Global Energy Management System Implementation: Case Study

Indonesia

Pasuruan

CJ Indonesia-Pasuruan is the first CJ Bio that has implemented ISO 50001.

World Best Green Bio Factory, Global No. 1 - CJ Pasuruan

Business Case for Energy Management

Company Profile/Business Case

Since 1989 PT. Cheil Jedang Indonesia Pasuruan Plant, a South Korean-owned factory, had been producing Amino acid (L-Lysine and L-Tryptophan). Our vision to be "**World Best Green Bio Factory, Global no. 1**" had made us to conclude energy as part of our factory strategy. In view of our vision we shall take green-house gas reduction and energy efficiency into account as the key element of our strategy, which were also aligned with the global climate change action.

Drivers: PT. CJIP applied energy management system (EnMS) ISO 50001 due to two main drivers:

1. Cost reduction had been an annual target through the suggestion and innovation program (SIP). In order to encourage all employee to take part into the program, our management decided to give reward of 1% saving suggested by the respective employee.
2. Environment was part of our compliance to the program of Indonesia Government so called "PROPER". In 2017 we achieved ***PROPER BIRU***, a compliance to the environmental aspect.

Energy management program: PT. CJIP Plant consumed energy of ≥ 6,000 TOE. Hence we were committed to annually report our energy use to the Indonesian Ministry of Energy and Mineral Resources and to comply with international standard of energy management system. Furthermore to complete our compliance to international standard in 2016 we were finally **certified for ISO 50001**. This certification was adding to our current certification of: ISO 18001 (in 2015), FAMI-Qs (in 2008), ISO 14001 (in 2005), and ISO 9001 (in 2000).

Energy reduction approach: Since 2009 energy savings and energy efficiency activities had been our culture through the implementation of production cost reduction program called ***SIP***.

In 2015, PT.CJIP called ISO consultant 50001 and making system **as Energy academy** which focuses in the energy field. In 2016, PT.CJIP had certified ISO 50001.

"ISO 50001 makes energy consumption more efficient and reduces CO2 emissions, hence helping CJ Pasuruan goal of World Best Green Bio Factory, Global no. 1"

—Lee Jun Won, Vice Precident Director CJ Pasuruan

Case Study Snapshot

Industry	Chemical
Product/Service	Amino acid (Lysine)
Location	Pasuruan, Indonesia
Energy Management System	ISO 50001
Energy Performance Improvement Period	3 years ago (2014-2017)
Energy Performance Improvement (%) over improvement period	4.99%
Total energy cost savings over improvement period	$USD 10,752,751
Cost to implement EnMS	$USD 2,209,789
Payback period (years) on EnMS implementation	0.19
Total Energy Savings over improvement period	139,574.28 GJ
Total CO_2-e emission reduction over improvement period	61,052.99 tons CO_2

Business Benefits Achieved

Business Benefits (Summary)

The management of PT. Cheil Jedang Indonesia Pasuruan Plant focused on:

1. Reducing production cost which is set out in ***SIP*** Program and leads to energy cost saving.
2. Reduction of CO_2 emission.

These 2 points supported the Factory's goal:" **World Best Green Bio Factory, Global no. 1**". In 2014-2017, the ***SIP*** program for **energy topic** brought positive outcome of dropping our energy consumption 139,574.28 GJ and green house gas (GHG) effect 61,052.99 Ton CO_2. Profit of ***SIP*** program for **energy topic** was amounted USD 10,752,751.

In light of the SIP program of employees reward of 1% saving, the impact of ***SIP*** Program was not only on our production and energy, **but also on our environmental aspect**. The impact of our ***SIP*** program on reduction of cost production was shown as follows:

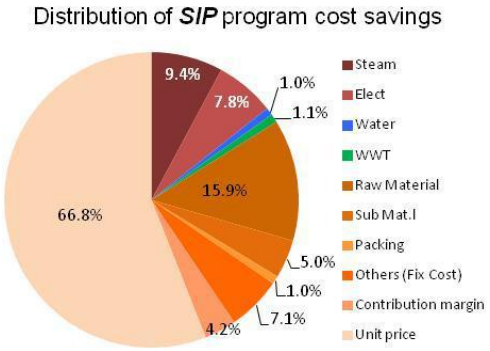

Figure 1. *SIP* Program on Raw material, environment, energy, etc.

PT. CJIP had a long history of energy saving and GHG reduction. Below graphics are showing the trend of efficiency energy and reduces Green House Effect (GHE) emission in PT.CJIP

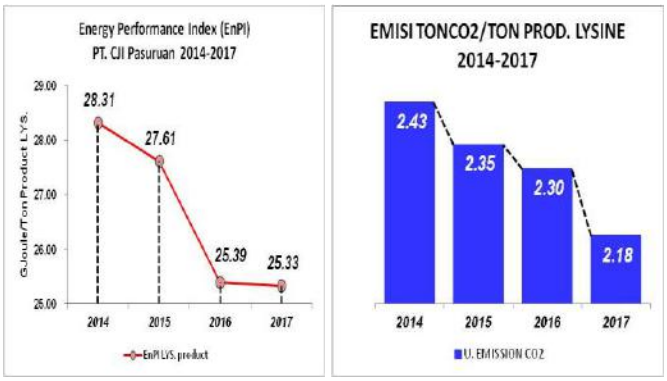

Figure 2. Energy and Emission of CO2 per ton Lysine production

As an appreciation for PT. CJIP commitment on energy efficiency, in 2017 the Government of Indonesia through the Ministry of Energy and Mineral Resources (MEMR) granted PT. CJIP as 1st Winner of National Energy Efficiency Award **(PEEN)**.

EnMS Development and Implementation

Organizational

Since 2014 our top management had been fully committed to energy management system aligned with ISO 50001. A weekly regular meeting to review every proposed energy saving program was conducted. The energy efficiency program was supported by the assignment of energy efficiency supervisor of each department, either production or non-production department. The assignment was directed by our vice president director through a decree. As a company consuming ≥ 6,000 TOE, we have energy manager certified by the MEMR and National Agency for Professional Certification (BNSP). The energy team controled daily energy consumption through a digital system and checked for any potential leakages or any abnormality. Our energy team also participated in preventive maintenance of every equipment and followed up by weekly energy meeting. To ensure the understanding of the urgency of energy efficiency, the energy team also conducted training and socialization to all employees and contractors working for PT. CJIP. Below is photo of patrol inspection and energy team meeting.

Figure 3. Patrol inspection of energy team by Vice

Our commitment for successful implementation of energy management system was proven also by the formation of energy efficiency supervisor of each section. Our strong commitment for EnMS of was finally succeeded by having certification of ISO 50001 in November 2016.

Energy review and planning

To control and monitor energy consumption our energy team installed a measurement in each equipment. By this action a parameter of the effectiveness of an equipment performance could be identified and eventually it facilitated the energy team to determine significant energy users (SEUs) in PT. CJIP.

Review, analysis, and planning:

As for determining the annual baseline, PT. CJIP referred to ISO 50006 compliance as per advice of our technical expert titled as UNIDO national expert of EnMS. The baseline was a linear line of co-relation between energy consumption and the product produced in a previous year. In order to control energy consumption we focused on equipment identified as as SEU (s).

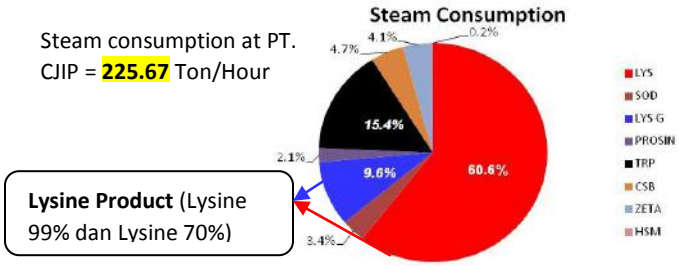

Figure 4. Determining SEU(s) PT. CJIP

From the above graph, our SEU (s) were a Lysine product process consisting of Lysine 99% and Lysine 70% with a total percentage of 70.2%. The breakdown of equipment was as follows:

Steam consumption = **122.74** Ton/Hr Steam Consumption = **15.46** Ton/Hr

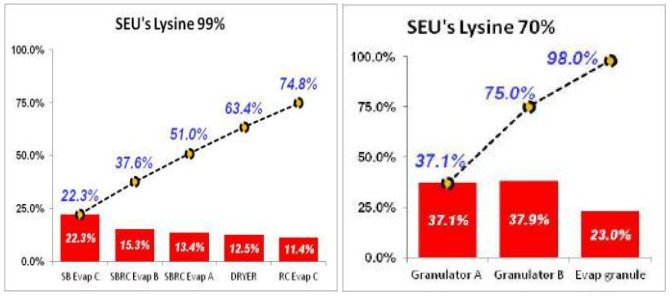

Figure 5. Identification os SEU(s) Equipemnt

Based on SEU (s) of equipment, our energy team had clear guidance to control analysis, action, and improvement. As an example was an action and case on a SB Evaporator aimed to reduce production costs and maximizing the product. Our energy team kept tracking the control on critical point evaporator i.e. **Steam economy** and **vacuum pressure**.

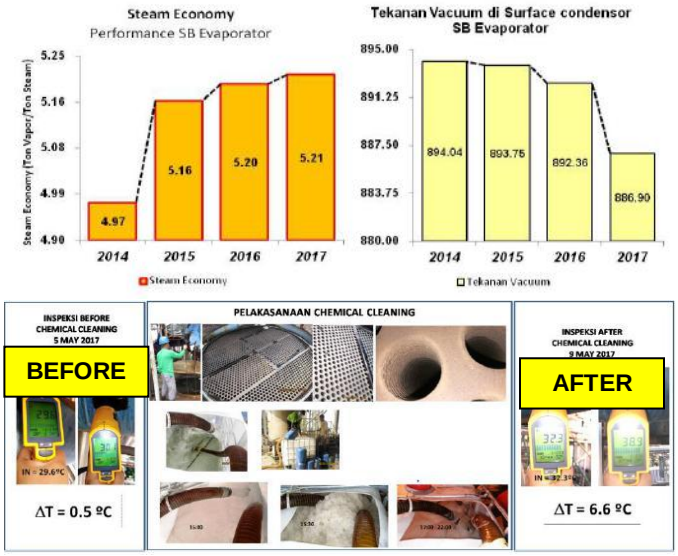

Figure 6. Monitoring energy efficiency on evaporator

Based on ISO 50006, we followed **baseline type 3** a regression analysis. Value of R2 = 0.8459 (relationship between product and energy consumption) with equation as follows:

$$Y = 3.5563X + 2650.4$$

X= Product (Ton/month) ; Y= Steam (Ton/month)

the data represented by the graph was from the last 3 years (2014-2017).

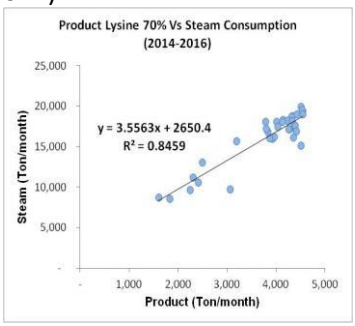

Figure 7. Linear regression among product and steam consumption

Financing:

We obtained financial support from our Cheil Jedang (CJ) Head Quarter by submission of plans through ***SIP*** program. Ourtimeline of 2018 budget submission is as follows:

Figure 8. The process of budget submission

Duration: The payback period was limited up to a year by CJ head quarter. As for big investment in energy sector CJ Head Quarter provides a limit of 5 year payback period. Our best practice of investment was done in 2017 when we installed 1 unit coal boiler capacity of 35 Ton / hour and replaced engine on gas turbine.

"Energy management system is very helpful in developing energy projects at CJI Pasuruan. It proven by the results of a new coal boiler install analysis in May 2017 reducing the cost of energy that has an effect on production costs. Our success story is the result of implementing ISO 50001."

— Lee Jun Won, Vice Precident Director CJ Pasuruan

Cost-benefit analysis

Table 1. IRR calculation 2014-2017

TOTAL ISO 50001 - COST BENEFIT ANALYSIS

	Cost	Incentive	Net	Savings
2014 - Program *SIP* Energy (Project)	$ 504,396	$ 172,836	$ 331,560	
2014 - Savings				$ 1,876,186
2015 - Academy class Energy	$ 1,135			
2015 - Re-certification audit ISO 50001	$ 6,222		$ 6,222	
2015 - Program *SIP* Energy (Project)	$ 207,345	$ 87,814	$ 119,531	
2015 - Savings				$ 777,402
2016 - Certification audit ISO 50001	$ 3,422		$ 3,422	
2016 - Program *SIP* Energy (Project)	$ 1,498,049	$ 804,428	$ 693,621	
2016 - Savings				$ 2,155,396
2017 - Surveilance audit 1	$ 1,711		$ 1,711	
2017 - Coal boiler New	$ 4,223,560	$ 916,458	$ 3,307,102	
2017 - Savings				$ 5,943,767
IRR 2014 to 2017	***156.99%***			

2014 Program *SIP* Cost Benefit Analysis

	Cost	Incentive	Net	Savings
2014 - Program *SIP* Energy (Project)	$ 504,396	$ 172,836	$ 331,560	
2014 - Savings				$ 1,876,186
2014 - Simple Payback period	0.27			
2014 - IRR	***272%***			

2015 Program *SIP* Cost Benefit Analysis

	Cost	Incentive	Net	Savings
2015 - Program *SIP* Energy (Project)	$ 207,345	$ 87,814	$ 119,531	
2015 - Savings				$ 777,402
2015 - Simple Payback period	0.27			
2015 - IRR	***275%***			

2016 Program *SIP* Cost Benefit Analysis

	Cost	Incentive	Net	Savings
2016 - Program SIP Energy (Project)	$ 1,498,049	$ 804,428	$ 693,621	
2016 - Savings				$ 2,155,396
2016 - Simple Payback period	0.70			
2016 - IRR	***44%***			

2017 Project coal boiler Cost Benefit Analysis

	Cost	Incentive	Net	Savings
2017 - Coal boiler New	$ 4,223,560	$ 916,458	$ 3,307,102	
2017 - Savings				$ 5,943,767
2017 - Simple Payback period	0.71			
2017 - IRR	***129%***			

The figure above is a summary of cost analysis from 2014-2017. It showed our saving of USD 10.75 million during the year for implementing the energy efficiency activities.

Approach used to determine whether energy performance improved

PT. CJI Pasuruan installed measurement on each energy- consumed equipment, specifically steam. It aimed for controlling and monitoring.

Figure 9. Data online control system to facilitate checking

Through the measurement device our energy team of PT. CJI Pasuruan conducted online web-based energy consumption monitoring.

From the 2014-2017 data consistency of energy saving could be identified and described in the below graph.

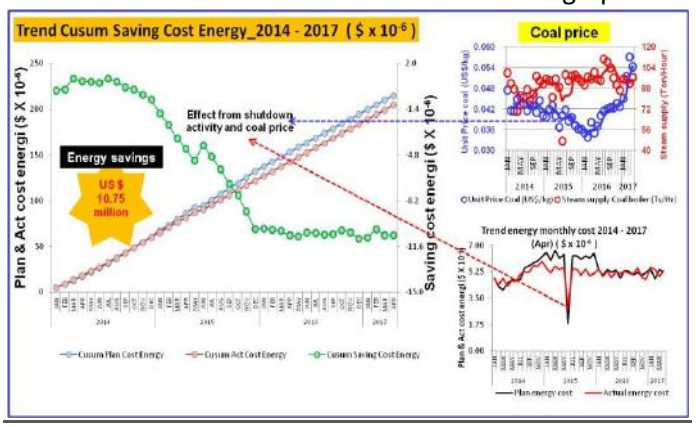

Figure 10. Graphic of summary cumulative energy saving PT. CJIP

Approach used to validate results

Installation of measurement of each equipment was a significant step to determine energy efficiency. From the measurement data, energy team was able to perform control, analysis, and action. To ensure the saving of the improvement result, we engaged **finance unit staff. The** value of IRR and NPV of a project improvement were well identified. Figure 11 is the

evidence of improvement result from the reduction of production cost which must be approved by **finance unit up to our vice president director** .

Figure 11. Involvement of finance people & VP director in validation of improvement results

Continues improvement with Plan-Do-Check-Action (**PDCA) System** was conducted to show our strong concern for the implementation of energy management system based on ISO 50001.

Steps taken to maintain operational control and sustain energy performance improvement

PT. CJIP also conducted a special weekly meeting agenda with topic on energy with the vice president director as person in charge.

Table 2. Schecdule of Meeting for energy discussion

		PIC	Time	Personel
1	Monthly Energy meeting	Energy manager	Every tuesday	20-30
2	Weekly Division Head meeting	**Vice Pres. Dir.**	Every Friday	10-15
3	Academy Energy class	Energy manager	3 months/ Year	25-30

Figure 12. Energy meeting situation

The result of meeting put a clear guidance for improvement and revision or development of Standard Operating Procedure (SOP) aiming for energy efficiency. Training on new SOPs were also done right away to the employees for obtaining immediate results.

Fig 13. Socialization of new SOP to employee and Energy academy

Development and use of operational expertise, training, and communications

Table 3. Training conducted done by PT. CJIP

No.	Theme	Organizer	Date	Personel
1	Pump System Optimiazation	KEBTKE UNIDO	2014	32
2	Energy management ISO 50001	KEBTKE UNIDO	2014	32
3	Steam system optimization	KEBTKE	2015	46
4	Awareness ISO 50001	IEI	2016	694
5	Life Cycle Cost (LCC)	EnCoSS	2017	42

Table 3 shows our commitment of energy efficiency and CO2 emission reduction by conducting capacity building activities. The training allowed our human resources to better understand on the importance of energy efficiency. The positive impact of the training was also to increase our employees' insight on inventing the idea of energy efficiency toward the ***SIP*** Program. The monitoring of improvement result can be seen on the **web based online**. (see figure 9)

Employee engagement: 1% savings of SIP program was rewarded to the energy efficiency-concept employees. It was a strong trigger to motivate our employees.

Professional expertise: External training conducted by UNIDO and MEMR which was delivered by the expert trainer in the field of energy efficiency. While the internal training at PT. CJIP also presented by our internal energy staff who had close consultation with UNIDO.

Tools & resources

Monitoring of process conditions and energy consumption at PT. CJIP was done digitally and automatically in order to obtain and identify the history in abnormal condition of process. The importance of communication built between energy efficiency team and the purchasing section was through **LCC (Life Cycle Cost)** training. The comply with international standard best practices of energy, environment, and customers, PT. CJIP was certified for ISO 9001, ISO 14001, OHSAS 18001, GMP, FAMI-Qs, PROPER, and **ISO 50001**.

Figure 14. ISO certificate, and FAMI-QS (Including ISO 50001)

Employees' enthusiasm and motivation were so high in achieving the certification due to the ***SIP*** programs as mentioned earlier.

Lessons Learned

Lessons Learned/Keyes to success

Following points are our lesson learned:

The process takes time

Changes and the formation of piker patterns were not possible within short term assignment. Through the SIP Program PT. CJIP had been initiated the energy efficiency culture for 9 years prior to ISO 50001 certification.

Involvement of all employee and top management

Support from top management, employees, and CJ Head quarter are the most important factor to achieve the goals.

Keys to Success

- Support from enterprise/head quarter, top management, and all employees
- Set for the internal-external goals and transparent reporting
- Engagement of employees at all levels individually and in teams
- Utilizing existing tools and SOPs.
- Join hand with other energy efficiency agency outside the company