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**RICOH**

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SEVEN-ELEVEN JAPAN CO., LTD.

Hitachi, Ltd.

Ricoh Co., Ltd.

Sanden Retail Systems Corporation

# **Start of a Full-scale Demonstration Experiment for Seven-Eleven's New Environmental Impact Reducing Store with Advanced Energy Saving, Creation and Storage Equipment**

**Initiative Makes It Possible to Reduce Purchased Electric Energy by Approx.  
60% and CO<sub>2</sub> Emissions by Approx 70% Compared to FY2013**

SEVEN-ELEVEN JAPAN CO., LTD. (Head Office: Chiyoda-ku, Tokyo; President & Representative Director: Fumihiko Nagamatsu) has started a full-scale demonstration experiment for our new environmental impact reducing store at Seven-Eleven Misato Hikonari 2-Chome Store. We are conducting this experiment in collaboration with Hitachi, Ltd. (Representative Executive Officer, President & CEO: Keiji Kojima), Ricoh Co., Ltd. (Representative Director, President and Chief Executive Officer: Akira Oyama) and Sanden Retail Systems Corporation (Representative Director & President: Masuya Mori). Our aim with this experiment is to further evolve energy saving, creation and storage initiatives by bringing together the advanced technologies of each company in one store.

We have been assessing the suitability and effectiveness of a variety of energy saving, creation and storage equipment aiming to reduce CO<sub>2</sub> emissions through demonstration experiments in 7-Eleven stores. At the same time, we have been horizontally deploying this equipment. We have now installed cold storage equipment which captures outside air and an air supply system which reduces the burden on air conditioning in addition to installing new freezing and cold storage equipment as a new energy saving initiative. Together with this, we are promoting energy saving through the introduction of an energy management system (EMS) aiming for overall optimization to grasp and control the usage situation of the various energy saving equipment and air conditioning equipment we are installing on an individual basis.

Moreover, we have installed next-generation solar cells for the first time and have also established solar carports in addition to solar panels on the roof as an energy creation and storage initiative. This initiative is raising our renewable energy ratio. Furthermore, we will effectively utilize the renewable energy generated with the installation of a mobile storage battery system (battery cube) which takes resource circulation into consideration. We will realize high energy saving, creation and storage effects through this equipment configuration optimization engineering. These initiatives will make it possible for us to reduce purchased electric energy by approximately 60% and CO<sub>2</sub> emissions by approximately 70% compared to FY2013 in this store.

Each company will proactively work to verify the effectiveness of the equipment through this demonstration experiment. Through this, we will accelerate the pace of our initiatives toward carbon neutrality and promote our response to social issues.



Exterior of the 7-Eleven Misato Hikonari 2-Chome Store

**Illustration of an Overview of the Initiative**



## Overview of the Technologies We Adopted in This Demonstration Experiment

### Energy Saving

#### Energy Management System (EMS)

Technology provided by Hitachi, Ltd.

Hitachi has expanded functions of the EcoAssist-Enterprise-Light environmental information database we have used to manage the energy data of all 7-Eleven stores. We are using this technology to aggregate and analyze the store EMS demonstration data and to then send control command target values.

#### Main Demonstration Contents

- ◆ We are demonstrating and analyzing energy saving with demand monitoring and coordinated control of air conditioners and ventilation equipment.
- ◆ We are measuring and analyzing the power consumption of each piece of equipment and the temperature and humidity inside and outside the store. We are analyzing and demonstrating the effective operating method of the mobile storage battery system (battery cube) for maximizing the use of renewable energy generated by solar panels and the use of inexpensive nighttime electricity.

#### New Freezing and Cold Storage Equipment

Technology provided by Sanden Retail Systems Corporation

Sanden Retail Systems has enhanced the air curtain of this open multi-stage chilled case (hereinafter “chilled case”). This minimizes the impact from the in-store environment and performs optimal operation. The result is a reduction in power consumption.

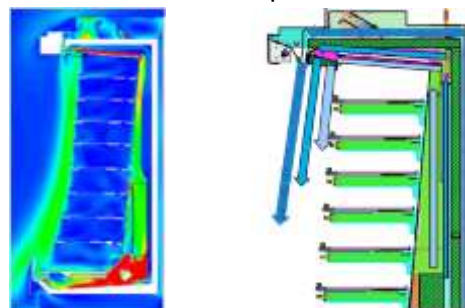
#### Main Demonstration Contents: Mechanism Improvement and Control Optimization

- ◆ Enhancement of the air curtain (triple air curtain): Sanden Retail Systems has added an air curtain to the outside of the regular air curtain. This minimizes the impact from the in-store environment and the leakage of cold air from the chilled cases (cold aisle reduction).
- ◆ Optimization with electronic expansion valves: Optimizing the control of the refrigerant flow rate stabilizes the cooling operation.

Applicable Equipment  
(Open Multi-stage Chilled Case)



Illustration of the Triple Air Curtain



## New Defrosting Control

Technology provided by Sanden Retail Systems Corporation

We are reducing power consumption by performing defrosting, previously done at regular intervals, at the optimal timing according to the in-store environment and operating situation for our freezing showcases.

### Main Demonstration Contents: Control Optimization

- ◆ We are saving energy by performing defrosting, previously done at regular intervals, at the necessary timing. This is done by sensing the operating situation of the freezing showcases and the in-store environment.

### Applicable Equipment (Freezing Showcases)

Ice Cream Case



Freezing Reach-in Case



## Energy Creation

### Next-generation Solar Cells

Technology provided by Ricoh Co., Ltd.

We have installed four types of next-generation solar cells in the store. Ricoh has developed these solar cells by applying the technology it cultivated in the development of multifunction machines. This is the first time we have conducted a demonstration experiment on next-generation solar cells in a 7-Eleven store in Japan. These solar cells are capable of creating new energy from the in-store lighting, walls and windows.



### Main Demonstration Contents

- ◆ Solid-state dye-sensitized solar cells (RICOH EH DSSC\*1): These solar cells are capable of highly efficient power generation even from the light of the in-store LED lighting which is on 24 hours a day. We have installed these cells on top of the cold storage equipment in the store and are utilizing the light in the store which is on all the time to generate power. We are reusing the energy in the store.
- ◆ Color see-through dye-sensitized solar cells (color see-through DSSC\*1): These cells have been configured in orange, green and red to reproduce the colors of Seven-Eleven stores. We have installed the cells in the windowpanes near the entrance of the store. They are generating power with the light from inside and outside the store.
- ◆ Utilization of the generated energy: The RICOH EH DSSC operates the wall clock of the in-store equipment. The color see-through DSSCs and OPVs operate the swinging signage for promotions. The excess energy is then stored in the mobile battery.
- ◆ Organic thin film solar cells (OPV\*2): We have installed thin, lightweight and bendable film-shaped OPVs in the windowpanes of the store. These OPVs are capable of highly efficient power generation in a wide luminance range. That is allowing power to be generated stably near the windows.
- ◆ Perovskite solar cells (PSC\*3): We have installed PSCs capable of stable power generation from low to high illuminance on the outer walls of the store. These PSCs are generating power on the outer walls where existing solar cells have not been fully utilized.

\*1: Dye Sensitized Solar Cell

\*2: Organic Photo Voltaic

\*3: Perovskite Solar Cell

### Carport Solar Panels

#### Main Demonstration Contents

- ◆ We have connected two four-vehicle parking type solar panels. These solar panels use high-efficiency double-sided power generation high-output modules. Adding energy creation to the parking lot is raising our renewable energy ratio.



## Energy Storage

### **Mobile Storage Battery System Equipped with Reused Batteries: Battery Cube**

Technology provided by Hitachi, Ltd.

This is a storage battery system which reuses used batteries from electric vehicles (EVs etc.) which are expected to become more popular in the future in consideration of resource circulation (circular economy).

- The mobile storage battery system (battery cube) employs the CHAdeMO V2H\*<sup>4</sup> standard. It can be safely attached to and detached from the store's electrical equipment (EV charger and discharger) compared to conventional stationary storage batteries. Therefore, it is possible to improve work efficiency during installation and maintenance.
- The system can supply power as a backup power source to continue store operations during an outage to the power grid.
- Total battery capacity: 100 kWh or more

\*4: Electric vehicle (EV) charging/discharging method standardized globally by the CHAdeMO Association

### **Main Demonstration Contents**

- ◆ This system will allow us to utilize to the maximum extent possible the renewable energy of the solar panels and other equipment and perform control which corresponds to the operating mode such as nighttime power utilization in conjunction with the charging/discharging instructions from the EMS.
- ◆ We will manage the operating status of the EV batteries equipped to the battery cube at all times with a remote monitoring system on the cloud. That will allow us to operate and maintain the system according to the battery status.



## Reference

This demonstration experiment store is also equipped with energy saving and creation equipment we have previously installed. We will verify the effectiveness of this equipment together with the new equipment.

### ◆ Large capacity solar panels



### ◆ Multi-layered glass



### ◆ Review of the LED lighting arrangement



### ◆ Utilization of drain water

