ISO 50001 Energy Management System
Case Study

P.R.CHINA

Qingtongxia Aluminum Industry Co., Ltd.

A state-owned key enterprise of China Nonferrous Metals Industry

The “QTX” trademark was registered by the London Metal Exchange in 1995.And it is a Chinese well-known trademark. The products belong to Chinese famous brand products.

Organization profile and business case

Qingtongxia Aluminum Industry Co., Ltd. is a state-owned subsidiary of Ningxia Energy Aluminum Co., Ltd. And Qingtongxia Aluminum Industry Co., Ltd. is a state-owned key enterprise of China Nonferrous Metals Industry.

The “QTX” trademark was registered by the London Metal Exchange in 1995.And it is a Chinese well-known trademark. The products belong to Chinese famous brand products.

Founded in 1964, the company has a total capacity of 990 thousand tons, an anode carbon capacity of 480 thousand tons, cathode carbon of 40 thousand tons, and aluminum alloy product capacity of 300 thousand tons now.

In2018, the comprehensive energy consumption completed 1,965.8 thousand tons of standard coal. At the same time, the gross industrial output completed $1,753.47 million, aluminum and aluminum products completed 980,529 tons, prepare baked anode block completed 350,926 tons. Profile products completed 13,510 tons, and graphite and cathode carbon completed 38,330 tons.

Case study snapshot	
Industry	Aluminum
Product/Service	Production of aluminum and aluminum alloy, carbon cathode related energy management activities and use of energy-saving technology
Location	Ningxia China
Energy management system	ISO 50001 GB/T23331 RB/T 117
Energy performance improvement period	4 year
Energy Performance Improvement (%)	2016’s -6.87% 2017’s -8.26% 2018’s -13.89%
over improvement period	USD $15million
Total energy cost savings	USD $2.37 million
over improvement period	1,124,412(GJ)
Cost to implement EnMS	203,797（metric ton）

$$EPI = \frac{\text{output value \$10000 comprehensive energy consumption in 2015} - \text{output value \$10000 comprehensive energy consumption per year}}{\text{output value \$10000 comprehensive energy consumption in 2015}}$$

"To perform ISO50001 as the means, to promote company of reduce energy consumption and increase energy efficiency."

- Fengjianqing，General Manager

Drivers: The company's energy costs is 43% of total, and that is a large energy consumption and has high energy cost. Energy management is the important method of reducing cost. The government issued 《energy management system requirements》(GB/T23331) standard(on the basis of ISO50001 standard to alter in 2012), that is required the important company must be set energy management system.(More than 10thousand tons per year of the comprehensive energy consumption)

Process:

Company makes energy management system implementation plan in October 2014 on business interests and government requires. The company make a leader group to make sure energy management system training、supplement document、work plan of three phase. We engage advisory body to give us guidance. Than the company starts to build an energy management system (ISO50001:2011/GB/T23331-2012 and RB/T 117-2014).

The energy management system starts to work in 2015. And the next year, we get the first certification from china classification society quality certification of company and certificate by Certification and Accreditation Administration of the People's Republic of China.

Business Benefits

Since the establishing of the energy management system in 2014, energy efficiency has improved significantly. And significant economic benefits have been achieved. The company continuously eliminated high-energy-consuming equipment through technical renovation and contract energy management, carried out energy efficiency benchmarking management, tapped energy saving potential, strengthened energy conservation and emission reduction management, applied advanced technology and scientific management methods, and strengthened management of key energy-consuming technologies. Reduce energy consumption. From 2016 to 2018, the company's annual average energy savings have reached 9,592 tce. And the energy saving effect is obvious.

plan

The company constantly improves and revises various energy management systems and procedures, strictly implements energy conservation work in accordance with relevant laws, regulations and standards. And company overcomes the influence of market situation of aluminum industry by adopting PDCA management mode and principle of continuous improvement through scientific accounting and statistics. It adheres to the implementation of contract energy management, strives to do a good job in energy efficiency benchmarking management, finds out deficiencies, improves in time and excavates energy saving potential. At the same time, advanced technology and scientific management means are applied to strengthen the management of key energy-consuming processes and improve economic benefits. Through increasing capital investment and the development and utilization of energy-saving technologies, we will constantly eliminate, replace and transform backward equipment. We will energetically carry out publicity and education on energy conservation and raise the awareness of all people to save energy.

The company implements a four levels management system for joint stock companies, branch companies, workshops and teams. In the electrolytic aluminum department, there is an energy-saving management office, which is responsible for the organization, supervision, inspection and coordination of the company's daily energy-saving work. Its subordinate units have set up an energy management group with the general manager as the group leader and vice general manager as the executive group leader. The

energy management office has been set up to be responsible for the supervision of the company's energy management. It has established energy management system, reward and punishment measures, energy saving and consumption reduction management regulations, measuring instruments management measures and other energy-related management systems. It specifies the work responsibilities, work standards, various equipment management, operation and other procedures of personnel in various positions, covering all aspects of the company's production, operation, management, safety and environmental protection, occupational health, etc on the basis of ISO 50001, GB/T23331 and RB/T116 standards and laws and regulations. It is an important standard system of the company's production and operation, energy conservation and other work.

"The keys of energy management system are effectiveness and suitability, update, improvement."

- - Fengjianqing，General Manager

Do, check, act

Good practice:

- We establish organizational structure that is the core of ISO50001, improve energy metering equipment, and revise the management system and procedures. The company makes energy performance objectives that must be to perform on working. Than the management mode of PDCA and the principle of continuous improvement are adopted to establish the energy management data center and strictly implement the energy-saving work.

Figure 1: the energy management data center

- Carry out contract energy management, and do a good job in energy efficiency benchmarking. Apply advanced technology and scientific management methods, and strengthen management of key energy-consuming technologies and improve economic efficiency; and continuously eliminate and replacement by increasing capital investment and development and utilization of energy-saving technologies; vigorously carry out publicity and education on energy saving work, and raise awareness of energy conservation among all employees.
- The company's leaders have always attached importance to the measurement management work, and all the employees participated in the establishment of a four-level measurement network system. And increased the measurement points, all of which met the relevant requirements of the General Rules for the Provision and Management of Energy Metering Apparatus for Energy-using Units, GB17167-2006.Relying on electrolytic tank optimization and upgrading, flue gas waste heat utilization transformation, frequency conversion energy-saving devices, compressed air system optimization, intelligent management platform and other technological innovation, energy-saving transformation projects to achieve energy-saving efficiency. It has obtained the energy management system certification issued by China Classification Society Quality Certification Company.

Figure 2: actual arrangement

- The company attaches importance to energy structure. The high energy consumption equipment has disabled and replaced by natural gas combustion mixer. Using anode process production system changes to waste hear recovery. The one million waste water per year use to irrigation and use again by processing
- Each year, energy saving training plans will be formulated. And energy saving training will be strengthened. Energy management personnel will be organized to participate in various energy saving trainings organized by the Autonomous Region Energy saving Supervision Center, the Economic and Information Committee, and the Management Committee, and to strengthen the training of energy management talents.

Figure 3： training

- The company improves energy management and daily check. We check the cost of energy by every quarter, month, week, class. The problems would be found that waste of energy, like pilot burner, running water.
- Energy management implement unified scheduling、hierarchical management、partition running. That gets obvious economic benefits by operation mode of overall arrangement. The annual average energy saving reached 9,592 tce. At the beginning of each year, we will formulate energy consumption limit indicators and unit consumption indicators for each process product, and decompose energy consumption into various units on a monthly basis. Each month we will make statistical analysis of energy consumption, for monthly assessment of units exceeding the target limit, and the wages are closely linked to monthly performance.

Figure 4: dispatch center

- Using energy-saving shares to increase investment in contract energy projects. Invested $3.84 million to adopt the contract energy management mode to carry out frequency conversion power-saving transformation for Qingtongxia 350kA electrolysis series and Ningdong electrolysis purification fan drive motor. After testing, Qingtongxia 350kA purification inverter fan has a power saving rate of 32.06% or more, and it can save electricity 1,242 per year. Wan Kwh. Ningdong purification inverter fan 33.70%, annual energy saving 23.37 million Kwh; invested $31.83 million, 210 cells for energy-saving technical renovation overhaul, annual energy saving 81.06 million Kwh; electrolytic flue gas waste heat comprehensive utilization project, through The flue gas heat exchanger recycles 400kA electrolytic flue gas waste heat instead of steam heating, and the steam saved can generate 22.19 million Kwh per year. Invested $1.79 million to optimize the compressed air system in Ningdong, the power saving rate is about 15%, and the annual energy saving is 16 million Kwh.

- Cooperated with Central South University of Technology, Beijing University of Science and Technology, North China University of Technology and other universities are implemented the "multi-dimensional analysis application of electrolytic production process", "electrolytic tank intelligent system energy-saving research and development project", "anode production process quality analysis research and development". In electrolysis Multi-dimensional analysis technology was introduced in the anode production management to improve the level of production intelligence management and achieved good energy-saving results.

Energy management performance analysis:

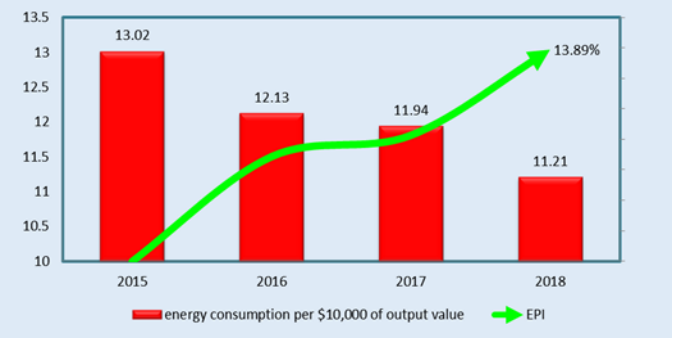

Figure 5: energy efficiency

In 2015, the company's comprehensive energy consumption completed 1,789.1 ktce, achieving a total industrial output value of $1,374.20 million, achieving energy consumption per $10,000 (comparable price) of 13.02 tce. In 2016, the company's comprehensive energy consumption was completed 1,711.4. ktce, the total industrial output value of $1,411.42 million, the energy consumption per $10,000 of output value (comparable) is 12.13 tce, the energy consumption per $10,000 of output value decreased by 6.87%. The company's comprehensive energy consumption in 2017 completed 1,882.1 ktce, the total industrial output value of $1,575.86 million, to achieve energy consumption per $10,000 (comparable price) is 11.94 tce, energy consumption per $10,000 of output value decreased by 6.26%.In 2018, the company's comprehensive energy consumption completed 1,965.8 ktce, achieving a total industrial output value of $1,753.48 million, achieving energy consumption per $10,000 (comparable price) of 11.21 tce, and energy consumption per $10,000 of output value decreased by 13.89%.

transparency

The company actively responds the requirements about energy management law, policy and energy saving. After obtaining ISO50001:2011/GB/T23331-2012 and RB/T 117-2014 energy system certification, the government admits those certification and gets rewards and money from governments at all levels, like " a clear water and blue sky" special reward. Though cleaning production audit, company gets special budget investment for ecological progress. That help company to reduce burden and support work improvement of energy saving.

Company takes "energy-saving and emission reduction" as a means and "controlling losses and reducing losses" as the goal. Energy management system construction is the strategic choice of enterprise development. At the same time, we set up a leading group that headed by the main person in charge of the enterprise and a dedicated work team by implementation of funds and other problems. The company actively promotes certification marks on various occasions, such as product identification, corporate promotional materials, key place posting, internet platform display, Each year auditing institutions train company personnel which is energy management, technical and statisticians. These can constantly improve energy management skills.

Lessons Learned

1. Looking back at the company's energy management system construction process, we still need to improve the following aspects:
2. With the rapid advancement of technology, the requirements for energy consumption standards are constantly improving, and the enterprise energy management indicator system should be updated

and refined to meet social and market requirements.

3. It is necessary to continuously organize training on the requirements of the employee's standard system, and to maximize employee recognition to improve employee engagement and initiative, which is critical to the success of the system.
4. Enterprises also need to increase investment in energy management system construction, continuously improve management objectives, actively promote production process improvement, and promote clean energy production.
5. The company needs to exchange experience of build energy management system indicators with excellent energy management. Studying good experience and mastering energy saving methods help us to improve energy management system.

- A “Developing and applying energy-saving technologies and equipment is only one aspect of energy-saving work. Simply relying on energy-saving technologies cannot ultimately solve the contradiction between energy supply and demand. Application system management methods reduce energy consumption, improve energy efficiency, and promote behavioral energy conservation. Building energy management systems is the key to energy management."
- B "Energy management system can reduce the energy consumption of enterprises while ensuring the normal production and operation of enterprises, so as to protect the environment on the premise of saving energy costs. The enterprise energy management system will inevitably bring huge development to the enterprise. contribution."

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visitwww.cleanenergyministerial.org/energymanagement.

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Accelerating the Transition to Clean Energy Technologies