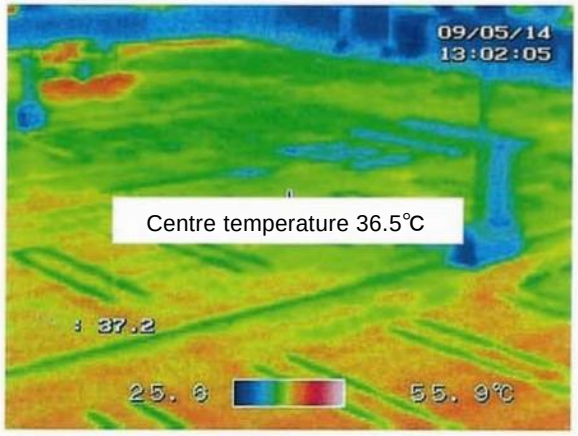
Effect validation case 2
Environment at asphaltic car parking at daytime is going to change dramatically, which is going to be friendly for children.

No application

(Car parking at roof at Aeon Hiroshima Gion shopping centre: Asphaltic surface application)



Heat Exchange Paint is applied



Outside temperature: 25.7℃

Asphaltic surface

Difference of road surface temperature

10.6℃

No application

47.8℃

Applied with Heat Exchange Paint

36.5℃

○Heat island provision

○Alleviation of heat radiation!

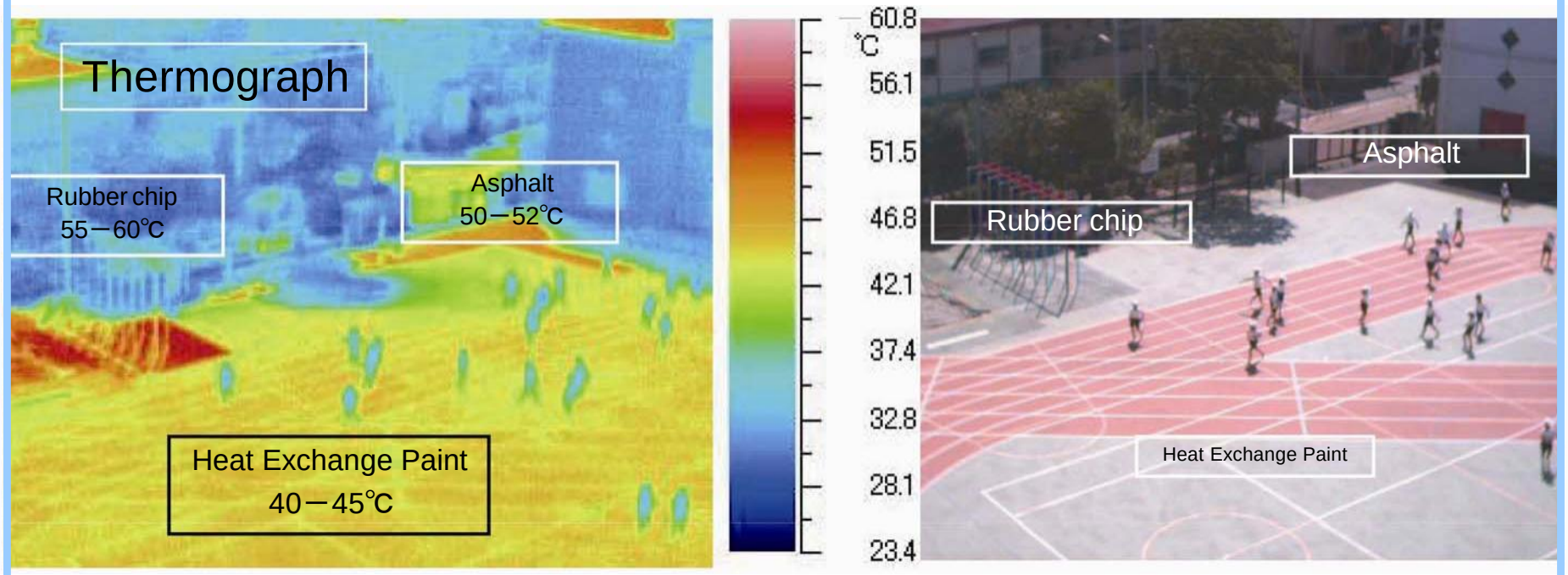
Effect validation case 3-1

Example of applying at Oshiage primary school playing ground in Tokyo

Playing grounds in Tokyo are paved with asphalt.
In case of Oshiage primary school, green part and brown part.

Heat Exchange Paint was reported as playing ground where people use with barefoot under the burning sun by news show "Hodo station" on 15th/September/2008.

Effect validation case 3-2
Oshiage 1 year after application(Picture taken from roof of the school)



Heat Exchange Paint applied for most of the playing ground keeps the temperature that you can walk on barefoot, which is the temperature is 33.5℃ and the surface temperature is between 40 and 45℃ though it passed 1 year after application. The highest temperature on the thermograph screen is indicated rubber chip thermal barrier application surface on the top left. Pupils' temperature keeps normal temperature because of no reflection from the playing ground. The surface temperature on rubber chip/asphalt is too hot between 50 and 60℃ to walk on barefoot.

Sumidakuritsu Oshiage primary school

Measured at 12:30 on 20th/September/2007 Weather: Fine Temperature:33.5℃ Humidity: 52%

Effect validation case 3-3

Picture 3years and 8 months after application at Oshiage primary school (Temperature: 30℃)

Effect validation case 4

Adhesion of dirty cannot be seen 8 years after application.

Example of construction of city-provided housing in Tagawa city, Fukuoka pref.

Built 8 years ago
Whole building applied with Heat Exchange Paint
As for meeting hall (low building), it is applied with ordinary paint

Difference of dirty

Magnified view of image of the building 8 years after application

Effect validation case 5 (verification test for provision of sultry night)

It is confirmed that Heat Exchange Paint that keeps drawing heat from brandering after sunset is valid for provision of sultry night.

Purpose of test

In order to verify whether Neat Exchange Paint is valid or not, it is confirmed to do heat exchange from heat storage medium as soon as sunset.

How to test

To compare and examine process of temperature after measuring road temperature at some point in the car parking from daytime to night

Place to measure temperature

①Part where Heat Exchange Paint applied (Black)
②Part on white line (=Applied part by high reflection thermal barrier paint)
③Paved surface (New asphalt)
④Unpaved surface (Old asphalt)

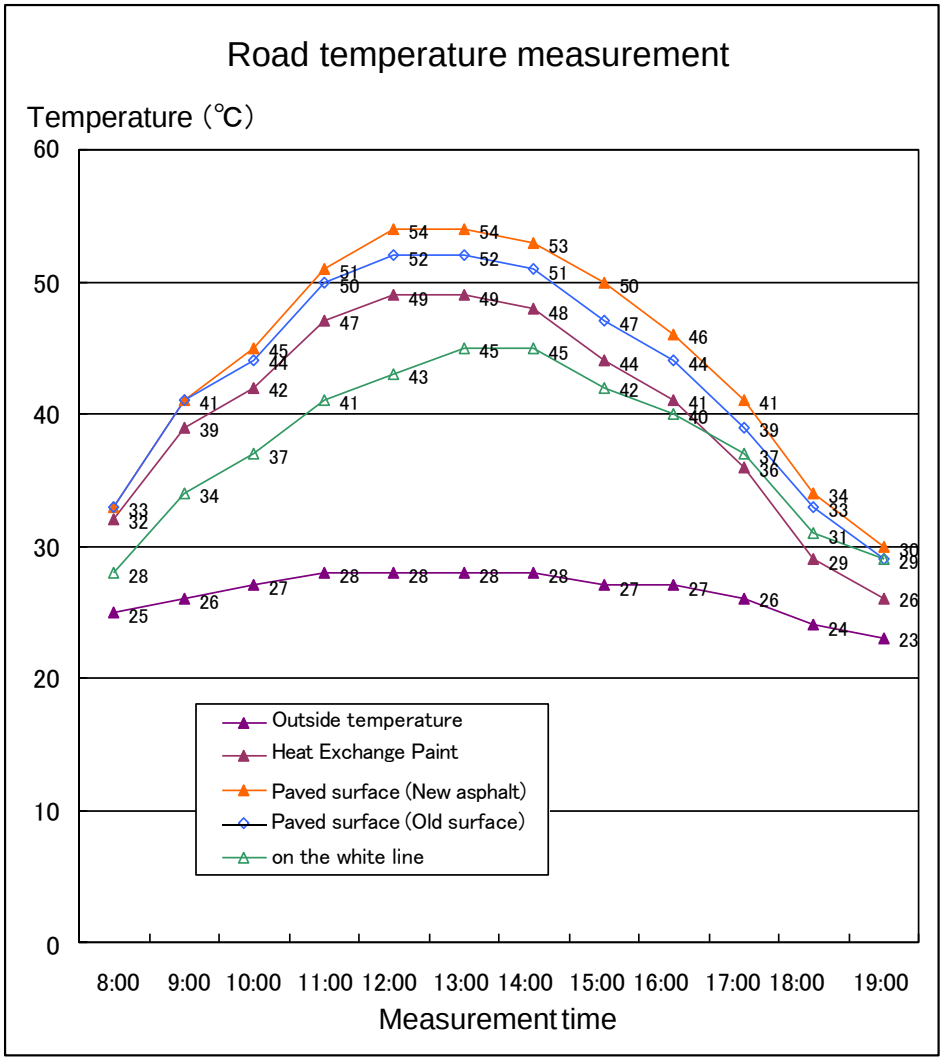
Time to measure temperature

Between 8:00 and 19:00 (11 Hours) in May, 2004

Test result

As for Heat Exchange Paint, the temperature is not homogenized but decreases parallel despite attaching brandering from time to decrease Sun heat. (Approx. 16:30) In contrast, as for white line, it homogenizes temperature with brandering from the same time as previous one.

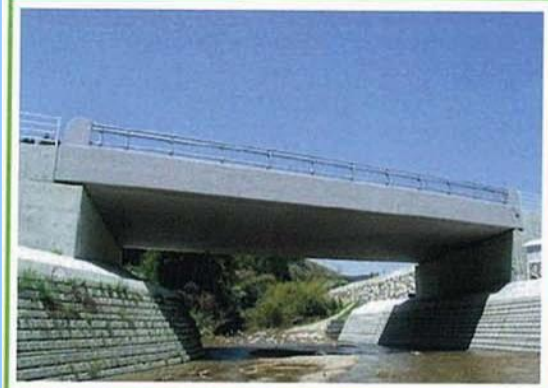
For this reason, it is proved that Heat Exchange Paint draws heat of brandering from sunset. Therefore it is judged that Heat Exchange Paint is valid for provision of sultry night.



Effect validation case 6 (Heat insulation construction test at Yado bridge in Saga pref.)

We verified thermal effect in Winter. We found that there was big difference of surface temperature between applied surface with Heat Exchange Paint and the one without Heat Exchange paint.

Photo of the bridge



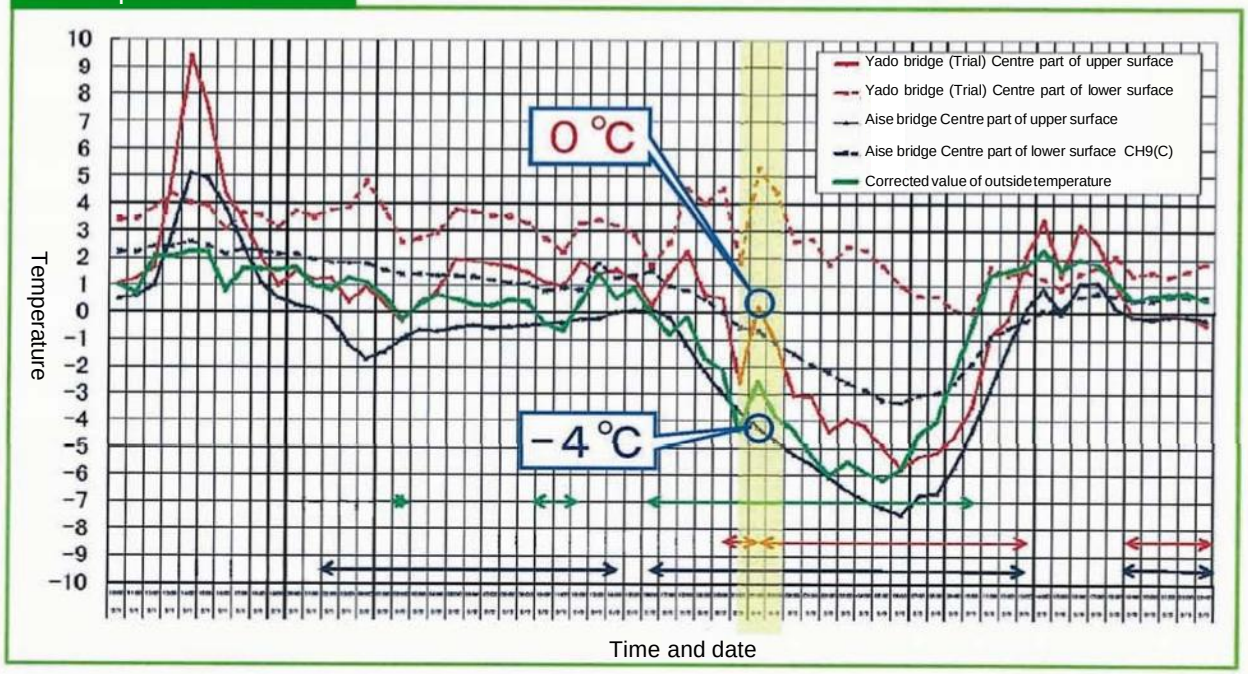
Pavement applied with Heat Exchange Paint: 0℃

Pavement applied without Heat Exchange Paint: -4℃

Difference of temperature between Pavement applied with Heat Exchange Paint and the one without Heat Exchange Paint: About4℃

Outside temperature：－2℃

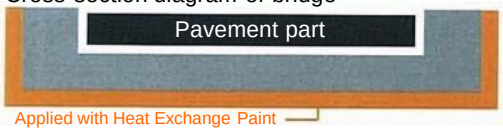
Temperature chart



How to verify

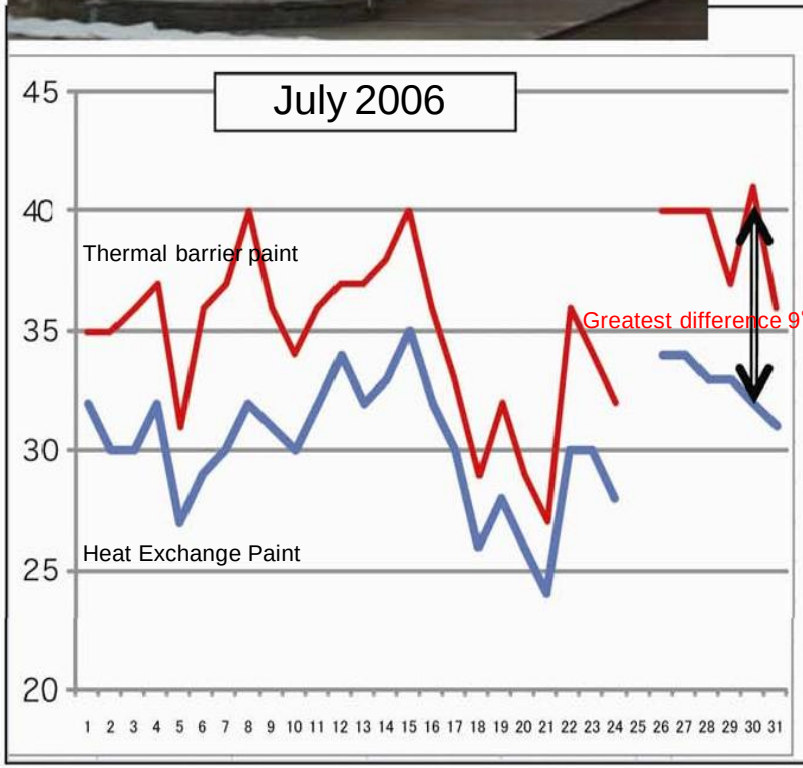
We investigated thermal effect in Winter measuring difference of the temperature between applied surface with Heat Exchange Paint and the one without Heat Exchange paint after installing temperature sensors at Yado bridge (applied with Heat Exchange Temperature) and Aise bridge (Non applied surface) where is approx.300m far from Yado bridge for 3 days.

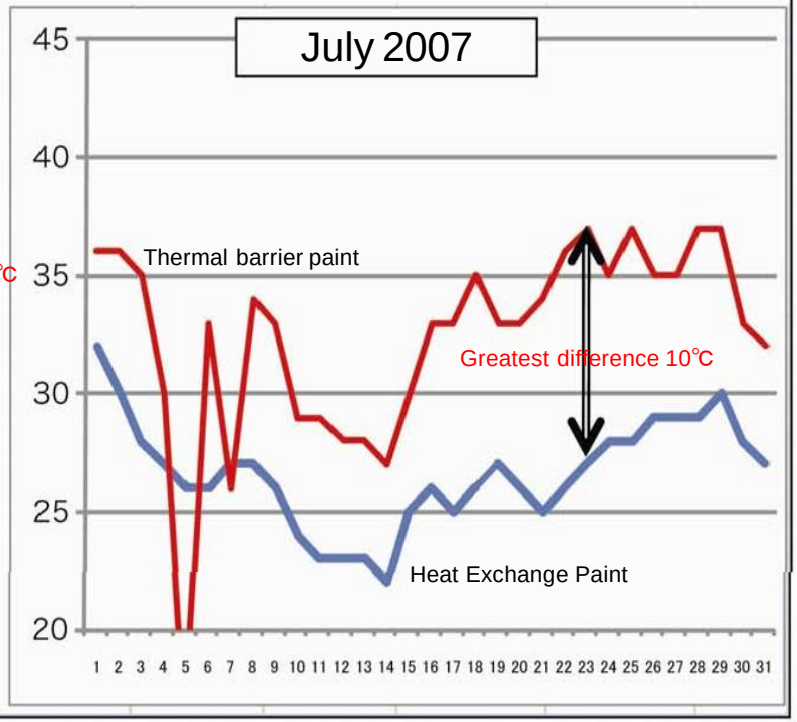
Cross-section diagram of bridge



Effect validation case 7 ADEKA CORPORATION MIE
Performance using at medium tank Keeping high effect in 2 years.

1)Liquid temperature of Heat Exchange Paint has been always low since first year except the day pouring from tanker lorry, which indicates that basic performance of Heat Exchange Paint exceeds the temperature.
2) Difference of temperature is expanding 2 years later.
Although ordinary also keeps effect 2 years later, difference of temperature and of performance are expanding.
3)The number of days which maximum liquid temperature of Heat Exchange Paint is over 30℃ decreases 2 years later. Therefore it is estimated that the number of aspersion cooling at midsummer decreases.





The difference of liquid temperature between Heat Exchange paint and thermal barrier paint is 10℃. In case of ordinary paint, it will be estimated that liquid temperature decreases widely.

Point that liquid temperature decreases dramatically and the day when the difference getting close mean that liquid was poured earlier than lorry..

Effect validation case 8-1
Achievement at poolside

Tokyo Summerland Co.,Ltd. (Akiruno-city, Tokyo)
Applied in July 2007

Moreover, as the first trial, we applied floor at newly-built poolside with Heat Exchange Paint, which is used as a high temperature control policy of poolside floor at midsummer after it is found that the difference of temperature between non applied surface temperature (38.3℃) and applied surface temperature (31.3℃) is approx. 7℃ when outside temperature is 28.2℃.

"Monthly Taiiku Shisetu" Issued in September, 2007
Excerpt from Tokyo Summerland Co.,Ltd. article
small room manager

Effect validation case 8-2

Measurement picture (Heat Exchange Paint・beige ordinary paint・green

Tokyo Summerland Co.,Ltd. (Akirunoshi, Tokyo)

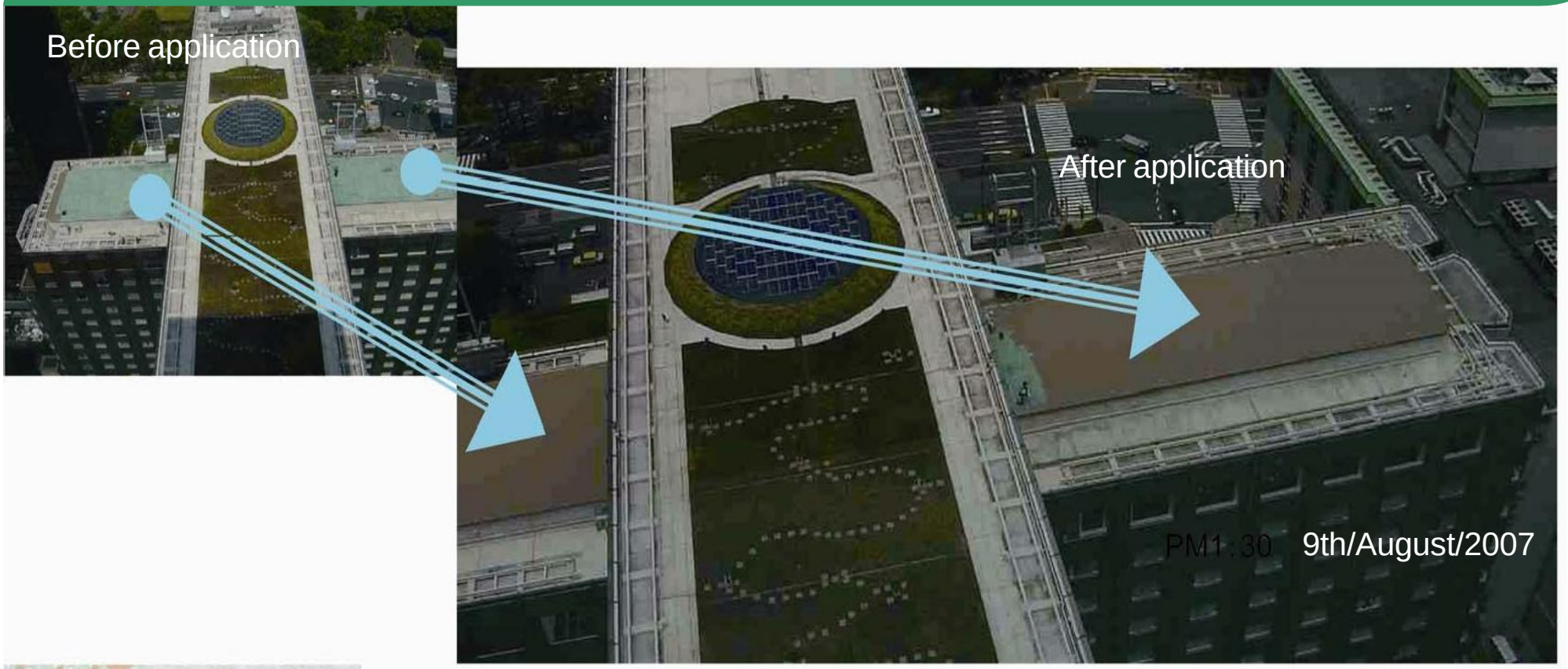
Measurement date: 27th/June/2007
Measurement time: 10.30 AM
Weather: Fine
Temperature: 28.2℃

Asphalt part applied with Heat Exchange Paint

Rubber chip part applied with thermal barrier paint

Unpainted rubber sheet part at poolside

Effect validation case 9
Achievement at Toshi hotel



Heat Exchange paint was used to apply on FRP roof of rooftop restaurant, so that ventilation efficiency grew.

Do the best, Japan!!

Netsu Kokan Toryo Koho kenkyukai

102 Concourse S, 382-2 Shimotogari Nagaizumi cho, Suntogun, Shizuoka 411-0943

AR PLC.

TEL&FAX 055-989-6670