ISO 50001 Energy Management System
Case Study

2020 CHINA

Tianjin Guodian Jinneng Co-generation Co., Ltd.

Strengthen management to energy saving, reduce power consumption rate of power plants

Aerial view of the company

Organization Profile & Business Case

Tianjin Guodian Jinneng Co-generation Co., Ltd. is located in Dongli District, Tianjin City. The first phase will build a 2 × 330MW domestic coal-fired heating unit and leave room for expansion. The company was established in 2005. As the key project of Tianjin's "Eleventh Five-Year Plan", the first phase of the project adopted advanced power environmental protection technologies and energy-saving facilities such as smoke tower integration, desulfurization and denitration, closed coal sheds, plasma ignition, and water recycling.

The company upholds the concept of creating an “innovative, leading, value-oriented” enterprise and the “endless, creating first-class” corporate spirit, and promotes the development of “clean, integrated, refined, intelligent, and international”, and adheres to the It is our responsibility to provide green, environmental protection, high-quality electricity, thermal resources and services, and vigorously promote the concepts of energy conservation and environmental protection, circular economy and sustainable development, and are committed to building the company into a green and environmentally friendly window power plant.

The company attaches great importance to energy-saving work. When the unit was officially put into commercial operation, an energy-saving leading group was set up to adjust its members every year according to personnel changes. The general manager is the team leader, the deputy general manager of production is the executive deputy team leader, and the directors of each department are members. A three-level energy-saving network of "company, department, and team" has been established. Ensure that energy conservation work continues in an organized and planned manner.

According to the company's "Energy Conservation Management Standards", monthly energy conservation work meetings are held. The content of the meeting: the completion of last month's production indicators and analysis; the completion of energy conservation work, the maintenance of equipment, the removal of defects affecting the economic operation of equipment, and the completion of energy conservation technical reform measures Situation; put forward influencing factors of indicators, improve the economic measures of indicators; company leaders communicate the spirit of superior energy-saving work meetings, and put forward requirements for future work. The monthly energy conservation work conference is one of the important working methods for information exchange and work plan formulation, coordination of energy conservation work, summarization of energy performance, formation measures and preventive measures.

As a co-generation energy product manufacturing company, the company's energy cost accounts for 60-70% of the total cost of the company. Reducing energy consumption is extremely important to improving business operations. Therefore, saving energy consumption is an essential requirement for corporate development.

The main ways of energy saving and efficiency improvement are structural energy saving, management energy saving, and technical energy saving.

Case Study Snapshot	
Industry	industry
Product/Service	electric power
Location	North Yangbei Road, Fanzhuang Village, Huaming Town, Dongli District, Tianjin
Energy management system	ISO 50001
Energy performance improvement period, in years	2018 to 2019
Annual average improvement in energy performance (%) Improvement period	5.87%
Total energy saving cost Improvement period	685714$USD
Energy management system implementation costs	13714$USD
Total energy savings during improvement	60152.49(GJ)
Total CO2 emission reduction during improvement	7850.18(Metric tons)

Among them, management energy saving is the key and foundation of energy saving. Not only can low-cost energy saving be achieved, but also structural energy saving and technical energy saving effects can be consolidated and improved. Promoting system energy management and behavioral implementation according to standards has become the key to improving energy performance. The company officially launched the promotion of the energy management system in 2015, using the energy management system as the main means to improve energy performance, and improving and improving the energy management system in accordance with the "Energy Management System Requirements" standard: establishing an energy policy, strengthening publicity and communication, and improving energy review, adjust energy performance indicator, improve working standards, strengthen supervision and evaluation, so as to form a more efficient, reasonable and interactive energy management system, reduce energy consumption, and promote continuous improvement and improvement of energy performance.

Looking back at 2015-2019, the company relied on energy energy management system standards to further advance the implementation of the energy management system, strengthen energy management and equipment governance, and complete the energy-saving goals of the "13th Five-Year Plan" ahead of time; coal power consumption for the units has been decreasing year by year.

— Li Liqiu, Party Secretary

Business Benefits

Under the unfavorable conditions of higher environmental protection requirements and lower power generation load rate, the company's power plant power consumption rate fell for two consecutive years in 2018 and 2019, which improved the economic efficiency of the company. Among them, there are factors for equipment transformation and governance, but the role of statistics, calculations, analysis, cause finding, formulating measures, supervising implementation, and summing up and improving the energy management system is normal.

Actively carry out benchmarking work. According to the company's "Energy Efficiency Benchmarking Management Standards", collect external benchmarking data every month and continue to conduct benchmarking work. At the same time, benchmark with the best level of design and history, find gaps, and develop improvement plans.

Through energy related factors identification and energy review, energy performance improvement measures and implementation plans were formulated. From 2018, the coal quality of the coal has changed to a certain extent. The calorific value has been increased, the ash content has been reduced, and the sulfur content has been reduced, which has opened up electricity-saving space: the amount of raw coal required for the same power generation load has been reduced, and fuel-related auxiliary machinery can be operated through Adjusted to reduce the power consumption rate of coal conveyers, coal mills, induced draft fans, blowers, and primary fans; the company has achieved ultra-low emissions in environmental protection indicators in 2015, reducing coal consumption, ash content and sulfur content under the same load Provides favorable conditions for

environmental protection equipment to reduce power consumption.

Adjusted the number of times of coal loading, from 3 times of daily coal loading to 2 or 3 times of coal loading according to the power generation load change of the unit; optimizing the belt operation method to shorten the coal loading time and idle time of coal transfer belt; And unloading work to reduce the start-up and running time of the bucket wheel stacker; reasonably arrange the stacking according to the quality of incoming coal, and reduce the running distance of the bucket wheel stacker to take coal. Reduced power consumption of coal transport equipment.

After the coal quality changed, the coal mill output test was re-performed, and the optimal loading force curve was drawn, which was downloaded and installed by the thermal control personnel to the control logic. The wear amount of the grinding roller of the coal mill gradually increases with the passage of time, resulting in a decrease in the output of the coal mill. According to the change of the current of the coal mill, the operator will increase the load of the coal mill by a positive offset to reduce the output Impact. When the unit is overhauled, check the wear of the grinding rollers, and overlay welding the grinding rollers whose wear exceeds 20% to restore the equipment performance. In addition, in 2018 and 2019, three coal mills were retrofitted with extremely wear-resistant ceramic grinding rollers to improve the performance of the milling system equipment. The total cost of replacing ceramic grinding rollers is 2.4 million yuan. The above measures reduce the power consumption of coal mills.

Due to the change in the quality of the incoming coal, the coking situation of the boiler is more serious than before, and a series of safety and economic problems such as the increase of exhaust gas temperature have occurred. Xi'an Thermal Power Institute was invited to conduct a combustion adjustment and optimization test on the boiler to improve the combustion, prevent the boiler from coking, and solve the smoke temperature problem. At the same time, the optimal combination of each fan and damper baffle is matched under different loads, and the power consumption of the induced draft fan, blower fan and primary fan is reduced on the premise of ensuring the optimal combustion oxygen amount and taking into account all the boiler parameters.

After the change of coal quality, the control standards for environmental protection indicators were comprehensively evaluated and demonstrated: the lower the environmental protection indicators, the better. After the indicators are lowered to a certain level, the benefits of reducing the emissions of environmental protection indicators are very low. Emissions are large, neither energy-saving nor environmentally friendly. Therefore, it is determined that the environmental protection emission index shall be reduced by half according to the ultra-low emission standard. Adjusted the working intensity of the electrostatic precipitator, extended the frequency conversion period, lowered the load current, and changed the rapping period; adjusted the ash conveying interval and ash conveying pressure; optimized the number of slurry pumps and slurry concentration of the desulfurization circulating slurry pump And pH control value. On the premise of ensuring environmental protection indicators, the power consumption rate of environmental protection equipment is reduced.

Reduce the consumption of compressed air through non-leakage treatment; adjust the operation mode in a timely manner: under the premise of ensuring the safety of gas consumption, reduce the pressure of the compressed air system, connect the compressed air system for ash transportation and instrumentation in parallel, and reduce the number of spare units for the air compressor And no-load time. Reduced power consumption of compressed air equipment.

According to the test results, it was determined that the head and flow of the circulating water pump did not reach the design values; the efficiency of the condensate pump was low. A pump modification plan is proposed to reduce the power consumption of the pump and increase the vacuum of the turbine. The rebuilding cost of circulating water pump and condensate pump is 2.4 million yuan.

Revise various optimization measures, improve the content of the measures, and solidify them in the operating regulations or operating methods, so that they can truly achieve the optimization effect.

Through the above work, the power consumption rate of power plants has been reduced. In 2018, the power plant power consumption rate was 4.43%, a year-on-year decrease of 0.16%. In 2019, the power plant power consumption rate was 4.06%, a year-on-year decrease of 0.38%, and the power consumption was reduced by 16,721,096 kWh. Ton.

Plan

1. Understand standards. In 2015, a meeting to promote the construction of an energy management system was held to organize training to improve the personnel's awareness of the energy management system, master the standards, and understand the working procedures of the standards.

2. Strengthen organizational leadership. In order to do a good job in energy management, the company set up an energy management system construction leadership group and working group headed by the deputy general manager of production, clarified their respective responsibilities, and worked out an energy management system construction work plan. Appointed energy manager representative.

3. Improve energy management system documents. In accordance with the requirements of the energy management system, the company has formulated the "Energy Management Manual", "Energy Review Management Standards", revised 31 systems and working standards, and provided the operating basis of the system from the system and standards.

4. Establish an energy policy. The company's energy policy was determined to be “saving, environmentally friendly, efficient, safe, and legally advancing power generation and heating services”, providing a direction and framework for energy conservation work, and establishing the status of energy performance improvement in the company's strategy.

5. Scientific strategy. According to the annual main production index plan issued by the superior company, the company issued an energy index plan based on factors such as the estimated power generation amount and the actual energy consumption level of the equipment, and decomposed it on a monthly basis. In order to ensure the completion of energy targets, in accordance with maintenance and production conditions and capital plans, formulate energy-saving measures including strengthening management, optimization and adjustment, standardized maintenance, and technological transformation to ensure the completion of energy targets and energy goals.

6. Ensure measurement accuracy. Inspection, calibration and use of measuring instruments in accordance with various standards and guidelines. The real-time production data is transmitted to the centralized control system, and the production process is precisely regulated through the automatic control system, thereby ensuring the energy efficiency level of the equipment.

7. The company's production data is uploaded to the SIS system, and online calculation and analysis of energy consumption indicators are conducted. Based on the results of the consumption difference analysis, production adjustments are guided, set values of automatic adjustments are adjusted by human intervention, and the best matching relationship between different equipment and systems is adjusted, thereby reducing Overall energy consumption level.

8. The energy management system enables enterprises to continuously improve themselves, and has established three key mechanisms: external energy-saving technologies and information collection, analysis, and application mechanisms; internal self-evaluation and improvement mechanisms; internal incentive mechanisms to ensure that the energy management system supports the company's Strategic improvement and continuous improvement of goals.

"Continuously revise and improve corporate standards, and promote further improvement of corporate management. The awareness of energy conservation has steadily increased, and preventive and corrective measures have been put in place. Actively adapt to changes in the situation, and energy-saving and environmentally-friendly enterprises have achieved greater success."

—Li Liqiu, Party Secretary

Do, Check, Act

Under the leadership of the company's energy-saving leadership group, rely on the energy management system, strengthen energy-saving management, continuously conduct energy reviews, optimize energy performance parameters, implement annual energy-saving measures, continuously improve various energy performance parameters, and continuously improve the energy management system.

A, Constantly revising and improving corporate standards to promote further improvement in energy management.

1. Revision of systems and guidelines. In 2017, the company revised and improved its management system, unified it as a management standard, and assigned a unified number for implementation. These include energy-saving standards such as the Energy Review Management Standard and the Energy-Saving Supervision and Management Standard. In the subsequent years, the standards will be revised and approved according to internal and external changes, and the "Energy Management Manual" and "Energy Saving Incentives and Assessment Management Measures" will be incorporated into the standard system. The working guidelines are revised every year according to the equipment condition and the results of analysis and evaluation. Ensure the compliance, timeliness and applicability of the system and guidelines.

2. Ensure compliance. Collect the latest applicable version and newly issued laws, regulations, rules and regulations and standards every year, and form a document and report it to the general manager's work department for release in the company. Promptly revise the enterprise standards in a timely manner, check the compliance of actual work, and implement the latest requirements.

B, Dynamically adjust the organizational structure of the energy management system to ensure the effectiveness of energy conservation management.

1. Improve the effectiveness of energy conservation management. In order to cope with changes in the situation, overcome adverse factors, and improve the company's economic benefits, a company's energy-saving and consumption-reduction planning leadership team was established for 3-5 years. The company's “Energy Saving and Consumption Reduction Plan for 3-5 Years” was compiled, and it was revised on an annual basis according to the implementation situation, changes in objective conditions, and self-examination results of energy conservation and consumption reduction work. The procurement of energy products and services has been improved in accordance with the requirements of the energy management system to ensure energy performance. Put forward more specific requirements for the parties serving the company that affect energy performance, and make energy management more comprehensive. Continue to carry out energy management system certification and identify weaknesses and improvement opportunities through certification. In 2019, the company passed the recertification audit of the CEC （Beijing)Testing＆ Certification Center Co., Ltd.

2. Improve energy-saving optimization measures. Adhere to the small indicator competition, adopt the small indicator online assessment system, collect statistics on small indicators, carry out five-value comparison and ranking, adhere to the principle of "who adjusts, who benefits, multi-adjust, and multi-reward", increase incentives, and mobilize operating personnel to save energy Work motivation. Strengthen fine-tuning adjustments, make timely adjustments and optimizations through monitoring and analysis system and management personnel comparison, comprehensive analysis results, and maximize the energy-saving benefits of equipment.

3. Actively implement energy-saving maintenance and technical transformation measures. In 2019, the company formulated and issued 75 energy-saving measures in 5 major categories, and completed and achieved 71 of the expected targets throughout the year. It began work, partially completed 3 items, and failed to implement 1 item, with a completion rate of 96.67%. Ensure the smooth completion of the energy target plan.

C, Advancing with the times, actively adapting to the new economic normal, and realizing energy performance improvements. 1. Achieve energy goals. In 2019, the power generation rate of power plants has been completed by 4.06%, 0.84% lower than planned,

and 0.38% lower than the same period last year. In 2019, the cumulative coal consumption for power supply was 296.98 g / kWh, 1.02 g / kWh lower than the annual plan, and 2.39 g / kWh lower than the same period last year.

2. Significant achievements in energy conservation and emission reduction. In the national energy efficiency benchmarking competition organized by CEC, the company's # 1 and # 2 units won the title of 300MW wet and cold heating unit energy efficiency benchmarking AAA level unit. In the Group's 2019 benchmarking of 300MW subcritical wet cooling heating units, the company's # 2 and # 1 unit plant power utilization rates ranked first and sixth respectively. The central government's key energy-consuming units in Tianjin are assessing the energy consumption “dual-control” target responsibility in 2018: the company ’s “13th Five-Year Plan” energy conservation progress target is completed; the 2018 annual energy “dual-control” evaluation level is completed.

D,check in time to find new problems and seek solutions. At present, the main problems are: the unit's heat consumption is higher than the design value, and the flow-through transformation is planned. The feasibility review has been completed and the project has been officially established; It is necessary to take temporary measures to prevent the clogging from worsening, and to use medicine washing and replacement of heat exchange components to restore its performance.

Transparency

Lessons Learned

- A， It is connected with the requirements of the government and higher authorities on the enterprise, reducing the number of documents of the energy management system, and working documents developed for the same purpose as the management system are directly used as documents of the management system.
- B， For company employees to weaken the terminology of the conceptual system and indicators that are not related to their work, strengthen the work related to energy performance within the scope of personal responsibility.
- C， Energy saving awareness and working ability are two necessary conditions for employees to actively save energy.

Company production site Energy saving honor