

# ISO 50001 Energy Management System Case Study

2020

China

## Organization Name

*Anqiu Shanshui Cement Co., Ltd.*



Company overlook picture

### Organization Profile & Business Case

Anqiu Shanshui Cement Co., Ltd., a subsidiary of Shandong Shanshui Cement Group Co., Ltd., was incorporated in August 2003 with a registered capital of RMB 226.5 million, and the company is located in the zhaohu village of Shibuzi town, Anqiu City, Shandong Province. The company adopts the international advanced new dry kiln pre-decomposition technology, equipment, advanced technology. With two 5000t/d cement clinker production line, 1# production line started construction in 2003 and was completed and put into operation in November 2004; 2# production line started construction in 2007 and was completed and put into operation in May 2008, with the construction of two 9MW pure low-temperature waste heat power stations, which can generate 100 million kWh of electricity per year.

Companies adhere to the quality of efficiency-oriented road, quality survival, quality and efficiency, quality and development. In 2006 through the ISO9001 quality

management system and ISO14001 environmental management system certification, in order to more effective internal management, in 2008 GB/T28001-2001 standard into the company's management system, in 2012 GB/T28001-2011 standard conversion.

#### Case Study Snapshot

<b>Industry</b>	cement
<b>Product/Service</b>	portland cement clinker
<b>Location</b>	Zhaohu Village, Shibuzi Town, Anqiu City, Shandong Province
<b>Energy management system</b>	ISO 50001
<b>Energy performance improvement period, in years</b>	5
<b>Energy Performance Improvement (%) over improvement period</b>	7.53%
<b>Total energy cost savings over improvement period</b>	4779392.24 \$USD
<b>Cost to implement EnMS</b>	691398.50 \$USD
<b>Total Energy Savings over improvement period</b>	638404.43 (GJ)
<b>Total CO<sub>2</sub>-e emission reduction over improvement period</b>	910947.69 (Metric tons)

In 2014 through gb / T23331 and ISO 50001 Energy Management System certification. in the operation and management of the implementation of the push hard, detailed quantification of the quality, economic indicators, Promote the excavation of potential to reduce consumption, strengthen the assessment of

hardening responsibility, the use of scientific management methods, shaping the company's new image, to promote the management and international standards. Company's energy target: The comparable comprehensive standard coal consumption of clinker  $\leq$  98kgce/t; The comparable comprehensive electricity consumption of clinker  $\leq$  54kwh/t; comparable comprehensive energy consumption of clinker  $\leq$  100kgce/t.

**The public innovation incentive action plan mainly includes:** the continuous operation award to improve the effective operation and reduce abnormal energy consumption, the benchmark management award to enhance the competitiveness of enterprises in order to improve the level of indicator control, the record-breaking award for the coal power consumption index which stimulates the participation of the whole staff of fine management.

**Outstanding energy efficiency practices compared to similar enterprises at home and abroad:**

1. Optimize the ingredients program, use iron ore mineral tailings powder and other waste ingredients conducive to improving the production of high-quality silicate cement clinker, and achieve energy conservation and emission reduction, 2018 physical coal consumption of 116.62 kg/t compared to 2015 physical coal consumption of 128.70 kg/t, a reduction of 12kg/t.
2. Effective use of energy-saving working mechanism methods. Including energy audit, clean production audit, energy control center, energy-saving diagnostics, energy management system and energy conservation monitoring.

*“Energy efficiency is the first energy source”*  
—Jianzhong Li, General Manager

**Business Benefits**

Energy performance improvement:

Through the energy management system certification in 2015 to 2019, Energy performance increased by 7.53% annually.

Total energy cost savings:

Savings of \$316,332.87 during operation of the energy management system and \$16,16066.37 for capital investment projects, resulting in total energy savings of \$4779,392.24.

Cost to implement EnMS:

1. Internal staff for the development, implementation and maintenance of energy management system time from 2015 to 2019, a total of 5 years. 13 internal auditors prepare the system for external audit in May of each year.
2. Energy management center and energy consumption online monitoring system construction RMB 1.08 million.
3. Third-party audit fee: audit fee RMB 129,800.
4. Technical assistance: 2017 four system integration, quality, environmental management system replacement consulting fee 8000 yuan.

Total Energy Savings :

years	output (t)	total energy consumption (t)	Comprehensive energy consumption per unit product (kgce/t)	amount of energy saving (tce)
2014	3094670	344871.21	111.44	
2015	2470971	273378.84	110.64	-1987.09
2016	2421105	257379.40	106.31	-10482.44
2017	2112483	219312.94	103.82	-5257.88
2018	2245982	225145.64	100.24	-8026.89
2019	2230803	227595.02	102.02	3970.96

Total energy saving is 21783.34 Mtce, is 638404.43GJ.

reduction in CO<sub>2</sub> emissions:

years	carbon emission (t)	Cers (t)
2014	2826536.69	
2015	2241657.71	-584878.98
2016	2103708.00	-137949.71
2017	1803551.00	-300157
2018	1915589.00	112038

**Plan**

**the commitment of top decision:**

1. Appoint the production manager as the manager's representative for the energy management system of the company.
2. Approve the publication of the Energy Management Manual, which requires all employees to comply with the implementation.
3. Set up a leading group on energy conservation, and serve as the group leader.

**Energy consumption and use:**

According to its own characteristics, the company from the energy purchase storage, processing conversion, distribution transmission, energy use and other links to improve energy statistics management. The statistical raw records and statements include energy balance sheet, energy consumption scale and corresponding raw statistics, and the company's comprehensive energy consumption, unit output value comprehensive energy consumption, unit product output energy consumption, etc.

Regularly carry out energy statistical analysis, actively carry out energy management system audit, energy audit and energy conservation monitoring work, to improve energy performance measures to make corresponding adjustments.

**To ensure that the energy management system supports the organization's strategy and objectives:**

1. The Company shall make regulations on monitoring, measuring, analyzing and improving the operation of

the energy management system and the implementation of the product, and analyze the relevant data by collecting the relevant data and using applicable statistical techniques in order to identify problems and implement improvements.

2. The company prepares the Internal Audit and Management Procedure to evaluate and verify whether the process and results of various activities conform to the relevant regulations and the requirements of the management system, whether the product realization and operation control planning arrangements, to determine whether the management system is effectively implemented and maintained.

3. In order to ensure the continuing suitability, adequacy and effectiveness of the management system, the company has prepared a "management review procedure" to achieve the evaluation of the management system.

**Prioritize implementation decisions:**

At present, some of the equipment supporting the production line is high energy consumption phase-out equipment, in order to speed up the transformation of old and new kinetic energy, enhance the overall strength of enterprises, improve enterprise visibility, improve product quality, reduce the energy consumption of the system, promote the sustainable and healthy development of production and operation of enterprises, the company plans to the production line during the wrong peak in the winter of 2019 to optimize the upgrading of the production line.

After the transformation can improve energy utilization, reduce energy waste, purify the environment, reduce production costs, enhance the competitiveness of enterprises, improve the economic and social benefits of enterprises, so that the company is more full of vitality and vitality. The production line is optimized for upgrading the energy-saving quality.

Finally, the final decision is to make priority transformation of the raw abrasive system, fan system,

preheater system, coal grinding system and cooler system.

## Do, Check, Act

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### executing processes:

First, organizational leadership and goal decomposition:

1. The company set up an energy-saving leadership group, developed the company's annual energy-saving targets.
2. To achieve operational control, the company set up an energy-saving management office, set up a special energy management post and energy statistics post, and appointed the head of energy management, overall responsible for the company's day-to-day energy management organization, supervision, inspection, coordination, metering, statistics, quota assessment, data reporting and other work.
3. All departments set up energy management team, by the department head group leader, the head of the section as a member, the implementation of the company-workshop-team three-level management, clear tasks and responsibilities, to the grass-roots level and into the economic responsibility system assessment. So that the company's energy-saving work to achieve one-stop management, the formation of layers of people caught, everywhere someone tube, to do horizontal to the edge, vertical in the end, to ensure the completion of energy-saving tasks and indicators.

### second, energy saving management

In accordance with the Requirements of the Energy Management System (GB/T23331-2012), our company passed the energy management system certification in 2015, and annual Supervisory Audit.

### Incentives and support from top management:

The Company revised the Energy Management System, from the establishment and responsibilities of institutions, energy use process management, energy process management, energy statistics management,

main energy equipment management, energy consumption limit index management, energy conservation target management, energy management system, energy audit management, etc. made clear, the top management approved the implementation.

### Key activities to improve energy efficiency:

1. Strengthen the process quality and stability control strength: the main raw materials limestone and the main fuel raw coal-based, for all raw materials from the source to strengthen quality and stability control. Process quality and stability is one of the reasons for our company's low coal consumption.
2. Optimize the ingredients program: make full use of iron ore mineral processing powder, fly ash, wet ash, slag and other waste ingredients, that is, conducive to improving environmental pollution, but also conducive to improving the easy burning of raw materials.
3. Energy management center and energy consumption online monitoring system construction: Completed the production of key energy consumption equipment online monitoring, the company's energy consumption centralized report, centralized display monitoring command and meet the requirements of online reporting of energy management center and energy consumption online monitoring system construction work.
4. Implementation of technical reform projects and the application of advanced equipment: In the past two years, our company through the production line system technology, equipment, such as technical transformation, to achieve energy saving and consumption reduction. 2016-2019 a total investment of more than 20 million yuan, to achieve an annual energy-saving capacity of 2000 tons of standard coal. Such as in 2019 my company has introduced magnetic levitation blowers, air suspension fans, permanent magnetic direct drive motor and other advanced energy-saving equipment, annual energy savings of 1.33 million degrees, equivalent to 163.46 tons of standard coal.

**target implementation:**

Energy consumption indicators for enterprises in the last three years

years	The comparable comprehensive standard coal consumption of clinker kgce/t	The comparable comprehensive electricity consumption of clinker kwh/t	comparable comprehensive energy consumption of clinker kgce/t
2017	94.84	52.64	101.31
2018	91.62	53.73	98.22
2019	93.41	54.51	100.11

Remark:

The comparable comprehensive standard coal consumption of clinker Advanced value  $\leq 103$ kgce/t, The comparable comprehensive electricity consumption of clinker Advanced value  $\leq 56$ kwh/t, comparable comprehensive energy consumption of clinker Advanced value  $\leq 110$ kgce/t.

**Energy performance improvement:**

years	total energy consumption (tce)	energy performance (%)	remark
2014	344871.21		(baseline energy consumption - reporting energy consumption) / baseline energy consumption *100
2015	273378.84	20.73	
2016	257379.40	5.85	
2017	219312.94	14.79	
2018	225145.64	-2.66	
2019	227595.02	-1.09	
average		7.53	

The baseline period for energy performance in the 2015 reporting period is 2014, the baseline period for energy performance in the 2016 reporting period is 2015, the baseline period for energy performance in the 2017 reporting period is 2016, and the baseline period for energy performance for the 2018 reporting period is 2017; The benchmark period for energy performance for the 2019 reporting period is 2018.

**Ways to improve energy efficiency:**

Through the company's production process, equipment products and other conditions, determine the energy efficiency benchmark system, carry out statistical analysis, energy audit, energy balance, testing, etc. to obtain the basic data of the energy efficiency benchmark system, Against the benchmarks, the standard practice, evaluation of the target, continuous improvement.

**Data standardization factors:**

1. Regression analysis

1.1 Comparable clinker comprehensive coal consumption: clinker comprehensive standard coal consumption according to clinker 28d pressure strength grade correction to 52. Standard coal consumption derived from the uniform revision of level 5 and altitude.

1.2 Comparable clinker comprehensive power consumption: clinker comprehensive power consumption according to clinker 28d anti-pressure strength level to 52.5 grade and altitude - the combined power consumption obtained after correction.

1.3 Comparable clinker comprehensive energy consumption: in the statistical period, the consumption of various energy per ton of clinker consumed by the clinker 28-day anti-pressure pressure strength grade was revised to 52.5 grade and altitude unified correction and converted into standard coal-derived combined energy consumption.

2. Key variable factors:

2.1 The quality of raw coal procurement is one of the reasons that affect coal consumption index. The actual situation of raw coal heat, volatile, ash, water and other indicators will directly affect the use of raw coal process, so the company strengthens the quality control room for raw coal acceptance, to ensure the quality of raw coal into the plant.

2.2 The lack of high-quality limestone resources also directly affects the operation of limestone crushing system and raw abrasive system, resulting in an increase in operating current, affecting the production of electricity consumption, and because the clinker magnesium oxide continues to rise, to Shaoxing variation, resulting in low clinker production and increased electricity consumption.

2.3 Because Weifang City, Shandong Province belongs to the key area of atmospheric pollutant emission control, the value of various pollutant emissions is strict, so the consumption of ammonia for denitrification of flue gas is large, resulting in an increase in physical coal consumption, which directly affects the overall energy consumption; In the case of unstable conditions in rotary kilns, the impact is greater.

Tools & Resources:

The company is dependent on ABB automation control system to produce automatic power collection system .set up an energy control center and energy consumption monitoring system, Through third-party organizations to assist in energy audit, energy-saving diagnosis, carbon emissions verification, thermal calibration, energy metering system and other work, the company's energy situation to conduct a comprehensive evaluation, improve the level of energy management, improve energy conservation awareness.

Transparency



Lessons Learned

- A High magnesium clinker research and development production (high magnesium low-grade limestone application) project by Shandong Province cement industry 2019 "Refa Cup" technical innovation award "technological innovation award" category second prize.
- B Airport road cement clinker project won the third prize in the "Technological Innovation Award" category of the 2019 "Refa Cup" Technology Innovation Award in Shandong Province cement industry.
- C The coal mill ingesting process optimization and transformation project won the third prize of the technical transformation category of the 2019 "Refa Cup" technology innovation award of the cement industry in Shandong Province.

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 visit [www.cleanenergyministerial.org/energymanagement](http://www.cleanenergyministerial.org/energymanagement).

