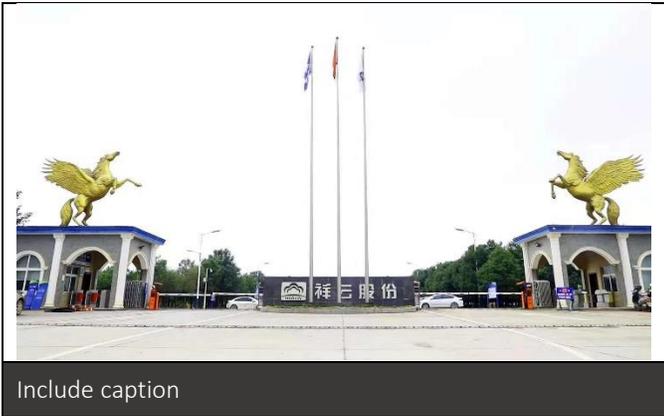


# ISO 50001 Energy Management System Case Study

CHINA

## Hubei Xiangyun (Group) Chemical Co.,Ltd.

*National civilized unit*



Include caption

### Organization Profile & Business Case

Hubei Xiangyun (Group) Chemical Co.,Ltd., a national civilized unit, is a large-scale chemical enterprise mainly producing phosphate and compound fertilizers. It is a large-scale phosphate chemical group that gains the key support of the Hubei provincial government. After more than 40 years'accumulation and 10 years' rapid development, XIANGYUN Stock Co., Ltd. has become the largest agricultural production base of monoammonium phosphate, the largest industrial production base of monoammonium phosphate and the largest production base of high purity potassium dihydrogen phosphate in China. The production scale of compound fertilizer ranks the first in the country. The annual comprehensive production capacity of fertilizer reaches 4 million tons, as well as supporting production of sulphuric acid and synthetic ammonia. Ammonia and other products, and the use of phosphate rock associated resources by-product magnesium hydroxide, fluoride and other products. The company has set up an energy management department, organized professionals to manage the company's energy, and implemented energy management system, benchmarking management, power demand side management, advanced energy-saving technology, and

### Case Study Snapshot

<b>Industry</b>	Fertilizer manufacturing
<b>Product/Service</b>	Ammonium phosphate/ Mixing fertilizer
<b>Location</b>	Tianzhen Pantang, Wuxue City, Hubei Province
<b>Energy management system</b>	ISO 50001
<b>Energy performance improvement period</b>	3years
<b>Energy Performance Improvement (%) over improvement period</b>	6.13%
<b>Total energy cost savings over improvement period</b>	\$1863.07
<b>Cost to implement EnMS</b>	\$190.55
<b>Total Energy Savings over improvement period</b>	3498420(GJ)
<b>Total CO<sub>2</sub>-e emission reduction over improvement period</b>	297664.2t

eliminated low-energy efficiency production equipment and devices. The company's leading product, slurry-based monoammonium phosphate (powder), was awarded the leading benchmark enterprise of energy efficiency in China's petroleum and chemical industries in 2015 and 2017. And the company got the title of Electricity Demand side Demonstration Enterprise and Energy Management Center Construction Demonstration Enterprise. The company's energy management platform was put into operation in 2017, marking the company's energy management entering a new era.

*“Create a world-class innovative green chemical company”*

—Hu Huawei Chairman of the Group

## Business Benefits

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The company began to establish the energy management system GB/T 233331-2012 in 2015. Through the standard management, energy evaluation, tapping the potential of energy saving, energy-saving transformation of steam waste heat and residual pressure utilization, energy-saving optimization transformation of main energy-consuming equipment and processes, good results have been achieved. In 2015, we formulated a plan for grinding mills to rush to avoid peak power consumption, implemented relevant policies such as peak-valley and differential electricity prices, and saved **0.74million** of electricity consumption cost. In 2016/2017, we actively participated in centralized competition of direct electricity transaction in Hubei Province, signed a direct purchase agreement with power plants, and compared the annual electricity cost savings of large industrial electricity prices with nearly **1.89million**. On March 16, 2017, the company was checked and accepted by the Electricity Demand side Demonstration project organized by the Ministry of Industry and Telecommunications of China.

In January 2016, our company took the lead in obtaining the third-party certification of energy management system in the same industry in Hubei Province. Meanwhile, slurry-based monoammonium phosphate was the leader in energy efficiency benchmarking enterprises of key energy-consuming products in China's petroleum and chemical industries in 2015 and 2017. According to the requirements of the implementation plan of energy management system evaluation, the company invested 96.598 million yuan to build the energy management center in 2016. The construction of the center greatly improved the management effect of energy management system. Through the energy saving audit of Hubei Chemical Industry Research and Design Institute, the company actually saved 20723 tce/a, reduced carbon dioxide emissions by 51,662 tons, and was checked and accepted by the energy management center of the Ministry of Industry and Information Technology in June 2018. The acceptance work of the demonstration

enterprise has been unanimously praised by the members of the acceptance expert group.

In June 2017, according to the requirements of the energy evaluation scheme, the company upgraded the ammonium phosphate plant in the old area. After upgrading, the comprehensive unit consumption of the ammonium phosphate project will be reduced from 249 kgce/t to 179.77 kgce/t, and the energy-saving capacity of 162,000 tons of P2O5 will be 11215.26 TCE calculated according to the output of 300,000 tons. The synthetic ammonia will be reduced from 1663 kgce/t to 1451.94 kgce/t, and the energy-saving capacity will be 636,00 TCE according to the annual output of 300,000 tons. Yield of 50.88 million yuan, the two energy-saving amounts of 74,815.26 tce/a, economic benefits of 59.8522 million yuan, reducing carbon dioxide emissions of 186,514.44 tons.

Every year, the company spends about **0.44million** on maintenance of measuring instruments, **0.09million** on software maintenance and updating, **14.77 thousand** on system certification, **14.77 thousand** on energy audit, **73.85 thousand** on energy efficiency monitoring, Three years totaling **1.91 million**.

From 2015 to 2017, the energy-saving amount was 119,400 tons of standard coal. According to the value of 104.44 per ton of standard coal, the average annual energy-saving benefit was **14.11 thousand**. The total economic benefit of self-purchasing electricity and Fengping Valley is 4.52 million, A total of 1863.07 million, and the input-output ratio is 1:9.78.

Through energy management in management, technology and industrial structure optimization, the company can promote energy management in various units and achieve good results.

## Plan

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Leaders of the company attach great importance to energy management, and put forward the enterprise vision of "building a world-class innovative green chemical enterprise". By compiling energy management

manuals, energy management system, management standards and work standards are formulated, and according to the system, relevant personnel, funds and equipment are invested to ensure the efficient and stable operation of energy management.

Energy management is not only a long-term strategic task, but also an urgent task in enterprise management. Energy management should comprehensively implement the scientific concept of development, implement the basic national policy of saving resources, and improve the efficiency of energy utilization. It is essential to change the mode of economic growth, adjust economic structure and speed up technological progress, strengthen the consciousness of energy management of all employees in enterprises, establish strict management system, implement effective incentive policies, and gradually form enterprises with their own characteristic Long-term mechanism and management system of energy management to create world-class innovative green chemical enterprises.

**Resource input:** The company has set up an energy management system with 179 full-time and part-time energy managers and technicians. At the same time, 1-5% of the profits are used for the introduction of energy-saving technology, the transformation of energy-saving equipment and the matching of energy measurement every year.

**Energy Statistical Analysis:** The company has formulated the relevant system of energy statistical management, clarified the relevant responsibilities, and established various statistical reports at different levels. The energy management center automatically collects data to generate energy report forms, and carries out data analysis in the form of pie chart, column chart, polyline chart, scatter chart, etc. to realize real-time statistical analysis of energy consumption data in every shift, daily and monthly. At the same time, according to the requirements of the government statistical department and the competent energy-saving department, all kinds of statistical reports are submitted on time.

**Through the energy review, we sorted out the implementation plan of energy management, sorted it according to the requirements, and organized the implementation:**

- The degree of impact on energy performance;
- Compliance with laws, regulations, policies, standards and other requirements;
- Technical feasibility of construction cycle, safety level environmental impact, technical maturity, system matching, etc.
- The economic rationality of investment payback period, internal rate of return, income other than energy saving, etc.
- Requirements from interested parties, etc.

The departments communicate and communicate with each other at the monthly and weekly meetings through energy assessment, so as to ensure the continuous progress of energy management and accomplish the established goals and tasks. Through monthly benchmarking assessment, energy satisfaction survey, daily inspection and special inspection, the energy management of each department is guaranteed to advance continuously in the way of PDCA cycle, and the energy use situation is improved and the energy efficiency will be higher.

### *No energy management without measurement*

—He Jincheng, Minister of Energy Management

### Do, Check, Act

The general manager is the top manager, the deputy production manager is the representative of the manager, and there are five full-time/part-time managers at the group company level. They organize and supervise the implementation of the energy management system.

The Ministry of Energy has 10 full-time managers and 113 technicians, who are responsible for daily energy management and implementation. There are 51 full-time/part-time managers such as Energy Efficiency

Management Commissioner in each secondary production unit. A total of 179 people, accounting for 8.95% of the total number of companies.

**Energy Performance Evaluation**

The energy index system is mainly divided into three levels: company-level comprehensive energy consumption index; product-level (total comprehensive energy consumption index, unit product comprehensive energy consumption index); main energy-consuming equipment and main energy-consuming process unit product comprehensive energy consumption index. Energy performance is monitored, measured and recorded according to Energy Statistics Management System and Energy Monitoring Management System.

By identifying the main energy-consuming equipment and the equipment implementation, system, process and personnel factors that have important influence on energy consumption, the company's energy consumption is subdivided into terminal energy-consuming equipment which can be independently controlled, and its influencing factors are identified. The influencing factors of energy consumption can be divided into two categories: one is controllable variable, that is, the factors that can improve the energy performance of equipment through improvement measures; The other is uncontrollable variable, which has an important impact on equipment energy performance but can not be changed for the time being.

**Related variables and assessment:**

This paper re-identifies and evaluates the related variables of major energy-consuming equipment from five aspects: raw materials, intermediate product quality indicators, equipment parameters affecting energy consumption, process parameters, equipment efficiency and related environmental factors affecting energy consumption. The relevant data of the same period in the previous year are taken as the benchmark value, and relevant performance indicators and targets for the next year are formulated. According to the decreasing proportion of energy-saving, problems are analyzed and corrected weekly, and benchmarking

assessment is carried out monthly. Preventive measures are formulated and implemented, and indicators are evaluated annually.

All the energy consumption of the company is converted into standard coal. By comparing with the benchmark, the percentage of energy consumption reduction is calculated and managed in a unified way, and is evaluated with KPI of management.

Every year, product energy efficiency is the national industry leader: reward 44.31 thousand; monthly, according to the overall energy consumption reduction rate of each unit, assessment is carried out: energy administrator, reward and penalty of over 1% per section \$14.78, production scheduling, reward and penalty of over 1% per section \$14.78, production section chief, reward and penalty of over 1% per section \$29.54, branch general manager, reward and penalty of over 1% per section \$44.31; daily, weekly, system transportation Conduct routine supervision, inspection and assessment.

number	Scheme name	Energy saving (tce)	Investment (USD)
1	Technical transformation of ammonium phosphate	11215.26	7.39 million
2	Establishment of Energy Management Center	20723	14.33 million
3	Reducing Coal Consumption by Using Tube Reverse Heat Energy	3400	0.22 million
4	Enhancing Water Temperature of Phosphoric Acid Cooling Tower by Using Concentrated Heat of Phosphoric Acid	2020	88.62 thousand
5	Recovery and Utilization of Heat from I-effect Steam Condensate	1780	73.86 thousand
6	Low Temperature Waste Heat Projects for Sulphur-based Sulphur Production	8090	1.48 million

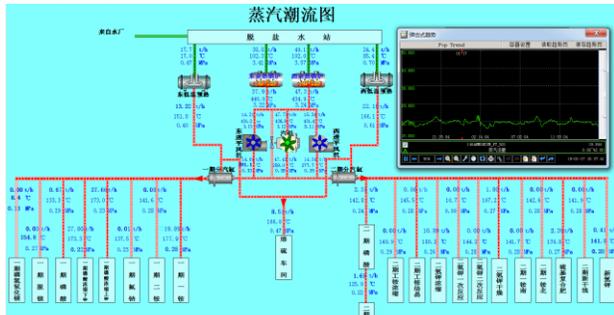
The base period is 2014 and the reporting period is 2015-2017. The total energy-saving amount is 119 400 tce, and the proportion of energy-saving is 6.13%, exceeding the planned target.

**Tools and resources:**

Taking GB/T 233331-2012/ISO50001 as the standard, the Energy Management Manual was formulated, the energy management system was established, and the certification was passed by CQM. Using modern management tools and mature management model, the company introduced process analysis method, system

engineering principle and PDCA cycle into energy management of enterprises. Through the management of main electrical equipment and key energy-consuming processes, as well as the improvement of system start-up rate and hourly production rate, standard management can achieve the purpose of energy saving and emission reduction of the system.

In cooperation with Zhejiang Central Control Technology Co., Ltd., a production energy management center has been built, which provides data analysis tools for energy management in the form of pie charts, bar charts, polyline charts and scatter charts. At the same time, the system is also a company-level integrated management and control computer system integrating process monitoring, energy management and energy dispatching, relying on the platform of Energy Management and Control System (EMS). With the combination of information technology and management process, centralized, flat and overall management is implemented in energy production, transmission and distribution, and consumption links, so as to improve the efficiency of energy management, establish an energy assessment and evaluation system based on objective data, and promote the development of energy conservation and emission reduction in the company.



The PC side and the mobile side view the entire process of the production, transmission, and use of steam energy, as well as the calculation of losses, and can view the situation at any time through the

We have conducted energy-saving evaluation with Hubei Institute of Chemical Industry Research and Design on the company's fixed assets investment, cooperated with CQC, Cobel Power Quality Co., Ltd. and

Shanghai Dongfangwei to introduce advanced energy-saving technologies, and actively participated in various energy training organized by Provincial Development and Reform Commission, Carbon Transfer Center and National Energy Conservation Center.

## Transparency

The company publishes the company's carbon emission performance through the company website and the website of Hubei Carbon Transfer Center, and publishes the social responsibility report every year. It also issues social responsibility reports to the public through reports to relevant government departments and online publications. Explain the implementation of stakeholder responsibilities, especially the implementation of environmental social responsibility, and the report is publicly available.



湖北祥云（集团）化工股份有限公司2017年温室气体碳排放核查报告

作者：祥云股份 来源：祥云股份文化部 浏览次数： 0 日期：2017年4月21日 15:06



The company's official website publishes carbon emissions compliance



2017湖北祥云集团社会责任报告



The company's official website publishes social responsibility reports

Lessons Learned

Utilize the scientific management of energy management system to make the company's energy management more systematic and refined.

- The focus of management has been shifted down. By changing the energy appraisal of each enterprise company to the energy appraisal of each enterprise company and each Pakistan level, the feasible energy management implementation plan is evaluated, the comprehensive checklist of each Barbadian internal audit is compiled, the operation of 2-3 Barbadian systems is checked every month, and the energy responsibilities are effectively monitored.
- Improve the allocation and accuracy of measuring instruments.

Energy types <sup>a</sup>	Input and Output Energy Units <sup>a</sup>				Main secondary energy-consuming units in and out <sup>a</sup>				Major Energy Consumption Equipment <sup>a</sup>				
	Equipped rate standard <sup>a</sup>	Number of configurations required <sup>a</sup>	Actual Configuration Number <sup>a</sup>	Allocation rate (%) <sup>a</sup>	Equipped rate standard <sup>a</sup>	Number of configurations required <sup>a</sup>	Actual Configuration Number <sup>a</sup>	Allocation rate (%) <sup>a</sup>	Equipped rate standard <sup>a</sup>	Number of configurations required <sup>a</sup>	Actual Configuration Number <sup>a</sup>	Allocation rate (%) <sup>a</sup>	
electric power <sup>a</sup>	100 <sup>a</sup>	2 <sup>a</sup>	2 <sup>a</sup>	100 <sup>a</sup>	100 <sup>a</sup>	229 <sup>a</sup>	229 <sup>a</sup>	100 <sup>a</sup>	95 <sup>a</sup>	258 <sup>a</sup>	253 <sup>a</sup>	98 <sup>a</sup>	
Solid state energy <sup>a</sup>	Raw coal <sup>a</sup>	100 <sup>a</sup>	2 <sup>a</sup>	2 <sup>a</sup>	100 <sup>a</sup>	1 <sup>a</sup>	1 <sup>a</sup>	100 <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	
Energetic carrier <sup>a</sup>	Fuel coal <sup>a</sup>	100 <sup>a</sup>	2 <sup>a</sup>	2 <sup>a</sup>	100 <sup>a</sup>	9 <sup>a</sup>	9 <sup>a</sup>	100 <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	
	steam <sup>a</sup>	100 <sup>a</sup>	/ <sup>a</sup>	/ <sup>a</sup>	80 <sup>a</sup>	37 <sup>a</sup>	36 <sup>a</sup>	97 <sup>a</sup>	70 <sup>a</sup>	20 <sup>a</sup>	20 <sup>a</sup>	100 <sup>a</sup>	
	water <sup>a</sup>	100 <sup>a</sup>	3 <sup>a</sup>	3 <sup>a</sup>	100 <sup>a</sup>	95 <sup>a</sup>	51 <sup>a</sup>	51 <sup>a</sup>	100 <sup>a</sup>	80 <sup>a</sup>	137 <sup>a</sup>	124 <sup>a</sup>	98 <sup>a</sup>

- Strictly carry out the evaluation of the management of benchmarking. Energy management and production management are inseparable. The management department formulates an effective incentive mechanism in line with the company system to assess the grass-roots managers and responsible persons, linking energy consumption with employees' income, and improving the consciousness of production managers to actively save energy and reduce consumption.

- Energy visualization management. Implementation of real-time energy data acquisition, automatic calculation of energy input and output, transmission balance, on-line monitoring of energy efficiency, fast and accurate feedback of energy loss in each link, at the same time through video surveillance of key areas, PC and mobile phone two ways to achieve a comprehensive monitoring of the production process of energy use, fast and efficient energy scheduling management, improve energy utilization Rate.



Statistics, analysis and comparison of various types of energy consumption in the operating team, and calculation of personnel's rewards and penalties based on consumption

- Implementing DSM vigorously. Harmonic control, power factor improvement, three-phase balance, peak and valley management, elimination of high energy consumption and low efficiency motor transformer equipment and other measures to improve power quality and efficiency.
- Energy-saving optimization management of key energy-consuming equipment or processes. Real-time calculation of energy efficiency of important energy-consuming equipment, instant detection of energy efficiency changes, through DCS, PLC automation control, according to the process requirements, real-time accurate adjustment of energy consumption, ensure that equipment or processes always run in high efficiency areas.
- Effective implementation of energy management implementation plans.

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).

