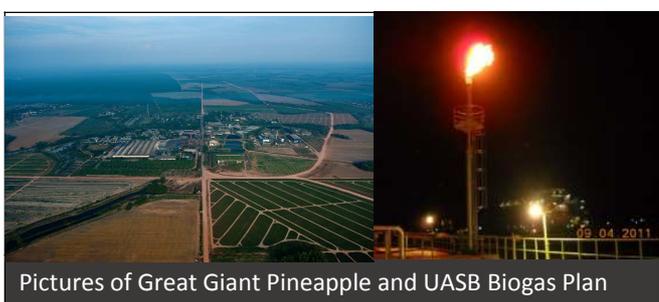


Global Energy Management System Implementation: Case Study

Lampung, INDONESIA

PT Great Giant Pineapple

The factory that implementing ISO 50001 and treating the waste water to become biogas as a part of energy conservation program to achieve sustainable growth



Pictures of Great Giant Pineapple and UASB Biogas Plan

Business Case for Energy Management

Company Profile

GGP was established in 1979. As one of the top three producers of premium pineapples worldwide, It now operates the largest integrated canned pineapple facility in the world, with its plantation and factory (including drum, can production and power plant) in one location. This integration gives GGP an edge in quality control and trace-ability of products, as well energy efficiency through energy management management.

GGP's land covers 30,000 hectares in Lampung, of which 19,000 is dedicated for growing Cayenne pineapples. Annually, GGP processes more than 500,000 tons of pineapples and exports 11,000 containers of canned pineapples to more than 60 countries in the world.

“Implementation of EnMS ISO 50001 has meet with the company objectives for sustainable growth to achieve low cost and high yield without abandon the responsibility to the environment.”

—Ruslan Krisno, Sustainability Director

Case Study Snapshot

Industry	Food Industry
Product/Service	Canned Pineapple
Location	Lampung – Indonesia
Energy Management System	ISO 50001
Energy Performance Improvement Period	2 Years
Energy Performance Improvement (%) over improvement period	5.77% from Baseline
Total energy cost savings over improvement period	\$ 528,070.48
Cost to implement EnMS	\$ 137.314,61
Payback period on EnMS implementation (years)	0.43 Years
Total Energy Savings over improvement period	221,535.41 GJ
Total CO ₂ -e emission reduction over improvement period	18,908.87 Ton CO ₂ e

Customer Requirement Drivers

GGP focus on energy management become a priority for a number of reasons. First of all, from reputation perspective, due to, 100% our product export to worldwide, so we driven by customer to applied system, including energy efficiency system through Energy Management System ISO 50001:2011. Nowadays, more customer realized that they not only concern to the quality of the product but also quality environment (decreasing fossil fuel and GHG).

Second, *GOING GREEN* corporate target by reducing fossil fuel consumption by 30% by 2020.

Third, compliance to regulation. Based on PP 70/2009, said that every company that use energy more than

6.000 TOE, shall implemented energy management system.

Energy Management Program

GGP has been a part of and learned much from three main energy management programs :

- Pilot Company to implementing energy management system – UNIDO (Joined since 2012)
- Management Energy reporting to Energy Ministry (since 2012)
- PEEN Award by Energy Ministry - (since 2015)

History of Energy Reduction Approach

In 2012, GGP set its first energy goal to reduce fossil fuel consumption by 30% by 2020 as a part of company goal being GREEN COMPANY 30:40:50. 30 means reducing of fossil fuel consumption by 30%, 40 means reducing of chemicals consumption by 40%, and 50 means increasing of production by 50%.

In 2014, kick off Energy Management System was held as a sign that we start to implement Energy Management System. In 2015 we achieved a 5,77% energy reduction meanwhile in 2014 we achieved a 2,54%. This achievement compared to a 2012 baseline. And in 2016 we achieved a 4,81% energy reduction in GGP. At the same time GGP established “energy consumption significant user” of our Energy Management System. This designation uses the power of EnMS structure to systematically drive, track and improve energy performance.

In the early of 2017, our Plant (Can Pineapple Plant and Power Generation Plant) certified to ISO 50001:2011. We are still catching up the company target reducing fossil fuel usage by 30% by 2020 by a number of smaller projects and implemented some operational control to maintain the consistency of the system. Moreover, for long term project we starting to invest gas turbine (energy source from Biogas from our waste water) to replace the existing power generation.



Figure 1. GGP’s Energy Team

Business Benefits Achieved

Business Benefits

GGP started to implemented ISO 50001:2011 in March 2014 and received ISO 50001:2011 certification 3 years later in early 2017. Since then the energy saving has been accomplished. These are summarized below:

	2014	2015	2016
Energy Saving (GJ) base on 2012 baseline	43,541	99,485	78,508
GHG Emission (TCO2e)	3,387	8,727	6,794

Energy savings have been realized since EnMS ISO 50001 implemented. The energy saving achievement in 2014 is 43,541.10 GJ (equal with US\$ 112,047.69) and 99,485.82 GJ (equal with US\$ 237,002.02) in 2015 and 78,508.52 (equal with US\$ 179,020.78) compared to the baseline of energy consumption in 2012. Total 2014 – 2016 savings is 221,535.41 GJ (equal with US\$ 528,070.48). Reducing of the energy consumption in 2014 and 2016 will cause the decreasing of GHG emission by 18,908.87 Ton CO₂e.

Decreasing energy target in 2016 due to the influence of weather conditions from the previous year. We faced a long drought season that impacted to our raw materials supplies in 2016.

Biogas used in GGP as renewable energy is a part of energy conservation program in the implementation of EnMS. Biogas is produced by anaerobically treatment of the waste water coming from the factory in UASB

Biogas Plant. Biogas is used to replace 100% of HFO used for Thermal Oil Boiler (equal with 2 mio Liter/year) and 8% of coal used in Power Plant (equal with 7,900 Ton of coal/year or 140,457 GJ/year). GGP's Biogas Plant as a waste to energy initiative is integrated with CDM program, the one of Kyoto Protocol mechanism. Reduction of CO₂eq emission in 2014 is 20,217 Ton, and 23,353 Ton in 2015. Currently, it is in preparation for verification to issue the CER.

Energy saving in 2014 - 2016 is 221,535.41 GJ. The saving can be achieved by doing improvement and innovation such as, modification steam system in the cooking area in the canned pineapple process, steam system improvement in the pausterilization machine in the pineapple juice process, VSD installation, improving coal calories, and changing or simplifying some of the process chain especially by reducing motor usage. This achievement is very useful and incredible for the company since the challenges raising and have to be solved and competitive. The saving achievement will lead to be low cost.

Other prestigious achievement of energy saving GGP received award in The 5th Indonesian National Energy Efficiency Award on August 4th, 2016 for category of ***Energy Management Implementation for Industry***. It will be a recognition for GGP as the green company that concern to the energy efficiency or conservation by managing it as well as maintaining and protecting the environment.

EnMS Development and Implementation

Organizational

Energy policy has been defined by our CEO and reviewed annually at the Management Review Meeting sessions and amendment as required.

Director and Energy Team has been determined Key Performance Indicator for energy saving in each section annually as an energy objectives. We used the Balance Score Card system to monitored monthly. This KPI become indicators of energy performance annually. As a result, the incentive scheme that received by each department based on this KPI.

Director has appointed management representative, Energy Manager, energy team and internal auditors team and conduct certification competency to improved their skills. Moreover, energy team lead by chief executive director as commitment of management support. Due to the unique characteristic of our site, our energy team consists of multi expertise background, such as utility, engineer, maintenance, production, procurement, accountant, data processing and HR persons. All of their roles, responsibilities and competency have been clearly defined in their job description.

All employee become involved in the energy efficiency improvement through focused improvement activities such as Small Group Activity (SGA), BPR (Business Process Re-engineering), TQM and Six Sigma as well as employee suggestion systems. Every year GGP held a competition to choose the best project and best suggestion.

Energy review and planning

Review, analysis, and planning

First of all, GGP has been defined energy review, analysis and planning procedure as a manual guideline and to drive consistency. This procedures includes methodology how to conduct energy review in the past, present and the future, energy baseline and energy performance indicators. The tools contains historical energy consumption data that our site reported in our SAP program which has been already verified and validated by each department.

Secondly, due to the scope and boundary of this EnMS certification was held in power captive generation and power's consumer, one of which is canned pineapple and juice processing area including can and drum making. So, GGP requires energy in the form of Coal, diesel fuel and Biogas as a form of power captive generation's energy. In other hand, canned pineapple and juice processing requires electricity and steam that generated from our power generation.

Boiler consumes about 93% of coal while the canned pineapple consumes 45% and juice processing consumes about 52% of steam. Therefore, using Pareto chart we select Boiler and Canned pineapple and Juice

Processing as Significant Energy Users (SEU) as shown in figure 02.

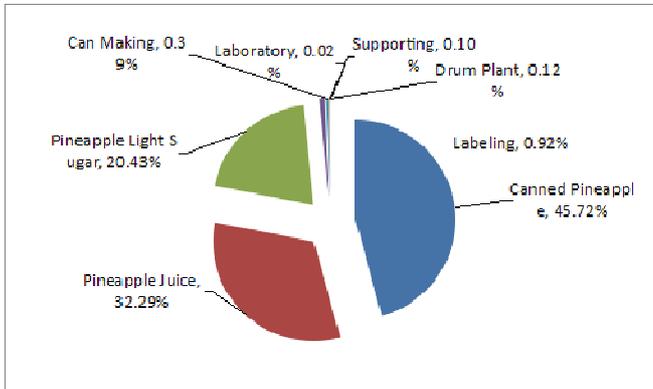


Figure 2. Significant Energy User

Baseline is determined by using statistical linear regression approach which describe the correlation between energy consumption and the driver for the last 5 years. We found that correlation between raw material volumes and energy consumption ($R^2 = 0.95$) in canned pineapple and correlation between coal consumption and steam generation in Boiler ($R^2 = 0.91$). Energy conservation opportunities has been identified by three different way such as: the result of energy audit, walk through audit in the SEU and non SEU areas and brainstorming among energy team.

Financing

The company capital budgeting process runs from August to December. The expectation is that energy performance improvement projects for inclusion in the following year’s capital budget, be scope out, compete with the feasibility studies and possibilities incentive agreements, in the time inclusion in the capital budgeting process.

while the company does have energy performance objectives, energy performance improvement projects compete for capital on a one-on-one basis with the other projects.

Cost benefit analysis

Activity	Cost	Potential Saving	Real Saving
2014-2016 - Training & Benchmarking	\$13.146,65		
2014 -2016 - Audit & Consultancy	\$2.570,60		
2014-2016 - Internal Communications	\$757,14		
2014 - Projects	\$15.159,37		
2014 - Saving		\$121.316,69	\$112.047,69
2015 - Projects	\$80.893,11		
2015 - Sub-Metering	\$8.888,89		
2015 - Saving		\$172.367,45	\$237.002,02
2016 - Certification Audit	\$15.898,86		
2016 - Saving			\$179.020,78
Total	\$137.314,61	\$293.684,14	\$528.070,48
Discounting Rate	11.55%		
Income Tax Rate	25%		
IRR - 2014 to 2019	230,68%		
NPV	\$475.149,72		
Discounted Pay Back Period (years)	2,18		

Activity	Cost	Potential Saving	Real Saving
2014 - Projects	\$15.159,37		
2014 - Maintenance cost per year	\$3.984,06		
2014 - Saving		\$121.316,69	\$112.047,69
2014 5-Year IRR		589,62%	
NPV		\$287.180,94	
Discounted Pay Back Period (years)		1,17	

Activity	Cost	Potential Saving	Real Saving
2015 - Projects	\$80.893,11		
2015 - Maintenance cost per year	\$7.407,41		
2015 - Saving		\$172.367,45	\$237.002,02
2015 5-Year IRR		154,29%	
NPV		\$344.055,29	
Discounted Pay Back Period (years)		1,65	

Figure 3. Summary Cost Benefit Analysis

A summary of total cost benefit analysis along with the 2014, 2015 and 2016 cost benefit analysis can be seen in figure 3, above.

Approach used to determine whether energy performance improvement

Energy performance Indicator (EnPI) can be demonstrated by comparing actual energy consumption with the estimated energy consumption as shown in figure 5. Management has approved as Energy Objective and Target to reduce energy intensity by 6% in the end of 2017 form baseline 2012. Performance against objective is reported to Top Management on a monthly basis.

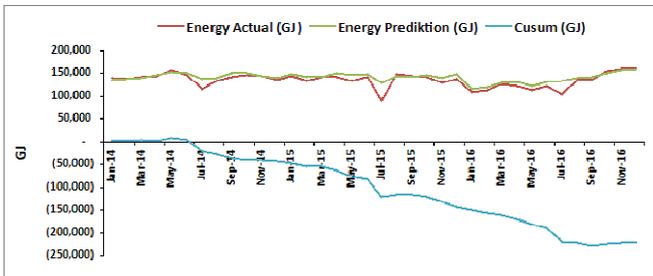


Figure 4. Energy Actual consumption versus prediction and Cumulative SUM (CUSUM) form 2014 - 2016
 If the actual energy consumption is lower than the estimation, it means that energy performance improve and vice versa. The gap between actual and estimation is energy saving. Total energy saving from 2014 - 2016 is 221.534 GJ as shown in the CUSUM graph above.

Approach used to validate result

There some method to validate the result. First of all, the primary tool for determining energy performance improvement is using cumulative SUM (CUSUM) graph. A positive slope for the trend on CUSUM graph, indicated a improvement in energy performance compare to the baseline.

Second, doing checking and calibration for the equipment and instrument to give confidence in the validity of data that generated from meters.

Third, EnMS Internal audit in every semester and annually external audit by certification body to guarantee that system management energy well implemented. Energy audit every 3 years conduct by third parties to give the clear energy performance that has been achieved by site.

Finally, Management Review Meetings in every semester to keep the spirit of continuous improvement of the system and to make sure that the system reviewed by Top Management.

Step taken to maintain operational control and sustain energy performance improvement

Operation control training modules for each SEU have been prepared outlining the factors affecting the SEU and the control limits. The control limits for optimal efficiency in SEU have been defined, standardized, and

documented by energy teams in every sections. Standard Operating Procedure (SOP) and Work Instruction (WI) have been developed for operation, to control the limits, and as guideline for corrective actions. All the SOP, WI and other operational controls has been reviewed periodically by energy team that lead by Certified Energy Manager. Every changes in the SOP, WI and other operational will be validated and calibrated by teams. Afterwards, the changes will be trained to the personnel in operation by energy teams. Although, there no changes in SOP, WI and operational control’s training still given to personnel to raise employee awareness

The effectiveness of the training will be evaluated every 6 month by HR personnel.

Development, training, and communications

Top management committed to develop and optimize our human resources through training programs and effective rewards system to improve and maintain the EnMS and energy performance. Here are some training topics that have been conducted or followed by the company:

- The expert Training on EnMS in line with ISO 50001 by UNIDO/Ministry of Energy
- Certified Energy Manager Training by LSP HAKE - Certification body to certified Energy Manager
- Energy Audit Course by UNIDO/Ministry of Energy
- EnMS introduction and Implementation Course and Internal Audit ISO 50001:2011 by TUV Sud
- The expert training on Steam System Optimization by UNIDO/Ministry of Energy
- Lead Auditor Course by RIC1
- Energy Efficiency Investment Training by UNIDO/Ministry of Energy
- Awareness training in Energy Efficiency to all of the employee

Employee engagement

GGP has a number of programs to increase employee awareness of energy management at the site. The program as following:

Monthly Meetings: Every month, the energy team updates all site employee on various aspects of the

business. Energy is given a platform at these meeting and employee are updated on the achievement of, and any changes to, the energy management system.

Newsletters: An energy management related article is included in the monthly “Factory Buletin” and in the quarterly internal magazine “GEMA Lampung”

Poster and stickers: Poster and stickers are produced for each energy performance improvement initiative. These are posted at strategic location of the site to create awareness around the initiative.

Energy Efficiency Convention Each Semester: Every semester, GGP held convention related to energy efficiency improvement. The best improvement will be rewarded.

Tools & resources

Tool used to support the energy efficiency includes :

1. Balance Score Card to monitoring Key Performance Indicator in term of saving energy every month.
2. SCADA system to real time monitor the key parameters in operation. It is installed in the Power Plant, Production (Juice Concentrate area), and Biogas Plant.
3. Instruments installed in the operation : electricity meter, steam meter, water flow meter and flow gas meter.
4. SAP system as a energy data resources from SEU and non SEU area to be analyzed as energy usage in past, present and future
5. Six Sigma, BPR (Business Process Re-engineering), Small Group Activities (SGA) and TQM (Total Productive Maintenance).
6. Re-evaluate system periodically

Lessons Learned

It will be a story to write down about lesson learn, but we can summarized the outline below.

Getting Involved: The involvement of all parties from top management to operator level and non SEU’s Person makes this implementation of EnMS successfully.

Energy Sustainability: It’s part of our Top Management in sustainability journey by decreasing fossil fuel and chemical fertilizer consumption. This Management commitment in energy sustainability lead the team enthusiasm to built the EnMS system

Continual Improvement: No matter, that energy saving target under 5% annually, the main idea EnMS system is how we can have a better understanding in PDCA cycle (planning, setting a target, implementing, checking, correcting and reviewing periodically).

Center of Excellent: This pilot site implementation (Canned Pineapple, Pineapple Juice processing and Power Captive Generation) was a great success allowing other sisters company such Pineapple Plantation, Tapioca plant, Bromelain enzyme and other sister companies to go forward EnMS Certification

Keys to Success

- Top Management’s support by established clear energy policies and targets makes this system implementation run smoothly although we achieved certification after 2 years later.
- Hard work, good team works, and good communication.

“Continuous improvement is the best way to make the Energy Saving become a culture of organization”

____Wayan Ardana, Production Director

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.

