2008 Prize of the Chairman of ECCJ

Energy Conservation Measures at Pachinko Hall Chain Stores

Maruhan Corporation

◎ **Keywords: Rationalization of heating, cooling and heat transfer (Air conditioning facilities, hot water supply facilities, etc.)**

◎ Outline of the Theme

We are aiming to be a world level entertainment company. Meanwhile, the global environment problem is becoming increasingly serious every year. It is the mission of Maruhan which uses 330million kWh electricity in a year, as a leading company of the pachinko industry, to think about the global warming seriously. We realized visualization of electricity used in pachinko halls as the first step and tried energy conservation by enhancing the awareness of all of our employees. Here, we would like to present the outline of activities.

◎ Implementation Period for the said Example

May 2007 – June 2008

- Project Planning PeriodMay 2007 – December 2007 Total of 8 months
- Measures Implementation Period January 2008 – March 2008 Total of 3 months
- Measures Effect Confirmation Period April 2008 now continuing Total of 3 months

◎ Outline of the Business Establishment

- Scope of Business Operation of amusement facilities including pachinko, bowling, golf practice yard, games, cinema and leisure
- No. of Employees 10,457 persons (Maruhan as a whole)
- Non-designated Plant (However, yearly electricity consumption by 230 halls altogether is 332,229,168 kWh, 85,458 kl of crude oil equivalent)

◎ Process Flow of Target Facility

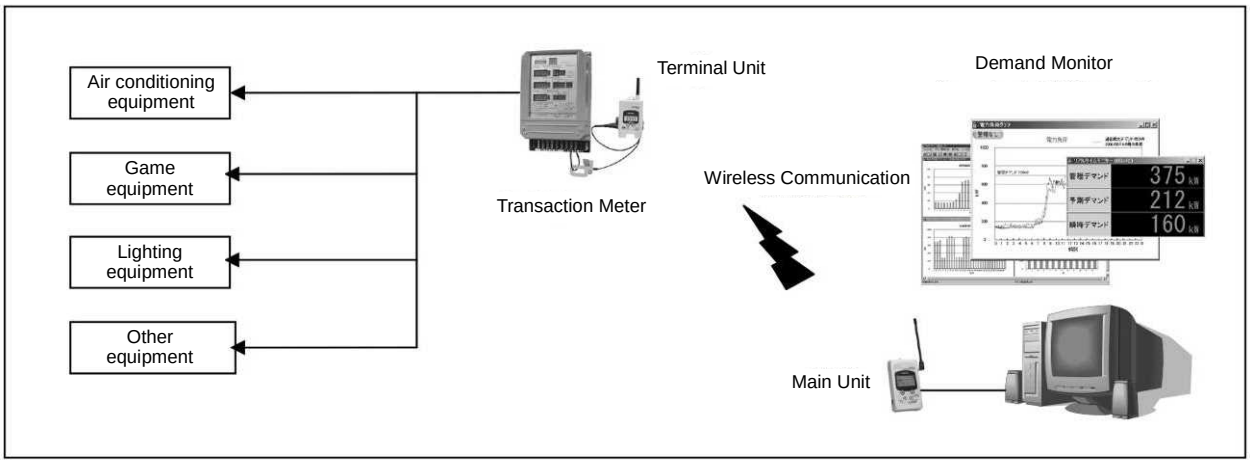

Fig. 1 Outline of the Process Chart of the Facility

1. Reasons for Theme Selection

All Japan Game Business Cooperative Association decided that the target of the CO_2 emission reduction in its “Voluntary action plan for environment” should be 3% reduction from 2007 level to be achieved every year up to 2012 and total 15% in 5 years”. Accordingly, we selected 4 halls from among 229 halls across the country as model halls of energy conservation for which we implemented our energy conservation measures. Of them, we present Yachiyo hall as the model of a small hall and Tsuzuki hall as the model of a large hall. Three major electricity power loads of pachinko halls are air conditioning, game machines and lighting. Therefore we made a selection of the theme to focus on the operational improvements in those major loads.

2. Progress of Activities

(1) Implementation Structure

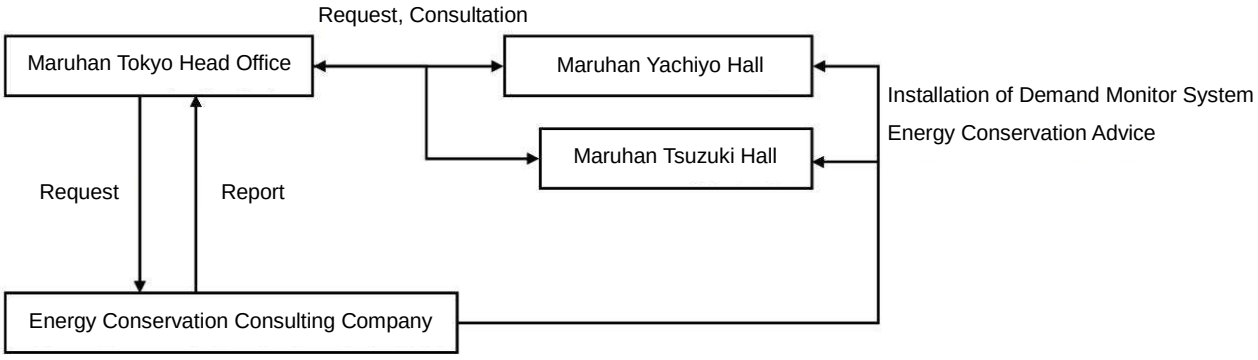

Fig. 2 Implementation Structure

We decided to put in place the demand monitoring system from Hioki E.E. Corporation which is a manufacturer of instruments and a provider of energy conservation consultant service as well, and we established the above implementation structure.

We think that powerful leadership and clear assignment of roles among our employees are important for promoting our energy conservation activities through operational improvements. So we selected Yachiyo Hall and Tsuzuki Hall as our energy conservation model halls to promote the activities under the initiative of the hall managers.

Schedule	Person in Charge	2007	2008					
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Head Office Purchasing Division	Mikami Ishii Kono	Planning →							
Yachiyo Hall	Tanaka		Equipment Installation, Data Analysis →			Improve-ment →		Verifi-cation →	Continue →
Tsuzuki Hall	Kunifusa Sato		Equipment Installation, Data Analysis →			Improve-ment →		Verifi-cation →	Continue →

Table 1 Activity Schedule

(2) Understanding of Current Situation

- Main equipment of each hall is as follows.

■ Maruhan Yachiyo Hall

Address	572-4 Owada-Shinden, Yachiyo City, Chiba	
Building	Iron Frame Structure	
Business Hours	10：00-23：00	
Completed	April, 2003	
Total Floor Area	1,380 m^2	
Main Equipment	Equipment Overview	Equipment Capacity
Air conditioning Equipment	Air Cooling Heat Pump Package Air Conditioner (Hall)	148.4 kW
	Air Cooling Heat Pump Package Air Conditioner (Office)	9.14 kW
	Air Cooling Heat Pump Package Air Conditioner (Prize corner)	9.14 kW
	Air Cooling Heat Pump Package Air Conditioner (Employee restaurant, rest room)	5.6 kW
	Air Cooling Heat Pump Package Air Conditioner (Restaurant)	5.6 kW
Lighting Equipment	Fluorescent Lights	25.62 kW
Pachinko Machine	400 Units	72 kW
Slot Machine	80 Units	22 kW

Table 2 Main Equipment of Yachiyo Hall

■ Maruhan Tsuzuki Hall

Address	3757-2 Ikonobe-Cho, Tsuzuki-Ku, Yokohama City, Kanagawa	
Building	Iron Frame Structure	
Business Hours	9：00-23：00	
Completed	February, 2006	
Total Floor Area	4,611 m^2	
Main Equipment	Equipment Overview	Equipment Capacity
Air Conditioning Equipment	Air Cooling Heat Pump Package Air Conditioner (Hall)	359.3 kW
	Air Cooling Heat Pump Package Air Conditioner (Office)	16.74 kW
	Air Cooling Heat Pump Package Air Conditioner (2F office, restaurant)	14.46 kW
	Air Cooling Heat Pump Package Air Conditioner (Warehouse)	2.94 kW
	Air Cooling Heat Pump Package Air Conditioner (Restaurant)	4.73 kW
Lighting Equipment	Fluorescent Lights	90 kW
Pachinko Machine	640 Units	202 kW
Slot Machine	319 Units	67 kW

Table 3 Main Equipment of Tsuzuki Hall

(3) Analysis of Current Situation

- At Yachiyo Hall and Tsuzuki Hall, we investigated the transition of the electricity use and the demand of a day and the capacity of main equipment. As a result, we found that air conditioning accounted for approximately 50% of the load and game machines and lighting accounted for the remaining 50%. We confirmed that measures for the air conditioning, game machines and lighting would be effective.

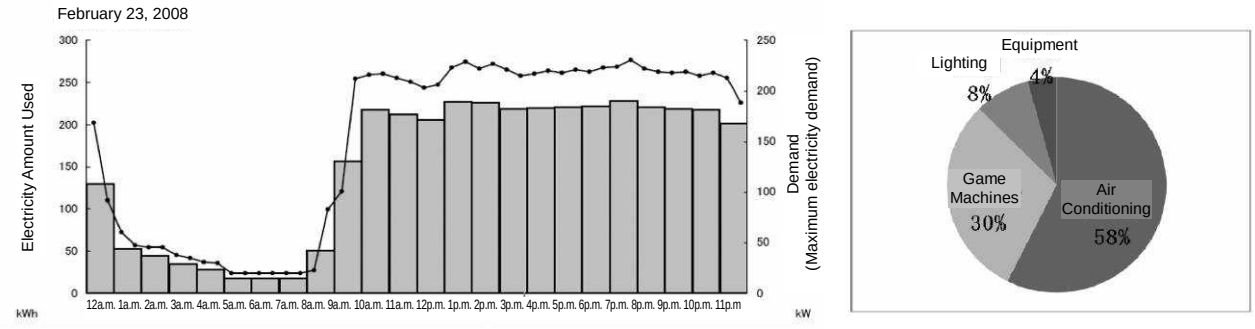

Fig. 3 Maruhan Yachiyo Hall, Demand and Load Graph

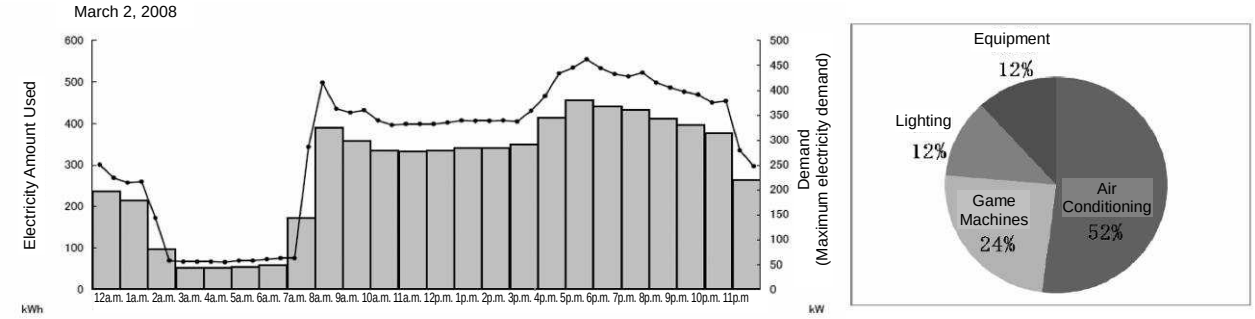

Fig. 4 Maruhan Tsuzuki Hall, Demand and Load Graph

(4) Target Settings

Based on the understanding and analysis of the current situation and after consulting with an energy conservation consultant company, we set targets as follows.

① At Yachiyo Hall, the yearly electricity consumption should be reduced by 12%, i.e. 167,998 kWh, against current consumption of 1,399,532 kWh.

② At Tsuzuki Hall, the yearly electricity consumption should be reduced by 15%, i.e. 449,178 kWh, against current consumption of 2,984,208 kWh.

(5) Problem Points and their Investigation

1) Air conditioning

【Problem Areas 】

- Our employees were so indifferent about energy conservation, so the customers would complain that the air conditioning temperature of the hall was too low.
- The temperature was adjusted based on the feeling of the employee.
- The switches of the air conditioners were turned on at a time in the morning so the electricity was used in excess.
- Unnecessary air conditioning was running even before opening the hall or after closing

the hall.

- Unnecessary air conditioning was running throughout a year for unused rooms such as the warehouse in the middle season.
- Ventilation fans were running at night.
- Temperature was adjusted inefficiently, because the correspondence between the air conditioner switches and their area of air conditioning was not clearly recognized.
- The temperature around the counter was extremely low because of inappropriate flow of the air.

【Details of Investigation】

- Approximately 50% or more of electricity is used by air conditioners, so we started from improving the use of the equipment to eliminate the waste of electricity happening when running the equipment and adjusting the temperature. We did it while avoiding causing inconvenience to the customers.
- By enhancing the awareness of the employees concerning energy conservation, problems which had not been noticed before were found, including unsuitable environment for outdoor units and clogging of filters.

2) Lighting

【Problem Areas 】

- Unnecessary lights were lit even outside hours such as before opening or after closing the hall.
- Time for outdoor lighting was unchanged throughout a year and occasionally it was turned on from the time when it was still bright outside.

【Details of Investigation】

- When turning on the outdoor lights in the evening, it was anticipated that the daily power peak load would come. In light of the importance of the demand management for this occasion, we studied the operational improvement.

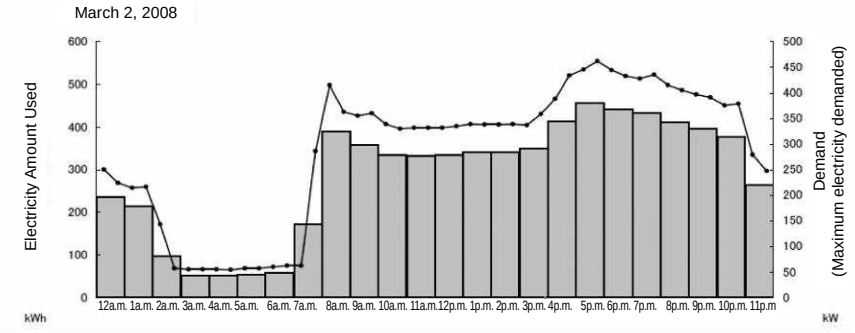

Fig. 5 Daily Demand and Use of Electricity of the Hall

3) Game machines

【Problem Areas 】

- Unused machines remained powered-on even before opening or after closing the hall.

【Details of Investigation】

- The electricity consumption of one game machine is approximately 200W. If we can power off the game machines as quickly as possible after closing the hall, it contributes to the energy conservation.

4) Others

【Problem Areas 】

- We didn't know what types of equipment were used in the hall and how much electricity they consumed.

【Details of Investigation】

- Since it takes a long time and considerable measurement cost to exactly understand the electricity consumption of all equipment, we started from listing up all equipment in the hall, and then making a list of power loads and running time for them.

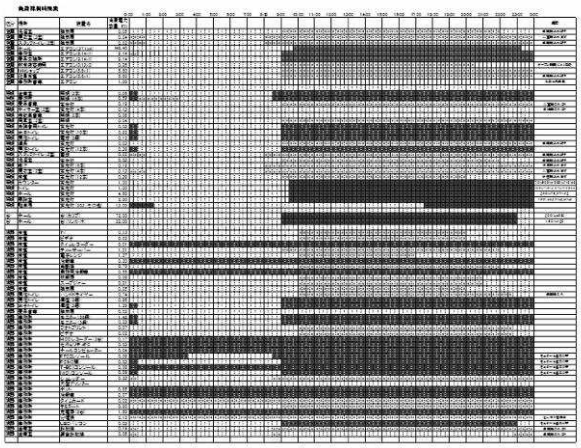

Fig. 6 Time Table of Load Running Hours

(6) Details of Measures

Followings are the contents of the operational improvement we implemented.

Before opening the hall

1. We powered on many air conditioners at a time. → We now power on them by one in every 30 minutes.
2. Lights and air conditioners unnecessary for opening the hall remained powered-on. → We now never power on lights and air conditioners which are not used.
3. The way to start up equipment is different among individuals. → We have made rules for powering on the equipment in addition to display the order of powering on it, etc. switching on.

Business hours

4. We have been controlling the room temperature based on the feeling of the employee. → We now measure and control the real temperature using temperature/humidity meters.

5. The correspondence between the air conditioner switches and their area of air conditioning was not clearly recognized.→ We can now adjust the temperature more efficiently referring to the improved display.
6. The outdoor lights used to be turned on constantly at fixed time throughout a year and they were lit when it was still bright outside. → We have changed the setting of turn on/off considering the sunset time and weather.
7. The air conditioner used to be running in full operation throughout a year in unused rooms such as the warehouse during the middle season. → We now change the setting of the air conditioning in response to the season changes (or stop).
8. The temperature used to be adjusted fully by air conditioning. → We now make use of outside air.

After closing the hall

9. The d unnecessary game machines remained powered-on. → We now power off them as quickly as possible.
10. Lights and air conditioners unnecessary for opening the hall remained powered-on. → We now quickly power off the lights and air conditioners which are not used.

After leaving the hall

11. We were indifferent to the stand-by electricity. → We started to reduce the stand-by power efficiently.
12. The lighting of the vending machines used to be lit for 24 hours. → We set the energy conservation mode and turn them off outside business hours.

To realize continuous energy conservation activities for the pachinko halls where a lot of people move between halls, we made “Energy conservation manual” by each hall and appointed people in charge of each measure. These activities were documented as a manual including successful case studies of 4 halls mentioned above, which is to be distributed to all of our halls.

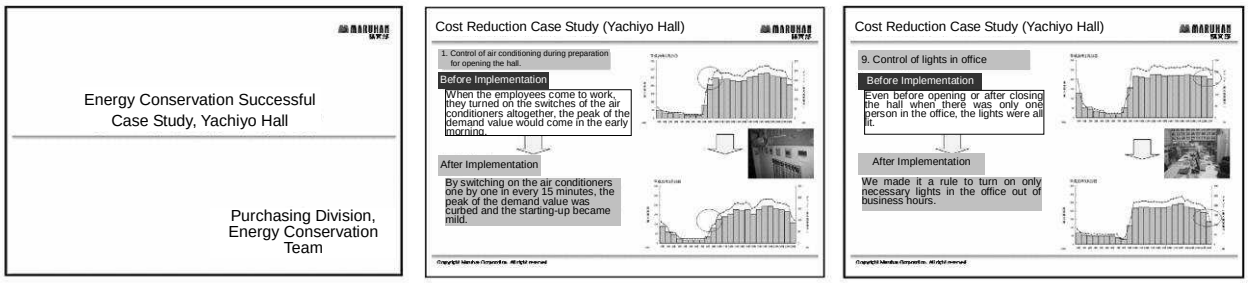

Fig. 7 Energy Conservation Successful Case Study

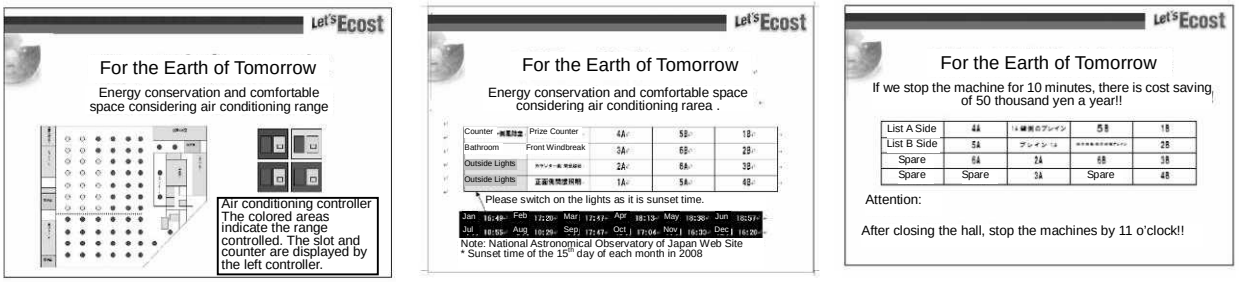

Fig. 8 Stickers Advocating Energy Conservation

(7) Effects Achieved after Implementing Measures

- We could confirm the following effects of the operational improvement in connection with the daily use of electricity.

Yachiyo Hall

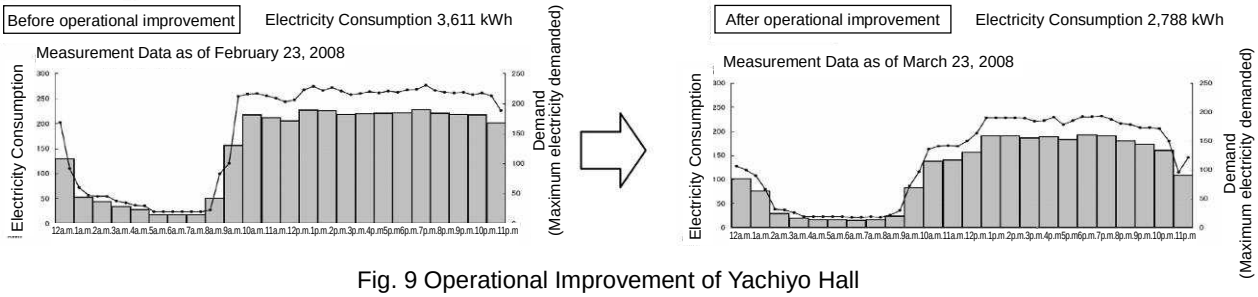

Fig. 9 Operational Improvement of Yachiyo Hall

Tsuzuki Hall

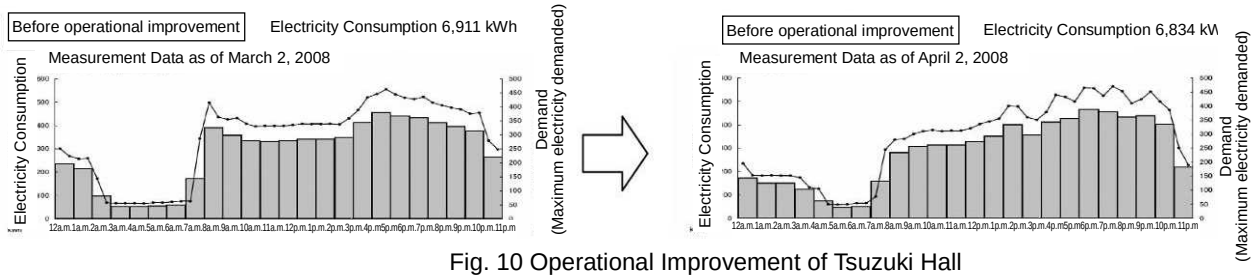

Fig. 10 Operational Improvement of Tsuzuki Hall

	Apr	May	Jun	Total from Apr to Jun	Jul	Aug	Sep
Electricity Consumption of Previous Year kWh	101,904	102,978	116,478	321,360	126,108	141,582	142,374
Electricity Consumption of Current Year kWh	83,160	84,600	10,854	268,614			
Difference kWh	▲18,744	▲18,378	▲15,624	▲ 52,746			
Reduction Rate (%)	18.40%	17.80%	13.40%	16.40%			
CO_2 Difference (t)	▲10.4	▲10.2	▲8.7	▲ 29.3			

Table 4 Achievement of Yachiyo Hall

	Apr	May	Jun	Total from Apr to Jun	Jul	Aug	Sep
Electricity Consumption of Previous Year kWh	239,616	245,640	273,024	758,280	296,520	330,456	308,856
Electricity Consumption of Current Year kWh	208,200	217,848	248,232	674,280			
Difference kWh	▲31,416	▲27,792	▲24,792	▲ 84,000			
Reduction Rate (%)	13.10%	11.30%	9.10%	11.10%			
CO_2 Difference (t)	▲17.4	▲15.4	▲13.8	▲ 46.6			

Table 5 Achievement of Tsuzuki Hall

3. Summary

The activities we did this time were the challenge to see to which extent we can achieve the energy conservation with operational improvements prior to equipment investment. Before this, we had not tried the energy conservation actively because we had simply thought that the energy conservation activities would worsen our service for customers. However, as a result of our activities done this time, it was proved that we could save energy by 10% or more by just changing the awareness of our employees. To begin with, energy conservation is tedious activities rather than being pleasant work.

However, through the visualization of electricity, we found it was possible that our activities contribute to the employee training through energy conservation activities, enhancement of employees' awareness concerning the cost of electricity and the prevention of the global warming. We think now is the time for Maruhan Group as a whole to continue the energy conservation activities.

4. Future Plans

When the Energy Conservation Law is revised next year, Maruhan will be classified as a designated business establishment. Then, we will have to promote the energy conservation activities more actively than ever before. This time, we selected four halls in Tohoku and Kanto areas as model halls to do the energy conservation activities ahead of other halls, but we already decided to have the same energy conservation model halls in Hokkaido, Tokai, Kansai and Kyushu areas within 2008 to spread the activities as early as possible and to verify the effect of the weather of each area on the activities. Based on these model halls, we will deploy the activities throughout the country by April, 2009. The same activities as those of model halls have already started in more than 50 halls in Tohoku Area.

After we deploy the activities in all of our halls, we are planning to introduce small-scale equipment such as lighting equipment and medium-scale equipment such as air conditioning equipment. We will learn a lot from the past experience and introduce new technologies. For example, it may be possible to optimize the control of the air conditioning according to the operating state of the halls.

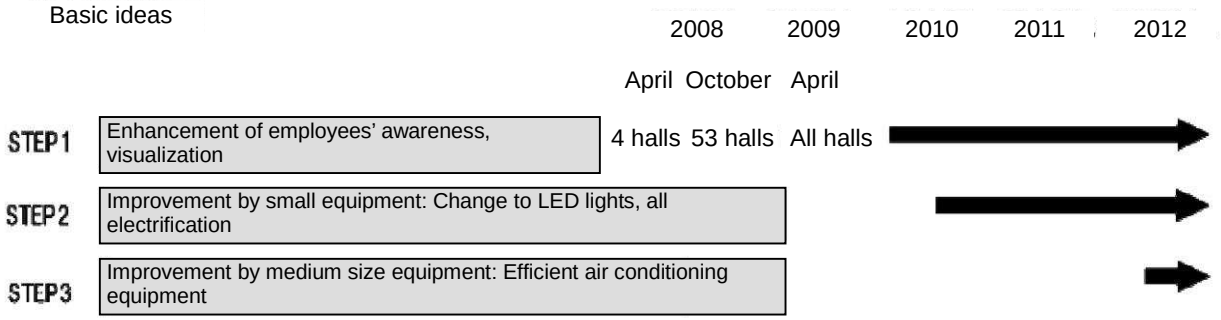

Fig. 11 Future Activities