

# Research and analysis of energy management in ceramic industry

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**Abstract:** This article mainly researches and analyzes the relevant standards of the energy management system of the ceramic industry at home and abroad, the content of the energy management system and the status quo of the industry's energy management, and elaborates the necessity and urgency of the implementation of energy management standardization in the ceramic industry.

## 1 Introduction

The ceramic industry with high energy consumption is one of the key industries for energy saving and emission reduction in my country. The current ceramic industry is in a period of adjustment of development mode. Low-carbon, green and sustainable development are the main keynotes of the industry in the future. Energy management is a key link in realizing the low-carbon development of enterprises, which directly determines whether enterprises can achieve sustainable development[1].

In 2015, the Energy Conservation and Comprehensive Utilization Department of the Ministry of Industry and Information Technology issued the "Notice on Printing and Distributing the Implementation Plan for the Construction of Energy Management Centers for Enterprises in the Steel, Petroleum and Chemical, Building Materials[2], Non-ferrous Metals, and Light Industry Industries", requiring the implementation of the "Energy Conservation Law" and the improvement of corporate energy management System, strengthen government energy-saving supervision methods, and improve enterprise energy management level. Among them, the "Building Material Enterprise Energy Management Center Construction Implementation Plan" clarifies the basic requirements, construction content, and acceptance standards for the construction of industry energy management centers.

In June 2016, the China Building Materials Federation issued the "Thirteenth Five-Year Science and Technology Development Plan for the Building Materials Industry", which proposed that "the energy consumption of the industrial added value of enterprises above designated size should be reduced by 20% compared with the "Twelfth Five-Year" period".

The "Thirteenth Five-Year Development Guidance for the Building Ceramics and Sanitary Ware Industry" compiled by the China Building and Sanitary Ceramics Association pointed out that "Develop green strategies, green standards, and establish a green evaluation system. Optimize internal industrial design, promote industrial integration in the park, and achieve resource efficiency Recycling. Strengthen energy management, establish an energy measurement management system, and actively carry out cleaner production audits"[4].

The above national ministries or industry plans all pointed out that ceramic industrialization should develop in the direction of green, ecological, and energy-saving. The introduction of national standards for the implementation of energy management system in the ceramic industry will improve the energy efficiency, energy conservation and emission reduction of my country's ceramic industry. Green development is of great significance.

## 2 Analysis of product quality spot check

Relevant countries in the world have formulated and implemented national standards for energy management systems, such as the "Energy Management Guidelines" formulated by the UK Energy Efficiency Office for building energy management, the MSE2000 "Energy Management System" developed by the American National Standards Institute (ANSI), and the Swedish Standards Institute The "Energy Management System Description" formulated, the "Energy Management System Requirements and Guidelines" formulated by the National Standards Institute of Ireland (NSAI), the "Energy Management Code" issued by the Danish Standards Association, etc. In addition, South Korea has also issued corresponding national standards[5], and Germany and the Netherlands have also formulated

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corresponding energy management system specifications. In addition, in 2010, the European Committee for Standardization (CEN) developed and issued the EU standard (EN 16001) required by the energy management system.

The domestic national standard GB/T 23331-2009 "Energy Management System Requirements" was promulgated on March 11, 2009, and officially implemented on November 1, 2009. On October 9, 2009, the National Certification and Accreditation Administration issued the "Notice on Carrying out the Pilot Work of Energy Management System Certification", proposing to carry out pilot projects for the construction of energy management systems in ten key industries including building materials and iron and steel from November 1, 2009, The pilot period is two years. The ISO 50001 international standard was officially promulgated and implemented on June 15, 2011. On December 31, 2012, the national standard GB/T 23331-2012 and GB/T 29456-2012 "Energy Management System Implementation Guide" equivalent to ISO 50001 were issued and released in 2013 It was formally implemented on October 1, 2015. Since the national standards of "Energy Management System Requirements" and "Energy Management System Implementation Guide" are applicable to all industries and all organizations, each industry has its own characteristics in the process of establishing an energy management system, so corresponding implementation guidelines are needed as guidance And action guide to make it operable. On December 31, 2020, the national standards GB/T 23331-2012 and GB/T 29456-2012 "Energy Management System Implementation Guidelines" equivalent to ISO 50001 were released and officially implemented on

October 1, 2013. On March 1, 2020, the national standard GB/T 38706-2020 "Energy Management System Implementation Guide for the Ceramic Industry" was officially released and officially implemented on October 1, 2020.

### 3 Energy management system content and status

The energy management system should cover the organization's internal processes and outsourcing processes related to energy management; management responsibilities: including management commitments, energy policies, roles, responsibilities, and authority requirements; planning: including energy factors, laws and regulations and other requirements, energy management Requirements for benchmarks and benchmarks, energy goals and indicators, energy management plans, etc.; implementation and operation: including requirements for resources, capabilities, training and awareness, information exchange, document control, record control, operation control, etc.; inspection and correction: Including monitoring, measurement and evaluation, compliance evaluation, non-conformity, correction, corrective measures and preventive measures, internal audit and other requirements; management review: including general rules, review input, review output and other requirements. The main energy-consuming equipment for ceramic industry production includes: jaw crusher, roller crusher, ball mill, forming machine, processing conveyor line, elevator, drying chamber, tunnel kiln, shuttle kiln, washing tower, water pump, etc. The detailed information is shown in Table 1.

**Table1.** Main energy-consuming equipment in the ceramic industry

Serial number	Equipment name	power	quantity
1	Jaw Crusher	30kw	1
2	Roll crusher	30kw	1
3	Ball mill	55kw	16
4	Ball mill	45kw	4
5	Ball mill	22kw	2
6	Ball mill	11kw	3
7	Forming Machine	20 kw	1
8	Forming Machine	2 0kw	1
9	Forming Machine	20 kw	1
10	Forming Machine	10 kw	1
11	Forming Machine	5kw	1
12	Forming Machine	5kw	3
13	Processing conveyor line	10 kw	3
14	lift	3 kw	33
15	Drying room	/	1

16	Drying room	/	1
17	Drying room	/	1
18	Drying room	/	1
19	Drying room (low pressure fast drainage)	/	1
20	Tunnel kiln	135 kw/	1
21	Tunnel kiln	135 kw	1
22	Tunnel kiln	94.7 kw	1
23	Tunnel kiln	141.5	1
24	Shuttle Kiln	44 kw	1
25	Shuttle Kiln	22 kw	1
26	Washing tower	220kw	2
27	Water pump (submersible sewage)	5.5	10
28	Water pump (other)	11	5
29	Water pump (Aoki)	7.5	10

The main energy measuring instruments produced in the ceramic industry include: watt-hour meters, floor scales, natural gas flow meters, watt-hour meters, natural

gas flow meters, water meters, etc. The detailed information is shown in Table 2.

**Table2.** Main energy measuring instruments in the ceramic industry

Serial number	Name	accuracy level	number to be allocated	number already allocated
1	Watt-hour meter	1	3	3
2	Weighbridge	/	/	/
3	Natural gas flow meter	1	2	2
4	Watt-hour meter	2	6	6
5	Natural gas flow meter	2	3	3
6	Water meter	1	1	1
7	Water meter	2	11	11

The energy consumption of natural gas, coal, electricity, gasoline and diesel is converted into standard coal to calculate the comprehensive energy consumption.

The energy consumption flow of enterprises is shown in Table 3.

**Table3.** The flow of energy consumption in the ceramic industry

Items		raw materials	ball milling	drying	firing	manufacturing	packaging	other	total
electricity (10,000 kWh/t)	Physical quantity	47	455	206	452	371	65	154	1750
	Scalar	57	560	254	555	456	80	189	2151
natural gas (M <sup>3</sup> )	Physical quantity	0	20404.5	644418.3	5773478.8	510145.4	0	163,265.4	7111710
	Scalar	0	27	857	7679	678	0	217	9459
gasoline (t)	Physical quantity	0	0	0	0	0	0	10.14	10.14

	Scalar	0	0	0	0	0	0	/	
Diesel (t)	Physical quantity	15.69	0	0	0	0	3.34	8.36	27.39
	Scalar	22.86	0.00	0.00	0.00	0.00	4.87	12.18	39.91
coal (t)	Physical quantity	0	0	0	0	0	0	0	0
	Scalar	0	0	0	0	0	0	0	0
Total conversion (t)		80.17	586.67	1110.72	8234.08	1134.36	84.95	418.33	11649.29
The proportion(%)		0.69%	5.04%	9.53%	70.68%	9.74%	0.73%	3.59%	100.00%

## 4 Conclusion

In the future, with the rapid development of modern information technology and manufacturing technology integration and innovation, the building ceramics and sanitary ware industry will develop towards integration, intelligence, and flexibility, and realize the integrated innovation of R&D, design, production and management, innovative research and development, Manufacturing and industrial organization methods to realize the flexibility, agility, digitization, networking and coordination of manufacturing and supply chains.

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