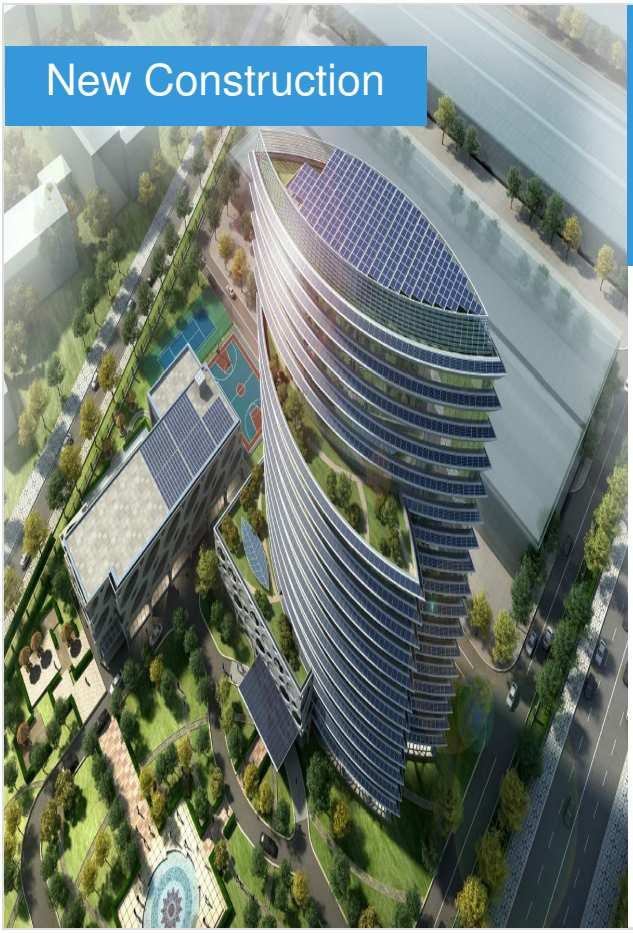
Zhuhai Xingye New Energy Industrial Park R&D Building

by Yuhui Wu / 2018-06-14 16:35:55 / China / 12482 / CN



Primary energy need :

50.25 kWhpe/m².

(Calculation method : Other)

ENERGY CONSUMPTION

Economical building *Building*

- *< 50* **A**
- *51 à 90* **B**
- *91 à 150* **C**
- *151 à 230* **D**
- *231 à 330* **E**
- *331 à 450* **F**
- *> 450* **G**

Energy-intensive building

Building Type : High office tower > 28m
Construction Year : 2014
Delivery year : 2017
Address 1 - street : 9 519085 ,
Climate zone :

Net Floor Area : 23 546 m^2 NGF
Construction/refurbishment cost : 100 000 000 ¥
Number of Work station : 1 100 Work station
Cost/m2 : 4247.01 ¥/ m^2

Certifications :

General information

Zhuhai Singyes Renewable Energy R&D Building("Greenyes" in short), is located at No. 9 Jinzhu Road, Technology Innovation Coast, High-tech Zone, Zhuhai City, Guangdong Province, China. The building covers an area of 2302.72m2. The total construction area is 23,546 m2, of which the total floor area is 22,148.38 m2,the plot ratio is 1.24%, the green plot rate is 50.4%.the number of building layers is 17 (including 3 podiums), and the building height is 70.35 m. It is a comprehensive office building integrating office, conference, experiment, display and leisure.

The project has many functions such as office, conference, and exhibition. The core idea of this building is land saving, water saving, energy saving, material saving and indoor environment protection, which can on behalf of ultra-low energy buildings in hot summer & warm winter regions in Southern China. It focuses on Smart Micro-Grid Solar Power technology based on office buildings, lighting energy-saving technology, building adjustment, R&D and demonstration of building mixed ventilation technology. The main technologies include products based on renewable energy technologies: Multi-functional photovoltaic curtain wall, Land scope-style PV roof shading system & photovoltaic louver parapet, double-skin PV canopy; the cooling without air-conditioning system at first floor based on passive energy-saving technology, products such as technology, rainwater reuse system, building energy management systems, tubular daylighting systems, energy feedback elevators and so on.

In addition, the R&D building is adapted according to the season change. The air conditioning season is from May 1 to October 15 each year. During the rainy season from March to April, the fresh air system is selectively activated according to meteorological conditions to reduce indoor humidity. Natural ventilation is used in other time periods to cool down and there is no heating throughout the year. Under the unremitting efforts of Singyes Solar R&D team, the

designed energy consumption is 50kWh/(m2·year), which is about 1/3 of the average energy consumption of office buildings in Guangdong Province. According to the actual commissioning situation, the actual energy consumption of the R&D building is reduced to 42.9kWh/(m2·year).

As the second ultra-low energy demonstration project of the CERC Building Energy Alliance, the project has also become the green building demonstration project of the Ministry of Housing and Urban-Rural Development of China. It was recorded as the best public building case in the “Annual development research report of 2018 China Building Energy Efficiency” and obtained the China certificate of green building design label--three stars and the US LEED green building NC-- Platinum-level, strives to contribute to the development and progress of China and the world green building industry.

Data reliability

3rd part certified

Stakeholders

Contractor

Name :

Construction Manager

Name :

Stakeholders

Function : Designer

zhangling@zhsye.com

http://www.singyessolar.com

Zhuhai Singyes Renewable Energy Technology Co., Ltd. , is responsible for the overall project planning, construction drawing design, consulting, commissioning and O&M.

Function : Construction Manager

Responsible for the construction of the curtain wall, photovoltaic power generation energy-saving technology

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Contracting method

General Contractor

Owner approach of sustainability

The project aims to build ultra-low-energy buildings in hot summer and warm winter areas in China. Focusing on land saving, water saving, energy saving, material saving and protecting indoor environment. It focuses on Smart Micro-Grid Solar Power technology based on office buildings, lighting energy-saving technology, building adjustment, R&D and demonstration of building mixed ventilation technology.

(1) Through passive energy-saving technology and solar hot water system, the project can save about 381,100 kWh per year, equivalent to 137.20 tons of standard coal; reduce carbon dioxide emissions by 359.45 tons, reduce sulfur dioxide emissions by 1.17 tons, and reduce nitrogen oxide emissions. 1.02 tons; (In accordance with the National Development and Reform Commission's medium- and long-term special energy conservation plan, the coal consumption of coal-fired power supply in 2010 will be 360 grams of standard coal/kWh, and the industrial boiler will produce 2,620 kilograms of carbon dioxide per ton of standard coal, 8.5 kilograms of sulfur dioxide, and 7.4 tons of nitrogen oxides. Calculated in kilograms; calculated according to the commercial electricity price of 1 yuan / kWh, equivalent to an annual savings of 381,100 yuan.

(2) The annual non-traditional water utilization is about 8381.9 tons, the water saving is 8381.9 tons, the water fee is 3.58 yuan/ton (including sewage charges), and the annual water saving is more than 30,000 yuan.

(3) It can effectively reduce environmental damage and pollution in material production while saving money by waste recycling and the use of recyclable materials.

Architectural description

The project is a comprehensive office building integrating office, conference, experiment, exhibition, leisure and other functions. Its graphic design is inspired by the leaves in nature, which means that the building returns to the natural, green and low-carbon design concept.

The project includes but is not limited to the following main technologies: products based on

renewable energy technologies such as: Multi-functional photovoltaic curtain wall, Land scope-style PV roof shading system & photovoltaic louver parapet, double-skin PV canopy; the cooling without air-conditioning system at first floor based on passive energy-saving technology, products such as technology, rainwater reuse system, building energy management systems, tubular daylighting systems, energy feedback elevators and so on.

Research and development of intelligent micro-energy network technology based on office buildings, lighting energy-saving technology, building adjustment and building mixed ventilation technology, through reasonable site design, green garden design, indoor thermal design, can achieve protection of the surrounding environment and indoor environment Improvement, indoor pollutants monitoring. At meantime time, it can indoor adjust light environment by high-transparence glass and adjustable external shading, effectively improve indoor environmental quality and enable employees to work in a healthy and comfortable environment while minimizing building energy consumption.

The annual energy consumption of the project is about 1010100kWh in 2017, and the design index per unit of building area is 50kWh/(m2·a). The actual electric energy provided by photovoltaic power generation is 150311kWh, accounting for 14.88% of the total annual electricity consumption. The actual energy consumption per unit of floor space is only 42.9 kWh / (m2.a). The visualization system also implements full-parameter, full-process management and control functions for energy consumption to ensure a comprehensive solution for energy consumption monitoring, centralized equipment control, and energy-efficient operation management.

Building users opinion

As a building user, the project evaluation of the project effect is as follows:
(1) In terms of thermal comfort, the project adopts the system of fan coil + independent fresh air. The office can adjust the air conditioning temperature and wind speed at the end through the intelligent control platform according to individual needs, which can meet the requirements of thermal comfort.
(2) In terms of air quality, a CO2 concentration monitoring system is also installed in the office area to adjust the indoor fresh air volume in conjunction with the ventilation system to ensure air circulation;
(3) In terms of light environment, the project adopts high-transparence glass, and the plane layout is reasonable, which has a good lighting effect; in addition, a light pipe system is arranged between the basement equipment for illumination;
(4) In terms of acoustic environment, the layout of the interior of the building is reasonable, the office area is made of office carpet, and the outer window is made of 8+12A+8 three-silver Low-E insulating glass, which has good sound insulation effect.

Energy

Energy consumption

Primary energy need : 50,25 kWhpe/m^2.

Primary energy need for standard building : 96,60 kWhpe/m^2.

Calculation method : Other

Final Energy : 50,25 kWhfe/m^2.

Breakdown for energy consumption :
HVAC: 18.93Kwh/m2/year;
General lighting socket equipment: 9.24Kwh/m2/year;
General power equipment: 22.08Kwh/m2/year.

Envelope performance

Envelope U-Value : 0,45 $W.m^{-2}.K^{-1}$

More information :
8+12A+8 three silver Low-E insulating glass, aluminum alloy window frame adopts broken bridge insulation technology measures. The system heat transfer coefficient reaches 1.6, the glass shading coefficient is 0.29, the external shading coefficient is 0.68, and the visible light passing ratio is 53%.

Building Compactness Coefficient : 0,15

Indicator : GB/T 7106-2008

Air Tightness Value : 3,00

Real final energy consumption

Real final energy consumption/m2 : 39,80 kWhfe/m^2.

Year of the real energy consumption : 2 017

Renewables & systems

Systems

Heating system :

- No heating system

Hot water system :

- Solar Thermal

Cooling system :

- Water chiller

Ventilation system :

- Double flow

Renewable systems :

- Solar photovoltaic
- Solar Thermal

Renewable energy production : 16,00

Solutions enhancing nature free gains :

The building is oriented in the south and the north. The first floor adopts a large open space without air conditioning system. The indoor vertical ventilation is realized by the horizontal glass louver curtain wall with 170°rotation around it. The vertic

Smart Building

BMS :

This project adopts BP neural network-based building energy management system to effectively monitor equipment such as air-conditioning system, lighting system, exhaust system, and power distribution system, monitor real-time key data, collect data related to energy consumption, and realize construction. Data management and visual management of energy management.

Smartgrid :

The smart-microgrid system has an installed capacity of 122.808 kW and a total of 714 monocrystalline silicon photovoltaic modules. The inside PV modules are connected to the microgrid system through five inverters. The core equipment of the equipment consists of: 1 micro-network control cabinet; 1 static switch; 2 50kW energy storage inverters run in parallel to form a two-way system; a set of 80kWh lithium battery cabinet.
The combination of smart micro-grid and building is an effective form of renewable energy utilization. The smart micro-grid of this project is dedicated to the green machine room center to ensure that the important load is always powered. It uses two energy storage inverters to operate in parallel. The AC dual-end hybrid microgrid redundancy system, the energy management system can effectively regulate the power resources through the energy storage link, which can balance the power consumption difference between day and night and different seasons, adjust the remaining shortage, ensure the safety of the power grid, and realize the traditional UPS guarantee. The power function of the load terminal.

Users' opinion on the Smart Building functions :

The office building adopts the technical measures of three-link control of fresh air, air conditioning and lighting based on human behavior induction. With information technology as the carrier, the human body is positioned by microwave and RFID, combined with the

integrated technology of building intelligent control system, lighting, air conditioning, The control of the fresh air is related to the activities of people inside the building, realizing “open when people go, close when people go”. And each person can adjust the air-conditioning wind speed, temperature and lighting switch of the independent terminal through the webpage or APP according to their own needs, which also avoids unnecessary energy consumption.

Environment

Urban environment

The project is located in the Science and Technology Innovation Coast of Zhuhai High-tech Zone, Guangdong Province. It has convenient urban rail transit stations. There are 2 public transportation stations within the 500m main entrance and exit, and one bus line. The name of the bus station is Jianfan Biological Station, and the bus line name is: 72a Road.

Land plot area

Land plot area : 2 302,72 m^2

Green space

Green space : 8 980,92

Products

Product

Seasonally controllable multi-function PV curtain wall integrated ventilation, sun shading and power generation

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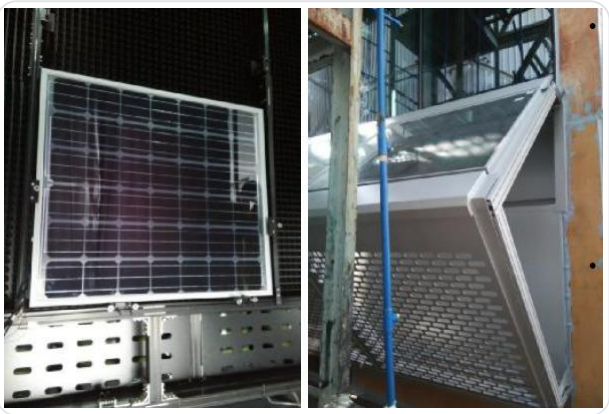
http://www.syelj.com/

Product category :

The functional photovoltaic curtain wall integrates photovoltaic power generation, shading and natural ventilation functions,



and can simultaneously achieve the effect
of saving photovoltaic power generation efficiency, reducing the heat transfer capacity of the enclosure structure into the room, reducing the use time of the air conditioner and reducing the indoor load, etc. Full utilization of natural energy and clean energy; natural ventilation by hot pressing and wind pressure, adjusting the opening position of horizontal ventilation adjusting device through effective control strategy, changing the ventilation mode in different seasons, improving indoor thermal comfort and ventilation It is suitable for adapting to changes in environmental parameters inside and outside the window.

Multi-functional photovoltaic curtain wall - This product is a light-weight multi-functional photovoltaic curtain wall integrating solar photovoltaic power generation, building shading and natural ventilation. R&D personnel use advanced computer simulation and monitoring technology to design and operate products while improving production processes and technical processes. The combination of photovoltaic technology with building shading and ventilation enables the integration of shading, ventilation and power generation in a single building component, while effectively improving energy efficiency and achieving building energy efficiency. While providing electricity to the building, it uses its natural ventilation function to reduce the temperature of the solar photovoltaic backplane, improve its power generation efficiency, reduce the temperature inside the channel, and avoid heat transfer to the room. Secondly, it can also utilize the natural ventilation of the multifunctional photovoltaic curtain wall. The function improves indoor thermal comfort, summer closure, spring and autumn and excessive season natural ventilation, winter heating, reducing air conditioning energy consumption; finally, this multifunctional photovoltaic curtain wall can also be used as a deep challenge to the building to achieve the effect of shading energy saving. This technology is suitable for all types of buildings in areas with abundant solar energy resources, especially high-rise buildings.

Costs

Construction and exploitation costs

Global cost : 100 000 000,00 ¥

Renewable energy systems cost : 1 177 360,00 ¥

Global cost/Work station : 90909.09

Cost of studies : 24 280 000 ¥

Subsidies : 300 000 ¥

Energy bill

Forecasted energy bill/year : 1 334 300,00 ¥

Real energy cost/m2 : 56.67

Real energy cost/Work station : 1213

Health and comfort

Water management

Consumption from water network : 15 141,90 m^3

Consumption of harvested rainwater : 8 381,90 m^3

Water Self Sufficiency Index : 0.36

Water Consumption/m2 : 0.64

Water Consumption/Work station : 13.77

Carbon

GHG emissions

Building lifetime : 50,00

Contest

Reasons for participating in the competition(s)

The core idea of this project is land saving, water saving, energy saving, material saving and indoor environment protection. It focuses on Smart Micro-Grid Solar Power technology based on office buildings, lighting energy-saving technology, building adjustment, R&D and demonstration of building mixed ventilation technology. Through the actual data to lead the green building trend in South China and the world, which can play a demonstration role for the ultra-low energy design of green buildings in the hot summer and warm winter areas.

Under the unremitting efforts of Singyes Solar R&D team, the design energy consumption is 50kWh/(m2·year), which is about 1/3 of the average energy consumption of office buildings in Guangdong Province. According to the actual operation of 2017, the actual energy consumption has reduced to 42.9kWh/(m2·year) then, the energy consumption of HVAC and lighting is about 13.3kWh/(m2·year), which greatly saves the energy consumption of building operation. This application is used to alleviate the current global energy exhaustion crisis in the environment. The angle provides energy security for renewable recycling and healthy

sustainable development in remote areas and islands, and promotes the application and promotion of renewable energy. The integration of environmentally friendly and energy-saving solar thermal buildings can provide clean and economical access to energy and contribute to the healthy and sustainable development of the world.

In terms of economic benefits, through research and development and practical applications, it can be radiated to many other high-tech industries. These technologies are closely related to high-tech industries and pillar industries such as electronic information, advanced manufacturing, new materials, energy and environmental protection, and modern service industries, thereby promoting the sustained and rapid progress of related technologies in these industries, and are also significant for the development of these industries.

Building candidate in the category

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