2006 Prize of Director General of Regional Bureau of Economy, Trade and Industry

Detonator Created by Steady Team Effort Where "Mottainai" Is The Password

Nihon Hard Metal Co., Ltd., Kyushu Plant
Sagano Gabai Niichan Team

◎ **Keywords: Recovery of exhaust heat for use**
Rationalization of electric power conversion into motive power and heat, etc., (lighting facilities, elevators, clerical equipments and consumer appliances)

◎ Outline of Theme

Becoming ISO 14001 certified is a rite of passage that cannot be avoided any longer by responsible businesses. Still, undertaking preparation for such certification procedure with the impression that it is about "making mounds of documents, accepting rigidly restricting rules and conducting utterly thorough control" would only lead to failure. We therefore decided to conduct our ISO certification preparatory activities, focusing primarily on energy conservation and proved that such effort does indeed prove to be a management success. Our energy conservation activities became the detonator for our ISO 14001 certification activities!

◎ Implementation Period for the Said Example

- Period for formulation of plan: April 1, 2005 through July 7, 2005 (Total of 4 months)
- Period for implementation of action:
  July 1, 2005 through March 31, 2006 (Total of 9 months)
- Period for verifying effectiveness:
  August 1, 2005 through July 31, 2006 (Total of 12 months)

◎ Outline of the Business Establishment

(Headquarters Located in Atsugi City of Kanagawa Prefecture with Same Production Items and Total Number of Employees Being Approximately 250 Persons)

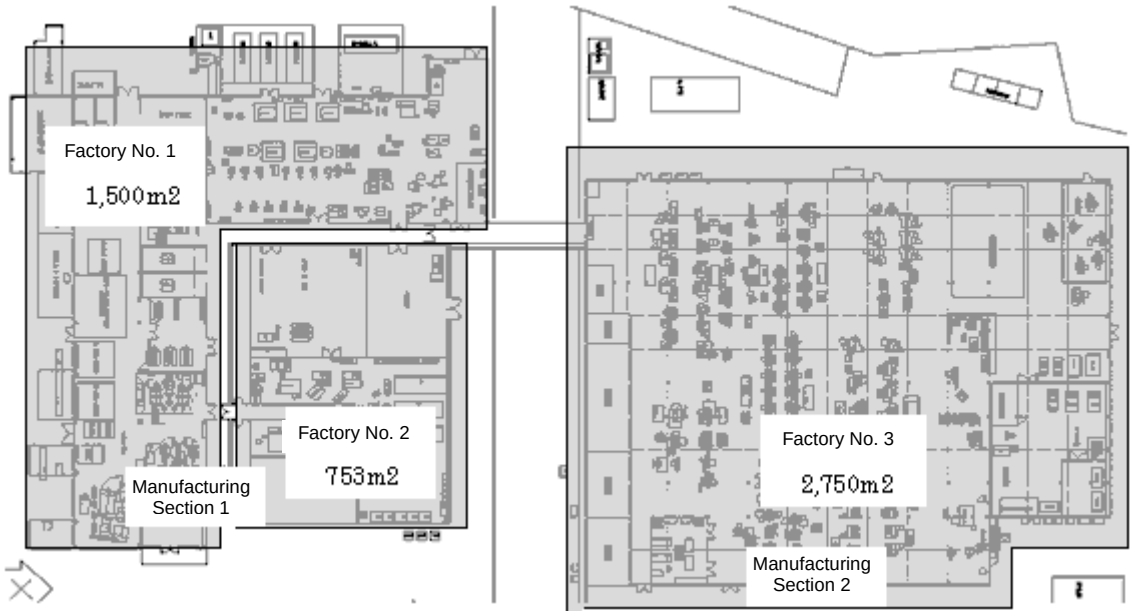
- Production items: Cemented carbide (carbide drill, carbide ENDOMIRU , carbide tap cemented carbide taps)
- Number of employees: Approximately 150 persons.
- Annual energy consumption: Crude oil: 848 kiloliters.

(record for FY2005) Electric power:2,130,000 kWh.

Crude oil equivalent total: 1,372 kiloliters.

◎ Process Flow of Target Facility

Facilities of the entire manufacturing plant are considered to be subject to this project, however, the improvement case examples are taken from the utility sections of the manufacturing plant
(air supply to all areas and lighting in the Factory No. 3).



(Figure 1)

1. Reasons for Theme Selection

As described in the Summary, we are planning to start serious preparation activities to qualify for the ISO certification in 2007 and we would like to ensure that everyone participates in these activities. For the purpose of triggering innovative awareness among our personnel, we decided to concentrate our effort in conducting energy conservation activities, effects of which are easily verified in numbers. It was also our intention to attain specific economic effects and to experience the effectiveness of such activities for the purpose of management.

We further consider these activities to be suitable undertaking to make our personnel acquire the habit of carrying out duties according to the PDCA cycle, from preparing a “plan” for improvement, the “do” things necessary to implement such improvements, then “check” the outcome and report on the improvement, then finally manage the resulting standard to “act” on.

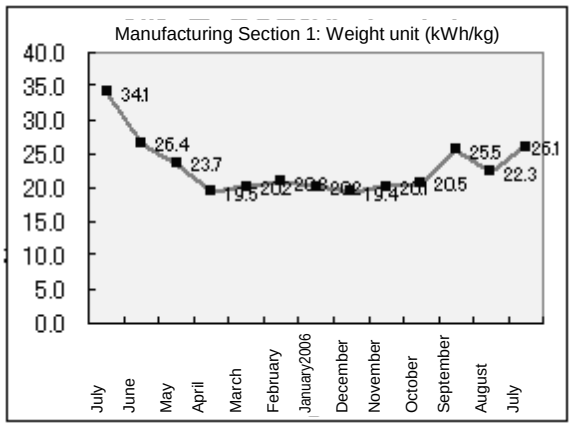
2. Understanding and Analysis of Current Situation

Production lines of our company can be broadly categorized into those of Manufacturing Section 1 (Factory No. 1 and No.2) and those of Manufacturing Section 2 (Factory No. 3) (Figure 1).

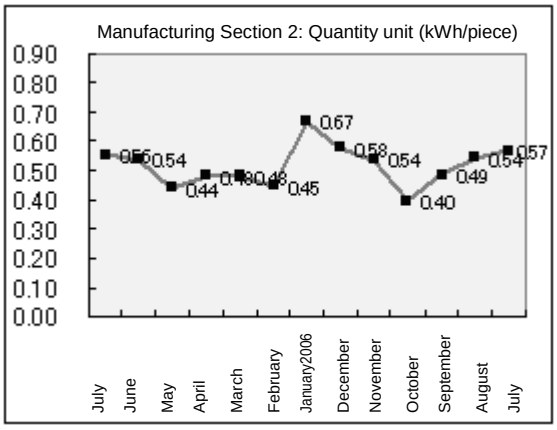
Manufacturing Section 1 produces alloys and conducts weight management. Manufacturing Section 2 is involved in the cutting and then polishing produced alloys, conducting quantity management. There is an increasing tendency for production for both Manufacturing Sections 1 and 2, with the electric power consumption transitioning proportionally. Manufacturing Section 1 has numerous baking equipments, which raise the room temperature with heat radiation. This results in the increased amount of electric power consumed for air conditioning during summer, which then drives the unit consumption higher. Manufacturing Section 2 experiences substantial impact of space warming heaters during winter, due to the structure of their building (high ceilings). In both cases, electric power consumption is influenced by the amount of production and for that reason it is managed in terms of unit consumption (Figure 2 and Figure 3).

The electric power consumption indicated for the month of July in 2004 abnormally high due to trial runs that were conducted for the implementation of large furnace and for that reason, this figure is removed from our data.

Manufacturing Section 1: Unit consumption 22.0; Manufacturing Section 2: Unit consumption 0.52 (average for 12 month period from August 2004 to July 2005).



(Figure 2)

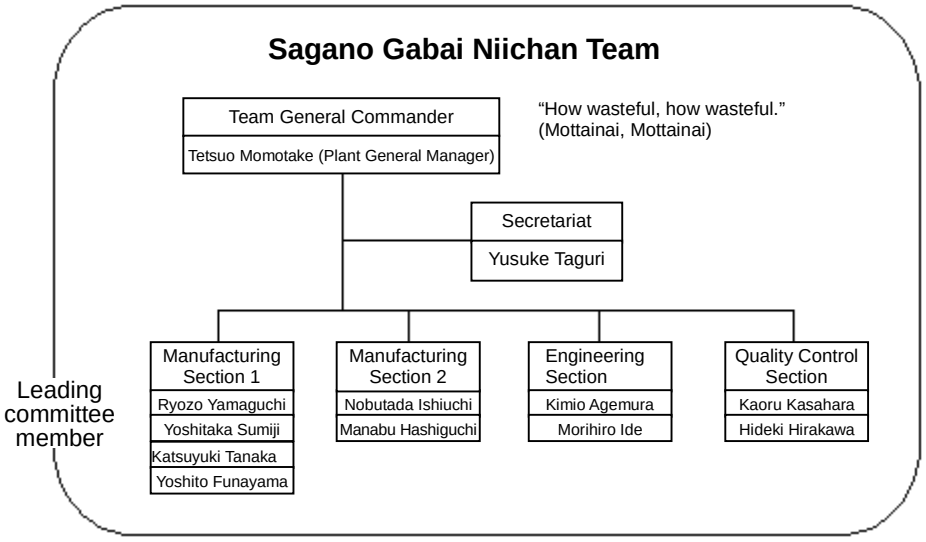


(Figure 3)

3. Progress of Activities

(1) Implementation Structure

An energy conservation organization with the Plant General Manager taking the helm as the General Commander was established. The name of this project team was called “Sagano Gabai Niichan Team”. A group was formed at each individual station (Figure 4). Progress is tracked through reporting at the Strategy Meeting, which was held twice monthly.
Minutes of meetings and results were posted in employee cafeteria to ensure that everyone was aware of what was going on.



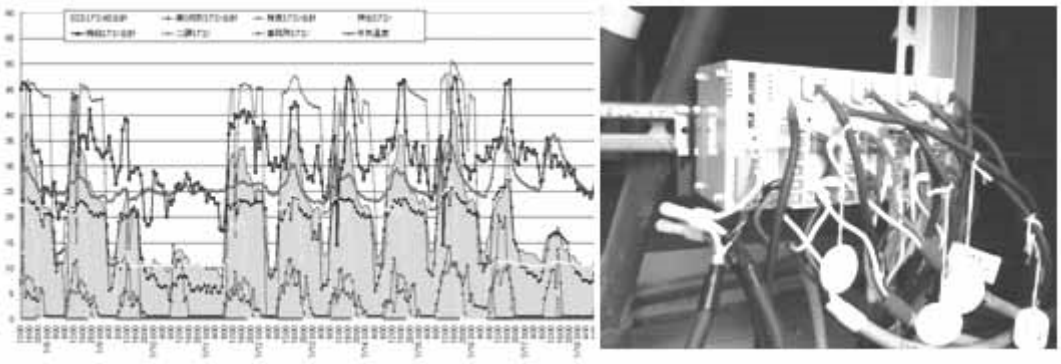
(Figure 4)

(2) Target Settings

We decided to set reduction targets according to unit consumption, in the spirit of the Standards of Judgment under the Energy Conservation Law. For the first year, we decided to set a target of reduction by 3 % in unit consumption.

(3) Problem Points and Their Investigation

We had no specific improvement themes to work with or any benchmarks that we could use, as this was our first attempt at such an activity. We needed to start by finding out the breakdown on the electric power consumption at the manufacturing plant, to learn how it is being used. Accordingly, we decided to install electric power consumption monitoring devices at major facilities at the plant. Spending money on things other than those necessary for production took some courage, however, we decided to practice the lesson behind the motto, “Penny-pinching brings worst out of us, economizing brings best out of us” and installed monitoring devices at 35 locations in the manufacturing plant. Installation cost: JPY1.6 million (refer to Figure 5).



(Figure 5)

4. Details of Measures

First of all, we made a thorough analysis of results obtained from our electric power consumption monitoring during the months of June and July in 2005. We drew out details on wasteful consumption of electric power and selected themes.

We had about 20 themes to start with, however, we decided not to be too greedy and decided to proceed steadily in an organized manner. We prepared an overall management table (Figure 11) so that the overall status can be seen and made sure that persons in charge, budget, progress status, predicted effects, actual records, etc., were visible in a

glance for each individual theme to press on with each theme. We would like to select two of such themes as improvement case example for this report.

(1) Group in Charge: Engineering Section

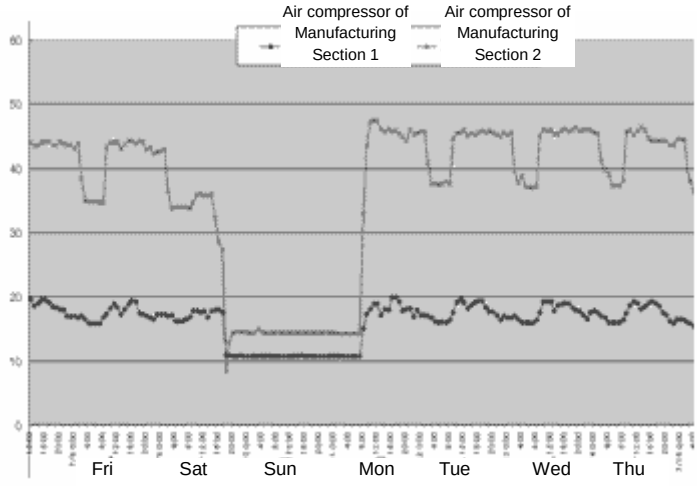
Improvement theme: Raising efficiency of compressors by “Thorough search Operation”.
Current status: Upon careful observation of transition graphs taken from our electric power consumption monitoring devices, it became clear that there were a lot of waste in the operating status of air compressors (Figure 6). More specifically, although equipment were shut down on holidays, electric power was still being consumed. Furthermore, all compressors (including those fitted with an inverter) were constantly operating with output of near full capacity.
Gabai Niichan Team considered “what must be done” and implemented three improvement actions.
Contents of Improvement

1) Suspension of operation on Sundays

2) Reduction in the number of air compressors used by Manufacturing Section 2 to one unit

3) Reduction of set pressure

Air compressor (22 kW)
Manufacturing Section 1: 1 unit; Manufacturing Section 2: 2 units.



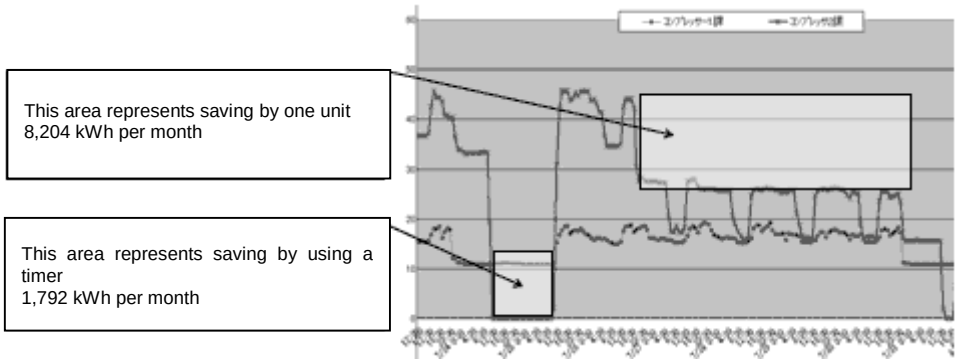
(Figure 6)

1) Suspension of operation on Sundays

Consideration was made to see whether or not operation of air compressors can be suspended on Sundays. It was determined that the air compressor cannot be turned off at Manufacturing Section 1, since air is being used for their baking furnace. It was determined that the air compressor cannot be turned off at Manufacturing Section 1, since automatic equipment continue to operate well into the night on Saturdays. These were situations, however, it appeared to us that “It is wasteful from late night on Saturday until Monday morning and something ought to be done.” Thus an automatic shutdown timer was installed on the compressor at Manufacturing Section 2.
This resulted in a reduction of electric power consumption by 1,792 kWh per month (Figure 7).

2) Reduction in the number of air compressors used by Manufacturing Section 2 to one unit

Reviews on details of facilities at Manufacturing Section 2 indicate that although the air compressor is being used intermittently, it is not in use continuously. “Why are two units of air compressors operating at full capacity? There must be air leaks!” and so we conducted an investigation into the leak volume of air compressors on a holiday, when the production facilities were shut down. Air compressors were shut down once the pressure in receiver tanks reached 0.74 Mpa. The valve of the supply side was closed and calculated the leak volume by observing the drop in pressure over a ten minute time interval. As a result, we discovered that the volume was 23 m^3 per hour. This is equivalent to the supply capacity of a single unit of air compressor. TheGabai Niichan Team immediately launched their thorough search for air leaking locations in the manufacturing plant. Approximately 20 leaks were found, which were then corrected immediately. Once corrective actions were implemented, the leak volume was calculated and it was discovered that the volume was reduced to 5.7 m^3 per hour, making it possible to conduct production activities using a single air compressor from that point on.



(Figure 7)

3) Reduction of set pressure

When specifications of all production facilities were verified again, there was none that required supply of air pressure that exceeded 0.5 Mpa. Since the pressure of air compressors were set to 0.7 Mpa, we decided to reduce the pressure in steps of 0.05 Mpa at a time. We had to be very careful since we are dealing with production facilities and thus we implemented a step each week. The diameter of the main hose was also increased (from 8 t o11 mm) at the same time, while connector devices were changed (to energy saving couplers) and auxiliary tanks were installed on lines where large amounts of air is consumed. As a result, it was possible to reduce the pressure down to 0.55 MPa.
Manufacturing Sections 1 and 2 combined reduced electric power consumption by 6,296 kWh per month.

- Effects of Improvement (summary of three improvements)

Electric power consumption reduction: 195,000 kWh per year (50.0 kiloliters)
Monetary value of effects: JPY2,535,000 per year.
Recovery period: 1 month.

- Standardization

In order to sustain efficient operation of air compressors (inverter types), the Energy Conservation Management Standard was prepared and air leaks were stamped out twice a year. Furthermore internal training was implemented periodically to instill on all employees the attitude to “reduce air blow”.

- Supplement: Cemented carbide ground sludge was changed from being disposed of as waste material to recycling as valuable item.

Improvements for air compressors were conducted in the heat of summer and it was extremely hot with the exhaust heat exceeding 70 degrees Celsius. Exhaust ducts were

prepared in order to improve the environment in which the air compressors were used and decided to expel hot air to a space three meters away. Here, we discovered yet another important thing!

Favorable conditions for utilizing exhaust heat were all there: (1) exhaust heat is generated periodically; (2) temperature gap in comparison with room temperature is quite high; and (3) Outlet of exhaust heat is relatively near. The Gabai Niichan Team with their “How wasteful…Something ought to be done” attitude drove their brains into high gear and came up with a design for the ground sludge dryer and manufactured it. In the past, it required over a year for each drum of sludge to dry naturally and for this reason, most of the sludge was disposed of by industrial waste processing service providers, who were contracted to dispose of them (for a fee). After the completion and installation of our dryer, however, it became possible to dry one drum of sludge in a week during summer (one month in winter). This resulted in the amount of ground sludge processed to exceed the discharged amount, making it possible to sell most of them.

Annual effect in monetary value: Approximately JPY1.92 million; Recovery period: 3.2 months.

(2) Group in Charge: Manufacturing Section 2

Improvement theme: Conserving electric power by changing lighting arrangements and changing lighting models, using the Task Ambient method.

Mercury lamps are used for lighting in Factory No. 3 of our company. Initially we had a casual notion that they should simply be replaced with fluorescent lamps and decided to do so, however, it was anticipated that there was very little cost effects from reduction in electric power consumption for lighting and that the recovery period will run for a long time. We decided that “if we were to do something, we might as well do it in an efficient way and a thorough manner”, so we utilized information available on the internet, looked up in the Energy Conservation Pocketbook”, studied and decided to implement three measures (all simultaneously implemented).

Contents of Improvement

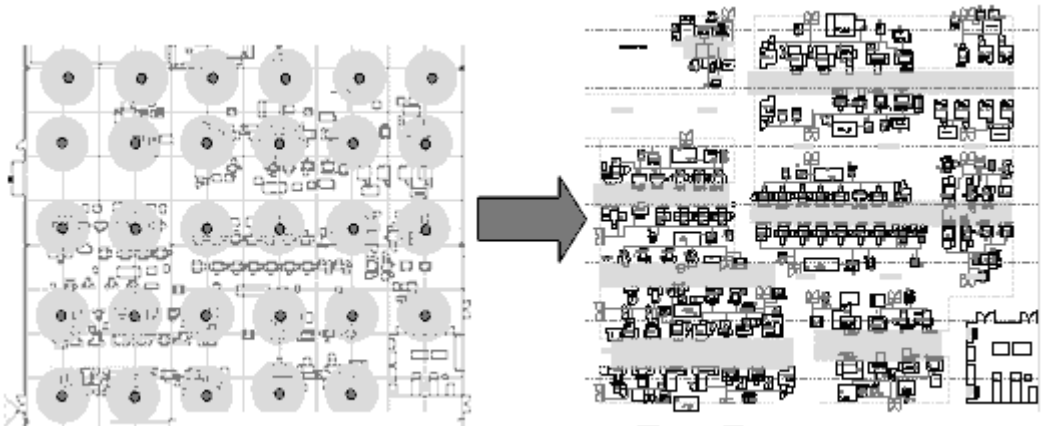
1) Change in type (mercury vapor lamps to fluorescent lamps),

2) Task Ambient method and

3) Resourceful devising for installation.

1) It came to our attention that in the past few years, the highly reflective types were becoming popular so we installed lighting of such a highly reflective type (twin mounted type) in a trial run at an area in the manufacturing plant. The height of installation was lowered, which contributed to the complaint from workers, who indicated that they were dazzling. We then decided to change the number of mounted lamps to one (light intensity directly under the lighting: Twin mounted type = 2,000 Lux; single mounted type = 1,800 Lux).

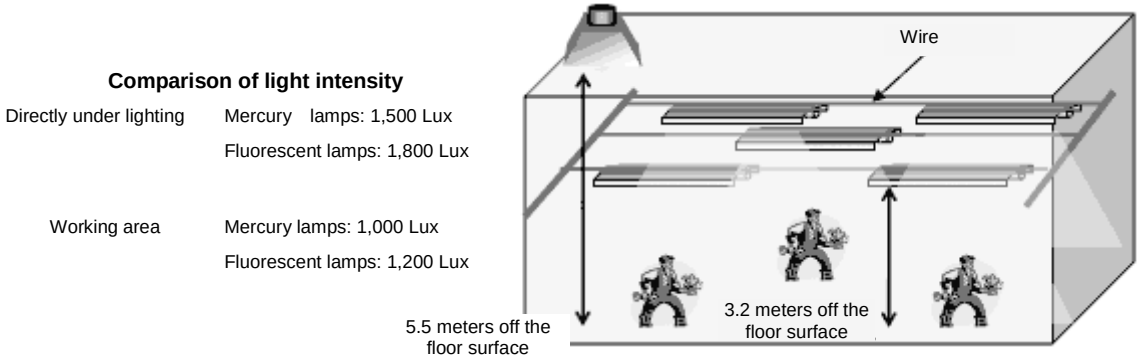
2) Mercury lamps illuminated the entire manufacturing plant brightly but we felt that there really is no problem with having the space near the ceiling dark and lighting on walkways does not need to be as brightly lit as work areas. Since we felt that it suffices to have adequate amount of light at locations where it is needed, we decided to look into the Task Ambient method and analyzed the situation. Sp > Wt / (Wg – Wa), which is [32 > 85 / (6.4 – 0.85)], thus it became obvious that the Task Ambient method would be more electric power conserving and so we decided to try it immediately (Figure 8).



(Figure 8)

3) In implementing the aforementioned improvement, Manufacturing Section 2 had to deal with relocation of equipment time and time again, faced with issues that needed to be met, such as no major relocation of lighting was possible each time there was a layout change, production could not be suspended outside Saturdays and Sundays, as well as installation costs had to be kept low. Gabai Niichan Team racked their brain and conceived the “String it with wires!” method, the first of its kind in Japan (Figure 9). Branching wires are suspended from main wires, with fluorescent lighting suspended by branching wires. Branching wires can be slid along main wires, while fluorescent lighting can slide along branching wires. The height of lighting was set at 3.2 meters, which we felt would not interfere with any relocations

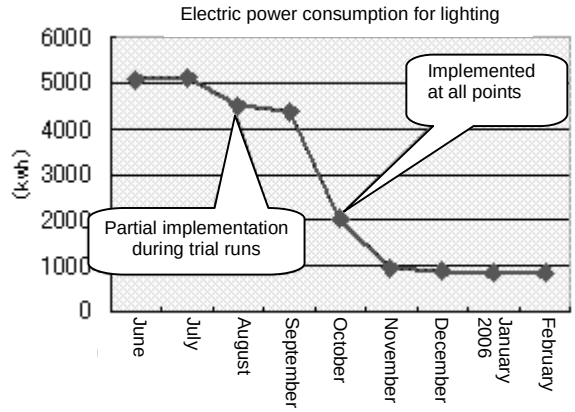
of equipment. Suspending lighting with wire made it possible for us to respond to relocations in a flexible manner. Installation time is short. Cost is moderate. With many benefits such as these, we were able to overcome the drawbacks of the Task Ambient method.



(Figure 9)

- Effects of Improvement

The transition of electric power consumption for lighting is shown in Figure 10.
The electric power consumption for mercury lighting was 5,143 kWh per month.
Once the switch was made to fluorescent lamps, the figure became 960 kWh per month.
Starting from November, the “How Wasteful (Mottainai)” expressions were uttered repeatedly, turn off lighting that are not needed through subdividing switch groups and emphasize the benefits of turning lights off during lunch hours!
As a result, the electric power consumption for lighting was reduced to 880 kWh per month.



(Figure 10)

Reduction in electric power consumption: 51,156 kWh per year (13.2 kiloliters).
Monetary value of effects: JPY665,000 per year.

Recovery period: 15 months.

The major electrical construction service provider “M”, from whom we were introduced our lighting equipment, were shocked to see such a short recovery period. They claimed that “there is no precedence. Please allow us to use this as our reference!” and came over to our manufacturing plant for a tour. It is our hope that this method will become pervasive everywhere in the future.

- Standardization

Periodical cleaning of reflector plates are essential, particularly when using highly reflective types of lighting. The Energy Conservation Control Standard was prepared and we are continuing to implement periodical measurement of light intensities, as well as cleaning.

(3) Other Improvement Themes

The room temperature at Manufacturing Section 1 rises due to the heat radiated by baking equipments, as mentioned in the section on Understanding Current Status. We therefore decided to undertake our “reduce heater output by winding thermal insulation materials on dry kilns and reduce electric power consumption for air conditioners by cutting down heat source” activities. As a result, the heater output was reduced by 22 %. The electric power consumption for dry kilns was reduced by 5,404 kWh per month. By cutting down the heat source, the electric power consumption for air conditioners in the month of July was reduced by 20 %. We are looking forward to the records until September.

It was mentioned earlier that the impact of space heater was great for Manufacturing Section 2 during winter. A trial run to “prevent heat loss by installing large fans on ceiling” was conducted in a selected area. As a result, the temperature of work area rose by 2 to 3 degrees Celsius (depending on weather conditions). We are planning to spread this into the entire Factory No. 3 before the end of this fiscal year. There were many improvement themes that were worked on by individual groups and it is truly unfortunate that we are unable to share specific details. Themes that were undertaken are shown in the table below, in Figure 11.

Items of measures	Order of priority	Person in charge of facility	Planned budget (JPY10,000)	Actual budget	Progress status (achievement rate)					Month of completion	Annual target value (JPY10,000)	Record of effects (JPY10,000)
					20	40	60	80	100			
Reduction of standby power through integration of transformers in cubicles	B	Taguri	—	—						December 2005	—	—
Reduction of energy consumed through improvement of dust collecting equipment efficiency in Section 2	B	Ide	20	24.8						February 2006	15	18.4
Energy conservation by preventing flowing through of heat from windows	A	Tanaka	2	0.7						July 2005	1	0.7
Suspension of refrigerator operations by changing storing method for products	A	Funayama	20							Next fiscal year		
Optimum management and review of air conditioning facilities (cooling)	AA	Tanaka & Funayama	0	0						February 2006		

Optimum management and review of air conditioning facilities (heating)	AA	Tanaka & Funayama	0	0						March 2006		
Savings by using cleaning equipment for lubricating oil of vacuum pumps	A	Tanaka	200							Next fiscal year	250	
Conservation of energy through optimum management (external) of circulating water	B	Sumiji	100	120						Next fiscal year	20	
Reduction in loss of electric power through optimum selection of electric motors	A	Ishiuchi	2	1.6						September 2005	0.12	0.12
Improvement of air blowing by implementing energy saving nozzles and installation of automatic shutdown switches	AA	Hashiguchi	3	2						August 2005	2	8.5
Automatic shutdown of compact facilities using mat switches	A	Ishiuchi	5	2						July 2005	0.6	0.56
Seasonal time management using OFF timers for external lights	B	Hirakawa	10	10.3						November 2005	5	7.4
Prevention of lights being left on in toilets by converting lighting to sensor lights	A	Hirakawa	30	24.3						January 2006	0.1	0.1
Overall attainment rate												

(Figure 11)

5. Effects Achieved after Implementing Measures

All improvement effects described above were compared in terms of records before improvements derived from August 2004 to July 2005 (12 months) and records after improvements derived from August 2005 to July 2006 (12 months).

Annual electric power consumption:

Before improvement: 4,999,000 kWh (1,286 kiloliters) → After improvement: 4,948,000 kWh (1,273 kiloliters)

The result indicated that the overall electric power consumption did not change by much. This is due to the fact that the new compounding process was established and put into operation starting from 2005 (the compounding process involves reprocessing of raw materials and thus is not proportional to the overall production amount).

Record of electric power consumption by each manufacturing section (excluding compounding processes)

Manufacturing Section 1:

Before improvement: 3,626,000 kWh; after improvement: 3,606,000 kWh; reduction by 20,000 kWh (5.1 kiloliters).

Result was a 0.5 % reduction in electric power consumption. The amount of production had gone up by 5 %.

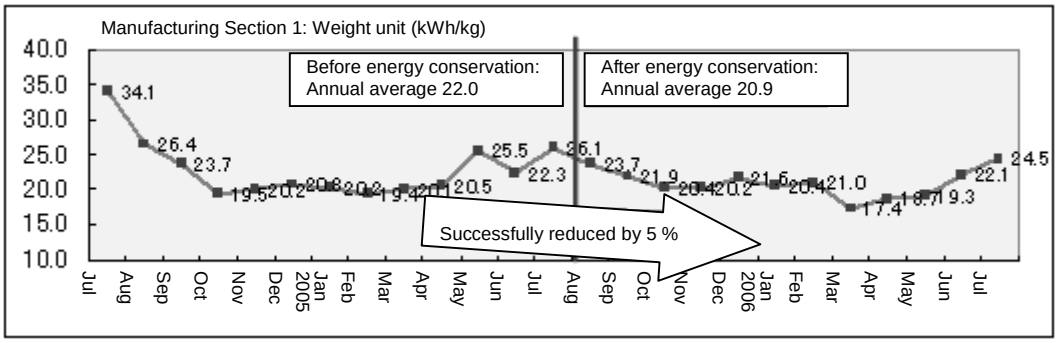
Manufacturing Section 2:

Before improvement: 1,269,000 kWh; after improvement: 1,141,000 kWh; reduction by 128,000 kWh (32.9 kiloliters).

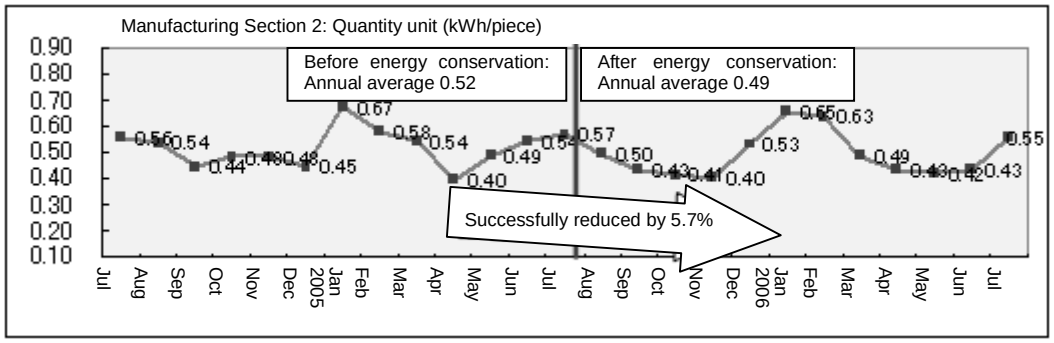
Result was a 10 % reduction in electric power consumption. The amount of production had gone down by 5 %.

Final verification on effects is conducted using unit consumption.
Unit consumption:
Manufacturing Section 1 Before improvement: 22.0 → after improvement: 20.9; reduction by 5 % (Figure 12).
Manufacturing Section 2 Before improvement: 0.52 → after improvement: 0.49; reduction by 5.7 % (Figure 13).

The achievement rate was 170% for the targeted reduction of 3 %.



(Figure 12)



(Figure 13)

6. Summary

All team members are extremely satisfied with the fact that they were able to adequately achieve all targets. Reasons behind the success include holding of the kick-off convention, interim report meeting and results announcement meetings to raise awareness of all

personnel and to call for proposals from all personnel. The fact that we procured all necessary items without delay, in the spirit of “Penny-pinching brings worst out of us, economizing brings best out of us!”, certainly paid off. Energy Conservation Pocketbook was also very useful. Incidentally, the total amount of costs relating to energy conservation activities was over JPY4 million. Since the annual monetary value of effects was JPY5.7 million, recovery took place within the first year (all completed improvement themes were recovered within two years).

Energy conservation activities conducted under this project became a means to dig up some buried treasures within the company. There was of course no way we could let none of this distributed to employees! So, all these improvement themes were incorporated into the corporate improvement proposal program. There were as matter of fact a number of people who received tens of thousands of yen in prizes, obviously pumping up motivation enormously.

7. Future Plans

Energy conservation activities conducted under this project was more than adequate as a detonator for ISO 14001 preparations. Just to show that all members thoroughly understood that the project proved to be a management success, the project is not only being continued this fiscal year, but people are working hard on new improvement themes. Perspectives were broadened further for this fiscal year and the scope includes activities for reusing lubricating oils and alcohol that are used in the manufacturing plant. Tests have been completed and equipments are being assembled. All team members enjoy each day and are vibrant! Being considerate of the environment …. Will most definitely leads to profits of the business. To ensure that the legend of “Gabai Niichan that existed in Saga” continues, the project is being spread not within our own manufacturing plant, but also to the headquarters (Kanagawa Prefecture) and other companies of the corporate group. Advertisements will also be made without any hesitation to peripheral businesses and we hope to bring progress to our Takeo City. A “small but gleaming business” exists in Takeo!

Our efforts for that important ISO 14001, by the way, is scheduled to be launched in September with intention of qualifying for certification in summer of FY2007. It is customary to establish an environment management committee within the organization created for ISO 14001, but we established our Environment and Energy Conservation Management Committee to take on activities intended for environmental protection with energy conservation activities taking on central roles. Yes, we are now ready! Let’s get it done!!