

# Food and Beverage Distribution

Vending Machines  
Cold Thermal Energy Control Technology  
Currency Handling Equipment



## Outlook

The keywords for R&D in the food and beverage distribution field in FY2013 were “energy conservation,” “convenience,” “globalization” and “safety and security.” Research and development has been focused on improving the technology to control cold thermal energy so as to achieve better energy efficiency of cold thermal equipment, particularly since the Great East Japan Earthquake.

The products in the food and beverage distribution field that apply the technology to control cold thermal energy include vending machines, which heat and cool beverages, and food showcases in shops.

For vending machines, Fuji Electric commenced producing the 2014 model of Fuji Electric’s unique hybrid heat pump vending machines that use external air as well as internal exhaust as heat source. The 2014 model is 26% more energy-efficient than the previous model. The newly developed freezer circuit has improved the heating capacity of the heat pump, while the load for heating and cooling has been reduced by improving internal ventilation. As a result, the product has achieved an annual power consumption of 590 kWh.

Also, the coin and bill validator mounted on the vending machines has reduced the power consumption in standby mode by 30%. The validator makes a transition to the energy-saving mode by the control of the vending machine, which enabled such substantial reduction.

There has been great demand from the convenience store industry for a reduction in the power consumption of showcases, and Fuji Electric has developed a wall-type refrigerated and freezer showcase with a built-in inverter freezer, cutting the power consumption by 30% compared with the previous model. Under normal conditions, the showcase keeps the freezer device running at a low operational speed continuously, thereby reducing the power consumption by 24% compared with the previous model. Furthermore, the new jet structure lowers the inflow of external air, making it possible to reduce the required freezing power and stabilize product temperature.

Fuji Electric has developed a glass-front vending machine that can hold a large volume of a wide range of products, and be used in public venues and offices serving as an unmanned satellite shop for convenience stores. With the added sales modules, the machines can sell a variety of abundant foods that were previously impossible to handle in vending machines. Furthermore, the glass area of the main body has been widened to improve the showcase’s functionality while its storage capacity has been significantly increased.

Aiming to compete in the global market, we have developed a vending machine with an IEC-standard-compliant glass front, for future export to the East Asia region, where the economy is showing remarkable growth. The vending machine has a built-in currency multi-interface to be compatible with the currencies in 10 ASEAN countries, with two types of vending mechanisms: the twist type which is adaptable to diverse beverage container forms depending on the local products, and the screw type, which can handle packed snacks and small foods.

We have developed a next-generation cold storage container “D-BOX” as part of our efforts to enter new fields and apply the technology to control cold thermal energy. This improves the temperature control throughout the logistical stages to deliver safety and security to the entire supply chain. The D-BOX can complete cold storage in a short period of time (3 hours), and maintain it for a long time (5 hours) “without a power supply” during transportation, using hyper insulation technology. A centralized control system, the “High Quality Cold Chain System,” has also been developed, utilizing a cloud environment to manage D-BOX data on temperature, running time and locations.

In the area of currency handling equipment, Fuji Electric has improved the sensor for coin roll stockers, which is an integral part of automated change dispensers used in supermarkets, for more efficient checkout work. The sensor monitors the stored coin rolls and ensures the machine does not run out of change. We have achieved the industry’s largest coin roll storage

capacity.

Fuji Electric will continue to develop and further expand environmentally friendly products leveraging

the company's unique technology to control thermal energy.



## Vending Machines

### 1 Wall-Type Freezer Showcase with Built-in Inverter Freezer

The demand to reduce power consumption in-store equipment is increasing greater than ever in the convenience store industry. Fuji Electric has developed a wall-type freezer showcase with a built-in inverter freezer, with enhanced energy saving. The main features are as follows:

- (1) Optimized pull-down control and constant low-speed operation control of the freezer realized high-efficiency operation, reducing freezer power consumption by 24% compared with previous showcases.
- (2) New jet structure allowed optimization of the air flow balance in a case longitudinal direction and at ventilation output opening, resulting to reduce the inflow of external air and also the freezing power required, as well as stabilizing product temperature.
- (3) Improved ventilation and anti-condensation heater with enhanced capacity and its optimized layout reduced power consumption by 9%.

Fig.1 Wall-type freezer showcase with built-in inverter freezer



### 2 Foods Vending Machine for Convenience Stores “FGS260W”

Fuji Electric has developed a foods vending machine “FGS260W” for convenience stores aiming to expand their business. The vending machine can be placed in public venues and offices, serving as an unmanned satellite shop.

In order to widen the range of products to be sold, it adopted spiral type and conveyor-belt type modules. Both types are designed to allow for flexible setting alterations and packed foods replacement. These modules make it possible to handle foods that were impossible previously, including 280-mm wide snack packs and packages with a thickness of 7 mm. In terms of holding capacity, the new vending machine can store 540 rice balls, for example. This is a significant increase from its old model that could hold 192 rice balls. Furthermore, the glass area of the main body has been increased by 53% to improve the showcase’s functionality.

More than 500 units have already been distributed in and around the Tokyo Metropolitan area.

Fig.2 “FGS260W”



### 3 Canned Beverage Vending Machine with Hybrid Heat Pump II “FA25M5RD4WK-FOP”

We have commenced production of “FA25M5RD4WK-FOP,” a canned beverage vending machine with a hybrid heat pump (HP) II. Its energy-saving features have been improved by 26% on an annual power consumption basis compared with the industry’s top-class hybrid-HP vending machines. The applied energy-saving technologies are as follows:

- (1) The optimized refrigeration cycle, achieved with an enlarged external evaporator, and newly-developed refrigerant circuit have improved the heating efficiency of the heat pump.
- (2) The exhaust heat from the compressor is proactively used by feeding it into the vending machine, which has enhanced the heat pump’s heating efficiency.
- (3) The load for heating and cooling is reduced by shortening the internal ventilation route and improving the air flow so that the internal temperature distribution is divided into zones.

These technologies enabled FA25M5RD4WK-FOP to achieve an annual power consumption of 590 kWh.

Fig.3 “FA25M5RD4WK-FOP”



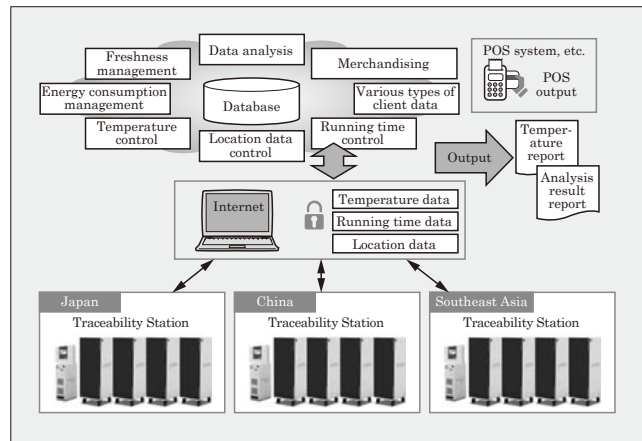
## Cold Thermal Energy Control Technology

### 1 “High-Quality Cold Chain System”

Fuji Electric has developed a centralized control system “High-Quality Cold Chain System” (HQCCS) related to development of “D-BOX.” It can manage “D-BOX” data on internal temperature, running time, and locations utilizing cloud computing environment. The system can realize safe and efficient logistic structure, and it enable users to offer high-quality cold chains into the market. The main features are as follows:

- (1) The system can control traceability of merchandise by gathering “D-BOX” data.  
“D-BOX” data is as follows: internal temperature, running time, door open/close operation, and locations.
- (2) The system can manage identification of “D-BOX” and oversee the rate of operation, which contribute to enhancement of the maintenance and quick judgment of a period of the maintenance.
- (3) Clients can use the system as a strategic merchandising tool by linking the freshness of products and consumer’s purchase activities.

Fig.4 “High-Quality Cold Chain System”



## Currency Handling Equipment

### 1 Coin Mech “FEVT Series”

Manufacturers have a social responsibility to improve energy conservation, and the same is required for 24-hour-operational vending machines. We have developed a new type of coin mechanism to meet this social requirement. The main features are as follows:

- (1) The coin mechanism achieved a significant reduction (30%) in power consumption by adopting an independent, time-sharing control method as opposed to the previous method which operates multiple coin sensors altogether at all times. Furthermore, the vending machine can prompt the coin mech. to switch to the energy-saving mode, reducing power consumption by up to 80%.
- (2) All units come with a change pay-out confirmation sensor as standard, enhancing the reliability of change dispensing.
- (3) A new sensor with high sensitivity to identify minute design characteristics of coins, which are produced with high anti-counterfeiting technology, for improved coin verification.

Fig.5 “FEVT Series”



### 2 Large Storage Capacity Coin Roll Stoker “CST770”

For avoiding running out of change in automated change dispensers, coin roll stokers need to increase their storage capacity in order to improve the efficiency of checkout work. Fuji Electric has responded to this request, and launched on the market a large-storage coin roll stoker “CST770” that interlocks with automated change dispensers. The main features are as follows:

- (1) The improved sensor has made it possible to improve the storage capacity up to the industry’s top level of 30 rolls, compared to the conventional 18.
- (2) In the stoker, there is a tray structure that contain units made from four coin rolls each, for easy and flexible rearrangement. This allows customers to easily customize the unit so as to add or remove coin domination types as required.
- (3) A magnet sensor is used to discriminate domination for precise management of coin rolls.

Fig.6 “CST770”





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