Second Batch of Domestic TOP TENs List

China Building BP List

BP1: Case of Guangzhou White Swan Hotel Energy Saving Reconstruction

As the representative of the earliest high-end hotels in China,Guangzhou White Swan Hotel,has implemented fine transformation,management and operation based on the systematic energy diagnosis and design,has gained 3 benefits: service quality improvement,significant energy consumption reduction,and operation costs saving,has made a good demonstration for China's high-end hotels to improve the level of energy efficiency,and provided a model for reference.

Before the renovation,Guangzhou White Swan Hotel carried out energy diagnosis to clarify the current state of energy consumption of the hotel. During the reformation,the main goal is to improve system efficiency,has implemented a variety of technical methods comprehensively: Adopting ultra-efficient refrigeration engine room technology,ensure the efficient operation of the engine throughout the year. adopting low-resistance water system and chilled water with large

temperature difference operation,while improving the energy efficiency of the system,it brings three benefits of material saving,energy saving and good outlooking. Adopting high-efficiency gas steam boilers to replace fuel steam boilers,increasing the heating efficiency of the system from 60% to 90%. Adopting high-efficiency hot water system with heat recovery by electric heat pump to replace fuel hot water system,which heating efficiency up to 8.0. The system operation have the performance Real-time monitoring,automatic adjustment of equipment operating strategies,mutual coordination and optimization. Adopting the ensuring mechanism of target control in whole process,implementing energy-saving targets to each energy-using system and each stage of design,construction,commissioning and operation,ensuring the overall goal achievement.

For this practical case,the building area is about 100,000 m^2,through the overall renovation,the operating energy consumption has been significantly reduced. In 2016,the annual energy cost was saved by more than 17 million RMB. the annual average energy efficiency of the air-conditioning refrigeration engine room was as high as 5.91. the annual average thermal efficiency of the steam boiler system was 92.3% . The heat pump system with heat recovery utilized the waste heat of air conditioning,meet more than 80% of the daily hot water demand. The annual comprehensive energy consumption per unit area of the hotel is 121kWh/m^2,which is far lower than the guide value of the Energy Consumption Standard for Civil Buildings.

In the recent three years,while hotel's turnover has increased year by year,the total energy consumption and which costs have decreased year by year. From 2017 to 2019,the hotel’s energy consumption costs accounted for as low as 5.76%,4.79%,and 4.24% of turnover. ■

BP2: China Academy of Building Research Nearly Zero Energy Building

China Academy of Building Research (CABR) has developed a Nearly-zero energy consumption demonstration building,which is guided by Demand reduction in passive priority,Efficiency improvem‘ent in active priority’,fully plays the advantages of intelligent operation and management,and fully mobilize the coordinated operation of various building energy-saving technologies,achieves'near-zero energy consumption',has embarked on the independent way of building energy conservation in China.

In the architectural design,this practice adopts an integrated design method to improve the insulation performance of the external wall of the building,the insulation performance of the external window and the airtight performance of the building,and control the building load from the architectural plan. In the energy system,the overall efficiency of the system is improved through the design optimization of the HVAC system and high-efficiency lighting system. Regarding the use of renewable energy,optimize the operation strategy of the energy system,make full use of solar energy and geothermal energy,and reduce the consumption of fossil energy. In terms of energy management and building automation,combined with the requirements of the building's indoor environment,an intelligent operation management system is adopted to achieve fine control and optimized operation of the system and equipment. In terms of behavioral energy conservation,complete and perfect rules and regulations,combine systematic guidance and behavioral voluntariness,improve personnel awareness of energy conservation,cultivate energy conservation habits,and reduce energy waste.

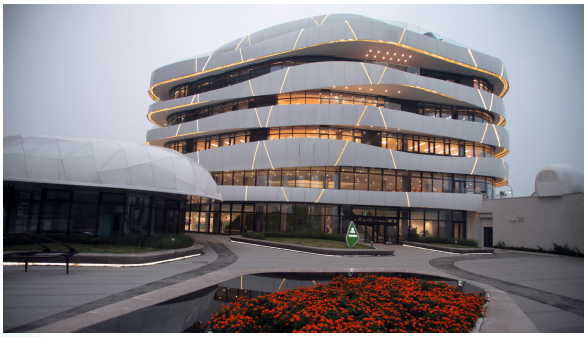
The practical building area is 4,025 square meters,and the annual operating power consumption is 34.2kWh/m^2. The annual energy consumption of the air conditioning system and lighting system is 21.6kWh/m^2,the operating efficiency of the ground source heat pump is up to 5.1,and the operating efficiency of the solar absorption chiller is 0.65. ■

BP3: Passive House Technology Center of Sino–German Ecopark

The passive house technology center of Sino-German Ecopark adopts key energy-saving technologies according to local conditions,combines scientific operation and fine management concept to create a healthy and comfortable indoor environment while greatly reducing operation energy consumption and the use of fossil energy. It is an exemplary ultra-low energy consumption public building,has a positive demonstration effects on the promotion of passive house technology in cold region.

The passive house technology center of Sino-German Ecopark applies the green - energy saving concept throughout the architectural design,selects high-performance envelope structural materials to reduce the cooling and heating loads from the demand side. adopts high-performance heat recovery ground source heat pump unit to improve the energy-saving effects of air conditioning system. combines local climate characteristics and energy endowments,rationally utilizes renewable energy such as geothermal and solar photovoltaics. optimizes the design and selects the appropriate air conditioner terminals,combined with temperature and humidity independent control technology,provides cold and heat sources with different water temperatures for the fresh air unit and the chilled beam system to maximize the system efficiency. Rationally design the airflow structure,ventilates the air from each room sufficiently flows through the public area,effectively improving the quality of the cold and hot environment in the public area. Intelligently manages lamps and lanterns and other equipment to achieve efficient lighting and avoid waste of electricity.

In this practice case,the building area is 13,769 square meters,the energy consumption per unit building area in 2017,2018,2019 is 34.24 kWh/(m^2a),29.75kWh/(m^2a),27.75 kWh/(m^2a) respectively. Through refined operation and maintenance,the energy consumption intensity of this practice has been reduced by 19% in three years. Under the precondition of meeting the first-class comfort level,it achieves energy saving 85% compared with conventional buildings of the same type,achieves annual power saving of 720,000 kWh,saving power expenses of 550,000 RMB,saving 88 tce of standard coal,reducing carbon emissions by 220 tons annually. ■



BP4: Life-cycle Management of Energy Efficiency Target—"Joy City" Project in Chengdu

Joy City in Chengdu is the first large-scale public building project to implement target management of power consumption and energy efficiency throughout the entire process from design to operation,has always implemented the concepts of green development and has achieved significant energy-saving effects. The whole project has lasted about 50 months,accumulated rich experiences and data,provided a model for the green construction and operation of commercial complex in China.

At the beginning of the project,Chengdu Joy City has clarified the energy consumption and energy efficiency targets,and then,the design team coordinated the design,construction,and operation etc. stages to ensure the effective delivery of energy-saving control targets. At the stage of design,using actual operation data of similar projects as the reference to establish energy consumption and efficiency targets,optimizes the design plan. At the stage of construction and installation,carries out construction quality inspection to ensure achieving the technical requirements of the design plan. At the stage of equipment commissioning,strictly controls the quality of the equipment system and carries out full performance testing and debugging. At the stage of system operation and maintenance,adjustment and continuous improvement,builds the energy management platform,develops an energy consumption and energy efficiency evaluation index system,monitoring operation performance in real time,realizing on-demand adjustment,avoiding excessive supply,and carries out coordinated system adjustment and optimized operation to ensure the energy efficiency targets can be realized.

In this practice case,the building area is 180,000 square meters. Since the project was put into operation in December 2015,under the premise of ensuring indoor environment comfort and customer's satisfaction,the actual energy consumption and energy efficiency have reached the design targets of 'cooling station comprehensive energy efficiency of 4.40 of the air-conditioning system,public area energy consumption

of 15 million kWh/y',and the average annual power consumption per unit commercial building area is 208kWh/m^2,which is lower than the guide value of 'Energy Consumption Standard for Civil Buildings'. In 2017,2018,and 2019,the cumulated energy saving is about 13.28 million kWh,and the cumulative reduction of carbon emissions is about 10,066 tons,has achieved significant economic and social benefits. ■

BP5: Zhuhai Singyes Renewable Energy R&D Building

The R&D building of Zhuhai Singyes New Energy Industrial Park relies on building energy-saving key technologies of the Sino-US Clean Energy Joint Research Center,focuses on energy conservation and water-saving and creating a healthy and comfortable indoor environment,sufficiently utilizes renewable energy and have a demonstrative effect on the ultra-low energy consumption design and operation of green buildings in hot summer and warm winter districts.

According to the climate characteristics of current season,sufficiently utilizes natural conditions to create indoor environments,formulates the energy-saving control plan based on energy consumption monitoring platform to accurately control and efficiently match energy demands. In the air-conditioning season,uses high-efficiency frequency variable chiller units to meet the cooling demands. in the transitional season,the fresh air system is selectively turned on according to the weather conditions,adopts the joint mode of natural ventilation and mechanical ventilation to greatly reduce cooling energy consumption of the building. combines natural lighting and LED lighting,while improving the comfort of the indoor environment,significantly reducing lighting energy consumption. Based on the structural characteristics of the building body,fully utilizes solar resources,installing solar photovoltaic and solar thermal components according to local conditions,and combining smart micro-energy grid technology to realize the linkage between renewable energy and the power grid,reducing the consumption of fossil energy.

The building area of this project is 23546 m^2. In three consecutive years from 2017 to 2019,the power consumption per unit area (kWh/m^2) are measured as: 39.8,35.4,33.8. the energy consumption per unit of HVAC and lighting equipment (kWh/m^2)) as: 23,14.8,13.2,the energy consumption has shown an obvious decreasing trend. ■

BP6: Application Case of the Whole–process Management of Near–zero Energy of No. 9 Building of Shanghai Hongqiao State Guest Hotel

No.9 Building of Shanghai Hongqiao State Guest Hotel,in the whole process of project approval,design ,construction,completion acceptance,commissioning and operation,has always been guided by the energy consumption targets,carried out energy conservation management work,and promoted the design and operation management of near-zero carbon emission buildings,has played a good demonstration role for similar building projects.

In the design stage of No. 9 Building of Shanghai Hongqiao State Guest Hotel,according to energy consumption and energy efficiency management targets,the passive energy-saving technique is introduced to optimize the thermal insulation effects of the envelope structure and reduce the actual heating and cooling demands of the building. fully utilizes natural lighting,combined with LED high-efficiency energy-saving lamps,through intelligent control of lighting power density to meet indoor lighting requirements. adopts high-efficiency air-conditioning equipment,combined with building intelligent integrated control system,and according to the actual environmental requirements of the building,implements the on-demand matching and efficient supply of fresh air heat exchange system,all-air system,and window magnetic auto-control system,to realize intelligent control of the air-conditioning system. fully utilizes renewable energy such as solar photovoltaics,simultaneously establish a renewable energy monitoring system to achieve efficient complementarity between fossil energy and renewable energy. The project focuses on construction process management,completion acceptance and commissioning,and operation management at trial run stage,ensure the building always have the goal to achieve nearly zero carbon emissions.

The building area of the project is 2866 square meters. In 2018,the operating power consumption is 34.57 kWh/m^2,equivalent to annual carbon emission of 24.89 kg/m^2. in 2019,the operating power consumption in is 34.25 kWh/m^2,equivalent to annual carbon emission of 24.66 kg/m^2. ■

BP7: CECEP–Green Building Museum

Aiming at the characteristics of hot summer and cold winter districts in China,the CECEP Green Building Museum presents an ecological,intelligent and environment friendly architectural form to the society,with its advanced technology and perfect system integration,explores the developments and applications of green,energy-saving technologies in hot summer and cold winter districts. It has demonstrated and promoted the applications of efficient,ecological and intelligent technologies in public buildings,and has a good demonstration effect.

The Green Building Museum project integrates the building function,architecture form,and the latest domestic and foreign technologies according to local conditions,sufficiently utilizes natural ventilation and lighting,combines low energy cons umption,ecological,humanized architecture forms and advanced technologies,integrated applies Green building technologies such as‘building self-shading system’,‘passive natural ventilation system’‘temperature and humidity independent control air conditioning system’,‘daylight lighting system’,‘building intelligent control system’,has greatly reduced building energy consumption. After being put into operation,it proceeds real-time monitoring of indoor and outdoor environment and energy consumption,etc.,optimizes operation strategies,has created the healthy and comfortable environment,promoted the harmonious development of man,building,and nature.

The building area of the project is 4,679 square meters. The final renewable energy utilization rate of the project reaches 17.4%,the utilization rate of non-traditional water resources reaches 40.2%,and the ratio of recyclable building materials reaches 13.5%. Compared with similar buildings,the annual power saving is about 320,000 kWh,the energy saving rate is as high as 72%. ■

BP8: Energy Saving Lean Management Case of Shunhe International Hotel in Shandong

Shandong Shunhe International Hotel,is based on the energy use characteristics of hotel industry,combines appropriate high-efficiency energy-saving technologies,carries out lean management to achieve good energy-saving and emission-reduction benefits,as well as,it also improves the hotel's profit margin and plays a good demonstration role.

According to the characteristics of hotel industry,Shandong Shunhe International Hotel adopts energy-efficiency gas boilers to recover waste heat from flue gas,greatly improves the boiler efficiency. Selects cooler units with heat recovery device to recover the cooling heat and supply the heat to the bath water system to realize the sufficient utilization of waste heat. Installs an extra air source heat pump to recover the waste heat of the boiler room and ice maker to produce domestic hot water,and at the same time,provides cooled air for the power distribution room,which gains multiple benefits by one act,has improved energy efficiency and the working environment. Transforming the gas evaporator to provide stable steam for the kitchen while reducing operating energy consumption. Replacement of LED lights greatly reduces lighting energy consumption. While adopting various energy-saving technologies,Shandong Shunhe International Hotel has established an energy sub-metering system to clearly control the energy consumption of the project and reduce energy waste. Actively carries out energy-saving management and training,takes benefits of energy-saving as a performance evaluation indicator to establish energy-saving and environmental protection awareness in the minds of every employee.

This project has the building area of 40,575 square meters,power saving of 74,200 kWh,and saving 53,000 m^3 of natural gas each year. The energy cost proportion in 10,000 RMB revenue of the hotel has dropped from 6.29% in 2011 to 4.58% in 2019. ■

BP9: Smart Energy Conservation Renovation Project in the Headquarter Building of SPIC

The Smart Energy Demonstration Project of SPIC applies integrated smart energy technology to the building energy conservation and consumption reduction project. It has innovated the photovoltaic energy-saving curtain wall technology firstly,realized the multi-level comprehensive utilization of energy,keeps an effective complementary status between building energy-conservation & consumption-reduction and photovoltaic power generation. While greatly reducing the energy consumption of buildings,it also relieves the power supply pressure of the power grid,improves the reliability of building power supply,improves the comfort of the working environment in the building,and plays a demonstrative effect on the construction of smart energy buildings.

The headquarter building of SPIC fully utilizes the valid area of the building's curtain wall and roof,replaces the original LOW-E glass with photovoltaic building integrated components and high transmittance and low radiation double silver coated glass. Combined with photovoltaic power generation technology,it not only utilizes the sunlight shining on the surface of the building to generate power,but also reduces the solar radiation entering the room to achieve the cooling effects,has saved the building's cooling energy consumption. At the same time,the photovoltaic components constructed by the integration of photovoltaic modules and building materials have improved the thermal insulation performance of the building,further saved the energy consumption of the building’s cooling in summer and heating in winter,and realized multiple effects,such as photovoltaic power generation,cooling,thermal insulation,energy conservation and consumption reduction.

This project has the renovation area of building curtain wall is 4200 square meters,involving 8600 square meters of indoor area. The renovated photovoltaic energy-saving curtain wall has an installed capacity

of 131 kWp in total. In 2018,the power generation of photovoltaic energy-saving curtain wall is 107,600 kWh,the annual power consumption of the building air conditioning and cooling system is reduced by 385,200 kWh,and the annual energy consumption of the building heating system is reduced by 357,200 kWh. In 2019,the power generation of photovoltaic energy-saving curtain wall is 105,400 kWh,the annual power consumption of the building air conditioning and cooling system is reduced by 406,300 kWh,and the annual energy consumption of the building heating system is reduced by 371,100 kWh. ■