

Global Energy Management System Implementation: Case Study

Indonesia

PT IKPP – Tangerang

The first paper mill in the South-East Asia to be awarded ISO 14001 certificate and the first paper mill in Indonesia to be awarded ISO 50001 certificate.



Business Benefits Achieved

Energy efficiency is a key metric, both in terms of environmental impact and financial performance of the company, so it is something we monitor closely and constantly strive to improve.

IKPP Tangerang succeeds to reduce energy consumption from **9.32 GJ/TP** in 2011 to **7.91 GJ/TP** in 2015. Total energy saving since 2012 until 2015 is about **428,834 GJ**. CO₂ emission also decreased about **30.45%** from baseline or equivalent to **60,605 tons of CO₂e**.

IKPP tangerang is the first paper mill in Indonesia that was awarded ISO 50001 certificate. Mill also **won** the National Energy Efficiency Award 2015 that held by the Ministry of Energy & Mineral Resources.

“IKPP Tangerang succeeds to reduce energy consumption by 15% from baseline after implement ISO 50001.”

— Mrs. Imelda Cunong, Management Rep.

Spectra Color • Sinar Spectra • Sinar Tech •
Sinar Color • Stickiii • Kokoru

Case Study Snapshot

Industry	Paper Manufacturer
Location	Tangerang-Indonesia
Energy Management System	ISO 50001
Product/Service	Colored paper grade
Energy Performance Improvement (%)	15.2 %
Annual energy cost savings	1.6 million USD
Cost to implement	2.3 million USD
Payback period	17 month

Company Profile

PT Indah Kiat Pulp & Paper (IKPP) located in Serpong-Tangerang, established in 1976 which is a joint venture of Indonesian and Taiwan companies. In 1986, Sinar Mas Group bought of IKPP's shares. Now, IKPP is subsidiaries of Asia Pulp & Paper (APP).

Since 1997, IKPP Tangerang specializes in the production of colored paper grades and is now one of the world's largest in this product segment. Key products are colored printing, writing and copier, computer and duplicator paper which 90% for export. There are three production lines; total capacity is 105,000 Ton per year.

IKPP Tangerang implements several management standards such as **ISO 9001, ISO 14001, ISO 26000, ISO 50001, OHSAS 18001, PEFC**, etc. Tangerang Mill is the first paper mill in the South-East Asia that was awarded

ISO 14001 certificate and first paper mill in Indonesia that was awarded ISO 50001 certificate.

Business Case for Energy Management

Since the strengthening of the issue of global warming and rising fuel prices, management of IKPP began to actively implement energy conservation project. The energy improvement projects have been carried out since 2000s.

In 2009, Indonesian Government issued new a regulation about energy conservation (Government Regulation No. 70/2009). The Regulation said that **users of energy equal to or more than 6000 Ton Oil Equivalent (Toe) per year must implement energy conservation through energy management.** Therefore, IKPP Tangerang that committed to comply the legal and other requirement, started to implement energy management system (EnMS) ISO 50001 in 2012.

IKPP participated in the training program organized by UNIDO in cooperation with Ministry Of Energy and Mineral Resources namely **“Promoting Energy Efficiency in Industries through System Optimization and Energy Management Standard”**. IKPP took part as pilot company and their energy manager became a national expert on EnMS and Steam System Optimization (SSO) after completing the training.

After implementing EnMS ISO 50001, energy efficiency was carried out more systematically and no longer through the ad hoc project as before. Energy has been managed better from day to day through daily operation control and involves all the function in the organization such as design, procurement, operation, maintenance, training, quality assurance and so on.

Top management fully support the EnMS. They provide the resources needed to establish, implement, maintain and improve the EnMS and energy performance. Commitment from top management has poured into company policy.

Keys to Success

- Commitment from Top Management to implement EnMS
- Develop energy policy and communicate both internally and externally
- Provide the necessary resources to establish, maintain, implement EnMS
- Appoint Management Representative and Energy Management Team
- Establish energy objectives, energy targets and energy performance indicators
- Conduct regular management reviews to evaluate the objectives, targets, performance indicators and effective implementation of EnMS

EnMS Development and Implementation

ISO 50001 is an international standard that gives guidelines or a framework for industry to implement Energy Management System. This standard applies internationally so it can provide added value to the product in the global market.

Business Impact

Energy efficiency improvement gives a positive impact to the company. Production volume increased significantly in 2015 compared to baseline 2011 (Fig 1)

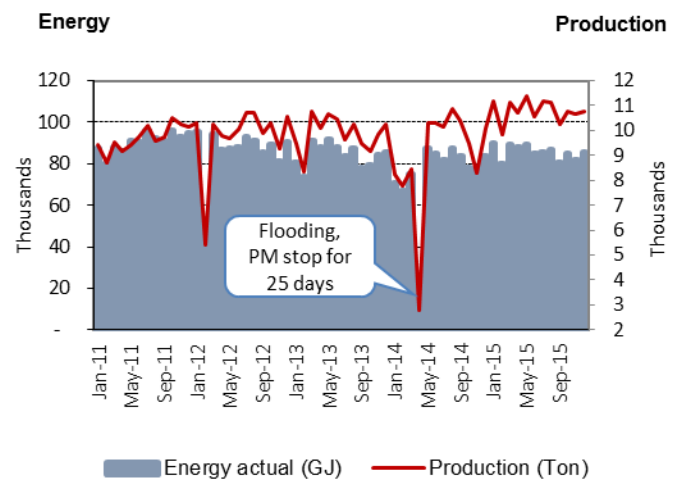


Fig 1. Trend of energy consumption & Production

Energy intensity also improves continually. Energy Intensity decreased by 15.2 % in 2015 compared to baseline 2011 as shown in the graph below.

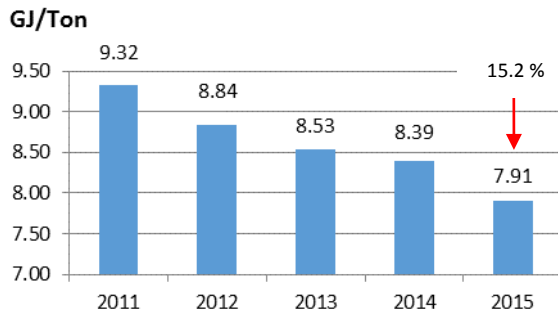


Fig 2. Energy Intensity 2011 - 2015

In the period of 2011-2015, IKPP Tangerang also succeeds to reduce CO₂ emission. In 2015 CO₂ emission reduced by 60,605 tons of CO₂e (30.45%) compared to 2011 (Fig. 3).

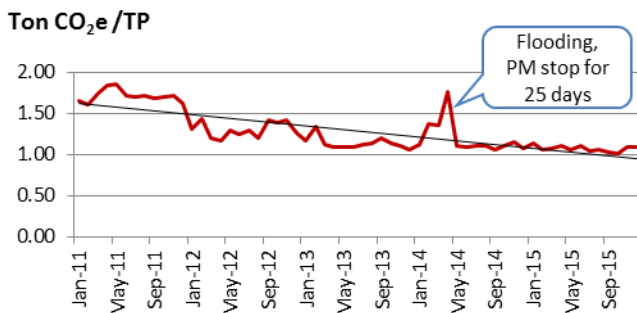


Fig 3. Trend of CO₂ Emission from 2011 – 2015

Organizational

After implementing EnMS, energy efficiency is not just belonging to Engineering Department but other Department also involved. The Energy Management Team that formed by Top Management in 2012, consists of Management Representative, Energy Manager and representatives of the related Department such as Engineering, Production, Quality Assurance, Purchasing, HRD and Finance. Main responsibility of the team as follow:

- Collecting and analyzing the energy data
- Determine the Significant Energy Users (SEU)
- Determine the factors that influence energy consumption
- Establish baseline and Energy Performance Indicators (EnPI)
- Identify the things desired by legal and other requirement
- Identify opportunities for improvement
- Identify the people who are responsible for the SEU area
- Establish energy objectives and targets
- Establish, implement, and maintain action plans

All employee especially in SEU areas became involved in the energy efficiency improvement through focused improvement activities such as Small Group Activity (SGA) and Skill Development Activity (SDA). Each employee may also give a suggestion through an online system (intranet). Every year IKPP holds a competition to choose the best project and best suggestion.



Fig 4. Winners of the Suggestion Competition

Energy Planning

IKPP Tangerang requires energy in the form of electricity and steam. Paper Machine (PM) and Stock Prep (SP) consumes about 82.1% of electricity while the PM also consumes 89.8% of steam. Therefore, using the Pareto chart we select SP and PM as Significant Energy Users (SEU).

After analyzing the historical data of SEU, we found that there are significant correlation between production level and energy consumption ($R^2 = 0.865$) as shown in

figure 5. Therefore, the regression equation obtained is reliable enough to estimate future energy consumption

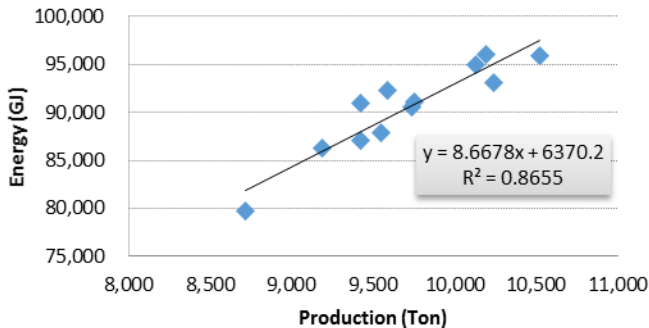


Fig 5. Correlation between production and energy

Energy performance can be demonstrated by comparing actual energy consumption with the estimated energy consumption (Fig. 6).

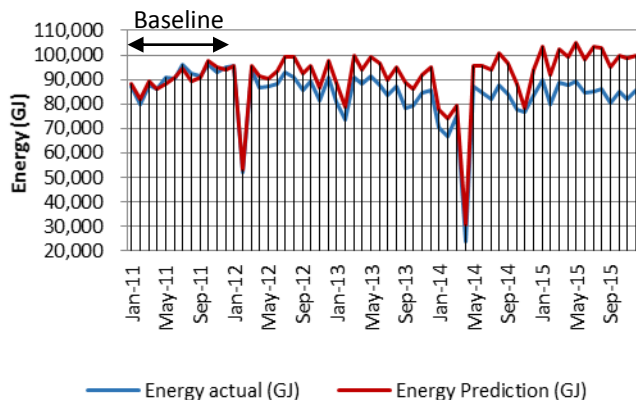


Fig. 6. Actual energy consumption versus prediction

If the actual energy consumption is lower than the estimate, it means that the energy performance improves and vice versa. The gap between actual and estimation is energy savings. Total energy savings from 2012 – 2015 is **428,834 GJ** as shown in the CUSUM graph (Fig. 7).

We use two indicators to show the energy performance. First, using Energy Intensity Index (EII) namely energy actual divided by energy estimation. Second, Specific Energy Consumption (SEC) namely energy consumption divided by production level (GJ/Ton).

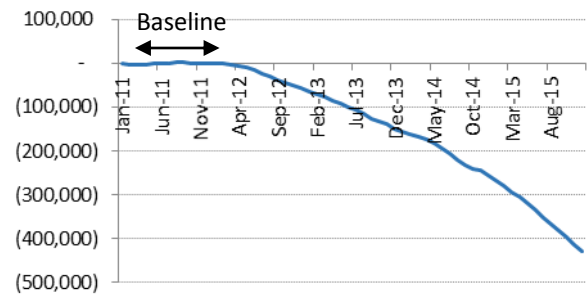


Fig. 7. Cumulative SUM (CUSUM)

Top Management has approved to set the energy performance indicator (EnPI) using EII and SEC and set the objective and target to reduce energy intensity by 15% end of 2015 from baseline 2011.

Some energy conservation opportunities have been identified and action plan has been established for achieving the objective and target. Some investment has been made to improve energy performance in PM such as upgrade steam and condensate system, replace line shaft with sectional drive, modify dewatering system, etc. Total investment is more than 2 million USD (2011 – 2015).

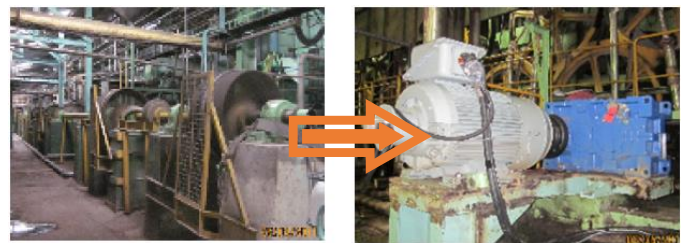


Fig. 8. Upgrade line shaft to sectional drive

Training & Communication

Top Management commits to provide the human resources, specialized skill, to maintain and improve the EnMS and energy performance. Training has been done regularly, not just the competence base training but also soft skill training like awareness training.

Here are some training topics that have been conducted or followed by the company :

- The expert Training on EnMS in line with ISO 50001 (UNIDO/Ministry of Energy)
- The expert Training on Steam System Optimization (UNIDO/Ministry of Energy)
- Pumping Systems Optimization (UNIDO/Ministry of Energy)
- EnMS Introduction and Implementation Course (SGS/In-house training)
- EnMS Internal Audit Course (SGS/in-house training)
- Energy Audit / Energy Manager Course (SGS/in-house training)
- 4 Days Training Workshop for Organization and Internal Auditors ISO 50001 (APEC, Thailand)
- Capacity Building for Energy Manager (Ministry of Energy)
- Capacity Building for Energy Auditor (Ministry of Energy)

Top management has decided to communicate about the energy policy, EnMS and energy performance both internally and externally. All the suppliers have been informed about the energy policy and that procurement is partly evaluated on the basis of energy performance. We also report regularly to Ministry of Energy and Mineral resources about our energy performance.

Tools & Resources

IKPP has implemented ISO 9001 since 1995, ISO 14001 since 1996 and OHSAS 18001 since 2007. All experience in the management system implementation is very helpful when we implement EnMS.

Not so many documents were created during EnMS implementation. We integrate all related document such as procurement procedure, document control, communication, training, internal audit and management review.

The seven basic quality tools have been known by employee such as cause-effect diagram, pareto chart and scatter diagram. They have used it in the SGA and SDA projects. It is also very helpful for analyzing energy use and consumption.

Other resources that helpful during EnMS implementation is energy meter. IKPP Tangerang already has power meter that installed in some

distribution panels. Therefore, energy data is available and easy to collect and analyze.

Operation Control

After implementing EnMS ISO 50001, energy efficiency has been managed better from day to day through daily operation control. All critical parameters for operation and maintenance related to SEU are identified, monitored, measured and analysed at planned intervals. Design and procurement process also consider the energy conservation opportunity.

All employees related to SEU are trained to improve their competency and awareness. The objectives of the training as follows:

- Employees who work especially in the area SEU has adequate competence
- Employees care about the importance of EnMS
- The employees concerned will benefit from improved energy performance.
- Employees concerned that the activities and behavior contribute to the achievement of the objectives and targets companies.

Monitoring & Checking

Some actions have been taken to ensure that the key characteristics of its operations that determine energy performance are monitored and measured accurately. Analog meter has been replaced with digital meter. Therefore, energy performance can be monitored online (Fig 9). All energy meter also calibrated regularly to ensure the accuracy and repeatability.



Fig. 9. Online monitoring of Energy & Process

EnMS audit carried out regularly once a year by internal and external auditors. This audit aims to verify whether the company's activities are still consistent with the EnMS ISO 50001 requirements, whether the company still meets the legal and other requirements, whether EnMS are carried out effectively.

IKPP Tangerang has internal audit team for EnMS, energy manager and energy auditor. Energy manager and energy auditor has been certified by National Professional Certification Board that is an institution independent which is in the form of government.

IKPP also conduct technical audit using professional auditor every 3 years. The last audit performed by TUV-SUD in 2014. It is useful for the mill to find out the energy conservation opportunities and get new idea from the expert.

Cost & Benefit

Top Management commits to provide the resources necessary to improve energy efficiency. Some investments have been made to improve energy efficiency and increase production capacity as shown in table 1. Total investment cost is approximately 2.3 million USD, with payback period is about 17 month.

“Energy is a controllable resource. Therefore, using it efficiently will help the company to improve their financial performance and increase the company image.”

— Mrs. Imelda Cunong, Management Rep.

Table 1. Energy Efficiency Project (2011 – 2015)

No	Project Description	PM	Cost (USD)	Payback (M)
1	Replace line shaft with sectional drive	1	300,000	18
2	Replace line shaft with sectional drive	2	300,000	18
3	Replace line shaft with sectional drive	3	300,000	18
4	Modify Steam and Condensate System	1	450,000	16
5	Modify Steam and Condensate System	2	450,000	16
6	Modify Steam and Condensate System	3	450,000	16

Lessons Learned

- Energy is a controllable resource. Therefore, using it efficiently will help the company improve their financial performance and increase the company image.
- ISO 50001 is an international standard that gives a framework for organization which will implement Energy Management System. This standard applies internationally so it can provide added value to the product in the global market.
- Commitment from Top Management is mandatory. Barriers for implementation is if Management just focuses on production and not on energy efficiency.

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.

