2008 Prize of Director General of Agency for Natural Resources and Energy

Implementing Energy Conservation Measures (Waste Elimination) by Visualizing the Electric Power Usage in Eating and Drinking Establishments

Watami Group: Watami Food Service Co., Ltd.

Watami Direct Franchise Systems Co., Ltd.

T.G.I. Friday's Japan, Inc.

Keywords   **Energy management structure for each facility, Rationalization of heating, cooling, and heat transfer**

Outline of Theme

The Watami Group, which operates the "Watami" Japanese-style bars and grills and other establishments, introduced monitoring devices from August 2004 that measure the electric power used by establishments in order to "visualize" the electric power usage and tackle the reduction of waste electrical energy. The measured data is made into graphs and converted into monetary amounts. By reporting these at the weekly Business Innovation Meeting and feeding them back to the establishments, the establishments are independently implementing improvements.

Implementation Period for the Said Example

- Project Planning Period   July 2003 – Continuously to the Present Time
- Measures Implementation Period   August 2004 – Continuously to the Present Time
- Measures Effect Verification Period August 2004 – Continuously to the Present Time

Outline of the Business Establishment

- Scope of Business   Management of eating and drinking establishments
  Introduction in 293 establishments out of approximately 600 establishments nationwide
- No. of Employees   Full-time Employees   1,597 persons (As of April 1, 2008)
  (Total of 3 companies)
  Part-time Employees 16,440 persons (As of April 1, 2008)

(Total of 3 companies)
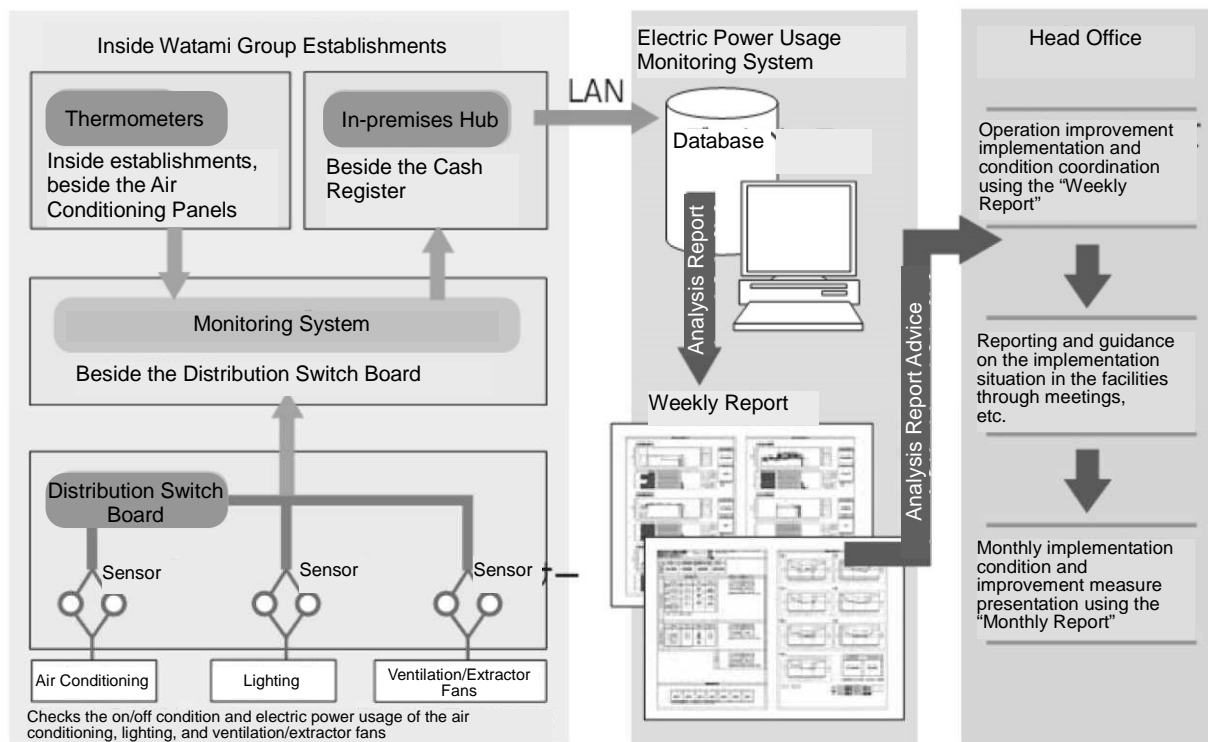
● Non-designated Plant

Overview of Target Facilities

Fig. 1

1. Reasons for Theme Selection

The Watami Group has been implementing its Group Brand themes of "Environmental Contribution", "Social Contribution", and "Human Contribution", and was the first Japanese food service business to acquire ISO 14001 Environmental Management System certification for all of its establishments including the head office in 1999. Among the activities implemented to the present time, Watami has tackled waste product recycling which had a high effect on the environment, and global warming countermeasures. However, for the theme this time, we selected the energy management system introduced at 293 eating and drinking establishments for the purpose of "Reducing Wasted Electric Power" and "Global Warming Countermeasures".

2. Progress of Activities

(1) Implementation Structure

In the management carried out, a one-week portion of the measured data between Sunday and Saturday is tabulated as the "Summary Weekly Report", which is reported at the Business Innovation Meeting[*1] on the Tuesday of the following week. A "Weekly Report for Each Establishment" is created for the store and area managers[*2], and this is distributed in a plan to achieve improvements on a weekly basis.

[*1]: Business Innovation Meeting: Improvement activity that is carried out on Tuesday of each week based on customer questionnaire and establishment inspection auditing reports. Participants consist of the business company presidents, group managers, department managers, and head office employees.

[*2]: Area Manager: Establishment Operations General Manager for approximately 5 establishments.

Fig. 2
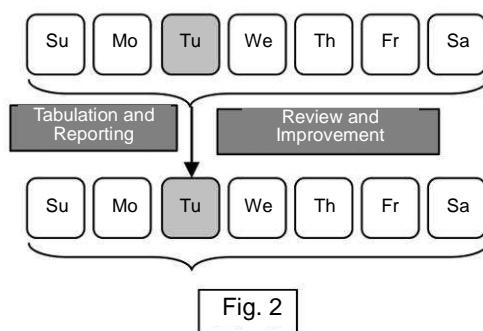
As shown in the data tabulation and distribution flow below, the electric power usage measured by the sensors mounted in the distribution switch board are tabulated and a report is made by an outsourcing destination company. Based on this report, Watami Eco Focus creates and distributes materials for the Business Innovation Meeting, and carries out management inside the Group in charge of the operations.
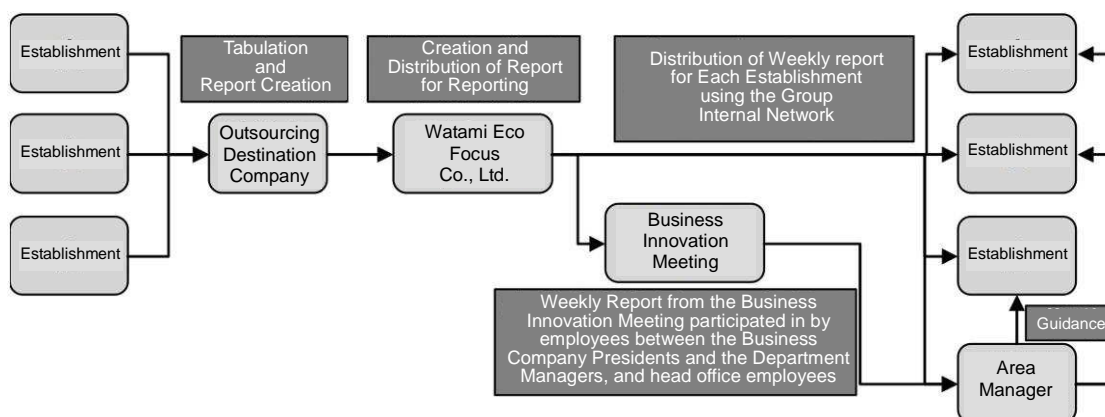
Fig. 3

(2) Understanding of Current Situation

Viewing the proportions of the CO_2 emissions for each one establishment, the amount generated by the electric power usage was taking up approximately 80% of the total. Further, it was also found that the "Rate of CO_2 Increase Originating in Energy for Each Division" for the business divisions that includes the food service establishments in Japan had increased by nearly 40% since fiscal year 1990.
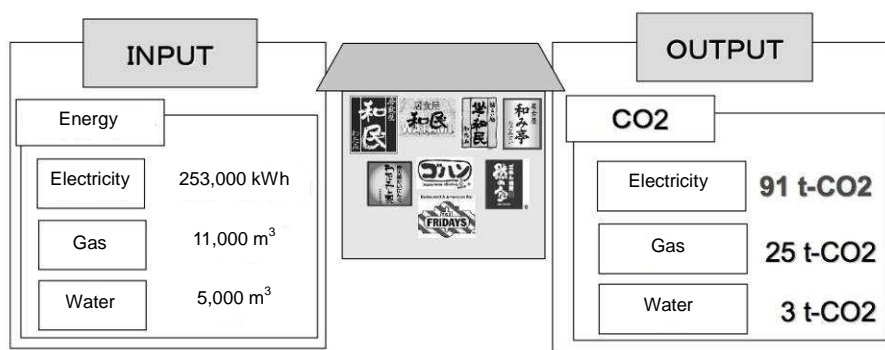

INPUT			OUTPUT		
Energy			CO2		
Electricity	253,000 kWh		Electricity	91 t-CO2	
Gas	11,000 m³		Gas	25 t-CO2	
Water	5,000 m³		Water	3 t-CO2	

Fig. 4 * Source: Electricity, water service, and gas usage for each 1 establishment in fiscal year 2003, taken from page 51 of the "Fureai ("Community") Report 2007" (Watami's CSR report)

(3) Analysis of Current Situation

For the reason that almost all of the food service establishments in the Watami Group have been opened as stores in tenant buildings, they are not appropriate for demand administration. In addition, because the commercial premises are small-scale and decentralized, when carrying out the activities initially it was not possible to refer to cost

effectiveness, since previous cases were mainly implemented in large scale facilities. Further, due to the characteristics of the establishment management, it was not suitable for mechanical (compulsory) control. Believing that the method of improving operations was to bring the matters to the attention of the working employees, which also matches the Watami Group policies, it was decided to select the installation of the devices, which has continued to the present time.

(4) Target Settings

From the actual verification results of testing in the Watami Otorii establishment, the target value for the activities was set as a 10% reduction compared to the situation before the introduction.

(5) Problem Points and their Investigation

Regarding the numerical values, it was not possible to understand the situations being faced by the establishments from the head office, and the management was entrusted to the on-location employees.

Although comparisons were made against the predicted values (previous year's actual results) each month at the beginning of the month, it was not possible to identify the causes using the 2-month previous billing details, and the situation did not allow timely measures to be implemented.

Simply arranging the monitored electric power data did not allow understanding of whether the usage method was appropriate or inappropriate. Aiming to realize zero waste electric power based on the above problem points, we set "Appropriate usage" as in the measures described below and defined waste electric power as the difference between these values and the actual results.

(6) Details of Measures

1) Visualization

Implemented visualization of the situation by introducing the monitoring devices and making reports showing the data as graphs and conversions to amounts.

a. Separated items into "Controlled Items" and "Non-controlled Items"
"Controlled Items": Lighting, air conditioning, ventilation, and air conditioner temperatures

"Non-controlled Items": Items apart from those listed above, such as refrigerators

## b) Separated "Controlled Items" into "Waste" and "Appropriate Usage"

● Outside Business Hours

"Waste electric power" was defined as the electric power used at times other than the "Electric power used during business hours and one hour before and after business hours" minus the "Electric power required for cleaning and standby work" set for each establishment.

Fig. 5
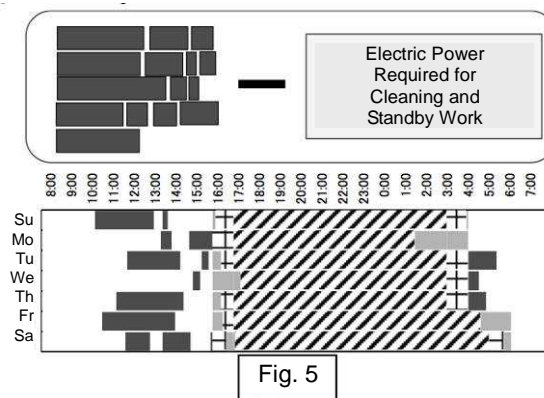
● During Business Hours

From the second year after the introduction, the temperature and humidity inside the establishments were measured, and a comfort index known as PMV was incorporated to allow an appropriate temperature to be maintained during business hours. Excess electric power used as a result of over-cooling was also considered as having the possibility of being waste, and was added to "Waste electric power".

Fig. 6
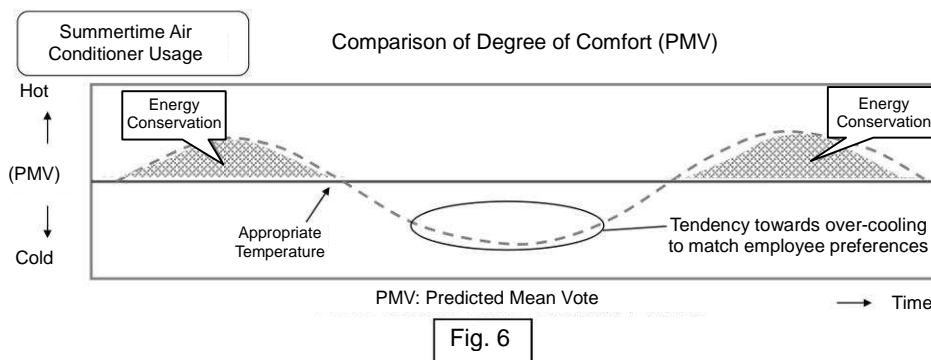
2) Reports

a. Summary weekly report

● Improvement Situation Progress Confirmation   Calculation of Comparisons with Previous Year and Previous Week

Table 1

		Period	Waste Electricity Amount (¥)	Average Temperature (°C)
Previous Year Comparison	90%	August 10-16, 2008	¥5,889/Establishment	28.9
		August 12-18, 2007	¥6,562/Establishment	30.0
Previous Week Comparison	85%	August 3-9, 2008	¥6,892/Establishment	29.6

● Understanding of Trends in Area Units   Tabulation for Each Area

Table 2

| Area		Area Average	Department Average	Area		Area Average	Department Average	Area		Area Average	Department Average
Metropolitan	1—1	4,595		Metropolitan	5—1	6,552		" Nagomitei	1	741	
Metropolitan	1—2	3,265		Metropolitan	5—2	6,568		" Nagomitei	2	1,639	
Metropolitan	1—3	1,924	4,472	Metropolitan	5—3	7,173	6,479	" Nagomitei	3	1,341	1,757
Metropolitan	1—4	7,707		Metropolitan	5—4	5,365		" Nagomitei	4	2,174	
Metropolitan	1—5	5,516		Metropolitan	5—5	1,555		"Gohan"	1	9,786	9,786
Metropolitan	1—6	4,754		Metropolitan	5—6	10,037		DFS	1—1	4,245	
Metropolitan	2—1	5,039		Metropolitan	6—1	9,433		DFS	1—2	5,990	5,791

● Promotion of Overall Improvement   All Establishment Ranking: No.1 - No.293

Table 3

| Position	Establishment Code, Establishment Name, Establishment Area (m²)			Waste Energy (Conversion Amount) [¥]		Waste Energy Comparison with Previous Year
				Total	Divided by Establishment Area (m²)	
1	001	Establishment A	297	−6,397	−22	¥1,501 ↓
2	002	Establishment B	114	−4,487	−39	¥2,315 ↓
3	003	Establishment C	274	−3,709	−14	¥1,509 ↓
4	004	Establishment D	304	−2,710	−9	¥2,979 ↓
5	005	Establishment E	278	−2,459	−9	¥3,013 ↓
6	006	Establishment F	317	−2,424	−8	¥1,581 ↓
7	007	Establishment G	363	−2,062	−6	¥2,288 ↑
8	008	Establishment H	284	−1,800	−6	¥9,204 ↓

b. Weekly report for each establishment

● Understanding of when, where, and how much "Waste Electric Power" is occurring

    Display of graphs for each administrative section [Kitchen and customer seating (Lighting, air conditioning and ventilation) and signs]

● Display that can be easily understood by the establishment employees

    Display of conversion amount

[Customer Seating Lighting]

Fig. 7
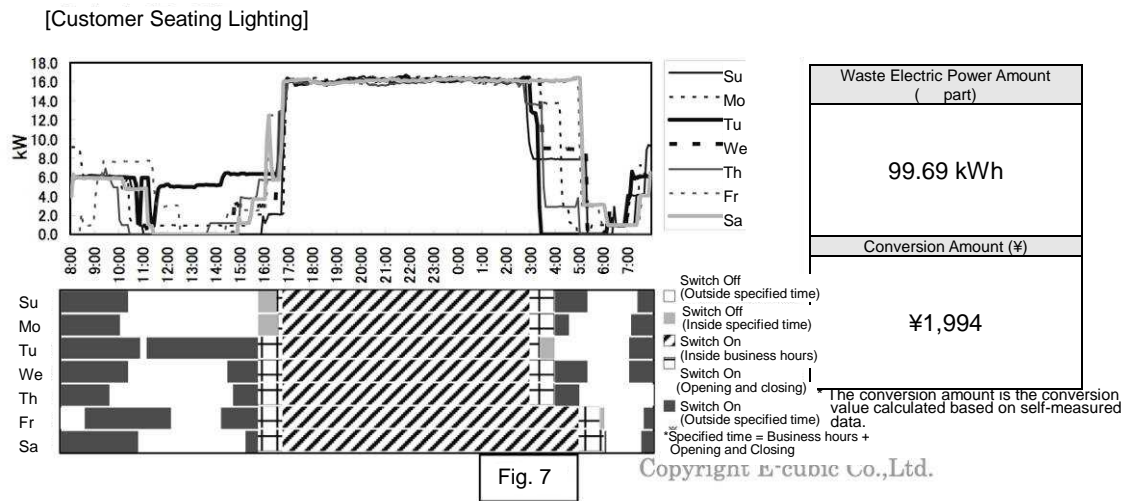
By looking at the above graph and amounts, a feeling of participating in the management will be instilled in the establishment employees, and they will implement improvement activities.

● Appropriate administration of the on-premises room temperature　Measurement of the temperature and humidity and giving guidance concerning over-use of the air conditioning using the PMV index.

[Water]

*Thick Line: PMV　Thin Line: Room Temperature
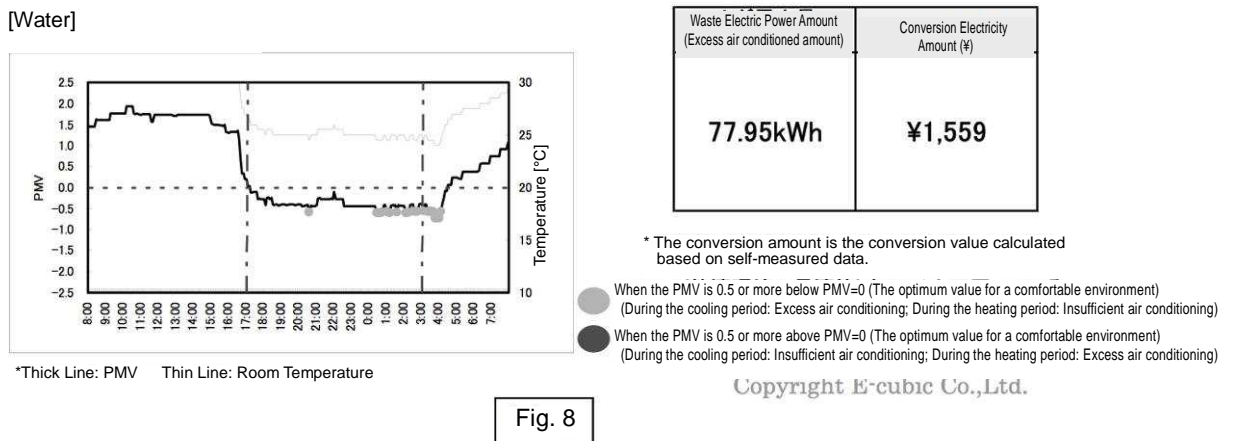
Fig. 8

From the line graph in Fig. 8, it can be confirmed that the on-premises room temperature lowers during the late-night time band, which is probably caused by the reduction in the number of customers. By knowing this tendency, it is possible to carry out the concrete measure of adjusting the temperature settings of the air conditioning late at night.

● Confirming the Change from the Estimated Amount (Previous Year's Usage amount)
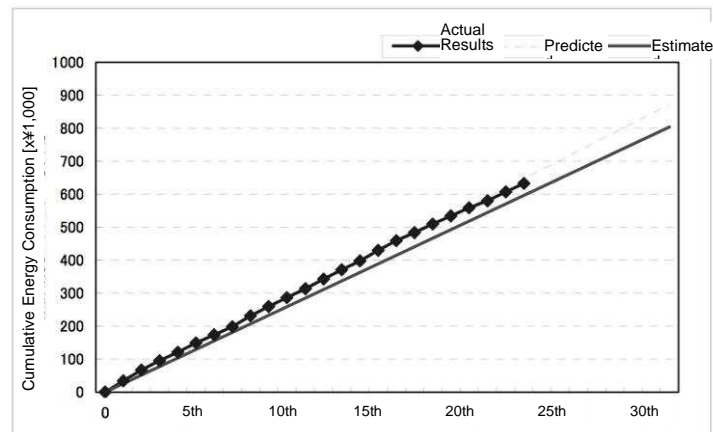　　Make a graph of the change of the estimated and actual results

Fig. 9

By switching on and off the lighting and managing the air conditioner temperatures, changes in the overall usage amounts can be confirmed using the above graph, which can be used for carrying out progress management.

3) Problem solving for each establishment

Each month, several of the establishments are selected from the lower positions of the "Summary Weekly Report" ranking table, and audits of the establishments are carried out or on-site improvement guidance is implemented, and periodic confirmations are carried out afterwards.

4) Introduction of improvement case studies

Improvement case studies are introduced at the time of the initial start through holding meetings, in order to assist with making improvements.

[Improvement Case Study] Lighting Adjusting Device Situation Settings

Comparing the waste electric power between the "Watami" business and the "Gohan" business, it was found that the proportion of the "Customer Seating Lighting" is higher in the "Gohan" establishment than for "Watami", as seen in the figure below.
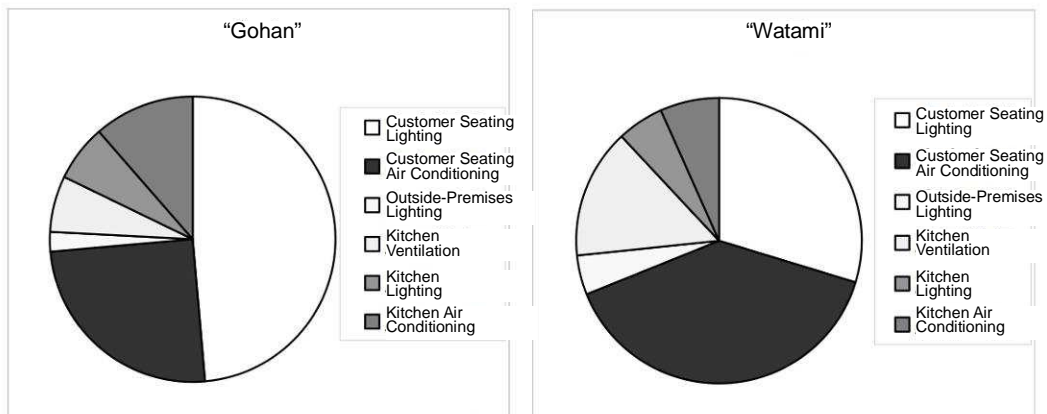
Fig. 10

Although the types of lamps used were different, the largest reason for the difference was that the lighting switches in the "Gohan" establishments used a light adjusting device that was only capable of setting the situations of "During Business Hours", "All Lighting 100%", and "Power Off". This meant that even if the establishment employees wished to carry out energy conservation activities they were forced to use the "All Lighting 100%" setting when they were doing work outside the business hours.

Accordingly, situations matching the work including "Work When Establishment is Closed", "Desk Work", and "Cleaning" were newly added to the light adjusting device to make improvements by allowing the establishment employees to use different lighting for different purposes.
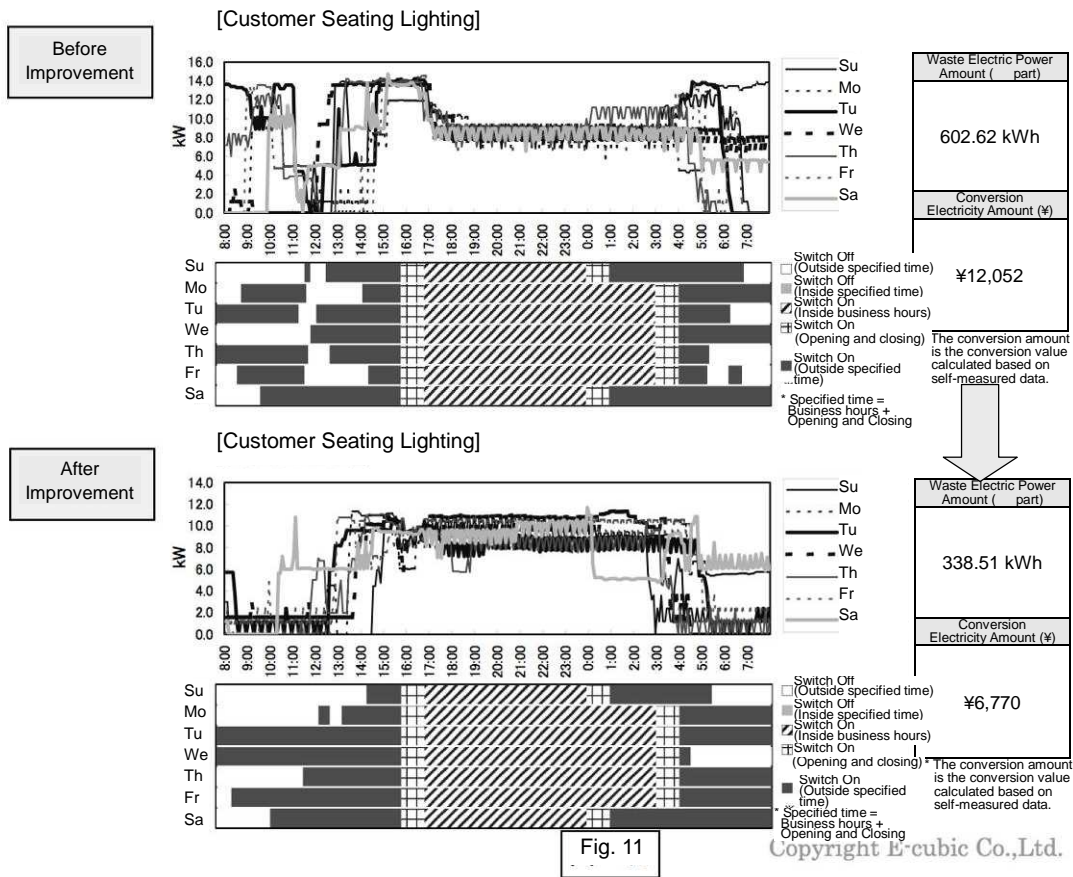
[Customer Seating Lighting]

Before Improvement

Su
Mo
Tu
We
Th
Fr
Sa

Switch Off (Outside specified time)
Switch Off (Inside specified time)
Switch On (Inside business hours)
Switch On (Opening and closing)
Switch On (Outside specified time)

* Specified time = Business hours + Opening and Closing

Waste Electric Power Amount (part)

602.62 kWh

Conversion Electricity Amount (¥)

¥12,052

The conversion amount is the conversion value calculated based on self-measured data.

[Customer Seating Lighting]

After Improvement

Su
Mo
Tu
We
Th
Fr
Sa

Switch Off (Outside specified time)
Switch Off (Inside specified time)
Switch On (Inside business hours)
Switch On (Opening and closing)
Switch On (Outside specified time)

* Specified time = Business hours + Opening and Closing

Waste Electric Power Amount (part)

338.51 kWh

Conversion Electricity Amount (¥)

¥6,770

The conversion amount is the conversion value calculated based on self-measured data.

Fig. 11

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Table 4

	Waste Electricity Amount (¥)	Waste Electricity Usage Time (Length of Red Band Graph)	Waste Electricity Amount per Hour (¥)	Waste Electric Power Amount per Hour (Height of Line Graph)
Before Improvement	¥12,052	57.3 h	¥210/h	10.5 kWh/h
After Improvement	¥6,770	65.5 h	¥103/h	5.2 kWh/h

As shown in the above table, even though the electric power usage time outside the business hours has increased, the comparison of the waste electricity amount showed a reduction by approximately half. Viewing the line graph before improvement, more electricity was used before and after the business hours than during the business hours. However, after the improvement there were no days where all lighting 100% was used, and it was confirmed from the waste electricity amount per hour and the waste electric power amount that the light adjusting device usage method had been improved.

5) Commendation of outstanding establishments

Once a year, commendations were awarded to establishments that have implemented outstanding results.

(7) Effects Achieved after Implementing Measures

Table 5

	2004 [3]		2005		2006	
Energy Conservation Amount (¥)	▲	¥143,435,000	▲	¥147,011,000	▲	¥160,623,000
Energy Conservation Rate	▲	11.7%	▲	11.8%	▲	13.2%
Energy Conservation Amount	▲	7,172,000 kWh	▲	7,351,000 kWh	▲	8,031,000 kWh

[3]: 2004, 2005, and 2006 represent the reduction effect calculated from the difference between the actual electricity amount portion paid by 288 establishments in each of the periods (August 2004 – July 2005), (August 2005 – July 2006), and (August 2006 – July 2007) and the electricity amount before the introduction calculated using the following correlation formula. Formula: $(y = 541.01x2 - 12.819x + 389.166)$ [4]

[4]: Correlation formula calculated from the target establishment electricity usage and the average temperatures of each month between April 2002 and July 2004.

3. Summary

The activities carried out this time have the characteristic that no result would have been possible without improvements being made in the behavior of the establishment employees. That is, we confirmed that the reduction in the waste electric power equaled to the improvement in behavior of the establishment employees. Rather than simply saying things without backing them up with actions, by visualizing the energy usage and the reduction conditions, it was possible to confirm the results. In addition, it was also possible to evaluate establishments that conscientiously implemented the energy conservation activities, allowing the further perspective of employee education.

Although evaluation from both the viewpoints of environmental loading reduction and economic effects is obviously possible, it is also possible to use the comparison between before and after the reduction as verification data for confirming that the introduction of energy conservation devices has certainly resulted in a reduction.

4. Future Plans

In addition to realizing operation improvements, investigations are also being carried out into changing equipment such as the on-premises lighting and signboard lighting to energy conservation type lighting in order to create establishments that apply little loading to the environment.

In addition, at the end of each fiscal year, verification of the effect of energy management introduction is carried out, and the continued investigation of parallel developments and additional introductions will be implemented.