

First Batch of Domestic TOP TENs List

China BP List

BP1: Using low-temperature industrial waste heat for district heating

Utilizing low-grade industrial waste heat from steel plants to provide heating service for civil buildings in urban area, replacing the original coal boilers, greatly reducing coal consumption, significantly improving the energy efficiency of industrial enterprises, and achieving good environmental and economic benefits, having innovated a new business model. Chifeng HERAN Energy Efficiency Technical Service Co., Ltd. utilizes low-grade waste heat from a steel plant 10 kilometers away from the Qianxi, Chifeng, provides heating service for 3.6 million m² of civil buildings in the town, has replaced seven pcs of 40-ton coal boilers. In order to realize the stable and efficient operation of the system, the project has developed

a special new vertical absorption heat exchanger to reduce the return water temperature of the primary network, realizes large temperature difference heating supply, improves the waste heat recovery rate and the transmission capacity of the pipe network. Establishing project companies in terms of the heating network and heat sources respectively, combines the business modes of Energy Performance Contracting (EPC) and Public-Private Partnership (PPP), has explored an operation model named "Integration of network and source", which is suitable for China's national conditions in the field of low-grade waste heat recovery, realizes the transformation of operation model and technology for heating supply, provides a practical mode that promotes utilizing industrial low-grade waste heat to urban central heating

projects.

According to the project operation status of the first phase, the total amount of industrial waste heat is recovered 64,000 tons of standard coal annually, reduces CO₂ emissions by 168,000 tons, reduces SO₂ emissions by 543 tons, reduces NO_x emissions by 473 tons, saves water by 380,000 tons. The energy saving rate is > 85%.

Chifeng HERAN Energy Efficiency Technical Service Co., Ltd. has changed the traditional business model of heating supply, uses long-distance industrial low-grade waste heat for urban heating service, operates the business model successfully. Its practice has actively explored in the field of industrial low-temperature waste heat utilization, has innovated a business model for centralized heating in "The Three Norths" of China where have increasingly tight heat sources, high energy consumption, and abundant low-grade waste heat resources from surrounding industrial enterprises.

BP2: Zero-energy office building practices

The public housing exhibition center of China-Singapore Tianjin Eco-City integrates clean energy utilization and integrated building design, combines the energy demands of buildings with the city energy system, maximizes the use of clean energy, achieves "zero energy consumption".

Based on the design concept of green building, there are multiple schemes of building benchmark model established in the design stage, comprehensively considering the possible happened complex energy uses of the building, performing the simulations such as sunlight, shading, natural lighting, natural ventilation, and underground heat storage, providing the basis for

passive energy-saving design in the architectural plan. At the same time, based on the design idea of the photovoltaic micro-grid system, in-grid operating of the city power grid, realizes power generation of the photovoltaic system is consistent with the building energy consumption, achieves the design goal of zero energy consumption. Maximizes the use of clean energies, integrates the design with the building, such as roof design and installation of solar photovoltaic power generation systems, ground-source heat pump air-conditioning systems coupled with solar hot water systems, to realize that the utilization of renewable energy accounts for 100% of the total building energy consumption.

The technology of the renewable energies, such as Air Through Tunnel technology, liquid desiccant fresh air unit, and capillary mat air-conditioning terminal radiation system etc., which is used in the project are all leading technologies in China.

The building area of the public housing exhibition center project is 3467m². Compared with the reference building in the same area and the same model that doesn't adopt various green building energy-saving technology, the energy saving rate is 52.6%. The operation saves 257,000 kWh (equivalent to 31.7 Tons of standard coal), reduces CO₂ emissions by 257.9 tons, SO₂ emissions by 0.7 tons, and NO_x emissions by 0.3 tons annually.

The public housing exhibition center project embodies the concept of green building from design, construction, operation, management and other stages, integrates the applications of green building technology. The practice has provided a path mode to promote "zero energy consumption" for new

buildings in the Northern China.

BP3: Energy conservation in the refining and chemical industries

Jiangsu Huachang Chemical Co.,Ltd. uses the excellent performance management model to establish overall strategic objectives and specific methods for energy efficiency management,clarify the organization structure and responsibilities - authorities,formulate short-term and mid-term energy conservation plans and performance evaluation targets. It combines the concepts of benchmarking and process management and excellent performance management model as an organic integration,continuously improves the company's energy performance through the four steps of Plan,Do Check,Analysis and improvement.

The management process of Jiangsu Huachang Chemical is: Establishing energy-saving working mode → Improving organization structure of energy-saving management → Making short-term and Mid-term energy-saving plans → Analyzing and determining key indicators → Setting benchmarks → Strengthening and improving information measurement management system → Carrying out expertise cooperation → Organizing energy-saving analysis of production facilities → Continuous improvement and promotion. The main methods include the establishment of a Three-Level energy management system in the company,workshops,and lines. setting annual and monthly energy-saving targets,and adjusting them according to the completion status to continuously improve performances. daily monitoring and analyzing to the targets and energy-saving KPI (key performance

indicators),identifying energy-saving improvement opportunities,and implementing them after review. using advanced process simulation software to carry out the whole process simulation calculation,analyzing the existing production process problems,and formulating process optimization and technical transformation schemes. sending employees to participate energy-saving professional training regularly.

From 2011 to 2014,the company has a total investment of 54.2 million RMB in energy conservation and environmental protection,with the profit rate of 22%,return period of 4.5 years. has been awarded with the honor of 'Leader' in energy efficiency in China's petroleum and chemical industry 4 times,achieves the accumulated energy-saving amount of 82,000 tons of standard coal,CO₂ emissions reduction by 204,000 tons. Annually reduces SO₂ emissions by 121 tons and NO_x emissions by 190 tons.

Jiangsu Huachang Chemical has combined years of experiences in energy management with "GB/T23331 Energy Management System Requirements",realizes systematic and standardized energy management. This model has a good demonstration and reference effect for various energy-consuming units and has the practical value.

BP4:'Gradual catch-up' Energy Manafement Model in Qingdao

SINOPEC Qingdao Refining and Chemical Co.,Ltd. 'gradual catch-up' energy management model takes the indicators of leading enterprises as the 'gradual catch-up' goals,continuous improves the energy-saving targets

through data collection, analysis and comparison, Cascaded tracking learning mechanism by learning the advanced experiences and practices to continuously improve energy performance, to catch up and step over the competitors.

The "gradual catch-up" energy management model can be summarized as: learning best practices and continuously improving metrics. The best practices refer to the most effective measures and methods adopted by leading companies in energy conservation and consumption reduction in the same industry. Continuously improving metrics refer to a set of indicator systems that can really and objectively present energy performances at different stages and the corresponding benchmark data for 'gradual catch-up'.

Use the "gradual catch-up" energy management model, learn from the advanced experiences of domestic and foreign refining and chemical companies, realize flat structure of energy management, systematic management systems, standardized process control, informatic monitoring and analysis, and continuous optimization and improvement. The first is to establish an energy-saving and emission-reduction management system in accordance with the requirements of 'gradual catch-up'. Refers to the experiences and practices of first-class domestic and international enterprises in the same industry, carries out systematic learning and continuous improvement. The second is to develop more professional and lean energy management and control. The lean management concept is implemented through the entire process of energy utilization, deploy repeated calculations, elaborate demonstrations, formulating schemes, strengthening implementation for the operation

and control at each step of energy utilization. Promote the maximization of energy-saving benefits by lean energy management. The third is to institutionalize the improvement of energy-saving technologies. Through benchmarking analysis, continually collect and search advanced domestic and international energy-saving technologies in the same industry, continuously carry out energy-saving technological transformations base on sufficient demonstration and evaluation.

Qingdao Refining and Chemical Co., by using the "gradual catch-up" energy management model, reduces the comprehensive energy consumption of refining from the design level of 74 kg standard oil/ton to 57.2 kg standard oil/ton in 2014, achieves drop of 23%. Its Energy Density Index (EII) that reflects the energy utilization level of the refinery plants takes the leading position in the Sinopec group, is also at the world's leading level in the performance evaluation system of Solomon's global refining industry.

The "gradual catch-up" energy management model is continuously learning the effective energy management measures and methods of leading companies in the same industry, as well as the continuously improving measurement standards, which has a general reference effect for energy conservation and emission reduction.

BP5: Water Cube LED lighting power-saving demonstration project

The National Aquatics Center ('Water Cube' for short) proceeds technological innovation and management model innovation in parallel, directly applies scientific research results to engineering practice, comprehensively

implements complex curved surface structure optical modeling technology, Efficient energy-saving LED lamps and advanced information network technology, realizes large-scale, full-color, variable-scene LED landscape lighting in large public building firstly.

Aims to the layout of the architectural membrane structure, Water Cube adopts the lighting method of "light transmission in cavity", which breaks through the technical problem of the surface brightness uniformity under the curved surface of the special ETFE air pillow. Uses computer simulation to construct the optical model of complex curved surface structure, establish a functional relationship between the surface illuminance and brightness of the membrane structure air pillow, maximize the optimization of the lighting layout under the ETFE irregular air pillow, provides a new application method to illuminate the transparent material with the complex curved surface structure. application methods. has researched and developed lens materials and lamp structures suitable for the characteristics of the building structure, realizes the high-efficiency secondary optical design of the LED and has solved the heat dissipation problem, formed the high-efficiency LED lighting technology with independent intellectual property rights. adopts information network technology to control the LED lighting, realizes remote high-speed synchronous control of Large-scale LED lighting, achieves more controllable energy-saving effects. The above-mentioned research and innovation are directly

applied to engineering practice, realizes large-scale full-color variable-scene LED landscape lighting on nearly 50,000 m² of ETFE membrane structure and its maintenance system.

The Water Cube LED lighting power-saving demonstration project uses 36,170 sets of LED lamps with a total power of 489 kW. Configures with information network control technology, the actual load power is 180 kW. Compared with using T5 fluorescent lamps, the power saving rate is 14.7%, achieves annual power saving 1.06 million kWh, reduces CO₂ emissions by 795 tons.

The Water Cube LED lighting power-saving demonstration project uses simulation technology to optimize the design for the special building structures, overcomes the problems of membrane structure air pillow lighting and corresponding heat dissipation, comprehensively uses multiple energy-saving technologies. This project plays an important demonstration role for high-efficiency application of LEDs used in large-scale public building landscape lighting.

BP6: Shendu Building Implements Passive Building Transformation in Shanghai

The transformation project of Shanghai Xian Dai Shendu Building is a transformation on an existing building, which overall plan is based on the characteristics of the original building, realizes the adaptation of building functions and operation modes, and establishes a comprehensive building operation energy-saving management system.

The transformation project is implemented in the whole process of planning, design, construction, operation and maintenance with green concept. According to the functional characteristics and operation modes of the building space, it integrates multiple passive energy-saving technologies for the envelope structure, applies efficient air-conditioning, lighting and intelligent control technologies. In the actual operation process, a set of analysis, adjustment and control measures have been established to control the standby energy consumption of air conditioners, the islanding effect of solar photovoltaic system, the supplementary water level control of the rainwater system, the overheating prediction control of the solar hot water system and the operation adjustment system of public lighting. The building information modeling (BIM) technology is applied to the Facility Management (FM) of the e-estate management, develops an operation and maintenance management portal platform combined with localized operation and maintenance requirements. Integrates the sub-metering system and the building auto-control system, proceeds optimization management.

The building area of this project is 7,301 m². It realizes annual power saving 434,000 kWh, equivalent to 130.1 tons of standard coal, which is less than 50% of the standard level of energy consumption of the same type building. This project reduces CO₂ emissions by 281 tons per year.

Shanghai Xian Dai Shendu Building transformation project fully considers the characteristics of building functions and operation modes through the whole project process, continuously optimizes the management

model during the operation process, which experiences can be promoted to the transformation of multi-story public buildings that have clear usage patterns and centralized management system of building air conditioning, ventilation and lighting.

BP7: Promoting "Educational energy conservation" and "Energy conservation education" in Beijing Jiaotong University

Beijing Jiaotong University implements energy conservation in its education system, uses modern communication and control technology to build a campus intelligent energy management system, realizes the organic integration of "educational energy conservation" and "energy conservation education".

Beijing Jiaotong University has listed energy conservation education in its teaching plan, strengthens energy conservation education and publicity for students through classroom education, campus education, demonstration education, and practical education. Over the past three years, there are more than 30 energy-saving renovation projects have been implemented, including building envelope renovations, classroom lighting system, air-conditioning intelligent power-saving system, elevator energy feedback system, and boiler flue gas waste heat recovery. Energy-saving products and new energy products have been widely used to improve energy efficiency level of buildings and operating equipment. It has built an intelligent energy management system covers all energy consumption factors of the campus, carries out system integration of energy-saving monitoring platform, heating

auto-control, 3D underground pipe network, classroom intelligent monitoring, library intelligent power-saving control, non-negative pressure water supply intelligent control, intelligent security system, and automatic repair claim platform, etc. systems, realizes online monitoring and real-time analysis of energy use, forecasting of energy consumption trends, optimizing scheduling and management, realizes intelligent energy-saving management in the university. In 2015, in accordance with the requirements of GB/T 23331, the university has accomplished an energy management system certification.

Since 2011, Beijing Jiaotong University has reduced its total energy consumption by 1407 tons of standard coal annually, water saving 43,000 tons, with an average energy-saving rate of 8.7% and a water-saving rate of 3.6% under the condition of continuous increasing of building area and energy-using equipment. Indirectly reduces SO₂ emissions of 23.2 tons, NO_x emissions of 22.0 tons, and smoke and dust of 13.5 tons annually.

Beijing Jiaotong University fully plays the role of educational institutions with its advantages and characteristics, integrates energy conservation into education process, realizes the visualization and systematic management and control of energy consumption. Its energy conservation practice has reference significance for comprehensive and systematic improvement of energy conservation work in universities.

BP8: Dynamic closed-loop energy management and control system in CIMC

Shenzhen Southern CIMC Equipment Manufacture

Co., Ltd. (hereinafter referred to as CIMC) combines HAIYIDA full-time dynamic energy efficiency management and control technology with production processes, establishes a dynamic closed-loop energy management and control system to realize fine management of energy-saving and consumption reduction, significantly improves energy efficiency.

CIMC combines the production process and equipment characteristics, has established a dynamic closed-loop energy management and control system of "monitoring → efficiency analysis and modeling → model simulation → efficiency management and control", provides an effective and fine management tool for enterprises continuous energy-saving and consumption reduction. The system adopts full-time dynamic energy efficiency management and control technology to realize real-time collection and storage of all energy parameters and operating parameters of energy-using facilities in the plant. A real-time online analysis model of energy efficiency is established based on process data, to realize real-time management and control of energy efficiency level and energy consumption process of energy-using facilities. A simulation model covering the whole process of 'monitoring → analysis-management and control' is established in further, continuously optimizes energy efficiency model through simulation verification, assisting enterprises to continuously optimize the energy management system, formulating energy management plan, providing supporting data for energy-saving transformation, and verifying the effectiveness of energy-saving transformation. Besides of direct energy saving, the system also has functions such as

safety management of energy supply and use, equipment management, malfunction alert and processing, remote control etc., realizes indirect energy saving and efficiency improvement by preventive maintenance of equipment

Since CIMC adopted full-time dynamic energy efficiency management and control technology to establish a dynamic closed-loop energy management and control system, the single-phase manufacturing has achieved a power saving rate of 35.4%. It saves power 19.85 million kWh and reduces CO₂ emissions by approximately 14,900 tons annually.

CIMC has established a dynamic closed-loop energy management and control system to provide decision-making support for company's energy-saving transformation and energy management. Its concept, design and management model provide a demonstration case for improving energy consumption in industries, public buildings, rail transit, petroleum and petrochemical, coal and other fields.

BP9: Energy saving in a gigawatt-scale coal-fired generation unit

Shenhua Guohua Power comprehensively utilizes internal and external research capabilities to formulate and implement a clean energy development strategic action plan based on specific turbine flow passage modification and "near-zero emission" technical routes, has established a long-term mechanism for energy-saving technological progressing.

Shenhua Guohua Power implements the "Guohua Power Strategic Action Plan to Promote Clean Energy Development", carries out comprehensive green

upgrading and transformation of existing coal-fired generator units in terms of energy-saving, environment protection, efficiency improvement, capacity increase and heating supply. During the period, the enterprise has played the technical leading role of the post-doctoral mobile station at Guohua Electric Power Research Institute-level, and brought together the strengths of the three power groups of Harbin, DEC Boiler and SAIC group to carry out technical research, forms a unique turbine flow passage modification and "Near zero emission" technical route, including high-medium pressure cylinder flow enhancement + low pressure cylinder Last Stage Blade optimization + nozzle group, regulating stage, high-medium-low pressure rotor, high-medium-low pressure inner cylinder, diaphragm and diaphragm sleeve upgrade and transformation + steam Sealing transformation + cold end optimization transformation + generator and auxiliary equipment efficiency improvement transformation + heating supply transformation, etc., and systematically establish and implement Energy-saving technological progressing mechanism, which core contents consisting of technical implementation routes, management organization, project implementation progress, investment planning arrangement, and operational risk control etc.

Suizhong Power Plant, Shenhua Guohua Power has No. 2 Russian-made unit, before and after the transformation of 800 MW at the same valve level, the coal consumption of power supply decreased by nearly 40 g/kWh, which saves 328,000 tons of standard coal

per year and reduces power consumption rate by more than 2%. All indicators are better than the requirements of "Coal Power Energy Conservation and Emission Reduction Upgrade and Transformation Action Plan" that issued by the three ministries and commissions.

The practice of Shenhua Guohua Power provides a practical reference for coal power companies to establish a long-term mechanism for energy-saving technological progressing,continuously promote energy-saving technology progress,and promote energy-conservation and emission-reduction of coal generator unit by gathering ideas from internal and external Think Tank.

BP10: IBR Green Building Demonstration Project

Shenzhen Institute of Build Research Co.,Ltd. (IBR) Green Building demonstration project is based on the local climate and resource conditions,fully integrated with the natural environment,passive technology priority,green building with a character of "growth".

The IBR Green Building is designed,constructed and operated based on the green design concept of "sharing and balance",under the premise of fully understanding the climate characteristics,resources - environment,social culture,and the principle of integration of "Nature-Building-People". First of all,according to the distribution of building functions,dominant wind direction and physical environment of the site,through digital analysis,adopts the shape of Chinese character "凹

" to design the building shape and layout,creates good conditions for the building's natural ventilation and natural lighting. Secondly,integrates the high-performance outer envelope structure,external shading facilities,3D greening system,solar shading system,etc. to construct a comprehensive building insulation system. Thirdly,adopts efficient conditioning system,LED lighting system,energy-saving elevators,ecological reclaimed water system,solar photovoltaic system,seat air supply system,energy-saving power distribution system,and optimized operation control system to efficiently utilize active technologies. Through the integrated application of green technology system,IBR Building provides a comfortable and healthy office environment for users while efficiently using commercial energy.

Compared with the standard of "Shenzhen Office Building Energy Consumption limits",the IBR Building saves power about 1.04 million kWh (equivalent to 347 tons of standard coal),reduces CO₂ emissions by 923 tons. The total investment of the project is 70.55 million RMB,of which the incremental cost of Green Building is 10.34 million RMB. The ROI (return on investment) is 10.3% and the return period is 9.7 years.

The IBR Building combines the concept of "sharing and balance" with architectural design and operation,which experience is suitable for projects in hot summer and warm winter districts.■