IRUV CUT COAT

-IRUV CUT COAT Energy Saving Performance Measurement-

Sketch

To Nature, Earth & Humans

ECO

- The purpose of energy-saving performance measurement

  - Verify the thermal barrier effect of IRUV cut coat application

  - Quantify the energy-saving effect of IRUV cut coat by measurement.

2 : Energy saving calculation method

▪ Preconditions of trial calculation

Condition 1
- When the average room temperature goes down 1℃ during the operation time , Energy saving gets to 10% reduction of air conditioner cost.

Condition 2
- The energy effect is calculated by electricity fee only (except gas , heavy oil , Heating oil.)

Condition 3
- Application room is working by the commercial air conditioning system, even if actual air conditioner is Central air-conditioning system and so on.

2 : Energy saving calculation method

■ Procedure of trial measurement

STEP1 : Preparation

The selected two rooms to be measured, to collect the necessary data

⬇

STEP2 : Room temperature measurement

It measures both coated and uncoated rooms temperature. And also,
It calculates the difference between the average room temperature of 2 rooms

⬇

STEP3 : To calculate the electricity consumption and the years depreciation

Set the energy saving performance to 10% reduction when the temperature
difference is 1℃．It calculates Annual electricity consumption reduction compared
between coated room and uncoated room.

2 : Energy saving calculation method

STEP1	STEP2	STEP3

【STEP1】 Two rooms to be measured

《Selection condition》 ※ **Prepare the rooms have same condition as much as possible !**

① Same floor area

② Same direction of Window

③ Same number and the size of window

④ Nobody use measuring rooms

⇒We recommend to measure during holidays and day off .

※Notes

・In the case of the measurement room is wide space (atrium, etc.) or large floor area, there might be no temperature difference between coated and uncoated room. Because the room temperature is often changed.

・Please select Small and medium-sized room (such as a conference room) that is as much as possible hermetically sealed as measure room.

・It might be difficult to see the effect by the measurement time.

STEP1：
Preparation

We select 2 rooms as measure target, and collect Necessary data.

2 : Energy saving calculation method

STEP1	STEP2	STEP3

【STEP1】 Collect necessary information before calculating

①Mean temperature difference：It measures room temperature of coated and uncoated

②Power consumption of air conditioning

③Operation time / day off/ holiday of Air conditioning

④Operation period for a year

STEP1：
Advance preparation

We select 2 rooms as measure target, and collect Necessary data.

2 : Energy saving calculation method

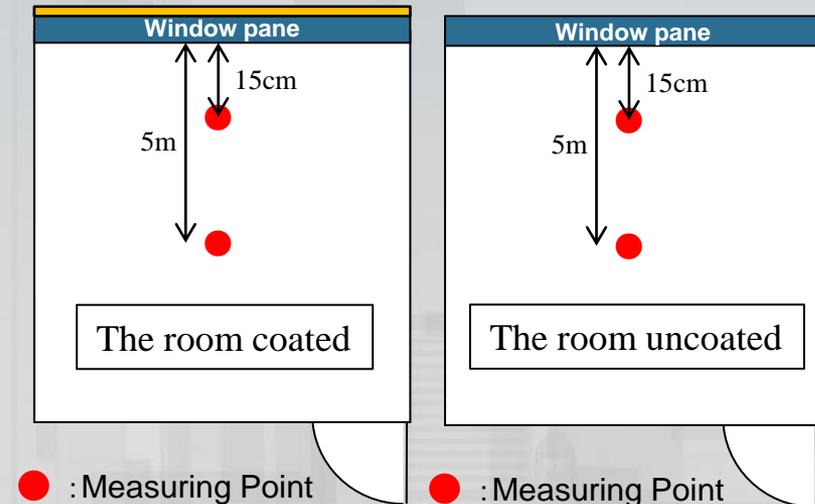| STEP1	STEP2	STEP3

【STEP2】 **Method of measuring the room temperature**

It measures 2 rooms temperature of Coated and Uncoated more than 1 week.

2 rooms are the same area of windowpane , floor , direction.

《Notes while the measuring period》

①2 measuring points; The distance is 15cm and 5m from the window pane at each room

②Measuring interval; 10-30 minute intervals

③Turn off air conditioner while measuring

④Keep open the curtain or the window shade

⑤Don't open the windowpane

Window pane
15cm
5m
The room coated

Window pane
15cm
5m
The room uncoated

● :Measuring Point   ● :Measuring Point

STEP2:
Measuring room temperature   It measures 2 rooms temperature and calculates the difference of mean 2 rooms temperature.

2 : Energy saving calculation method

| STEP1 | STEP2 | STEP3 |

Measuring room temperature device for example

Product **'Thermo cron SL'** is made from KN Laboratories company in Japan

http://www.kn-labs.com/thermochron_sl.htm

Mounting

Setting of temperature measurement before measuring

① ② ③ ④

Measurement Name

Starting Date

Measurement Interval

⑤

Measuring room temperature

Verifying measurement of results and the mean room temperature difference

1 week later

⑥ ⑦

Recording date and time	Coated Temperature(℃)	Uncoated coated Temperature(℃)	Temperature difference Temperature(℃)	Outside temperature Temperature(℃)	Weather
2013/10/01 11:00:01	30.5	32.0	1.5	26.6	
2013/10/01 12:00:01	38.0	43.5	4.5	27.5	
2013/10/01 13:00:01	37.5	46.0	8.5	27.9	
2013/10/01 14:00:01	35.0	51.5	16.5	29	
2013/10/01 15:00:01	43.5	53.0	9.5	29.9	
2013/10/01 16:00:01	32.5	38.0	5.5	28.5	
2013/10/01 17:00:01	34.5	35.0	0.5	27.3	
2013/10/01 18:00:01	28.5	29.5	1.0	25.7	

October 1st
Maximum temperature difference :16.5 degrees

⑧

STEP2:
Measuring room temperature

It measures 2 rooms temperature and calculates the difference of mean 2 rooms temperature.
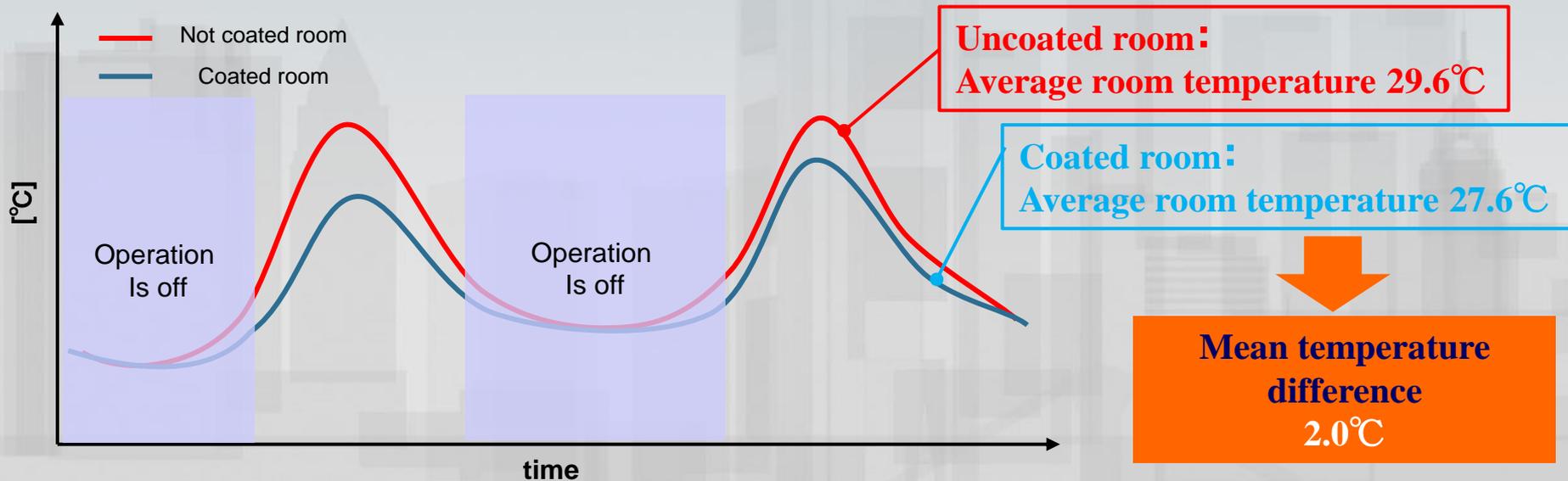
2 : Energy saving calculation method

STEP1 〉 STEP2 〉 STEP3

【STEP2】Calculating the mean room temperature difference

- It calculates an average value of the room temperature during the operating time.

- It calculates the mean room temperature difference between coated room and uncoated room

Not coated room
Coated room

[℃]

Operation Is off

Operation Is off

time

Uncoated room：
Average room temperature 29.6℃

Coated room：
Average room temperature 27.6℃

Mean temperature difference 2.0℃

STEP2：
Measuring room temperature

It measures 2 rooms temperature and calculates the difference of mean 2 rooms temperature.

2 : Energy saving calculation method

STEP1	STEP2	STEP3

【STEP3】Calculating electric consumption amount

■ Calculating the power consumption of air-conditioning after application

・Simulation：The mean temperature difference is 2℃. Power consumption of air conditioning is 18kW

After application , the power consumption of air-conditioning is below
$$18kW-(18kW×0.2)=\underline{\textbf{\textit{14.4kW}}}$$

■ Calculating the reduction amount of electricity consumption

・Simulation：Operation time of air-conditioning per a day：10hours , a year : 365days

power consumption before application[kWh]＝（18kW×10hours×365days）＝$\underline{\textbf{\textit{65,700Wh}}}$

power consumption after application[kWh]＝（14.4kW×10hours×365days）＝$\underline{\textbf{\textit{52,560Wh}}}$

Power consumption reduction ＝$\underline{\textbf{\textit{657,00Wh-}}}$ $\underline{\textbf{\textit{52,560Wh}}}$＝ $\underline{\textbf{\textit{13,140Wh}}}$

■ Calculating the energy saving cost and the payback period

・Simulation：Electricity rates is 15Yen/kwh, Application area is 200sqm, Application cost is 200sqm×2,500Yen=500,000Yen

Reduce cost for a year ＝$\underline{\textbf{\textit{13,140Wh}}}$ ×15Yen＝$\underline{\textbf{\textit{197,100Yen}}}$

Payback period = 500,000Yen ÷197,100Yen ＝$\underline{\text{within 2.6 years}}$

STEP3：The calculated power consumption	Assumption is that「the mean temperature difference of 1℃⇒energy saving of 10%」 We calculated the annual power consumption reduction

2 : Energy saving calculation method

STEP1 > STEP2 > STEP3

Using Calculating formula at excel sheet

Calculating formula of energy saving for IRUV Cut Coat

Please write only inside [ ] space
[ ] is automatically calculated

① What is the Mean temperature difference between coated room and uncoated room?
[2]℃ [20]% Energy saving of air conditioning

② What is thePower consumption of air conditioning ?
[18]kwh

③ After application , the power consumption of air-conditioning is below
[18]kwh — [3.6] = [14.4]kwh

④ How many time is your Operation time of air-conditioning ?
[10]hours [365]days for a year

⑤ Power consumption reduction for a year
[13140]Wh

⑥ What is the electricity rate ?
[15]Yen/kwh

⑦ How many field did you apply ?
[200]㎡

⑧ How much is the application cost ?
[200] × [2500]Yen/㎡ = [500000]Yen

⑨ Did you pay other cost for application? How much is it?
[ ]Yen ⇒ Total cost is [500000]Yen

⑩ Reduction cost for a year
[197100]Yen

⑪ Amortization period
[2.5]years

STEP3：The calculated power consumption

Assumption is that「the mean temperature difference of 1℃⇒energy saving of 10%」
We calculated the annual power consumption reduction