

Global Energy Management System Implementation: Case Study

Indonesia

PT. Nippon Shokubai Indonesia (NSI)

NSI expected to improve energy performance by 4% in 2016.



View of production plant in PT. Nippon Shokubai Indonesia

Business Benefits Achieved

The implementation of energy management system was strongly supported by the commitment of the top management of NSI and the active participation and awareness of the employees, which was a major enabler for the system's continuous improvement. By implementing a structured approach, NSI has been able to apply extensive solutions to reduce their energy consumption. It has helped NSI to transform from a project-oriented company into an energy conscious company. Due to intensive and well-planned energy performance monitoring, the company has seen improvements in their energy performance.

NSI began to implement ISO 50001 in 2015. At that time only a few small projects were executed which can only maintain the energy performance not to be worse. In 2016, NSI will execute several projects that could significantly improve energy performance. NSI expects a decline in energy costs could reach eighteen billion rupiah per year with no/low investment cost.

"We believe the Energy Management System will give benefit for our improvement in the future."

— H. Takaki, Director of Production & Technology

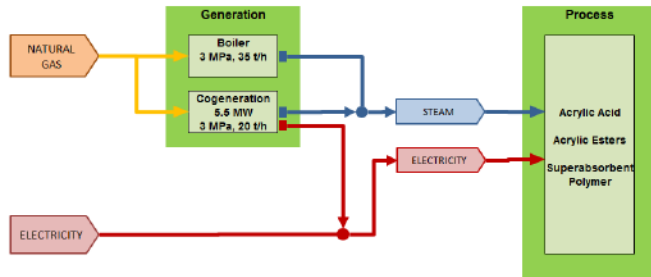
Case Study Snapshot	
Industry	Petrochemical
Location	Banten, Indonesia
Energy Management System	ISO 50001
Product/Service	Acrylic acid, acrylic esters, and superabsorbent polymer
Energy Performance Improvement (%)	4% (expected in 2016)
Annual energy cost savings	Rp. 15,000,000,000 (expected in 2016)
Cost to implement	< Rp. 100,000,000
Payback period	< 1 year

Company Profile

PT. Nippon Shokubai Indonesia (NSI) was the first acrylic acid and esters manufacturing company in Indonesia and South East Asia, and also the first manufacturing company of Superabsorbent Polymer in Indonesia (2013). The company employs 500 people and is located in Kawasan Industri Pancapuri in Banten, Indonesia.

NSI uses natural gas as energy source to generate electricity and steam in cogeneration system for production process. Generated electricity is combined with imported electricity to supply requirement in production process. Generated steam is also combined with steam from process waste heat and fueled boiler to be balanced with steam requirement in production

process. The energy is included in scope of energy management system in NSI.



Business Case for Energy Management

We aware energy is important part of business sustainability. When energy consumption increases, we must consider the limited availability of energy sources, as well as energy cost rises up, we must consider declining of business profit. Globally, we are directed by mother company, Nippon Shokubai Co., Ltd., to reduce energy intensity year by year.

NSI is located in one of the industrial areas in Cilegon Banten, where the condition of energy supply is strongly influenced by the development of industry in that area. The stability of energy supply could be affected when a number of industries are increasing but availability of energy supply is limited. Likewise, the cost of energy consumption for the production process will be affected, and will certainly require an action and energy efficiency efforts in all industries including NSI. Related environment matter, in order to contribute in global issue about reduction of greenhouse emissions, energy management consideration is important.

Implementation of energy management system in Indonesia is required by several regulations such as Indonesia Law No. 30 Year 2007 concerning Energy, Government Regulation No. 70 Year 2014 concerning Energy Conservation, and Regulation of Energy and Mineral Resources Minister No. 14 Year 2012 concerning Energy Management. Regulation mentions Energy usage greater than or equal than 6,000 TOE (ton oil equivalent) per year is obligated to implement energy management,

therefore NSI has to implement energy management system.

Energy efficiency is an important part in evaluation of “PROPER” Environmental Award (award program by Ministry of Environmental of Indonesia) and GREEN Industry Award (award program by Ministry of Industry of Indonesia). NSI joined to both of those award programs every year. In other hand, Ministry of Energy and Mineral Resources of Indonesia also have energy conservation award program called National Energy Efficiency Award and NSI just joined it last year in category of energy management in big industry.

Previously, NSI had already conducted energy conservation practices through an Environment Management System program, which did not focus exclusively on energy and made technical aspects a priority. As a result of implementing energy management system, the following energy cost measures were undertaken:

- Strengthen and more intensively monitor and control each operation parameter of the process equipment categorized as significant energy use.
- Increase focus on improving utility supply-demand management, especially steam demand management due to its identified position as the biggest energy waster.
- Optimize the operation of “energy converter” cogeneration and boiler in order to attain greater operation efficiency.

Keys to Success

- Full management commitment
- Government support (i.e. Ministry of Energy and Mineral Resources)
- International project support (UNIDO project)
- Existing management systems (ISO 9001, ISO 14001, OHSAS 18001)
- Staff support and cooperation
- Adequate measuring devices, plant automation, and historian process information system.

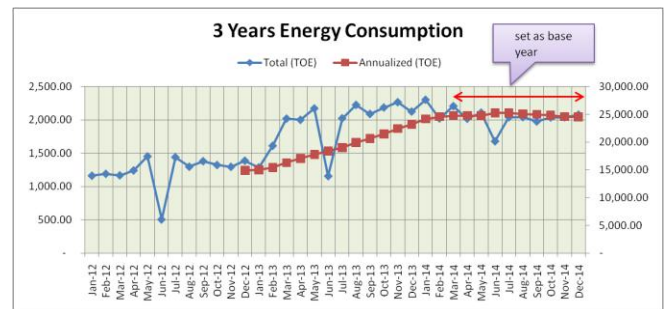
EnMS Development and Implementation

By implementing a structured approach in accordance with ISO 50001 standard, NSI has been able to apply extensive solutions to reduce their energy consumption. The company has developed an energy policy, set up an energy committee and developed energy management system manual and procedures. Furthermore, by identifying the significant energy users (SEU), key objectives and targets for the mid- and long-term have been set and energy awareness training provided to mid- and top-management to ensure understanding and ownership. In order to enable effective monitoring of the energy management system progress, the necessary monitoring devices have been installed on machinery, and the defined significant energy use will further optimize the energy program. This approach has helped NSI to transform from a project-oriented company into an energy conscious company.

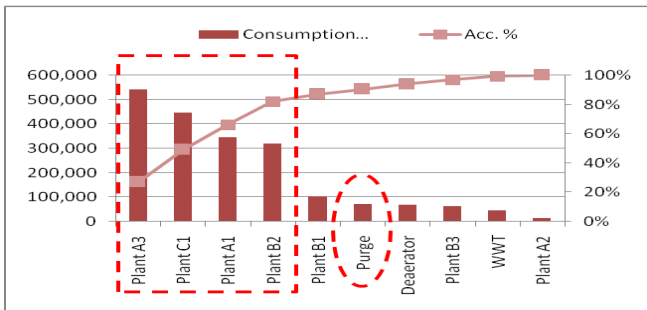
Top management fully support energy management system which manifested by each commitment in energy policy, providing resources, and financing implementation process (training, consultation certification). NSI has weekly management meeting which involving mid- to top-management of all division and department. The monitoring result of energy performance indicator and other issues relating to energy is reported by Energy Manager. In other hand, 2 (two) times a year management review meeting is conducted in accordance to management system requirement. Plant Manager has role to report plan, progress, and achievement of energy efficiency program to Nippon Shokubai Co., Ltd., head quarter through Responsible Care promotion activities. NSI has Energy Management Committee which be led by Chairman of Energy Committee and certified energy manager is part of it. Energy committee consist of members from several department those are Operation, Technical, Engineering, Maintenance, Quality Assurance, Safety Environment, General Affair, Purchasing, Human Resources, Finance.



The core of energy management system is energy review and planning. Energy review was executed by compiling energy data for 5 (five) years and then defined what period energy consumption was stable. NSI expanded production plant and started mechanical construction in 2011. 2 years later, new plant started commercial production and it resulted increasing in energy consumption. Energy consumption was stable in 2014, therefore 2014 was set as base year to define energy baseline. NSI made recapitulation of each energy consumption (natural gas, electricity, steam) in each plant based on 2014 data.



Significant energy uses also were defined used Pareto rule whether in plant level and in equipment level of each plant. Some special item could be considered as significant energy use even though Pareto rule didn't recognize it. In example is steam purging ratio, this is considered in order to evaluate steam consumption and generation balance efficiency. Other example is electricity for Building, this is not significant energy use but we can improve employee awareness in energy efficiency by good energy efficiency management example in office building.



Based on ISO50006, NSI defined energy performance indicator in each defined significant energy use even in plant level and equipment level. Mostly, energy performance indicators are obtained from statistical analysis (regression) and most driver of energy consumption is production quantity.

Opportunity for improvement were extracted from each significant energy use which done by internal. Also NSI have project of steam system optimization hosted United Nations Industrial Development Organization (UNIDO) Industrial Energy Efficiency (IEE) Project and recommendation were issued. Opportunities for improvement were ranked in accordance with internal criteria which defined in Energy Planning Procedure. Criteria for ranking consist of how to implement, how much cost saving, how much investment cost, and how long to be completed. Highest ranking has easier to implement, biggest cost saving, lowest investment cost, and fastest to be completed. Selecting objective based on ranking and then define action plan. At first, NSI focused on no cost or low cost project, improving operation management.

Energy committee would to proof to top management the benefit of energy management system by cost reduction with no or low investment. Next we step toward to focus on improvement with investment in order to gain bigger energy and cost reduction. This approach will make easier to consider financing energy efficiency projects by top management.

NSI started implementation of energy management system by kick off meeting on September 1, 2014. However, UNIDO IEE project started energy management system briefing in 2012 and NSI joined it.

Final certification audit by Lloyd’s Register Quality Assurance (LRQA) was conducted in September 2015 and official certificate ISO 50001 was issued on October 23, 2015.

NSI has self-improvement program through Kaizen activity. Proposed Kaizen item shall be “a change” which categorized in scope of Management of Change Procedure or an item related to energy conservation. Kaizen could motivate employees to dig out opportunity for energy improvement due to it is awarded by top management every six month and giving the present for first, second and third winner. In order to check competency of each member, each department has skill maps for each member and then conduct evaluation by comparing actual and standard competency level. Evaluation is conducted every year. Member who is not complied with standard will get some treatment i.e. coaching, counseling and training. Human Resources Department organizes such needed training.

In accordance with others management system, NSI communicates energy management system activity internally and externally through regular meeting (daily, weekly, monthly), email, banner, letter, electronic board, induction, notebook, online reporting, open day etc. This communication is stated in Internal & External Communication Procedure.

Implementation project of energy management system in NSI was supported by consultants from national expert of UNIDO IEE project which consist of national expert of energy management system and national expert of steam system optimization. Members of energy committee were trained by national experts and then they conveyed their knowledge after training to their colleague in department. Members of internal auditors were also trained about ISO 50001 auditing process as requirement to conduct internal audit. Some of concerned staff joined in technical training for pump system optimization, compressed air system optimization, steam system optimization, and also financial analyze method for energy investment consideration. NSI conducted energy audit in order to

map energy use and consumption and to find opportunity to improve energy performance. Energy audit is done by certified Energy Auditor. In accordance with compliance to Indonesia legal requirement, NSI has appointed a certified Energy Manager. Through UNIDO IEE project, NSI has a strengthened professional network of energy conservation experts and energy-oriented companies to share knowledge and experience.

Existing management system which implemented in NSI (ISO 9001, ISO 14001, and OHSAS 18001) is a strength due to energy management system standard implementation and documentation could be integrated to them. We just prepared a couple procedures which exclusively only existed in ISO 50001 i.e. Energy Planning Procedure. Moreover, we have adequate energy measurement devices, plant automation (distributed control system, DCS), and historian process information system. However, we only utilize spreadsheet (Microsoft Excel) to conduct data analysis relating to monitoring energy performance reporting. NSI have a plan to install online energy performance monitoring system future, it is under consideration now.

Energy performance could be maintained by good operation control. Procedure of operation control was updated by connecting critical parameter for energy with existing control parameter. Special mark is putted in sheet of table of normal operation condition in order to easier to find control parameter of significant energy use. Critical control parameter shall be trained to operator and they will able to set the value in alarm system of DCS, so that if there is process deviation, process/utility operator will know it and take action to avoid inefficient energy consumption. By strengthening control limit of equipment which categorized as significant energy use, NSI expected can get more energy efficiency. Also to improve energy performance of significant energy use, technical training shall be prioritized.

NSI conduct measurement and monitoring of energy management by the following ways:

- Daily monitoring is done in order to monitor energy consumption of equipment categorized as significant

energy use. This activity is executed by Operation group in Production Department which included in their daily operation activity.

- Monthly monitoring is done in order to monitor energy performance in plant categorized as significant energy use. This activity is executed by Energy Manager and reported in weekly management meeting.

In other hand, monitoring progress and achievement of energy project as action plan of energy objective and target is important think in order to gain energy efficiency. Person in charge of energy project (project leader) shall prepare verification plan how to measure targeted energy efficiency. Every 3 (three) month project leader shall report progress of project activity. After project was completed, verification shall be done based on verification plan. Result of progress monitoring and verification will be summarized and reported in management review meeting every 6 (six) month. NSI also has obligation to report activity of energy management to government through Ministry of Energy and Mineral Resources which be reported in March every year.

Cost-benefit analysis is one of important consideration to decide an energy project will be feasible or no. NSI consider it in initial design by Energy Committee in energy consideration review step. Method of net present value (NPV) and internal rate of return (IRR) is utilized in this review. In addition, when NSI has procurement of equipment or services which involves energy use and consumption, Purchasing Department and Energy Committee conduct energy assessment in order to decide which equipment or service has better energy efficiency and better cost benefit. Method of life cycle cost (LCC) is used.

“EnMS is more specific other than other management system, but with structural approach in ISO 50001 we believe can manage our energy use and consumption and achieve our energy efficiency target.”

— Heroe Soesanto, DPM & GM of Operations

Lessons Learned

Not focus in implementation project is one of our obstacles, this could make delaying from planned schedule. In order to avoid much delaying, regular monthly meeting is needed to report progress activity and set next action plan. Schedule forced by consultant is an effective way to commit doing activity based on planned schedule considering contract penalty.

Doing data analysis due to complexity of process may become headache, NSI tried to solve by doing piece by piece analysis. Firstly, NSI do energy and process mapping to each plant/production unit and then separate each energy type to be natural gas, electricity, and steam. NSI conducted data analyzing each energy type in each plant/production unit. Energy performance will be monitored in plant level and then in equipment level.

NSI has a little bit difficulties to define opportunities for improvement in process side because typically Japanese technology already considers energy aspect in every design process. Therefore NSI tried to dig out opportunities in energy distribution system and energy conversion efficiency. NSI improves demand-supply balance management due to it was identified that unbalance of demand-supply means wasting energy. NSI

also accommodate small improvement even through it is not significantly improving energy performance.

To integrate energy management system to existing management system, NSI find similar section between ISO 50001 standard and other management system (ISO90001, ISO 14001) and then absorb ISO 50001 standard requirement in existing management system. NSI prepared Energy Manual in order to accommodate interaction each section with existing management system manual. NSI prepared new procedure only for standard requirement which specific in ISO 50001 (i.e. energy planning, measurement and monitoring).

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.

