

ACHIEVEMENTS, PROBLEMS AND COUNTERMEASURES OF ENERGY CONSERVATION

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Abstract:

In present study, the energy utilization of salt industry in Hubei Province was investigated. The achievements and features of energy-saving were summarized. Furthermore, the problems in this area were analyzed and countermeasures were developed.

Key words: Salt industry; Energy efficiency; Energy-saving Approach; Energy-saving proposal

1. ACHIEVEMENTS ENERGY-SAVING

OF

Hubei Province. And thus a lot of achievements have been made, which can be concluded as follows.

Recently, considerable efforts have been devoted to the energy conservation and efficiency improvement in salt industry by

1.1 Enhancement of energy efficiency

- Coefficient of elasticity in energy consumption. The average coefficient of elasticity is 0.38 from 1996 to 2008, which indicates a significant reduction in energy consumption per unit output.
- Comprehensive energy consumption per ton of salt. In 2008, the comprehensive energy consumption for one ton of salt is 159.6 kilogram of standard coal, which is 103.7 kilogram lower than that of 1995, with an average annual decrease rate of 3.78 percent.
- Steam consumption per ton of salt. The steam consumption for one ton of salt is 1.1 ton of steam in 2008, which is 0.6 ton lower than that in 1995, with an average annual decrease rate of 3.29 percent.
- Power consumption per ton of salt. The power needed for one ton of salt is 80.15 kilowatt hour. This is 27.85 kilowatt hour less than that in 1995, with an average annual decrease rate of 2.27 percent.
- Brine consumption per ton of salt. The brine consumption for one ton of salt is 14.4 standard cubic meter in 2008. It is 2.13 standard cubic meter less than that of 1995 (see Table 1).

Table 1 Consumption of energy and raw materials ^a

Terms	Unit	2008	1995	Absolute reduction	Average annual decrease rate (%)
Comprehensive energy consumption	kilogram of standard coal/ ton of salt	159.59	263.29	103.70	3.78
Steam consumption	ton / ton of salt	1.10	1.70	0.60	3.29
Power consumption	kwh/ton of salt	80.15	108.00	27.85	2.27
Brine consumption	standard cubic meter/ ton of salt	14.40	16.53	2.13	1.06

^a From "Annual Statistics Report in Salt Industry of Hubei Province"

1.2 Substantial financial gains

The energy consumption for ten thousand Yuan GDP is 14.97 ton of standard coal, with a 56.84 percent reduction in comparison with

that in 1995. This means that 878 000 ton of standard coal was saved in 2008, as described in Table 2.

Table 2 Effect of energy utilization

Terms	Unit	2008	1995	Relative increase rate (%)
Energy consumption	Ton of standard coal	666673	388656	71.53
Industrial increase	Million Yuan	445.25	112.04	297.40
Comprehensive energy consumption for ten thousand Yuan	Ton of standard coal	14.97	34.69	-56.84
Total energy-saving	Ton of standard coal	878033	---	---

1.3 Great progress in energy-saving technology.

The waste gas, waste water and industrial residue of salt production have met the discharge limits. For some cases, zero release has even been achieved. There is a project entitled "energy-conservation optimization project for salt production". It was developed by five enterprises, including CNSIC Hongbo Co.,Ltd, Hubei Lantian Sallification Co.,Ltd, CNSIC Changjiang Co.,Ltd. It was approved by National Development and Reform

Commission and National Ministry of Finance. This project can save up to 144 thousand ton of standard coal one year. And thus, it was awarded a National Special Award on Energy-Saving.

2. FEATURES OF ENERGY-SAVING

In conclusion, several approaches have been employed to save energy.

2.1 Adjusting structure and eliminating

backward production.

The "Restructuring Plans for Salt Industry of Hubei Province during Eleventh Five-Year" was set and implemented. Based on the plans, the utilization efficiency of energy and resources was enhanced by using resources appropriately and optimizing products structure. Take the mirabilite-producing system for example. Enterprises, including CNSIC Hongbo Co.,Ltd, Hubei Lantian Sallification Co.,Ltd, and CNSIC Zaoyang Co.,Ltd, optimized and upgraded the old system. As a result, the producing efficiency and product quality were both enhanced. And the product structure was also optimized. For the salt industry, enterprises increased the extent of eliminating backward production. Both the equipment with a capacity below 150,000 ton per year and with high energy consumption was concealed. Instead, equipment with larger scale, which is also automatic and high-efficiency, was installed. 14 devices have been installed in the nine fixed salt companies in Hubei Province by the end of 2008. Among them, there are 4 equipments with a capacity of 60 ton and there are 5 devices with a capacity at 30 ton. In conclusion, the purpose of saving energy and enhancing efficiency was achieved via adjusting the structure and eliminating backward production.

2.2 Developing new technology.

Sponsoring the new technology development in energy conservation was always considered as the important part in salt industry, promoting the development on

the key technology. There are some examples. First, enterprises technologically transformed the power plant boiler via using the technology of circulating fluidized bed boiler combustion, improving the combustion efficiency and desulfurization. Second, companies optimized power facilities, reducing power consumption. To save energy, they equipped some motors with compensation capacitor and applied the VVVF technology on the boiler, salt point (cited) fan, and hot-bed. Third, companies used advanced equipment to improve the cooling system. They recycled condensed water. Moreover, they used them in a ladder-like way, making full use of water resources and heat. Forth, companies utilized ash comprehensively. When building circulating fluidized bed boiler, they also built the coordinated ash-clean power plant and gas-transportation system. As a consequence, they made the ash a useful material for preparing cement and brick. Therefore, they not only saved the energy for the society, but also protected the environment.

2.3. Strengthening company management.

There are several steps to strengthen management on energy conservation. First, the Provincial Salt Department set the long-term goal and annual plans on energy-saving, and examines and supervises their implement in salt industry. Second, every company need to establish the Energy Conservation Committee (leading team), which wholly assign the task of energy saving. Third, enterprises need to set up the target-responsibility and assessment rules and

then decompose energy-saving to each company, each sub-factory and each team. Forth, in the guidance of "Temporary Measures in Managing Funds for Awarding Energy-saving Technological Transformation", jointly issued by National Development and Reform Commission and National Ministry Of Finance, and "Temporary Measures in Managing Funds for Energy-conservation of Hubei Province", jointly made by Provincial Ministry Of Finance and Provincial Development and Reform Commission, the application for the 2008 financial awards on technological transformation and technology promotion of energy-saving should be well prepared in the entire province. For example, the "Energy-conservation optimization project for salt production" developed by five enterprises, including Lantian Sallification Co.,Ltd, won a national special prize of 33 million Yuan in total. In addition, the Provincial Ministry of Finance will issue the incentive funds in batches, supporting the energy-saving projects, such as utilization of residual heat and pressure, optimization of energy system, transformation of industrial boiler, energy conservation of electrical system, and so on.

2.4 Entirely participating.

There are two steps. On one hand, the energy-saving publicity should be strengthened, raising people's awareness on energy conservation. Gradually, this will make the awareness on energy-saving and efficiency enhancement a habit of every employee. Salt enterprises can made full use of mass media, such as newspaper, radio, and

television, to vigorously promote national policies, regulations and important actions on energy-saving, as well as the company's plan. Also, they hold affairs of energy-saving and environment protection. The employees will fully understand the fundamental knowledge and approaches to save energy. Consequently, they can enhance the awareness on energy crisis, energy conservation and environmental protection in the company-wide. On the other hand, enterprises need to deepen the building of enterprise's culture, regulating employee's professional ethics, and widely carry out innovation and efficiency enhancement of energy-saving. In this case, they can make full use of Labor Union to hold activities on energy conservation, such as Labor contest, rationally proposing, technically innovating and inventing. They also need to instruct employees to actively take part in these activities. Gradually, the company will form the positive atmosphere on saving "drop of water, drop of oil, piece of paper, kwh of power".

3 PROBLEMS IN ENERGY CONSERVATION

The energy-utilization efficiency of salt industry in Hubei Province has been improved greatly since 1995. However, in comparison with related domestic enterprises, there is still a big gap. Therefore, for the salt industry of Hubei Province, there is still a long way to go on energy-saving. Several comparisons will be made here to illustrate the gap.

3.1 Coefficient elasticity of energy consumption

From 1995 to 2008, there is an economic increase of 11.2 percent in salt production and 4.24 percent growth in energy consumption. On the whole, the coefficient elasticity of

energy consumption is 0.38. Here, the question is whether this value is advanced or reasonable enough. For the answer, the comparison with related domestic enterprises needs to be made at first. Due to the limited data, only the period from 1999 to 2008 can be obtained. The result is displayed in Table 3.

Table 3 Coefficient elasticity of energy consumption for domestic enterprises ^a

Province/City	Increase rate of energy consumption (%)	Increase rate of GDP (%)	Coefficient elasticity of energy consumption
Chongqing	14.12	18.47	0.76
Sichuan	3.49	5.11	0.68
Yunnan	3.83	10.11	0.38
Hubei	5.21	6.93	0.75
Hunan	6.78	9.70	0.70
Jiangxi	16.03	24.48	0.65
Henan	13.79	12.85	1.07

^a From «Compilation of Statistics for National Salt Industry»

As shown in Table 3, the annual increase rate of GDP in Hubei Province is 6.93% in the studied range. This means that the GDP in 2008 is 0.96 times higher than that in 1999. The energy consumption in 1998 was 401,000 ton of standard coal and the value is 666,700 ton of standard coal in 2008. The latter is 0.66 times higher than the former case. In this period, the annual increase rate is 5.21 percent and the coefficient elasticity of energy consumption is 0.75. As can be further appreciated from Table 3, the coefficient elasticity of energy consumption in Hubei Province is lower than that of Henan Province and Chongqing City, but is higher than that of Sichuan, Yunnan, Jiangxi and Hunan Province. As we all know, the coefficient elasticity of energy consumption reflects the increase of energy consumption for each

percent of economic growth. To some extent, the higher is the coefficient elasticity of energy consumption; the lower is the efficiency of energy utilization. According to the result in Table 3, the efficiency of energy utilization in salt industry is lower than that of Yunnan, Hunan, and Jiangxi Province.

3.2 Energy consumption for each unit of output

In 2008, the energy consumption is 14.97 ton of standard coal for every 10,000 Yuan. The value in 1998 was 17.60. This means there is a decrease of 14.93 percent. However, the energy consumption is still higher than that of the advanced provinces. As can be seen from Table 4, the value of Hubei Province is 1.61 times higher than that of Yunnan Province, and 0.55 times higher than

that of Jiangxi Province. Also, it is 0.42 times higher than that of Chongqing City. In conclusion, the efficiency of energy use in

salt industry is still at a low level in our province.

**Table 4 Energy consumption for each unit of output in salt industry
(Ton of standard coal per ten thousand Yuan)**

Province/City	2008	1998
Chongqing	10.56	15.35
Sichuan	14.33	16.73
Yunnan	5.74	10.32
Hubei	14.97	17.60
Hunan	13.72	17.98
Jiangxi	9.67	19.52
Henan	21.53	19.82

4 MEASURES TO IMPROVE ENERGY CONSERVATION

Generally, there is still a big gap between energy utilization in our province and the advanced companies in our country. Therefore, effective steps should be taken to deepen energy conservation, saving energy and enhancing efficiency of using energy.

4.1 Strengthening awareness on saving energy and resources, saving energy initiatives and consciously.

After years of unremitting efforts, great achievement has been made in salt industry of Hubei Province. In general, the efficiency of energy utilization has been enhanced greatly. However, we should be soberly aware that the energy consumption indicators of many enterprises are still much lower than the advanced level. Moreover, relative shortage of energy has been a constraint for developing salt industry. And thus, it will be more than important to do well on saving energy in present situation. We should fully

understand the importance of energy-saving in a strategic and overall perspective. Also, we need to strengthen the sense of responsibility and urgency, and firmly implement the concept of scientific development and concept of correct performance. Various forms of publicity, education and training can be used to make people know clearly that saving energy and protecting environment are not only the requirement of our country, the needs of society and the responsibility of corporation, but also the inevitable choice to enhance the core competitiveness of enterprises and establish the good image. The objective is to constantly emphasize the awareness of energy crisis and energy conservation, and make saving energy be a conscious action of the members.

4.2 Persevering in coordinated development and speeding up structural adjustment and system optimization.

In accordance with the change of economic growth and the requirement of new industry,

saving energy, reducing energy consumption and protecting environment should be placed in a prominent position. The requirement of new industry includes advanced technology, higher benefit, low resource consumption, less environmental pollution, and that human resources can be full used. The product-structure adjustment and entire system optimization should be accelerated continuously via overall planning and harmoniously developing. The objective is to unionize speed, kinds of product, quality, safety, environment protection and benefits. Enterprises should implement the "National Salt Industry Restructuring Plans" and optimize the process by firmly eliminating equipment and product forbidden by the government. These are high-consumption, low-efficiency, and high-pollution. Consequently, the efficiency of system running can be improved, and energy and water can be used in a ladder-like way. At the same time, technology, including comprehensive utilization of mineral resources and solid waste, and recycling the water resources, need to be promoted appropriately. The development of recycling economic will be accelerated in this way.

4.3 Pushing technology advancement and speeding up its application

In the guidance of "Energy Conservation Plans for Salt Industry in Hubei Province during Eleventh Five-Year", the technology advancement of salt industry should be promoted via considering energy-saving as the key areas of investment and high-tech industry's promotion. The stable and reliable

energy saving engineering needs to be formed technologically as soon as possible. Enterprises can strengthen their technological transformation of energy conservation by applying new technology, process and device. Key projects and demonstrated engineering of energy conservation should be supported in the first order. These projects include restructuring coal-fired boiler, co-using heat and power, recovering waste heat, electric energy-saving, optimizing energy system, as well as monitoring energy-saving and building technical service system. Furthermore, the evaluation systems of energy saving need to be established and fulfilled. And the scientific research and technological transformation should be strengthened. Then, the technology of energy conservation will be improved entirely.

4.4 Strengthening the based work of energy conservation and managing effectively

Enterprises need to improve their management network of energy conservation continuously and implement the responsibility system of energy saving, enriching enterprises regulations on saving energy. Enterprises should start with accounting, statistics and test of energy consumption, and establish conservation managements on ration, norms, standard and system. They need to promote the management of energy contract and energy auditing positively and reduce the resources and energy consumption constantly. They are also required to save energy from the original and make well evaluation on energy and

water conservation. They should build facilities of energy saving, water saving, and environmental protection with the main projects, and make sure their capacity of can meet the requirements of energy conservation. At the same time, they need to use appropriate measures and management, achieving goals of energy saving.

4.5 Promoting communion and cooperation, progressing together.

Exchanges and cooperation with enterprises internal or international, especially with companies from the same filed, should be strengthened. In this way, companies can learn from each other and make progress together. Moreover,

Association of Hubei Salt Industry should play an active role to popularize the advanced technology in energy saving, trying to share the management of energy saving and technological information in salt industry. For the salt enterprises of Hubei Province, competition with companies internal or international should be encouraged. This will force them to improve their technology and management, helping reduce the unit energy output of main products, and energy consumption of important process. Moreover, affairs on promoting advanced technique should be held regularly to promote high-tech and advanced technology for the conventional salt industry, enhancing the role of high-tech in saving energy and increasing efficiency.