IEQ Control & Operation Performance on Industrial Project Case

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June 6, 2017

WORLD Sustainable Built Environment Conference

Organisers:

CONSTRUCTION INDUSTRY COUNCIL 建造業議會

HKGBC 香港綠色建築議會

International Co-owners:

SBE SERIES

iiSBE

Sustainable Buildings and Climate Initiative

FIDIC

Global Alliance for Buildings and Construction

Project Introduction

Brief Introduction

• Project location: Xi'an high-tech development zone with total land area of 126,667m^2 and total building area of 52,120m^2

•Total capital expenditure: 400M RMB, including green feature investment capital 13.5M RMB for LEED platinum and Chinese 3 star certificates

• Construction period: Mar. 2012 ~ Jul. 2013


Frame Workshop
Cladding Workshop

IEQ Control Efforts and Performance

High-reflection Roof

High-reflection Roof

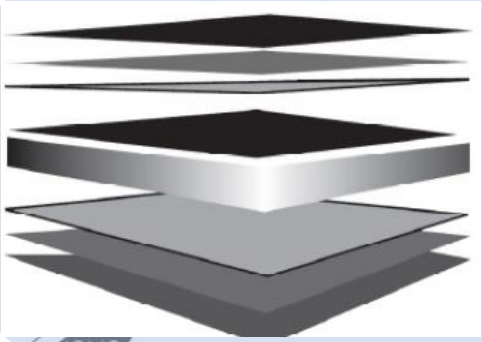
Requirements

• Energy Star : Use Star compliant(highly reflective) and high emissivity roofing(emissivity of at least 0.9 when tested in accordance with ASTM E408) for a minimum of 75% of the roof surface. The reflectivity and emissivity requirements are shown below.

• LEED : Use roofing materials having a Solar Reflectance Index(**SRI**) equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

Rating System	Roof Type	Slope	SRI	Reflectivity–ne	Reflectivity–age	Emissivity
Energy Star	Low-Slope	≤2:12	None	0.65	0.50	None
Energy Star	Steep-Slope	>2:12	None	0.25	0.15	None
LEED	Low-Slope	≤2:12	78	0.65	0.50	0.9
LEED	Steep-Slope	>2:12	29	0.25	0.15	0.9

Note: Aged reflectivity is measured after at least three years of exposure.



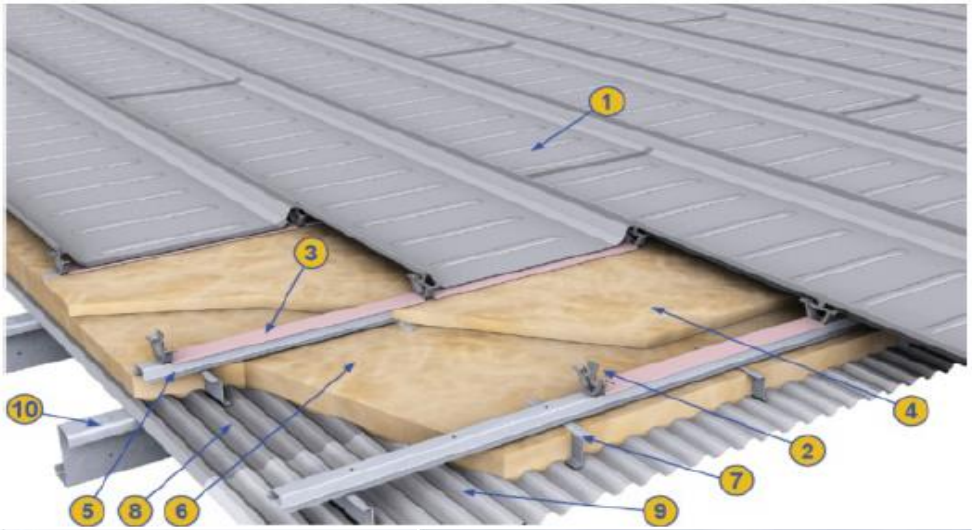
Test Result of Roof Panel: SRI = 94

Sample	Summer White
Solar Reflection	0.77
Thermal Emittance	0.87
Solar Reflectance Index (**SRI**)	**94**

*M=1.5, Convection Coefficient(medium wind): h_c=12W/(m^2·K), ASTM E1980

Enhanced Insulation System-Roof

1. **Roof Panel(Zincalume)**
2. Panel Clip(Moveable)
3. Spacer Block for Cold Bridge
4. **Fiberglass Insulation**
5. Hi-Tensile Spanning Member
6. **Fiberglass Insulation**
7. Support Bracket
8. Vapor Retarder
9. **Hi-Ten Roof Liner**
10. Hi-Ten Purlin



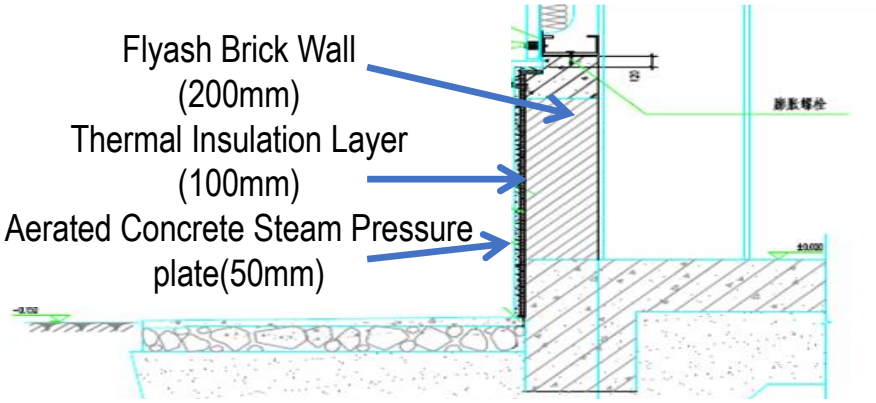
Wall Liner

Insulation

Wall Panel

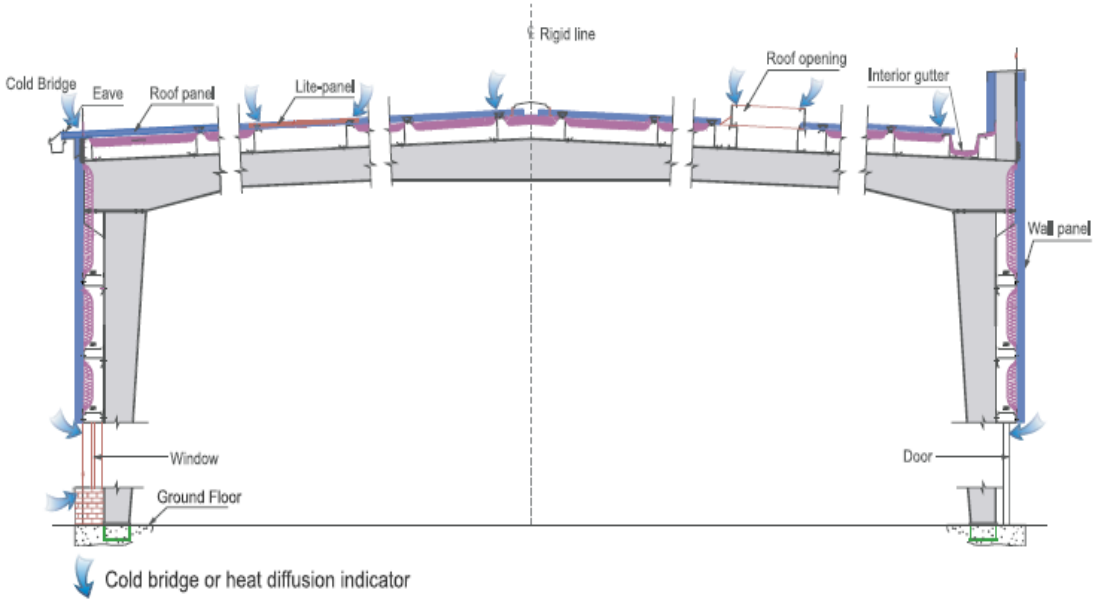
Enhanced Insulation System-Wall

	Insulation Layer Thickness	Heat transfer coefficient K(W·m-²·K-1)
Metal Roof	150mm	0.262
Masonry Wall	100mm	0.270
Metal Wall	100mm	0.386

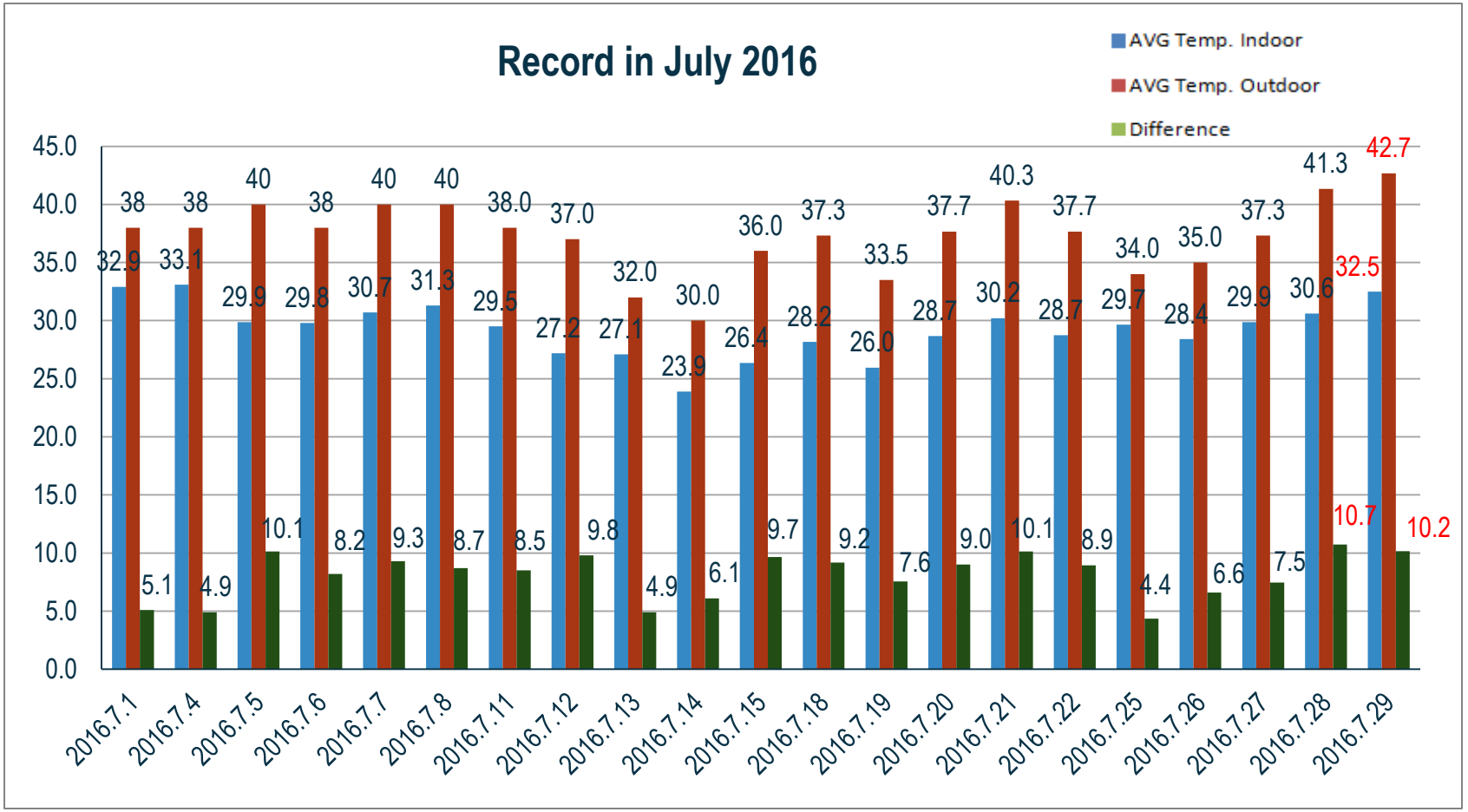


Cold Bridge Treatment

The cold bridge is formed by insulation compressed and construction gap on the interface. It is usually located on gutter, purlin, roof opening, lite-panel, windows and the interface of steel wall and brick wall. This will make the coefficient of heat transfer at some parts in the cladding system greater than others, resulting in rapid heat transfer and loss from these parts. The cold bridge depresses the building's thermal performance and increase the energy consumption of air-conditioner and heating system. A more serious problem is the condensation in the warm side(most interior side) of the cold bridge. The condensed water will influence the performance of thermal material and the indoor activity of manufacturing.



Interior Temperature Monitor

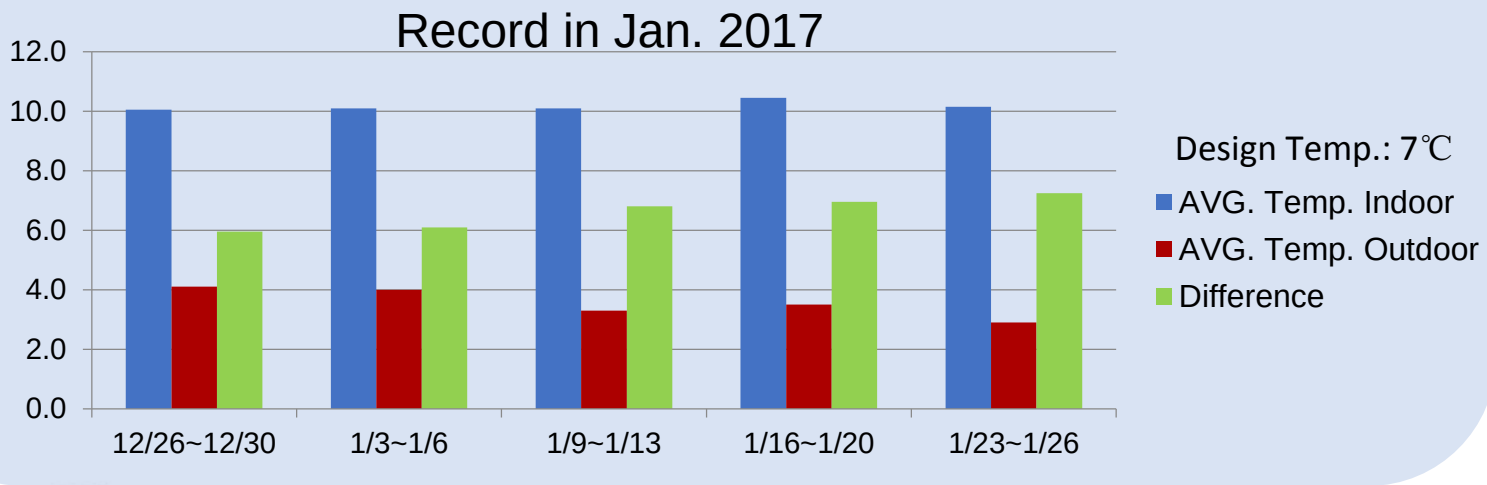


* Set 5 monitors in plant to measure temperature at 10am, 2pm and 4pm every day

Radiation Heating System in Winter

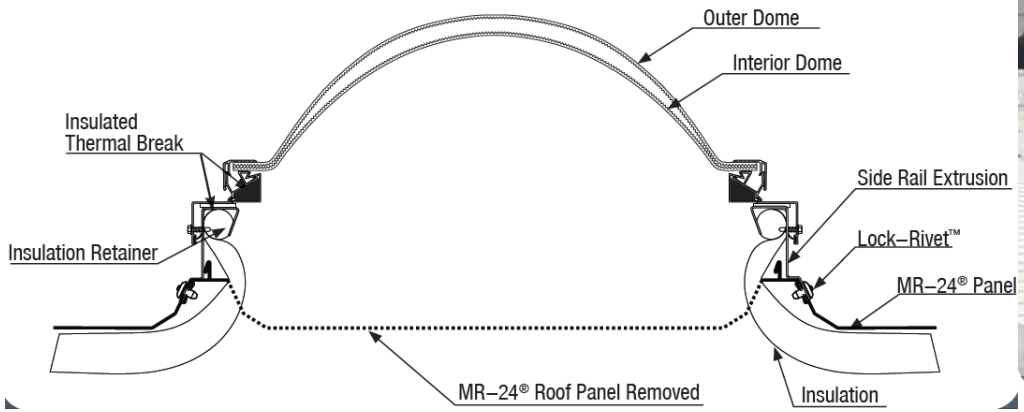
Radiant heating system can heat indoor environment by burning natural gas inside. The programmable controller regulates temperature automatically:

- 44 sets for cladding workshop
- 40 sets for frame workshop



Natural Lighting

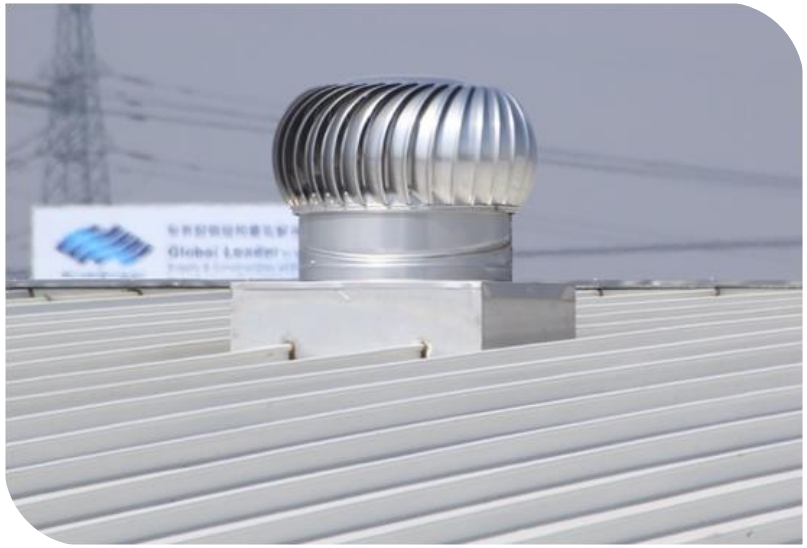
SUNLITE STRIP™ CURBLESS DAYLIGHTING SYSTEM



Performance Values	Double Dome
Dome Type	acrylic
U-Factor(W/cm·K)	0.74
Solar Heat Gain Coefficient	0.42
Visible Light Transmission %	68%

Natural Ventilation

Natural Ventilator developed as low-cost and easy to install product, with stable and reliable performance and other advantages. It runs entirely on gravity, and does not need any electricity consumption. Use proper numbers and types of ventilators to match architectural features and airflow requirements to ensure a comfortable and healthy indoor environment.

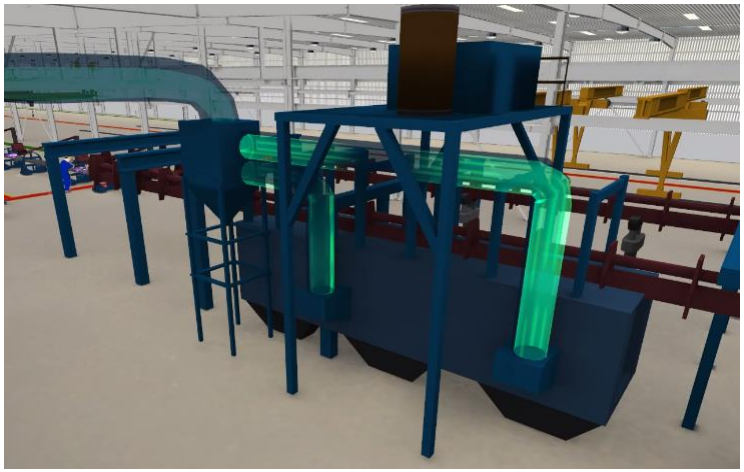


Roof Ventilator

Ridge Ventilator

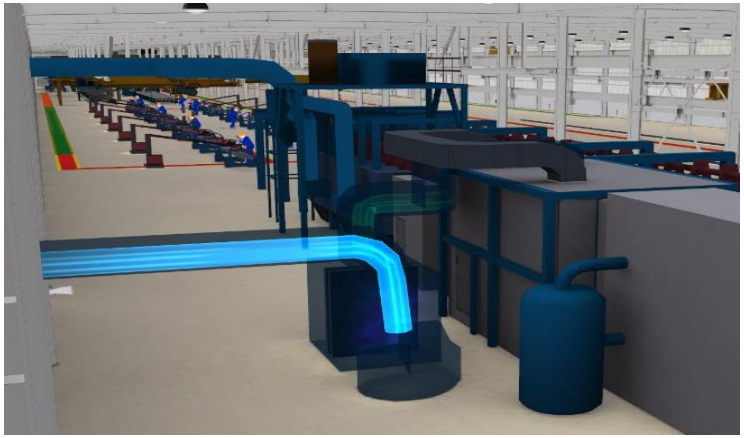
Natural Ventilator

Indoor Pollutants Control



Dust-handling System in Shot-blasting Cleaning Unit

Fume Collector in Manual Welding Station



Paint Spray Treatment System

Employee Health Management


检 验 报 告

No：2012A-295 共

试样编号：2012A-295 温 度 23℃ 湿

主要检测仪器：

电子天平、气相色谱仪等。

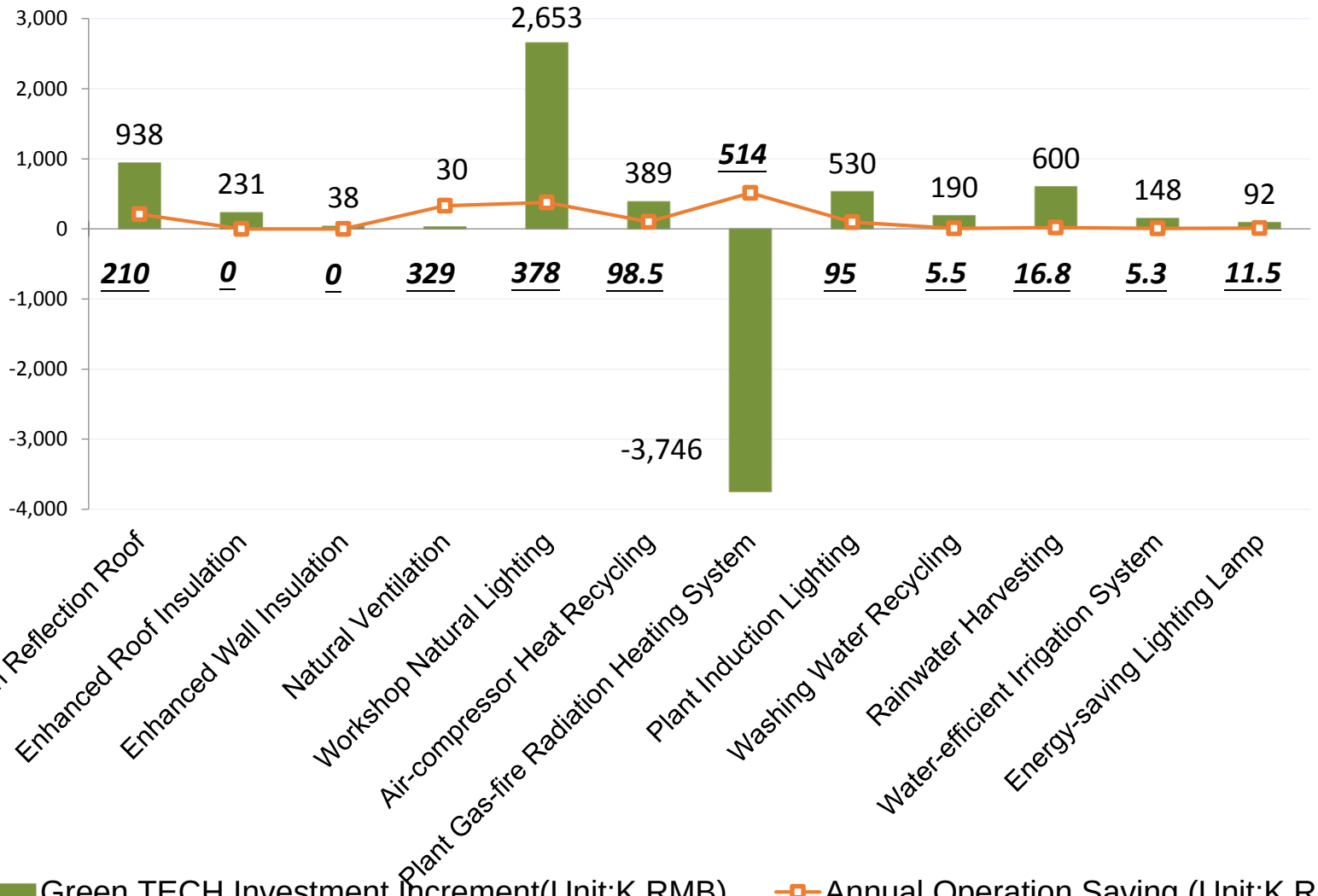
序号	检 验 项 目	标准要求	实测结果
	挥发性有机化合物含量（VOC）（g/L）	≤120	35

Organisers:

International Co-owners:

Investment & Rewards

How much we paid ?



What we can get ?

西安工厂绿色技术投资增量及回收期 Green TECH Investment Increment and Recovery Period of Xi`an Plant				
绿色项目涉及金额 Capital of Green Item	传统造价 Traditional Capital	绿色投资增量 Green TECH Investment Increment	年节省费用 Annual Cost Saving	回收期 Recovery Period
RMB K				年 year
13,541	4,056	9,993	2,266	4.4

西安工厂每年节约能源量 Energy saving every year of Xi`an Plant				
类别 Item	节水（吨） Water Saving (T)	节电（度） Electricity Saving(KW.H)	节气（立方米） Natural Gas Saving(m^3)	节地（亩） Ground Saving (Mu)
数量 Amount	7,360	1,562,815	76,072	4.5

节水7360吨
Saving Water 7360T

节约标准煤521.5吨
Saving Standard Coal 521.5T

减少 1190.4 吨 CO_2
Reduce CO_2 1190.4T

减少 212辆汽车的碳排放
Reduce CO_2 of 212 Cars Emission

Thank you