

# Food Distribution

Vending Machines  
Stores  
Distribution Systems



## Outlook

A shrinking population coupled with a declining birthrate and an aging population, together with an increase in single-person households and an increase in the number of women entering the workforce is causing changes in the manner of consumption and the retail environment in the food distribution market. Consumers have a particularly strong tendency to demand convenience and food safety and security, and the manufacturers who handle food products and beverages show a strong interest in meeting consumer demands and also in conserving energy for environmental reasons. In the food distribution field in which Fuji Electric participates, we are expanding the areas of our business that are proximate to the final consumer, such as at supermarkets and with vending machines, and are also entering into business opportunities in the food processing and storage fields with refrigerated warehouses and so on, and with refrigeration-related business for food processing plants. In the future, we plan to expand our business further to plant factories, and to enlarge our domain upstream to extend from production through consumption.

Research and development-related keywords in the food distribution field include “energy savings,” “convenience,” “global responsiveness,” and “safety and security.” The cooling and heating control technology that is driving the reduction in energy consumption by cooling and heating equipment is being used in vending machines that heat and refrigerated beverages, store showcases used to display an array of beverages, and so on. This technology is also being applied to products and systems that contribute to the distribution process for food.

For vending machines that sell beverages in cans and PET bottles, we have developed Fuji Electric’s proprietary hybrid heat pump vending machine that utilizes ambient air, in addition to internal exhaust heat, as a heat source. We improved the energy-saving performance further in FY2014, and introduced to the market the 2015 model of the “Hybrid ZERO,” the industry’s first heaterless vending machine. This vending machine heats products using only a hybrid heat pump,

and employs a heating method developed without using any of the heaters that had been used in part in the past. As a result, a 50% increase in heating efficiency was obtained. In addition, we developed a cooling circuit in collaboration with an automotive parts manufacturer, and employed a component called an “ejector,” which makes effective use of the energy loss when a liquid expands, for the first time in a vending machine. As a result, efficiency was improved greatly and the annual power consumption was reduced by 25%.

For vending machines that sell beverages in cups, we have developed an ultra-small cup type vending machine that is specialized for use in offices and provides easy access to delicious coffee. This product has a single-cup drip-type coffee extraction system and a hygienic and easy-to-clean cup mixing mechanism, and we developed and installed mechanical components for miniaturization. This product also features the industry’s top class performance in terms of power consumption.

For global expansion, Fuji Electric has developed the multipurpose vending machines named “Twistar” for the purpose of overseas production, started mass production in Thailand in July, and began selling to China and Southeast Asian countries.

For products to be used in stores, as a follow-up to the coffee machines that have been installed on convenience store counters since 2013, we developed a fixture for selling donuts. Focusing on the internal environment in which donuts are stored to maintain their particular deliciousness, we realized a fixture that is able to supply a delicious product at all times by cooling the donuts to a constant temperature while preventing them from drying out. Moreover, in order to meet the growing demand for frozen food and ice cream products, we developed a horizontal ice cream case having a built-in freezer. As a result of an improved air curtain, the required refrigeration capacity is reduced, thus making it possible to achieve a smaller size and improved energy-saving performance.

In the cold storage market that exists for the purpose of storing and sorting food during the food distri-

bution process, many of the refrigerators and refrigerated warehouses in existence were constructed more than 30 years ago. For this reason, administrative costs often have frequently increased significantly as a result of higher maintenance costs due to stricter regulations for Freon refrigerant and higher electricity costs due to deterioration in the thermal insulation performance of walls. In response to these environmental changes, we have developed an energy-saving control system for optimizing the operation of the refrigeration equipment. Through performing capacity control for the refrigeration unit and airflow control in accordance with the load on the fan for the unit cooler, and so on, we have realized a 12% reduction in annual power consumption by refrigerated warehouses.

In addition, as a new initiative for sunlight-based plant factories, we have delivered complex environmental control systems, substation equipment, refrigeration equipment, etc., and have promoted demonstration testing, promoted the construction of an optimal environment for growing plants and energy savings, and we plan to provide comprehensive engineering for plant factories.

Based on the societal needs for convenience, food safety and security, and energy savings, Fuji Electric will expand its development of products that fully incorporate “cooling/heating technology,” “mechatronics technology,” and “embedded software technology,” and intends to apply new technology to develop new markets.



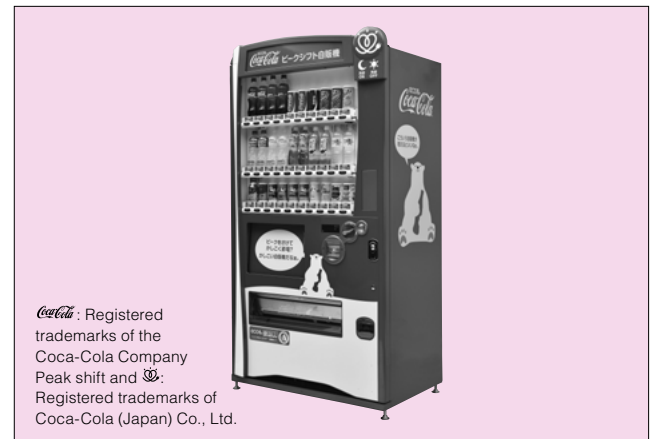
## Vending Machines

### 1 Peak Shift Vending Machine Equipped with Ejector

Fuji Electric has introduced a peak shift CO<sub>2</sub> refrigerant vending machine capable of supplying cool drinks all day long, without using power for cooling for up to 16 hours maximum. In order to improve energy savings and energy conservation further, an ejector is installed in the cooling circuit to establish an energy-saving system with enhanced cooling efficiency. The compressor power is reduced by approximately 30%, and the annual power consumption can also be reduced by approximately 25%. Main features are listed below.

- (1) By using an ejector, the compressor loss due to the driving force and the expansion process could be reduced.
- (2) Precise, energy-saving operation was realized by constructing a pressure optimization control that boosts the pressure in according to the ambient environment and the load.
- (3) The gas-liquid separator was optimized, and the amount of refrigerator oil returned while maintaining the gas-liquid separator function is ensured.

Fig. 1 Peak shift vending machine equipped with ejector



### 2 Ultra-Compact Cup-Type Vending Machine for Japan Beverage Holdings Inc.

In collaboration with Japan Beverage Holdings Inc., a leading cup beverage company, Fuji Electric has developed an ultra-compact cup-type vending machine. Featuring a compact size, low power consumption and so on, the vending machine has specifications that are well suited for installation in an office environment, and is able to provide familiar delicious, full-fledged coffee. The main features are as follows:

- (1) Based on the image of a menu board at a coffee shop, this vending machine is equipped with an integrated sheet key that shows selection buttons and summarizes the products on display.
- (2) The vending machine is equipped with a single-cup drip-type coffee extraction system and, as a compact cup mixing system having excellent sanitation and cleanliness, the industry's first transverse uniaxial transport system.
- (3) Realized industry-leading low power consumption of 849 kWh/y.

Fig. 2 Ultra-compact cup-type vending machine



## Stores

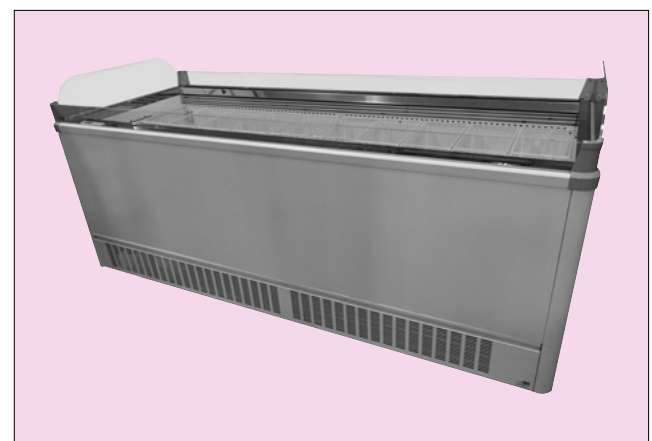
### 1 7.5-Shaku Horizontal Ice Cream Case

In the convenience store industry, there is a growing need for large-capacity open-type horizontal ice cream cases that will be of considerable assistance in the sales of frozen food and ice cream. Fuji Electric has developed a 7.5-shaku\*-wide horizontal ice cream case that has a built-in freezer with enhanced energy efficiency. The main features are as follows:

- (1) With a high-performance air curtain that controls the amount of external air heat intrusion, the amount of frost formation is reduced and the amount of power consumed is reduced by 20% compared to models from other companies.
- (2) By optimizing the heat exhaust structure inside the machine room, condensation capacity was increased and the condensing unit attained higher efficiency.
- (3) From the beginning of the development process, the design was standardized and was constructed as the base model of a horizontal showcase. This allows the series to be expanded to freezer and refrigeration showcases.

\* Shaku: an old Japanese unit of length equivalent to approximately 30.3 cm

Fig. 3 Horizontal ice cream case



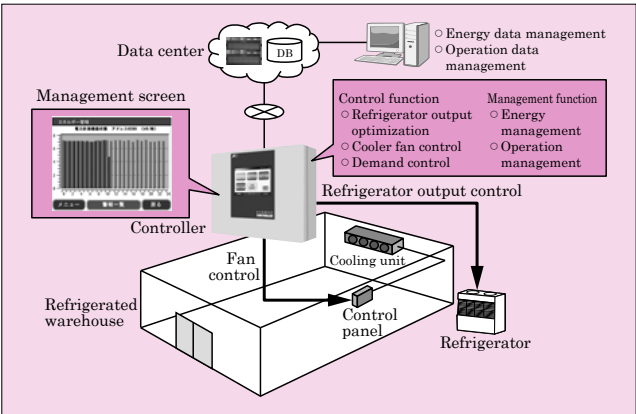
Distribution Systems

1 Energy Saving Control System for Refrigerated Warehouse

In these days, a refrigerated warehouse for the purpose of food storing and sorting in a distribution process has a big problem of reducing energy usage due to increased electricity costs. Fuji Electric has developed an energy-saving control system that optimizes the operation of refrigeration equipment (cooler, refrigerator) in a warehouse. The main features are as follows:

- (1) Energy-saving function: Owing to a refrigerator output control function based on a proprietary algorithm that operates according to the internal load status and by controlling the cooler with intermittent operation, the annual power consumption in the warehouse can be reduced by 12%.
- (2) Management function: A display function having high visibility and operability allows energy management and operation management to be implemented with ease.

Fig. 4 Configuration of energy-saving control system for refrigerated warehouse





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