

Second Batch of Domestic TOP TENs List

Japan Industrial BP List

BP1: Promotion of Energy Conservation by Circle Activities at a Paperboard Manufacturing Plant

1.Details

Under the slogan of “Less Weight,Less Carbon”,Rengo Co.,Ltd. is making efforts to reduce the weight of corrugated boards and paperboards. The company has developed a cutting edge product,C-flute corrugated board and is promoting marketing of the product. At its Yashio Mill,Rengo is manufacturing thin inner sheet to reinforce lightweight corrugated board. Although energy conservation per area can be achieved as a packaging material,the Yashio Mill needed to improve its production method urgently to achieve energy conservation by weight.

In addition,Saitama Prefecture,where the Yashio Mill is located,has enforced an ordinance to promote the measures against global warming. Depending on the conditions certified by the prefecture,companies in Saitama Prefecture were required to reduce their CO₂ emissions significantly by 6%-15% from the base year of FY2002-FY2004.

In order to comply with the ordinance,the Yashio Mill implemented the followings:

- (1)Promoted the development and production of thin and lightweight corrugating medium
- (2) Promoted energy conservation by introducing the high nip

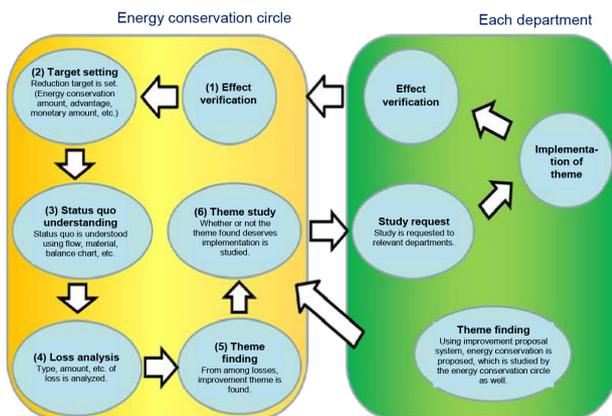
load shoe press prior to the drying process

(3) Implemented energy conservation activities in the material preparation process by actively introducing energy-saving facilities, a conventional method of small-group activities

(4) Grass-roots activities to find and implement energy-saving measures by a newly established energy conservation circle (Team Low Emission Yashio) with the participation of all members of the circle

The results are: (compared with 2011; crude oil equivalent)

(1) Weight reduction of “Less Weight, Less Carbon” corrugated boards and paperboards: A reduction of 89 kl/year



(2) Reduction of energy consumption of paperboard machines: A reduction of 1,435 kl/year

(3) Energy conservation activities in the material preparation process: A reduction of 3,239 kl/year

(4) Grass-roots activities of a small-group energy conservation circle with the cooperation of business departments: A reduction of 3,900 kl/year

The total reduction reached 8,663 kl/year, achieving a 8% reduction of total energy consumption of the mill.

2. Diagrams, etc.

- Consultants are invited so that the members can learn the

basics of the activity. → Establishment of PDCA cycle

3. Energy conservation performance

(Crude oil equivalent)

(1) Weight reduction of “Less Weight, Less Carbon” corrugated boards and paperboards: A reduction of 89 kl/year

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(3) Energy conservation activities in the material preparation process: A reduction of 3,239 kl/year

(4) Grass-roots activities of a small-group energy conservation circle with the cooperation of business departments: A reduction of 3,900 kl/year

Sum total of the above: 8,663 kl/year

The total reduction reached 8,663 kl/year, achieving an 8% reduction of total energy consumption of the mill.

4. Advanced nature and originality

(1) Rengo is the leader in the industry in the efforts to reduce the weight of corrugated boards and paperboards. The company has worked to develop and manufacture C-flute corrugated board, which has become the standard in Europe and the U.S. but is still considered a cutting-edge technology in Japan. It also developed a proprietary technology to manufacture thin corrugating medium for corrugated boards.

(2) After investigating and considering the usage outside Japan and technical information, Rengo has introduced the high nip load shoe press of the highest linear pressure in Japan. This helped the company achieve energy conservation.

(3) Considered technologies of energy-saving equipment utilizing advanced technologies in the material preparation process and expanded the technologies to similar facilities in the mill.

(4) Based on a newly established energy conservation circle (Team Low Emission Yashio), learned the basics of small-group activities, established a procedure so that all the employees in the mill can participate, implemented a PDCA cycle to find and implement continuous efforts of energy conservation.

5. Versatility and expandability

(1) Compatible with the existing corrugated boards and paperboards. Weight reduction is becoming an important issue in the industry.

(2) A new press machine had been introduced to corrugating medium making machine. Also, the press machine was introduced to liner making machine, too. Introduction and optimization of new press machine is possible, irrespective of the type of paperboard.

(3) Optimizing the facility specification will enable updating from the existing facility and expansion to similar facilities.

(4) Based on a newly established energy conservation circle (Team Low Emission Yashio), learned the basics of small-group activities, established a procedure so that all the employees in the mill can participate and advanced the efforts as mill-wide grass-roots activities.

6. Continuity and sustainability

Based on the energy conservation circle (Team Low Emission Yashio), implemented mill-wide information sharing from management to rank-and-file employees, through ISO activities, Environmental Committee and the efforts at workplace, implemented and continued a PDCA cycle of energy conservation activities.

7. Investment efficiency

Vary by case.

8. Secondary results

Environmental effect: Reduction of CO₂ emissions

- (1) 233 t/year
 - (2) 3,758 t/year
 - (3) 8,483 t/year
 - (4) 10,214 t/year
- 22,688 t/year in total

Awards:

Minister Prize of Economy, Trade and Industry in the FY2014 Energy Conservation Grand Prize for excellent energy conservation equipment

Human resources development:

Energy conservation circle consists mainly of young employees from various workplaces. Through acquiring knowledge on the structure of equipment, verification of energy usage, gathering information, and creation and implementation of a plan, the circle nurtures human resources able to promote energy conservation and other improvements. The participants can also gain knowledge from other business departments. From a medium- to long-term view, they can broaden their perspectives necessary when making judgments.

At workplaces, the employees became more aware of the problems, through the verification and implementation of the ideas they have suggested, and also understanding the effects of such ideas. ■

BP2: ECO Activities to Actualize "Visualization(energy audit)" and "Optimization" Using EQS-AD10 (Environmental Andon System)

1.Details

After obtaining an Environmental Management System(EMS) in 1996,the company's facility management department has implemented energy-saving activities such as controlling operation of air conditioners and lighting. However,such activities were not introduced to manufacturing sites due to concerns over a possible negative impact on quality and productivity. With the aim of reducing total costs and preparing for addressing energy problems,which will be a future challenge in manufacturing factories,the company has launched activities to achieve (optimization) both "energy conservation" and the "improvement of quality and productivity" in 2010. The target was to become the No.1 eco factory in the industry in three years.

(1)Under the concept of "optimization" and"visualization" various sensors were installed on equipment. The collected data are aggregated by Environmental Andon System (EQS-AD10) monitoring system.

(2)Environmental Andon System (EQS-AD10),originally

developed at OMRON's Ayabe Factory,creates graphs and makes analysis based on gathered data,and also detects gaps between the current state and the ideal state,thereby supporting energy audit for appropriate control and prevention of wasteful use of energy. In addition,all employees at the factory,from those in charge of factory management to equipment operators,can select the layer to check for the status of production and the environment. This enables energy audit with the participation of all employees at the factory.

2.Diagrams,etc.

Refer to Figure 1.

3.Energy conservation performance

(1)Power consumption for production of the factory (compared with FY2010): A 27.3% reduction (2,741,000 kWh → 1,993,000 kWh).

(2)Electricity intensity per unit production of the factory (compared with FY2010): A 20.1% reduction.

<Major cases of improvement>58 cases in total.

(3)Electricity intensity per unit production of the clean room:

Environmental Andon System (EQS-AD10)
Visualization System (Patent No. 4377353)



Figure 1

Down by 50%.

(4)Power consumption of the booth in the printing process:
Down by 50%.

(5)Power consumption of the clean booth using the fan filter
unit: Down by 40%.

(6)Power consumption by lowering temperature setting when
the forming machine is not in operation: Down by 35%.

(7)Power consumption by improving compressed air:Down by
28% and others.

4.Advanced nature and originality

(1)Develop and operate an original system,not only for
detect electricity consumption,but also to constantly monitor
information on electricity consumption,the environment and
production once in every minute in real time for 24 hours a
day,compare the information with past data for integrated
monitoring.

(2)Implement total ECO activities aimed at optimizing all
energy conservation,the environment,quality,productivity,saf

ety and reliability.

5.Versatility and expandability

(1)Our activity is not just for visualization of energy usage
but also for auditing energy consumption. It can provide
new findings and know-how from a new perspective,and is
expandable as a value-added energy conservation activity.

(2)A real-time goal can be set to Environmental Andon System
(EQS-AD10) . Its function to give a forecast or an alarm when
an abnormal condition of electricity and environmental data
is detected and take an appropriate measure improves the
environment for energy conservation.

(3)Environmental Andon System (EQS-AD10) has
beencommercialized in June 2013 to meet the market needs,so
that our customers can use the system in their worksites.

6.Continuity and sustainability

(1)Energy conservation at manufacturing sites is considered
difficult due to concerns over possible deterioration of

productivity and quality. For this reason, we presented measurement data to verify that energy conservation measures have no negative impact on productivity and quality and established an ideal environment in which the manufacturing sites can implement energy conservation measures without concerns.

(2) In order to solve problems at manufacturing sites, Environmental Andon System (EQS-AD10) has been introduced to be used by all employees at the site to promote energy audit and enhance communication in the workplace.

7. Investment efficiency

(1) Investment amounts Recovery periods.

(2) Investment amount: 14.8 million yen Investment recovery: 1.5 years.

8. Secondary results

(1) Since its commercial launch as standard software in June 2013, Environmental Andon System (EQS-AD10) has been accepted by and introduced to more than 160 manufacturing companies and their offices. It is an environmentally-friendly ECO activity that leads to social contribution.

(2) It presented a concept of energy conservation at manufacturing sites, tips and know-how of energy

conservation and also introduced energy conservation and environmentally-friendly contents not only to the customers that purchased Environmental Andon System (EQS-AD10) and also to other companies and factories, contributing to society on a continuous basis.

(3) In terms of human resources development, 'ECO Ayakurian' (The dojo to study about ECO for the education on the environment and handing down knowledge to the next generation was established, to promote factory-wide energy conservation activities.

1) Patents: 1 patent

2) Awards: 3 in total, Minister Prize of Economy, Trade and Industries in the FY2012 Energy Conservation Grand Prize for excellent energy conservation equipment, Keidanren Chairman's Award at the 23rd Grand Prize for the Global Environment Award, etc.

3) Release on newspapers: 8 times (Nikkan Kogyo Shimbun, Nikkei Monozukuri, etc.)

4) Inspection tours and lectures outside the company: About 100 times a year ■

BP3: Reduction of Base-load Energy Usage

1.Details

After the Great East Japan Earthquake in 2011, business environment surrounding the company changed dramatically, pushing down the operation rate of its plants significantly. This resulted in the deterioration of energy use per unit of output. This was due to high base-load energy usage rate of approximately 70% necessary for maintaining clean rooms and other utility facilities. Sharp Corporation Kameyama Plant developed factory-wide efforts to lower the rate.

Effort 1: Energy-saving measures introduced to outdoor air-processing units Recovered heat by flowing heated water (waste heat) generated in the plant to reheating coils and also cold/cool water coils even in winter. This resulted in the reduction of the amount of both cold/cool and hot/warm water.

Effort 2: A reduction of circulating air volume in clean rooms In cooperation with the production and

engineering departments, determined six conditions that must not be changed while maintaining interior conditions (cleanliness, temperature and humidity, air current, chamber pressure). This reduced circulating air volume and also decreased energy consumption.

Effort 3: Energy-saving measures utilizing free cooling effect in winter on formerly low-loaded cooling towers In order to maintain high operation rate of the cooling tower, rearranged piping so that the function of the towers can be switched by season (summer or winter), to reduce energy consumption.

Effort 4: Modification of software to control backup fans and pumps in the production process (production units)

Modified software to control the fans and pumps in the production units so that all the inverter-type fans and pumps, including ones formerly not in operation as for backup use, can be operated constantly and also the non-inverter-type fans and pumps can be changed to work as

backup,instead.

This reduced the loss of pressure of dampers and valves,cutting energy consumption.

Effort 5: Reduction of power consumption by introducing LED lightings in the plant and offices The liquid crystal plant operates 24 hours a day,365 days a year,consuming a large amount of electricity for lighting. 20,050 fluorescent lamps and mercury lamps in the plant and offices were replaced by LED lamps to reduce energy consumption.

2.Diagrams,etc.

N/A.

3.Energy conservation performance

Other than listed above,302 measures to save energy were taken during three years. As a result,energy usage per unit of output for FY2013 improved by 43.3% from FY2011.

Effort 1 Reduction:	2,568 kl/year
Effort 2 Reduction:	1,091 kl/ year
Effort 3 Reduction:	233 kl/ year
Effort 4 Reduction:	458 kl/ year
Effort 5 Reduction:	1,155 kl/ year
Total	5,505 kl/ year 7,359 ton-CO ₂ /year

4.Advanced nature and originality

Keeping the plant-building concept since its foundation,grasped and analyzed the current situation and future challenges and switched the function of equipment and coil sections by season. Through utilizing the potential of each facility/equipment to the full,we

sought for total optimization by flexible thinking.

(1)Development of outer air processing technology (Effort 1)
-Supplied waste heat from the plant to reheating coil and also cold/cool water coil even in winter. This established a system to reduce the usage of both cold/cool and hot/warm water.

-Established an effective heat recovery system for spring and autumn periods by controlling the amount of cold/cool water (waste heat).

(2)Enhancement of operation rate of the cooling towers (Effort 3)

-Established a system to improve the operation rate of the cooling towers by switching the function of the towers by season (summer or winter).

5.Versatility and expandability

(1)All the measures listed above can be implemented just by modifying the existing facilities. This concept can be applied and is expandable not only to device factories but also to other industries.

(2)Four measures except for Effort 5 (ESCO) are cost effective,requiring less than one year to recover the cost.

6.Continuity and sustainability

(1)Energy conservation measures are continuing through small-group activities (under the company-wide system called R-cats).

(2)The progress of measures implemented and considered at each factory and each process in the Kameyama site is reported at the site's energy-saving

WG every month, so that the report can be utilized by other processes or the other factory in the site.

(3) Organize study meetings on energy conservation periodically to raise the knowledge level of the employees in charge of promoting energy conservation.

(4) Actively promote information sharing with regard to implementation of energy-saving measures and activities, including participation in the energy-saving meetings held by other plants.

7. Investment efficiency

Refer to table below.

Energy saving (1,000 yen/year)	Investment (1,000 yen)	Years required for recovery
Effort 1 45,558	39,400	0.86 years
Effort 2 43,238	—	—
Effort 3 5,883	3,000	0.51 years
Effort 4 18,166	16,600	0.91 years
Effort 5 45,748	—	ESCO contract: 5 years
Total 158,593	59,000	0.52 years
(Calculation excluded ESCO in Effort 5)		

8. Secondary results

(1) CO₂ reduction: 7,359 ton-CO₂/year

(2) Release (newspapers): 4 times including Mainichi Shimbun

(3) Posting literature: 4 times including ENECO

(4) Accepting a site visit to our energy-saving facilities: 7 times

(5) Joining in a study meeting with other companies: Once. ■

BP4: Reducing CO₂ Emissions in the Supply Chain

1.Details

(1)Cutting CO₂ emissions is a pressing issue because it increases temperature and causes an abnormal climate,resulting in global warming. In its new business vision 'FUSO 2015 Program' released in 2011,Mitsubishi Fuso Truck and Bus Corporation sets the target 'Leader in Green Innovation' as one of its goals. Under the goal,the company launched activities to reduce CO₂ emissions in its entire business operations.

(2)The activities aiming to achieve the target 'Leader in Green Innovation' were implemented by five teams for 'products','plants and facilities','supply chain','sales

and maintenance',and 'awareness and activities of the employees'.

(3)Our distribution department takes the lead in advancing activities to reduce CO₂ emissions in the supply chain. Since 2011,the company has quantified and controlled CO₂ emissions from cargo transport by trucks and railroad,cargo handling using forklifts,and distribution using our trucks.

<Major energy conservation activities>

- Modal shift to milk run or rail transport
- Introduce electric-powered forklifts to the plants
- Utilize carrier cars to transport finished vehicles and enhance direct delivery rate by reducing stopovers

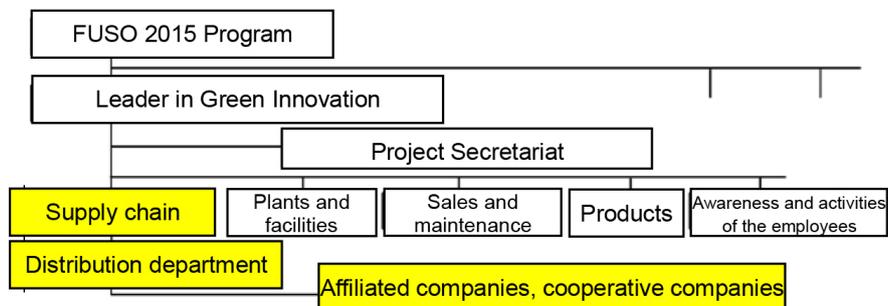


Figure 1

-Eco-friendly driving training

2. Diagrams, etc.

Refer to Figure 1.

3. Energy conservation performance

The company set a target to reduce CO₂ emissions by 5% in 2015 from 2010 level by introducing milk run, modal shift, improving the ratio of consolidated cargoes and direct delivery and introducing electric-powered forklifts. To achieve this target, the company advanced many projects.

Numerical target: reduce CO₂ emissions by 5% in 2015 from 2010 level. It means that target value is 1500 tCO₂ reduction and year target level is 375 tCO₂ reduction.

In 2012 as activity starting year, 418 tCO₂ reduction is achieved and it means over 10% reduction as compared with the target.

4. Advanced nature and originality

(1) Our core business is the development, production and sales of trucks. Since the introduction of the modal shift to rail transport of the delivery of parts in the supply chain, which encompasses receiving parts from the suppliers, production and the delivery of vehicles to the customers, may have a negative impact on the company's production plan, some people in and outside the company had a feeling of resistance to the introduction of the modal shift. Focus on the benefits of reducing CO₂ emissions by introducing the modal shift (change from truck delivery to rail transport) lowered the resistance, achieving a reduction

of CO₂ emissions.

(2) Transport of trucks using carrier cars is considered to be difficult because trucks are larger than passenger vehicles. The company manufactured eight units of the carrier car that can carry up to four light-duty trucks at a time. This further contributed to the reduction of CO₂ emissions.

(3) The company also implemented eco-friendly driving training for the truck drivers at affiliated companies and cooperative companies. This was a new initiative to reduce CO₂ emissions from a different point view.

5. Versatility and expandability

(1) Efforts to improve the loading ratio were also made in the distribution of repair parts within the company and containerized transportation to overseas production bases, and achieving an effect. This will be especially effective for containerized transportation to overseas production bases, since in many cases cargoes are divided or loaded inefficiently for the convenience of the customers or the destinations.

(2) Milk run is becoming increasingly popular in the corporate distribution as a standard method to reduce CO₂ emissions. It is expected to prevail further as it reduces fuel consumption, CO₂ emissions and also costs.

6. Continuity and sustainability

(1) Improving distribution is an important issue for the manufacturing sector in terms of environmental preservation and cost cutting. The activities were managed using database to continue the activities.

(2)Eco-friendly driving training for the truck drivers at affiliates and cooperative companies,which aims at enhancing eco-driving techniques and awareness toward eco-driving,targets to reduce CO₂ emissions on a continuous basis.

(3)Long-lasting effect can be expected because the company improved the distribution process itself and equipment and facilities.

7.Investment efficiency

N/A.

8.Secondary results

(1)Eco-friendly driving training provided to a total of 200 truck drivers at our 150 cooperative companies has enhanced awareness toward energy conservation and got it entrenched in our supply chain.

(2)In many cases the efforts to reduce CO₂ emissions also reduce energy cost and production costs.

(3)Electric-powered forklifts emit no exhaust gas and less noise,expected to improve the environment in and outside the plants. ■