2008 Prize of Director General of Regional Bureau of Economy, Trade and Industry

Promotion of Energy Conservation Activities through Steadily Building up Improvements

Hokurikukako Co., Ltd. Sabae Plant
Group to Brighten Up Hokurikukako

◎ **Keywords: Improvement of fuel, electricity, and supply/waste water intensities through implementing improvements from a plant management point of view**

◎ Outline of Theme

Following the increase of small-lot, short delivery deadline products, a switch to high value-added products, and a further steep rise in crude oil and gas prices in recent years, energy costs have been rising. In order to overcome this critical situation, energy efficiency was implemented through promoting improvements from a plant management point of view under the supports from the prefectural government and the prefecture industrial support center.

◎ Implementation Period for the Said Example

- Project Planning Period August 2007 – November 2007 (Total of 4 months)
- Measures Implementation Period November 2007 – February 2008 (Total of 4 months)
- Measures Effect Confirmation Period March 2008 – Currently Implementing
  (Comparison with same month in previous year)

◎ Outline of the Business Establishment

- Scope of Business Various textile dyeing, chemical processing, and functional coating processing
- No. of Employees 35 persons
- Annual Energy Usage Amount (Actual results for fiscal year 2007)
  Type 2 designated energy management factory
  A Heavy Oil (Boiler Fuel) 1275 kL/year

LPG (Heat Setter Fuel)	286 t/year
Electricity	1,566,000 kWh/year
Crude Oil equivalent : 2053 kL/year	

◎ Process Flow of Target Facility

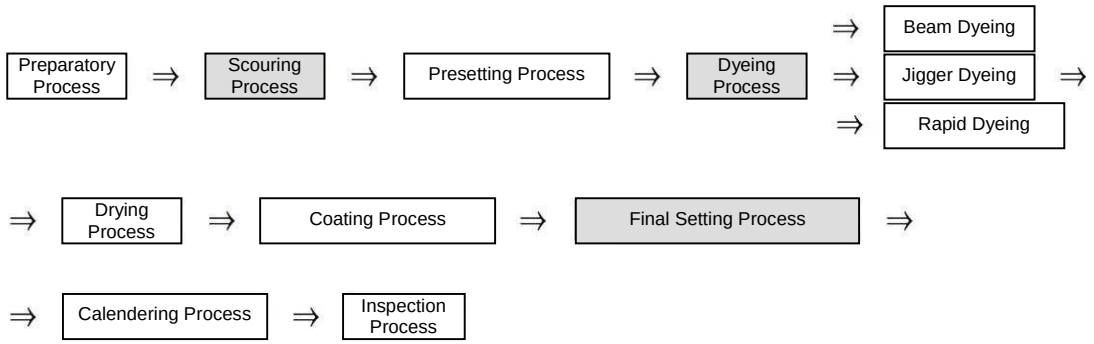

Fig. 1 The Process Chart of the Facility

1. Reasons for Theme Selection

Under the current severe state on capital finance, the activities implemented to reduce the energy intensity were restricted to making improvements from a plant management point of view which would not require large investments of capital, and small-sum improvements that would allow recovery of the investment over a short period.

2. Progress of Activities

(1) Implementation Structure

Making practical use of the specialist dispatching business of the Fukui Prefecture Industrial Support Center, an improvement group with a total of six members centered on the Plant Manager and Production Department Manager was established jointly between the Center and our company.

(2) Understanding and Analysis of Current Situation

The cost ratio taken up by the energy consumed by this plant had been gradually increasing since fiscal year 2003, and was falling into a critical situation.

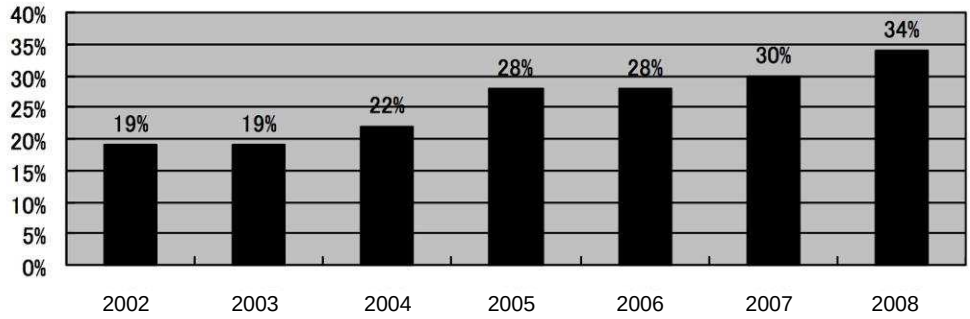

Fig. 2 Overall Cost Ratio out of Total Energy Consumption

Accordingly, specialist diagnoses were carried out a total of 10 times (over a 4–month period) by the Support Center.

[Details of Support]

① Fuel intensity reduction methods

② Production efficiency improvement methods

③ Production control and quality control effective methods

[Details of Analyses]

① Investigation of the steam consumption amounts for each operation process per unit -time

② Investigation of the LPG consumption amount during operation when the heat setter is rising temperature

③ Investigation of the actual electric power consumption in the operation processes

(3) Improvement Items, Targets, and Results

Scouring Process

This process plans to realize dyeing process stability (soiling prevention and hue reproduction ability) by scouring the processing fabric using surface active agents and alkali agents to eliminate the acrylic sizing agent, PVA, and fats and oils. The process is comprised of the Prewetting Tank → No. 1 Soaper → No. 2 Soaper → Hot Water Washing Tank → Water Washing Tank → Cylinder Dryer.

[Improvement Item] Change in the Chemical Injection Supplementing Method (Small-amount equipment improvement)

[Previously] Chemical injection supplementing was carried out in the No. 1 soaper, and overflowing was implemented in all tanks.

[After Change] Chemical injection supplementing was carried out in the prewetting tank, and overflowing was only implemented in the No. 2 soaper, hot water washing tank and water washing tank.

[Improvement Target] 10% reduction in the overflowing water amount

[Anticipated Effect] Reduction in the supply and waste water amounts, steam amounts, and chemical injection amounts.

[Improvement Result] Overflowing water amount 3.3 t/h → 3.0 t/h (Reduction of 9%)
The overflowing water amount and the corresponding steam amount were reduced, and the stability of the scouring effect was also verified.

[Reduction Energy Intensity]

A Heavy Oil	0.019 ℓ/kg
LPG	kg/kg
Electricity	kWh/kg
Supply/Waste Water	0.004 m^3/kg

[Improvement Effect Total Amount]

¥2,292,000/year (Trial calculation at August 2008 fuel prices)

Dyeing Process

This is the process where the processing fabric is dyed, and the process is divided among beam dyeing machines, jigger dyeing machines, and rapid dyeing machines according to the type of gray goods and the weight of each batch.

[Improvement Item] Dyeing Time Shortening (Omission of Scouring)

[Previously] Dyeing was carried out after re-scouring was implemented by the dyeing machine.

[After Change] Because the stabilization of the scouring effect had been verified in the scouring process, the re-scouring in the dyeing machine was omitted.

[Improvement Target] Required time: Reduction of 20% per batch
A Heavy Oil: Reduction of 15% per batch
Supply/Waste Water: Reduction of 15% per batch

[Anticipated Effect] Reduction in supply/waste water amount, steam amount, and chemicals amount

[Improvement Result] Required time: Reduction of 20% per batch
A Heavy Oil: Reduction of 13% per batch
Supply/Waste Water: Reduction of 13% per batch

[Reduction Energy Intensity]

A Heavy Oil	0.041 ℓ/kg
LPG	kg/kg
Electricity	kWh/kg
Supply/Waste Water	0.017 m^3/kg

[Improvement Effect Total Amount]
¥5,331,000/year (Trial calculation at August 2008 fuel prices)

Final Setting Process

Water repellent agents, flame proofing agents, antibacterial agents, and other resin-based chemical agents are thrown into a padder bath to be applied to the fabric for processing. The fabric is then dried in a non-contact drying machine and has dry heat applied by the setter to maintain the various coating functionalities.

[Improvement Item] Simplification of Recipes
[Previously] Recipes required to realize the various functionalities were finely subdivided into 252 types according to the processing method and type of gray goods. Each time the recipe was changed, program changing was carried out.
[After Change] The 252 types of recipes were classified, and streamlining was carried out according to functionality evaluation and chemical changes. By simplifying the recipes into 100 types, the number of program changes was decreased.

[Improvement Target] By reducing 252 recipes → 100 recipes (reduction of 60%), the setter halting loss was to be improved by 20%.

[Anticipated Effect] Reduction in LPG and waste liquid chemicals.

[Improvement Result] By reducing 252 recipes → 155 recipes (reduction of 38%), the setter halting loss was improved by 15%.

[Reduction Energy Intensity]

A Heavy Oil	ℓ/kg

LPG 0.032 kg/kg

Electricity 0.032 kWh/kg

Supply/Waste Water m^3/kg

[Improvement Effect Total Amount]

¥4,006,000/year (Trial calculation at August 2008 fuel prices)

3. Summary

Table 1 Summary of Reduction in Energy Intensity

	March-July 2007	March-July 2008	Substantial Reduction	Accumulated Portion Reduction due to Measures Implemented This Time
LPG (kg)	148,636	92,789		
A Heavy Oil (ℓ)	595,000	459,000		
Electricity (kWh)	759,804	590,004		
Supply/Waste Water (m^3)	246,498	197,333		
LPG Intensity (kg/kg)	0.32116	0.241	0.080 kg/kg (25.0%)	0.032 kg/kg(10.0%)
A Heavy Oil Intensity (ℓkg)	1.28562	1.19215	0.093 ℓkg (7.3%)	0.060 ℓkg (4.7%)
Electricity Intensity (kWh/kg)	1.64171	1.53241	0.109 kWh/kg(6.7%)	0.032 kWh/kg(1.9%)
Waste/Supply Water Intensity (m^3/kg)	0.53261	0.51253	0.020 m^3/kg (3.8%)	0.021 m^3/kg (3.9%)
Improvement Effect Amount			¥21,660,000	¥11,628,000

Crude Oil Equivalent	0.00213	0.00191	0.00022k ℓkg(10.3%)	0.00011k ℓkg(5.2%)

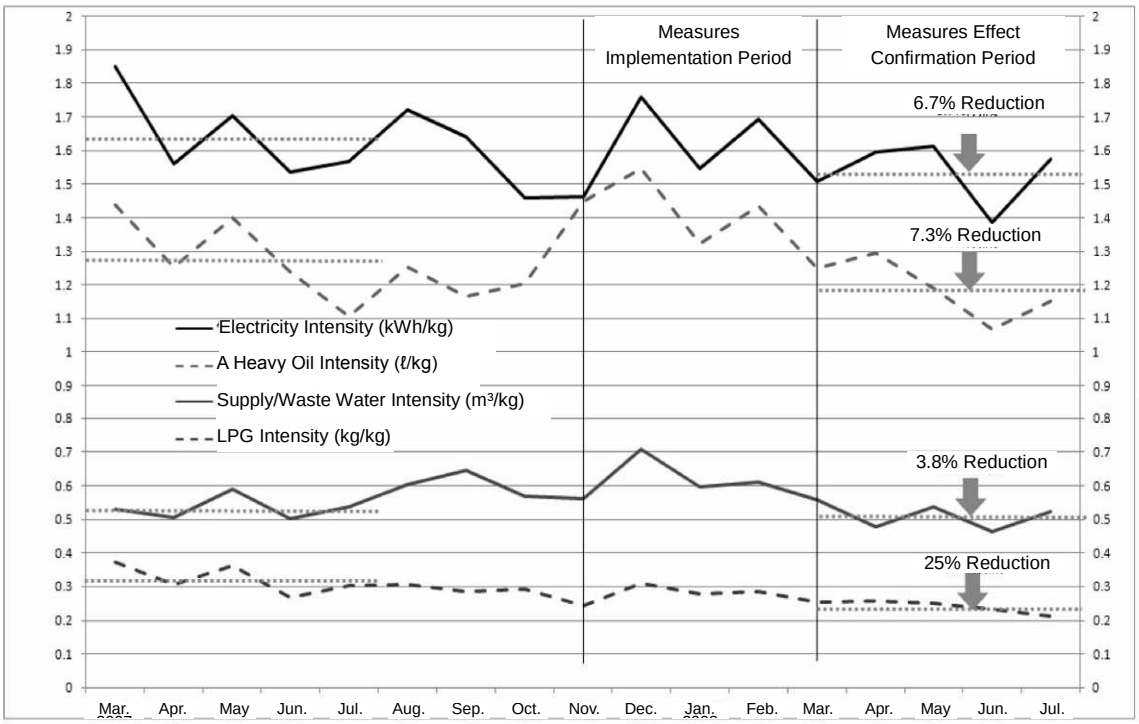

Fig. 3 Energy Intensity (Usage Amount/Processed kg)

[Overall Evaluation]

The support for the activities by the Fukui Industrial Support Center provided a great stimulus inside the plant, and the accumulated portion of the improvement effect amount realized by the activities this time was ¥11,628,000/year (trial calculation using fuel prices current at August 2008), enabling a large improvement effect to be achieved even without making investments in equipment. During the measures effect confirmation period (March-July 2008), the crude oil equivalent of the energy conservation amount achieved was 5.2% compared with the same months in the previous year (March-July 2007), roughly realizing the target.

In addition, the accumulated total substantial reduction rate realized through implementing the measures this time was approximately 2 times larger than the one planned. This synergistic effect was realized as the combined result of carrying out many other measures in addition to the measures implemented this time, such as “Appropriate selection of the dyeing machine depending on the size of the lot”, which resulted in a production efficiency improvement and a large reduction in the energy intensity.

4. Future Plans

The energy intensity due to reprocessing, particularly caused by products returned to the dyeing process, is an extremely important element that increases the intensity according to the (Appropriate lot/Reprocessed lot) ratio. Accordingly, the following measures will be treated as matters requiring urgent attention.

[Measures]

① Laboratory beaker and dyeing process on-site expansion reproduction

② Dyeing process repeated reproduction

③ Energy intensity simulation system development
(Energy intensity/weight for each process)

The “Beaker → On-site Expansion” measure will be the basic measure, and we intend to tackle the reduction of the energy intensity by improving the accuracy of the reproduction as far as possible as a theme for the future.