Second Batch of Domestic TOP TENs List

China Building BAT List

BAT1: Intelligent District Heating Platform with Monitoring and Operation Optimization Technology in Heating System

1.Technical principle

Intelligent heating network monitoring and operation optimization technology,through the integration of Internet of Things (IoT),Internet,cloud computing and automatic control related technologies,build an intelligent heating management platform to realize centralized monitoring and heat measurement of the entire heating system from heat sources,heating stations,pipe networks to heat users,and using the built-in analysis model to automatically analyze historical data,summarize the heating operation rules,economic flux,thermal indicators,energy consumption indicators,etc.,simulate and predict the operation and development trend of the heating system,and give early warning to optimize heating network dispatch,improve the operation and management level of thermal power enterprises and the safety and reliability level of heating systems. Combining big data and artificial intelligence (AI) technology to realize the control and optimization based on the user's indoor temperature,finally achieve the energy conservation of heat source,the operation safety of heating network and supplying comfortable heating to heat users.

2.Main technical specifications

The upper limit of the cluster monitoring capability is greater than 1 million resident users. The algorithm is able to conclude the characteristics of the heating pipe network based on the accumulated heating system operation data,pipe network data,and heat users'operation data,combining the meteorological parameters and in-door temperature requirements,is able to predict the future 72 hours' heat load.

3.Energy conservation effects

After adopting the intelligent heating network management platform,the heating energy consumption in northern China urban areas will be reduced by about 0.04GJ/(m^2·a),the average energy saving rate is 9%~15%.

4.Application areas

This technology can be widely used in cogeneration central heating systems and district boiler central heating systems.

5.Technology Application Case

Case I

A power generation plant,which original heating network had maximum heating capacity was 1.37 million square meters,could not meet the heating demand,and the heating network was a large-scale direct supply network,was difficult to adjust the water conditions,resulting in poor heating quality for end users. Moreover,the power consumption of the mixing pump and relay pump in its heat exchange core station was relatively high. In order to meet the development needs of heating load,the original heating pipe network has been reformed by intelligent heating network monitoring and operation optimization technology,implemented direct connection water mixing transformation,and build an intelligent heating network monitoring center to solve the problem of primary network hydraulic imbalance. aim to the 6 heating stations with poor heating efficiency,implemented buildings' balance reconstruction,and in-door temperature monitoring to typical users in parallel.

After the transformation,the consumption of water,heat and power all dropped significantly compared with the same period,of which heat was saved by 14.76%,power was saved by 14.76%,and water consumption was saved by 40.42%. There were total 12.64 million RMB operation costs saving from the above 3 indicators,has improved the heating capacity of the heating pipe network,solved the problem of new users accessing the network,and increased the revenue of new users in network.

Case II

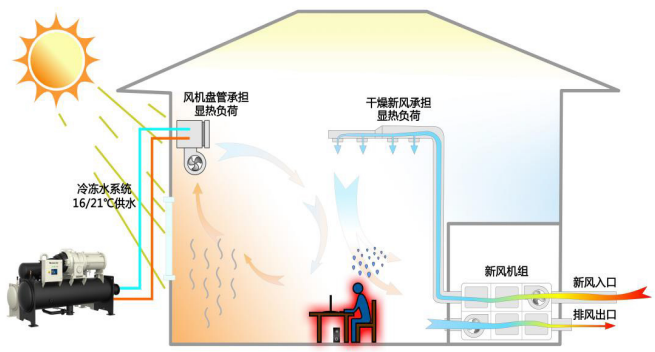
The heating period undertaken by a heating supply company is about 150 days from November to April,which heating area is nearly 15 million square meters,110 heat exchange stations in total. The average temperature in this district in January is -15.2℃,and the extreme temperature can be as low as -41.5℃. The heating network covers a large area,the wide implementation area,accurate data transmission and completion of data monitoring at the same time are all difficult problems for the project. The heating supply company has two heat sources,the No. 1 heat source plant has 4 pcs 70MW gas boilers,and the No. 2 heat source plant has 6 pcs 70MW gas boilers. After the reformation,there is one large-scale IDH intelligent heating network dispatch center was established,more than 500 public building heat metering and control

systems were built,and 110 heat exchange stations realized Distributed Variable-frequency self-service energy-saving control,reduced water consumption and gas consumption effectively. The project has realized a remote automatic self-service operation mode,energy-saving rate is about 15%.

BAT2: Key Technologies of Centrifugal Units Based on Temperature and Humidity Independent Control System

1.Technical Principle

Temperature and Humidity Independent Control Technologies of Centrifugal Units can process the heat and moisture load separately,so that the cooling water supply temperature of sensible heat system can be increased from 7℃ in conventional condensation dehumidification air conditioning system to 16℃-18℃,improves the unit efficiency. In view of the cooling and oil return problems caused by the higher outlet water temperature,the 'small compression ratio' centrifugal refrigeration compressor adopts the new 'micro differential pressure' automatic oil return technology and the cooling technology that combines the orifice plate and the electronic expansion valve to meet the requirements of high temperature operation conditions and improve the efficiency of the compressor. The new high-efficiency water chiller which was developed based on the above technology causes the higher water supply temperature than indoor dew point temperature,has no risk of condensation,achieves efficient and reliable operation under the higher temperature conditions.



2.Main technical specifications

This technology keeps the chilled water outlet temperature from 16°C to 18°C,independently takes the sensible heat load. The COP (Coefficient Of Performance) reaches 8.6 with outlet water at 16°C and COP reaches 9.1 with outlet water at 18°C,which comprehensive performance reaches the international leading level.

3.Energy conservation effects

Compared with traditional centrifuges with the same cooling capacity,the energy efficiency of this technology at different outlet water temperatures is increased by about 30% in average,and the energy saving rate reaches more than 20%.

4.Application Areas

This technology can be applied to air-conditioning systems in large-scale public buildings and data centers,effectively reducing energy consumption,and contributes to the sustainable development of air-conditioning systems in public buildings.

5.Technology Application Case

Case I

Wuhan Tianhe Airport T3 has complex exterior shape and complex indoor space structure,which has design characteristics with the streamlined integrated roof,significant shading by the building itself,and a large space connected vertically. The building air conditioning loads include indoor sensible heat load,indoor latent heat load,and fresh air sensible heat load and fresh air latent heat load. The large spaces such as international terminal,domestic entry and exit passages,and corridors have been designed and simulated to adopt the combined temperature and humidity independent control air conditioning system of 'fresh air humidity control + capillary tube + floor convection + full air'. The centralized cooling and heating source system undertakes the most of the indoor cooling sensible heat load of air conditioning in summer and all indoor sensible heat load of air conditioning in winter. The water system adopts a distributed pump variable flow and two-pipe remote system in order to reduce the transmission power consumption of the water pump as much as possible while ensuring the normal operation of the system. The cooling source of the system adopts 3 pcs of high-outlet temperature centrifugal chillers,which single cooling capacity is 3,516kW and the cooling capacity of air conditioning units is 10,548kW. According to the needs of this system,the unit technically design the 'small compression ratio' variable frequency pneumatic for the 16℃-18℃ water outlet condition,which improves the operating performance of the conventional fixed frequency unit in the medium temperature condition by 25%.

The air-conditioning area of the independent temperature and humidity control system for this project is nearly 140,000 square meters,accounting for 35% of the total air-conditioning area. The operating COP under the design conditions of the unit reaches 8.45,and the total annual electricity cost is 1.2468 million RMB,compare with the fixed-frequency unit,it saves 549,600 kWh per year,and the energy saving rate reaches 30.6%.

Case II

China Mobile International Information Port,Phase II IDC data-control room project has long-term construction scale of 1.3 million square meters,and the short-term construction scale is about 0.41 million square meters,including R&D center,data center,call center and academic exchange center,which final target number of the air conditioning units is about 2000.

The buildings adopt apartment-style modular design,the

structural safety level is level 1,the fire resistance and roof waterproof level is level 1,and the air conditioning system adopts the N+1 redundancy mode. Base on the characteristics of high heat generation and low moisture dissipation of the air conditioning load in large scale data centers,and the high precision requirements of the cooling temperature and humidity control of the computer room,this project adopts an independent temperature and humidity control air conditioning system. The system separately processes the heating load and the moisture load,so that the cooling water supply temperature of the sensible heat system is increased from 7℃ in the conventional condensing dehumidification air-conditioning system to 14℃ ,efficiently utilize the energy saving potentiality generated by the higher outlet water temperature and has improved the unit efficiency. The cooling source of the system adopts two 3516kW high outlet water temperature centrifuges,as for the cooling and oil return problems caused by the higher outlet water temperature,the unit adopts a 'small compression ratio'centrifugal refrigeration compressor,a new type of "micro differential pressure" automatic oil return technology and the cooling technology that combines the orifice plate and the electronic expansion valve,so as to meet the requirements of high temperature operation conditions and improve the efficiency of the compressor.

The units of this project were installed in 2016,the operating COP has reached 7.60 under design conditions. Compare with the traditional centrifuges,which energy efficiency has improved 20%,has achieved significant energy-saving effects. ■

BAT3: Treatment Process of the Prefabricated Directly Buried Thermal Insulating Pipes

1.Technical principle

Treatment process of the prefabricated directly buried thermal insulating pipes is to adopt the cyclopentane foaming agent with ODP of 0 and GWP <25,through high-pressure foaming equipment and spraying equipment ,spray rigid polyurethane on the surface of the steel pipe to form an insulation layer after steel pipe quality inspection,shot blast cleaning and temperature increasing control,and then,spray the special bonding material on the surface of the insulation layer through the bonding device and bonding process,and finally,wind the HDPE (High Density Polyethylene) sheet materials on the surface of the thermal insulation layer to form an outer protective layer by extruder equipment,winding device and guiding process,and simultaneously,pass through the cooling device and the circulation process,which is once cooled to form the prefabricated directly buried thermal insulating pipe with integrally strengthened and stable structure.

2.Main technical specifications

The thermal conductivity of the thermal insulation layer <0.029W/(m·K),the density >60kg/m^3,the compressive stress >0.35MPa,the average cell size <0.5mm,and the service life >30 years under the condition of continuous operation at 120°C.

3.Energy conservation effects

The heat loss is reduced by more than 30% in the heating pipe network,the energy consumption is reduced by more than 3% compared with the traditional thermal insulation pipe.

4.Application areas

This technology is applicable for pipeline networks that transport liquid and gas media,including central heating,district cooling,petroleum and petrochemical,marine ships and other urban operations and industrial production areas.

5.Technical Application Case

Before the energy-saving transformation,the heating pipe network DN800 of a heating company in a certain group provided heat of 4,583,797 GJ,the heat loss of the water supply pipe network was 484,103 GJ,the heat loss of the return water pipe network was 434,461 GJ,and the total heat loss of the pipe network was 868,561 GJ,the average efficiency of the heating pipe network was 81.05%.

After the prefabricated directly buried thermal insulating pipe is used to renovate the DN800 double-circuit heating pipeline of about 5 kilometers,the average efficiency of the heating pipeline is 89.41%,the energy saving is 383,205 GJ,which is equivalent to 13,074 tons of standard coal,and the energy saving benefit is 4.57 million RMB,the energy saving rate is 44.12%,and the return period is about 3.1 years. ■

BAT4: Integrated Low-nitrogen Combustion Condensing Technology Based on New Type of Heat Transfer Structure

1.Technical principle

The integrated low-nitrogen combustion and condensing technology based on new heat transfer structure integrates the four core technologies,such as flue gas side enhanced heat transfer technology,heating surface self-cleaning technology,condensed water anti-corrosion technology and low-nitrogen furnace body structure design technology,with the characteristics of stable,efficient,energy conservation and environmental protection. Based on the principle of maximizing energy utilization,the pipeline network system is optimized for low loss to achieve the maximum energy saving of the system. Adopting a three-in-one intelligent heating control system,combining cloud,big data collection and intelligent analysis,mastering system operating data,making optimization and upgrade recommendations to ensure the continuous and efficient operation of the system.

2.Main technical specifications

When return water at 30°C,the full load thermal efficiency is 106.7%,and the minimum load thermal efficiency is 109.5%. when return water at 40°C,the full load thermal efficiency is 102.2%,and the minimum load thermal efficiency is 105.1%. when return water at 50°C,the full load thermal efficiency is 98.5%,and the minimum load thermal efficiency is 100.5%. The nitrogen oxide emissions by using this technology are reduced by about 40% compared to conventional emissions by using diffusion burners.

3.Energy conservation effects

This technology can recover about 8% of the sensible heat and 10% of the latent heat of flue gas,which is more efficient than the existing domestic condensing gas boilers,can save energy more than 15% compared with the normal gas boilers.

4.Application areas

Applicable for the buildings of natural gas heating,includes heating and hot water supply for civil buildings (office buildings,commercial buildings,public

buildings in the fields of science,education,culture and health,and residential buildings) and industrial buildings.

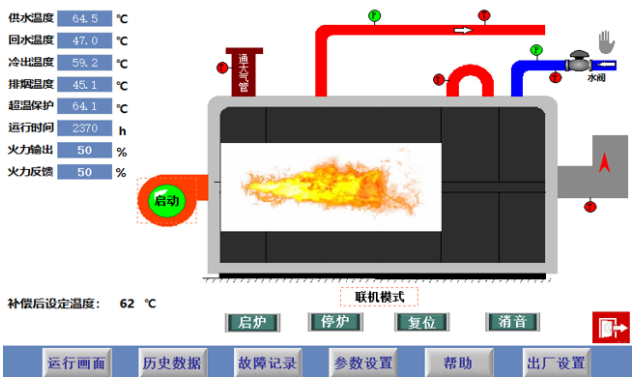
5.Technical Application Case

Case I

Before 'coal-to-gas' project implementation in a certain village,decentralized coal-fired boilers were used for heating mainly. Under the national policy of the "coal-to-gas" guidance,the heating method of the village has transformed,including pipe network laying,boiler installation,800kW transformer installation,construction of water wells with continuous water output of 70 m^3 per hour,the laying of DN500 medium pressure natural gas pipelines,the installation of gas pressure regulator box,the optimization of the heating pipe network,as well as adding an intelligent control system for boiler heating system intelligent control,which heating area reaches 800,000 square meters. This project uses a condensing gas boiler,single heating capacity of 7MW,efficiently utilize the latent heat of vaporization of the steam in flue gas. By testing and measuring,within the output range of 30%~100% of the boiler,the average thermal efficiency is 97%~105%,has significant energy saving effects. In this practice,the energy saving of each heating season is 1641.7 tons of standard coal,2655.3 tons of CO_2 emission reduction,and the NOx emission is less than 15mg/m^3 that is less than the national standard of 30mg/m^3.

Case II

Before the transformation in a certain university,coal-fired boilers were used for heating. During the transformation process,it adopts the integrated low-nitrogen combustion and condensing technology,has equipped 4 pcs of condensing gas boilers,which single heating capacity is 2.8MW,an intelligent control system is added to intelligently control the boiler heating system,and the heating area reaches 161,000 square meters. By testing and measuring,the average water supply temperature of boiler is between 55℃~65℃,the average return water temperature is between 30℃~40℃,the average boiler efficiency is about 105%. In this practice,the energy saving of each heating season is 404.8 tons of standard coal and 654.7 tons of CO_2 emissions reduction. ■



BAT5: Skid–mounted Heat Exchange Station Technology Based on All–welded High–efficiency Heat Exchanger

1.Technical principle

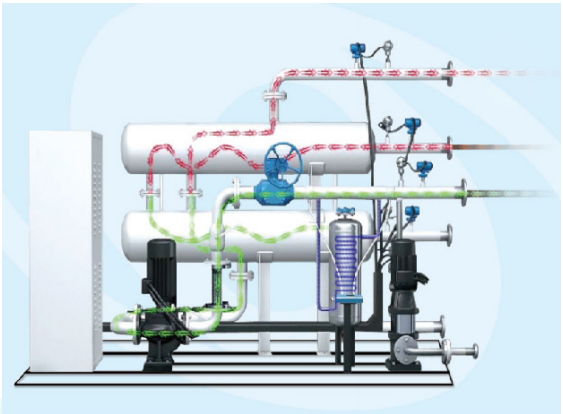
The skid-mounted heat exchange station technology based on all-welded high-efficiency heat exchanger is based on the theory of heat transfer,process control,and numerical calculation methods,and integrates all-welded high-efficiency plate shell type of heat exchangers,intelligent water treatment equipment,intelligent electrical control Equipment,intelligent operation monitoring equipment and other techniques,completes a new generation of 'new high-efficiency energy-saving intelligent heat transfer station' with functions of 'simulation','data modeling',and 'mobile Internet' to realize online monitoring of the operation of the heat transfer station and the optimization of heating system's full-condition operation,proceed second time utilization of the low-grade heat (the low-temperature return water of the primary heating network),and the cascade utilization of energy. It also integrates water treatment devices,circulating water pumps,supplementary water pumps and other driving devices,control systems etc. equipment,has the characteristics of high heat exchange efficiency,less land occupation,high temperature and pressure resistance etc. The inlet and outlet on the primary side,the inlet and outlet on the secondary side,the water supplementary inlet,and the sewage outlet are designed on one side,to facilitate on-site construction and installation easily. Adopting advanced heat preservation technology,the entire heat exchange station can be placed outdoors to realize safe and stable operation.

2.Main technical specifications

Compared with traditional detachable heat exchanger,the utilization rate of the heat exchange plate is increased by more than 30%,the specific pressure drop ΔP is reduced to 40,and the heat exchange efficiency reaches 97%.

3.Energy conservation effects

Besides of land space saving of the heat exchanger and reducing the operation and maintenance man-hours etc.



advantages,the average energy saving rate of each heat exchanger is increased by 5%~11%.

4.Application areas

It is applicable for the heat exchanger stations of the central heating system in cities and towns.

5.Technical Application Case

Case I

There are two communities of a thermal power group have realized the functions of primary return water's secondary utilization and climate compensation,time and temperature division by adopting all-welded high-efficiency heat exchanger in skid-mounted heat exchange station. At the same time,it integrates modern intelligent control and mobile communication technologies to achieve online monitoring,has achieved the effects of balanced heating,rational use of heating,and supplying on demand,ensures the heating safety. The heating area of the two heat exchange stations totally reaches 360,000 square meters. After two new high-efficiency and energy-saving intelligent heat exchange stations are used for transformation,the energy saving rate is estimated to be 13.3%,the cost saving in one heating season is about 1.6 million RMB,and the investment return period is about 2.5 years. Compared with the traditional heat exchanger station,energy saving is increased by 30%,land space is saved by 70%,comprehensive investment is saved by 30%,and operating cost is saved by 80%.

Case II

The heating supply area of the heat exchange station of a heating supply company is 45767 square meters,has no change before and after the transformation. This project adopts a skid-mounted heat exchange station with all-welded high-efficiency heat exchangers to replace the original plate heat exchange system,by using high-efficiency heat exchangers,frequency variable control,climate compensation,time and temperature division,PID control,intelligent water treatment devices,etc. techniques,by operation parameters setting,operation frequency controlling of the water pump,the opening of the electric control valve of the primary network,etc. operations,realized water flow adjustment, has achieved the purpose to reduce energy consumption under the pre-conditions of ensuring user's indoor temperature meets the relevant regulations. After the transformation,the skid-mounted heat exchange station of the fully welded high-efficiency heat exchanger has an overall energy saving rate of 24.03% compared with the original heat exchange system. ■

BAT6: Energy-saving Synthetic Resin Curtain Wall Decoration System Technology

1.Technical principle

Energy-saving synthetic resin curtain wall decoration system technology is based on inorganic modified polymer technology,with oily organic resin or high polymer as the main body,through biomimetic chemical synthesis technology,grafting or inlaid inorganic functional groups,forming an inorganic modified polymer that combines inorganic and organic as a integration. synthetic resin is used as the main bonding material,mixed with pigments,fillers and additives to prepare various coating materials such as putty,and painted in layers on the building wall to form a building decoration layer with the appearance of a curtain wall,to realize the replacement of traditional decorative building materials such as aluminum-plastic panels,stone and ceramics. The whole system adopts hydrogen bond association reaction,and can have a certain penetration function on cement-based materials,thereby forming an organic whole,realizing energy conservation and environmental protection in its whole life cycle from production,installation,applying to renovation.

2.Main technical specifications

The solar reflectance of reflective heat insulation products reaches above 0.85,the hemispherical reflectance is above 0.88,and the thermal conductivity of the thermal insulation decoration material is 0.018w/(m·k).

3.Energy conservation effects

It achieves 65% energy saving rate when the product is applied to the reflective insulation in South China. achieves 75% energy saving rate when applied to the prefabricated thermal insulation decoration in the Northeast. achieves 75% energy saving rate when applied to the reflective insulation + thermal insulation decoration in other areas.

4.Application areas

It is mainly applicable to the fields of public building energy conservation,such as office buildings,commercial buildings,tourism buildings,buildings in science,education,culture and public health area,and transportation buildings.

5.Technical Application Case

Case I

The exterior wall decoration project of a surgical inpatient building in a certain hospital utilizes energy-saving synthetic resin curtain wall decoration system technology,adopts liquid ceramics to replace traditional ceramic tiles and other building decoration materials,creates the decorative effect of traditional ceramic tile curtain walls. This project meets the requirements of cost saving and 'Four conservations and One environment',fulfill the appearance effects requirements as well. At the same time,the system surface layer is compounded with reflective heat insulation and photocatalytic self-cleaning material technology. Through the reflective heat insulation material technology,the heat gain of the building is effectively reduced,avoiding the high cost of traditional thermal insulation technology and the problem that the indoor heat cannot be dissipated due to thermal insulation. Through the photocatalytic self-cleaning material technology,the photocatalytic reaction of ultraviolet rays and self-cleaning materials is used to decompose oily pollutants,and the 'super-hydrophilic effect' is generated under light induction,causing the pollutants are easily washed and cleaned by rain,and the above mentioned two effects produces a 'self-cleaning' effect,which can extend the cleaning cycle of the building's exterior wall,reduce water consumption,and ensure that the curtain wall system keeps as new.

Based on the integrated applications of the above material technologies and processes,the synthetic resin curtain wall decoration system has achieved many technical advantages such as energy saving,environmental protection,simple installation,safety and reliability,long lifecycle,recycling,light weight,and rich colors. This project has building area of 20,000 square meters. Through using energy-saving synthetic resin curtain wall liquid ceramics,can reduce the energy consumption of traditional ceramic tile production and installation processes,which has saved 160.4 tons of standard coal.

Case II

An affordable housing in a city adopts energy-saving synthetic resin curtain wall decoration system,compounded with reflective heat insulation technology,selects heat insulation pigments according to the nano spectrum,and achieves heat insulation through the principle of rapid emission of reflecting and absorbing heat in the infrared band of sunlight. At the same time,it adopts the inorganic modified polymer resin as the base material to carry out systematic design and flexible gradual design,forming a good penetration association with base material,has super

weather resistance and good fineness and color retention. In terms of energy efficiency indicators,the visible light reflectance is above 0.89,and the near-infrared reflectance is above 85%,which meets the requirements of 65% of energy saving in South China. in terms of economic indicators and environmental protection indicators,it is better than traditional thermal insulation boards and thermal insulation mortars etc. insulation systems. In addition,this practice adopts systematic construction technology,which is convenient for construction,high safety,and convenient for maintenance and renovation.

The project has a total building area of 602,150 square meters,of which a residential area of 564,000 square meters (12,363 units in total). Through the transformation of the project,the investment cost has been reduced by 20%,the comprehensive energy saving of the building has reached 20%,improves the management efficiency by 15%. It laid the foundation of 'Intelligent Community' and further improved the ultra-low energy consumption design and operation level of green buildings in hot summer and warm winter district. ■

BAT7: Modular Central Air–conditioning Energy Saving Technology Based on Variable Flow Control of Cooling Tower Group

1.Technical principle

Modular central air-conditioning energy-saving technology based on variable flow control of cooling tower group adopts cooling tower group variable flow technology to make full use of the valid heat exchange area of cooling tower,improve cooling efficiency,reduce cooling water flow demand,and reduce the energy consumption of main engine and cooling water pump. After independent data collection of temperature,pressure,flow and other related equipment signals,each equipment is directly driven,and operates according to pre-settings to achieve modular control and system efficient operation.

2.Main technical specifications

Even water distribution between the cooling towers,the water tray in the tower distributes water evenly,reducing the floating water loss,cooling water temperature is reduced by an average of 1.5℃~ 3℃,cooling efficiency is increased by 1 to 2 times,cooling fan energy consumption is reduced by more than 40%,the energy consumption of cooling pump is reduced by 20% ~ 30%,the energy consumption of main engine is reduced by 4% to 8%,and the adaptive flow demand range is 20% to 100%.

3.Energy conservation effects

For the objects that have already implemented energy-saving control,the comprehensive energy-saving rate can be improved about 10% more if the relevant optimization measures of this technology can be applied.

4.Application areas

This technology can be applied to water-cooling central air-conditioning systems with cooling tower group.

5.Technical Application Case

Case I

A shopping mall adopts the cooling tower transformation technology,installs hydraulic regulators,variable flow nozzles,and modular energy efficiency control cabinets to realize the combined frequency variation of all fans to achieve the minimum power consumption for efficient cooling. uses cooling water pump transformation technology,installs cooling water pump energy

efficiency control cabinet,to achieve the variable flow effect that meets the flow demand of the main engine. uses chilled water pump transformation technology to achieve constant flow operation at the main engine side and automatic variable flow operation at the load side. uses main engine transformation technology,installs energy efficiency strategy control cabinets to achieve real-time monitoring effects. uses intelligent control platform technology to realize centralized management and one-stop service.

This project has building area of 240,000 square meters. The comprehensive energy efficiency of the cooling system has been improved to 5.11 by the integrated transformation,compared with the system before the transformation,the efficiency has increased by 34%,the annual operation cost saving of 940,000 RMB,the annual power saving of 1.38 million kWh,that is equivalent to 456 tons of standard coal and 1379 tons of CO_2 emissions reduction per year.

Case II

The energy-saving transformation of a hospital's central air-conditioning system adopts a water-cooling system consists of a steam-type lithium bromide main engine,cross-flow cooling tower,and chilled and cooling water pumps. At the same time,it uses intelligent variable flow cooling tower technology,two-way variable flow technology,and one pump to multiple machine technology,hydraulic balance technology,modular control technology. The building area of this project is 80,000 square meters. Compared with the system before the transformation,the operating energy consumption has been greatly reduced,and the comprehensive energy saving rate has reached 52%,annually save 884 tons of standard coal,reduce 2,334 tons of CO_2 emissions,gains economic benefits of 2.2 million RMB annually. The hospital has reduced energy consumption,reduced operating costs,and achieved the effects of energy conservation and emission reduction. ■

BAT8: Flow Passage Style Heat Exchange Technology for Sewage-source Heat Pump System

1.Technical principle

The flow passage style heat exchange technology for sewage-source heat pump system is a complete set of technology for sewage source heat exchange equipment,which can extract water and heat exchange in the main pipeline of public sewage to realize the on-site extraction of sewage heat. The flow passage heat exchanger is the key equipment for extracting heat from sewage. At sewage side,it adopts single flow passage,large cross-section,no contact structure design,with anti-blocking and anti-scaling performance. At clean water side (media water),adopts compact,small cross-section,Multi-supporting points,multi-layer parallel connected and then serial connected structure. This technology ensures the overall pressure-bearing capacity and deflection resistance of the heat exchange equipment,reduces the volume size and land occupation of the equipment,solves a series of problems such as blocking and corrosion of the equipment in the heat exchange process,realizes efficient heat exchange.

2.Main technical specifications

The pressure bearing capacity of the equipment is > 1.0 Mpa. the heat transfer coefficient in the clean water condition is > 3000W/m^2·k. the designed water volume of single unit is 20^2/h ~ 100m^2/h. the resistance of the heat exchanger is 40kPa ~ 80kPa. the cycle time of cleaning maintenance is > 180 days (Single unit cleaning requires about 1 labor-day).

3.Energy conservation effects

The heating COP of the system reaches 3.4-4.5,has significant energy saving benefits.

4.Application areas

Applicable to winter heating,summer cooling and domestic hot water supplying in various public and civil buildings. At the same time,it can be applied to industrial production such as sludge heating,heat exchange from oily sewage or waste water with high content of impurities.

5.Technical Application Case

Case I

The total building area of a certain estate project is about 10 million m^2,a sewage source heat pump system is one of the main heat sources of the project's commercial complex. This application case adopts flow passage style heat exchange technology for sewage-source heat pump system to undertake one-third of the heating load and all the cooling load of the overall heating area,uses the flow passage style heat exchanger to extract the waste heat resources of the public sewage along the pipeline to meet the heating demand of the system in winter. by switching the system operating direction,to meet the cooling demand of the commercial part in summer.

The total planned heating area of the sewage source heat pump energy station is about 3.5 million m^2,provide heating and cooling service for hotels,apartments,office buildings and other buildings of the commercial complex,the operating service area is more than 2 million m^2. In one heating season,a total of 1.037 million GJ of waste heat is recovered. By using sewage source heat pump technology,the annual energy consumption is reduced by about 32,000 tons of standard coal,reduces atmospheric pollution emissions such as carbon dioxide and sulfur dioxide by nearly 90,000 tons.

Case II

Using flow passage style heat exchange technology for sewage-source heat pump system,a certain college has built a sewage source heat pump energy station that uses public sewage as the heat source. The heat is extracted from the public sewage through the flow passage heat exchanger,transferred to the media water. The clean media water circulates and transfers heat between the heat pump unit and the flow passage heat exchanger,avoids the problems such as pollution and corrosion of the heat pump unit caused by the sewage entering the heat pump,efficiency reduction of the heat pump etc. ensuring the efficient and stable operation of the system as a whole. The energy station has a total heating area of nearly 300,000 m^2,and adopts geothermal heating to supply heats to student apartments,faculty residences,teaching office buildings and other buildings in the college. In one heating season,saves a total of 114,000 GJ of heat (has recovered 148,000 GJ of waste heat,consumes 9.32 million kWh,equivalent to 33,000 GJ of heat). Through using sewage source heat pump technology,the annual energy consumption is reduced by about 3,900 tons of standard coal,reduces nearly 10,000 tons of atmospheric pollution emissions such as carbon dioxide and sulfur dioxide. ■

BAT9: CO_2 Air Source Heat Pump Heating Technology

1.Technical principle

The CO_2 air source heat pump heating technology has the characteristics of strong adaptability to outdoor temperature in cold areas and high temperature of outlet water,has a higher heating coefficient under the condition of large temperature difference between supply and return water. Compared with the traditional Freon heat pump,the outlet water temperature of the CO_2 heat pump can reach 70℃ or higher,meets the needs of various radiators to realize the heating and domestic hot water supply.

2.Main technical specifications

Under the nominal working condition (outdoor dry bulb temperature 7℃) reaches the hot water inlet/outlet temperature 50°C/70℃,COP is 2.46. Under low temperature conditions (outdoor dry bulb temperature -20℃),the hot water inlet/outlet temperature reaches 50℃/70℃,COP reaches 1.66.

3.Energy conservation effects

Compared with heating equipment such as oil boilers,gas boilers,and electric boilers,the energy saving rate is more than 50%.

4.Application areas

Applicable to construction industry,including civil buildings,office buildings,commercial buildings,science, education,culture,public health and other public buildings and residential buildings,for centralized or distributed heating and domestic hot water supply.

5.Technical Application Case

Case I

An office building has a total heating area of 8,640 square meters,which is divided into two building groups - a new building and an old building. The new building has a 7-story frame structure,and the old building has a 3-story brick-concrete structure. The original heating source is a coal-fired boiler. During the transformation process,the project has selected 10 pcs of CO_2 air source heat pump heating units to replace the coal-fired boilers,and equipped with circulating pump unit,water softening device and constant pressure device. The project has invested 1.81 million RMB in total,realized energy

saving of 128tce,annual carbon emission reduction of 301 tons,gains annual energy saving benefits of 280,000 RMB about.

Case II

A certain railway section is equipped with a CO_2 heat pump heating unit to replace the original traditional heating equipment,involving 5 stations,about 10,000 square meters in total. The CO_2 air source heat pump heating unit can meet the heating requirements of end users,can still efficiently and stably operates under low temperature conditions of -15℃,and the outlet water temperature reaches 65℃ or more. After the transformation,the actual indoor temperature was stably controlled at 21℃ ~ 23℃ in average,base on the monitoring results of the heating operation status in one station of the railway section. Compared with the oil boiler,the economic cost saving is about 414,700 RMB/134 days,energy saving of 86tce,carbon emission reduction of 227 tons. ■