

Featured Articles

Development of Products in Response to Changing Lifestyles

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OVERVIEW: Due to changes in the structure of demand in the domestic Japanese market, with an aging population and a shift toward smaller families, changes are also being seen in lifestyle with respect to clothes, eating habits, and living. In terms of eating habits, approximately half of households only cook 2 or less cups of rice at a time. It is based on this background that Hitachi developed a rice cooker that can make delicious rice even in small amounts. After examining consumer needs from a global perspective, Hitachi developed an air purifier with high dust-collection performance (high flow rate). As interest in the influence of PM2.5 continues to grow, Hitachi will continue to respond to the trend toward further emphasis on dust collection performance.

INTRODUCTION

HITACHI conducts a variety of different surveys in order to grasp changing consumer lifestyles. As these surveys are used to dig deeper into the actual state of consumer lifestyles, many new discoveries are made.

When rice cooking behavior is examined within Japan, it becomes apparent that approximately half of all households only cook 2 cups*1 of rice or less at a time. Almost all rice cookers in current use have a capacity of 5.5 cups, and an awareness survey has shown that consumers feel that large-capacity rice

cookers produce rice that is not very tasty when cooking in small amounts. This is why Hitachi has developed rice cookers that specialize in cooking delicious rice in small amounts (see the left side of Fig. 1).

Hitachi currently sells home appliance products in approximately 50 different countries, so it is imperative that we accurately assess the needs of consumers in all of these markets, including Japan.

As part of its market research in target countries, Hitachi has visited homes to observe actual lifestyles (see the middle of Fig. 1), observed how well products sell in sales outlets, and postulated and then researched and verified hypotheses during

*1 A cup corresponds to a volume of 0.18 L.



Fig. 1—New-concept Rice Cooker that Responds to Changing Demand Structure, and Global Model of an Air Purifier. External appearance of the 5.5-cup rice cooker (RZ-VW3000M) that can cook delicious rice in small amounts and the small-amount 2.0-cup rice cooker (RZ-VS2M) (left), international lifestyle survey (middle), and the global model air purifier (EP-KVG900) designed to satisfy the needs of consumers in Japan and other Asian countries (right).

the development process. Although the air purifier described in this article (see the right side of Fig. 1) has only just been introduced in Asia and the Middle East, it was developed based on activities such as those listed above, on the sense of dependability and the expectations regarding “made in Japan” products expressed by consumers, and on factors such as an increasing consciousness regarding cleanliness and health as well as the living environment in each country.

This article describes a new concept rice cooker aimed at responding to the changing demand structure of the domestic Japanese market, and the global model of an air purifier.

DEVELOPING PRODUCTS THAT CREATE NEW MARKETS BASED ON NEW CONCEPTS

Rice Cooker that Responds to a Changing Lifestyle

A domestic Japanese survey of rice cooking revealed that for approximately 51% of households, 2 or fewer cups of rice are cooked each time without any differences in either household size or age (see Fig. 2).

Furthermore, approximately 60% of respondents are dissatisfied with the manner in which small amounts of rice are cooked by large-capacity rice cookers (5.5 cups or more), responding that rice cooked in such a way does not taste good (see Fig. 3).

Although there are induction heating (IH) models on the market that have a capacity of 3 or 3.5 cups, they only amount to approximately 8% of the units sold.*2 Possible reasons for the lack of low-capacity

rice cookers on the market include the fact that current models of this type are low specification products, or that they are similar to the 5.5-cup models without outstanding features. Group interview surveys revealed two different types of consumers. One type of consumer cooks a small amount of rice and eats all of it each time, whereas the other type cooks extra rice for storing in the freezer and then reheating in the microwave oven later. The product discussed in this article was developed for the first type of consumer.

Two Product Concepts

Two types of products were considered when constructing the new development concept. The first is the 5.5-cup model, which has a capacity of 5.5 cups of rice, but can also cook delicious rice in small batches.

The second type of product is aimed at consumers who cook only small batches of rice. During the group interviews, the monitor’s words “rice is delicious when you scoop it out of the ohitsu (wooden serving container for rice) while eating at a Japanese inn” were used as the basis for the new 2.0-cup model concept of a compact and lightweight low-capacity model that can cook between 0.5 and 2 cups of rice. This product allows the consumer to take the rice right to the dining table and serve it freshly-cooked and hot with an “ohitsu” feel (see Fig. 4).

Since the 2.0-cup model is a new concept, an acceptability survey was conducted. Mock-ups similar to the product were presented along with a concept validation video (see Fig. 5), product features were

*2 From The Japan Electrical Manufacturers’ Association (JEMA) shipment statistics for FY2013.

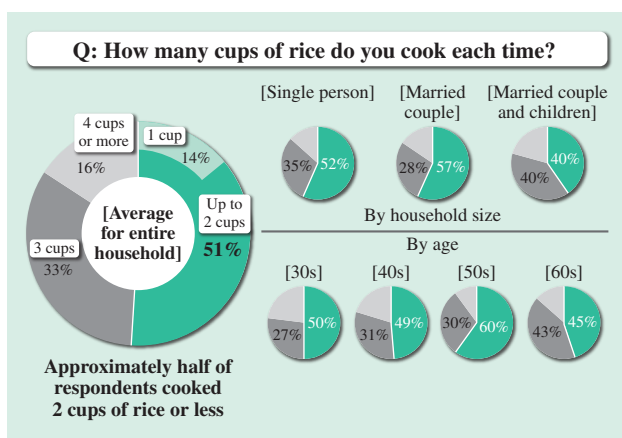


Fig. 2—Rice Cooking Amount Survey (Hitachi Survey from March 2014: n=279). The state of rice cooking was surveyed by both household size and age.

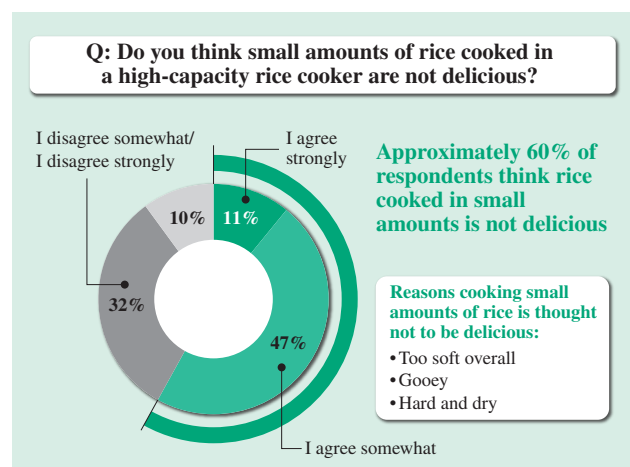


Fig. 3—Rice Cooking Impression Survey (Hitachi Survey from January 2014: n=312). Impressions about cooking rice in small amounts were surveyed.

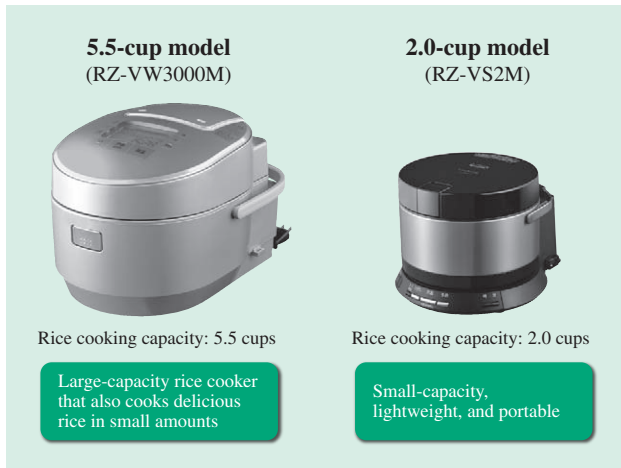


Fig. 4—Two Product Types. Hitachi developed a rice cooker with a 5.5-cup capacity, and a rice cooker with a 2.0-cup capacity.



Fig. 5—Concept Validation Video. The product concepts were explained with an easy to understand video featuring usage scenarios.

explained, and homemakers were asked for their opinions. It was discovered that the attractiveness of this new concept was praised not only by the small households that were the initial targets, but by families as well.

The Process of Cooking Delicious Rice

Cooking delicious rice requires a rice cooking process (including both temperature and heating duration) that matches the characteristics of the rice, whether in small or large amounts. Cooking rice involves soaking, boiling, and steaming steps (see Fig. 6). For the steaming step, the rice must be cooked at a high temperature of 98°C or higher for 20 minutes or longer. Therefore, the rice is heated after boiling until the water dries up, and then the high temperature is maintained for an appropriate time period by steaming. Because the heat capacity of rice itself is insufficient when cooking small amounts, the temperature tends to decrease during steaming, which makes heat control

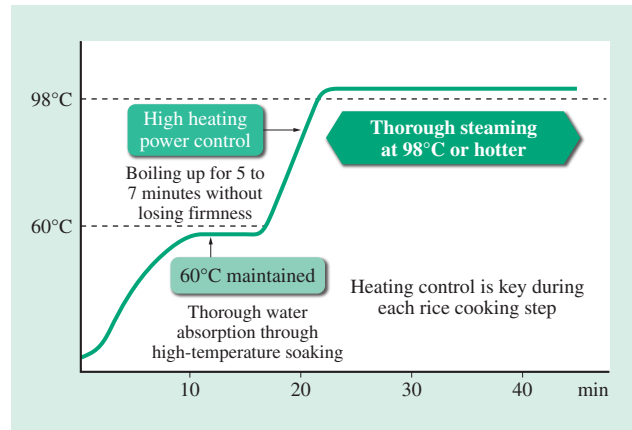


Fig. 6—Process for Cooking Delicious Rice. A high temperature of 98°C or hotter is maintained while steaming.

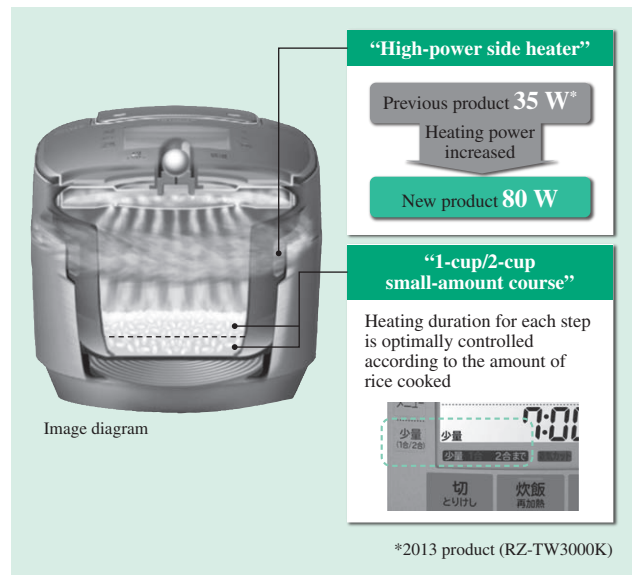


Fig. 7—Measures for Making Small Amounts of Rice Delicious. The temperature of the inner pot is appropriately maintained with the high-power side heater to ensure deliciousness.

a challenge.

5.5-Cup Rice Cooker Cooks Delicious Rice in Small Quantities

When cooking a small amount of rice in a 5.5-cup large-capacity rice cooker, there is more empty space in the inner pot, which makes it difficult to adjust the heat to cook delicious rice. Therefore, when cooking a small amount of rice, this rice cooker has a small-amount course that can be set, which will heat up the internal space using the high-power side heater to produce delicious rice, making this rice cooker good at cooking small amounts as well (see Fig. 7).

2.0-cup Rice Cooker Specializes in Cooking Small Amounts of Rice

One of the challenges that must be addressed when cooking small amounts of rice is adjusting the heat. Because the heat capacity of rice is low, it is important that the structure is designed to maintain the correct heat level and that heating is controlled.

(1) Thick thermal sprayed iron for cooking small amounts of rice

The optimal dimensions for the inner pot were verified to reduce uneven cooking, and the inner pot was designed to enable the cooking of delicious rice whether there are 2 cups, 0.5 cups, or 1 cup of rice. Melted iron particles are quickly sprayed on the base material to form the thick thermal sprayed iron pot with a multilayered structure that offers superior heat storage performance (see Fig. 8).

An iron pot with a thickness of 3.6 mm (at the thickest part) is used to provide high thermal capacity



Fig. 8—Thick Thermal Sprayed Iron Pots.

A 2.0-cup inner pot was manufactured using the same method as the one used to manufacture a 5.5-cup inner pot for cooking rice.

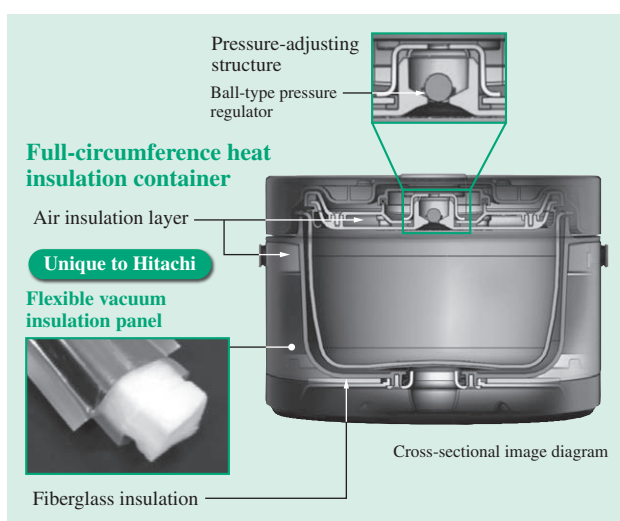


Fig. 9—Full-circumference Heat Insulation Container.

This container was implemented using a special flexible vacuum insulation panel designed for rice cookers along with an air insulation layer and fiberglass insulation.

which effectively inhibits temperature drop during steaming.

(2) Full-circumference heat insulation container

A ball-type pressure regulator is mounted on the steam port to ensure that the hot steam in the inner pot does not escape during steaming, which would reduce the temperature.

Insulation material, manufactured the same way as flexible vacuum insulation panel⁽¹⁾ developed for use in refrigerators, is used on the sides of the rice cooker. This insulation was developed specifically for use in rice cookers to ensure that performance can be maintained in a high-temperature and high-humidity environment, without raising the temperature of the packaging film due to electromagnetic induction.

A two-layer structure is used in the top lid, including an air insulation layer with fiberglass insulation on the bottom. The full-circumference heat insulation container is used to inhibit heat leakage over the entire circumference (see Fig. 9).

(3) Separable structure

In order to achieve delicious “just-cooked” rice at the dining table, the serving container unit is separable from the heat source unit (see Fig. 10).

This structure makes it possible to keep the serving container lightweight at approximately 2.0 kg (2.7 kg when cooking 2 cups of rice), so that it can be easily carried to the dining table.

Also, the previously described full-circumference heat insulation structure retains freshly-cooked and hot state of the rice even after the serving container is carried to the dining table, ensuring that the rice is kept at the proper serving temperature of approximately 70°C or more for two hours, in the case of 2 cups of rice (see Fig. 11).

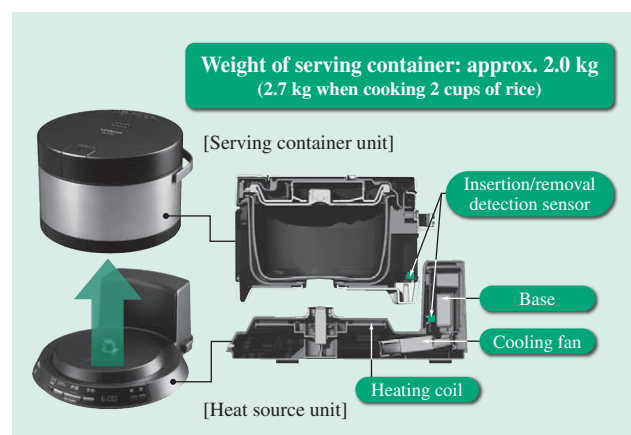


Fig. 10—Separable Structure.

The serving container unit and heat source unit are separable.

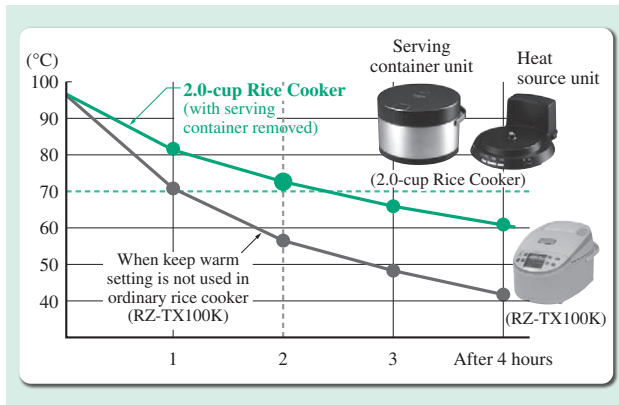


Fig. 11—Changes in Rice Temperature after Cooking (2 Cups). After the serving container unit is separated, a temperature of approximately 70°C is maintained even after two hours.

This product has a number of features aimed at user-friendliness, including simple and easy-to-use controls, an internal lid that can be removed for complete cleaning, and a measuring cup designed for cooking small amounts of rice.

DEVELOPING PRODUCTS IN RESPONSE TO NEEDS FROM A GLOBAL PERSPECTIVE

Hitachi has developed a new-concept air purifier with the goal of simultaneous deployment in Japan and in international markets.

Air Purifier Designed for Global Deployment

Consumer surveys conducted in international markets have shown that rooms are not generally divided into smaller areas in Southeast Asia, the Middle East, and other regions, so there is comparatively more space (see Fig. 12). Therefore, support for larger spaces, that is, the expansion of applicable floor space,^{*3} is seen as a major sales point.

Due to the influence of particulate matter 2.5 (PM2.5),^{*4} interest in air purifiers is extremely high, especially in China. Furthermore, as consciousness grows with respect to both cleanliness and health, demand is being seen in Southeast Asia for solutions to house dust allergens and haze (smoke pollution). In all cases, the common thread is that dust collection efficiency is seen as the number one priority.

In certain regions, “made in Japan” products are well accepted.

*3 Item stipulated by the JEMA standard (JEM1467), indicating the size of a room for which a prescribed concentration of dust can be cleaned in 30 minutes.

*4 Particulate materials with a size (grain diameter) of 2.5 μm or less that float in the air.



Fig. 12—Lifestyle Surveys (Indonesia [Top Left], Thailand [Top Right], Saudi Arabia [Bottom Left], Kazakhstan [Bottom Right]).

There is a lot of wide space with tall ceilings, and rooms are not often divided into smaller areas.

In the domestic Japanese market, although ion emission functions have been emphasized, increasing numbers of consumers have been emphasizing dust collection performance (applicable floor space) due to rising concerns about PM2.5. According to surveys conducted by Hitachi, approximately 40% of consumers mentioned applicable floor space as a priority for their next purchase (see Fig. 13).

It is based on this background that Hitachi developed a new air purifier for export, with the high dust-collection efficiency necessary to satisfy shared domestic and international needs.

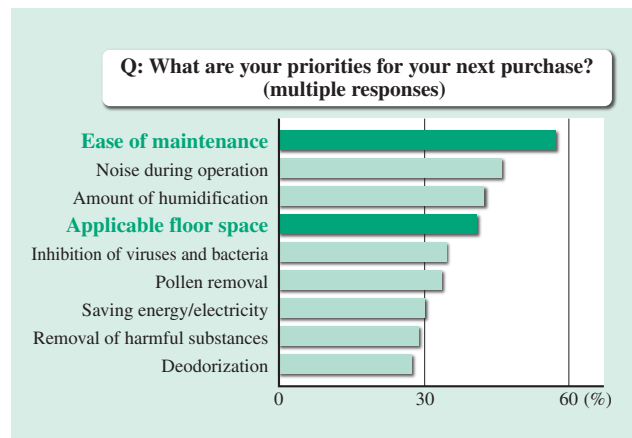


Fig. 13—Priority Survey (Hitachi Survey from October 2013: n=191).

Results are shown for a survey of priorities as expressed by consumers regarding their next purchase of a humidifying air purifier.

Technology for Achieving High Dust Collection Performance

An air purifier's dust collection performance is determined based on the amount of floor space it can cover. Hitachi set as its development target improving the previous model's applicable floor space of 40 m² (EP-JV700) to support a space of 68 m², which would make it the top of its class both in Japan and overseas. High flow rate is a must for expanding applicable floor space, and the improvement of fan performance and the reduction of flow resistance are challenges. The fan performance was enhanced by adopting a high-torque motor and a compact, high-efficiency fan, along with optimization of the outlet scroll passage of the fan. Flow resistance was reduced by moving the suction area from its previous location in front

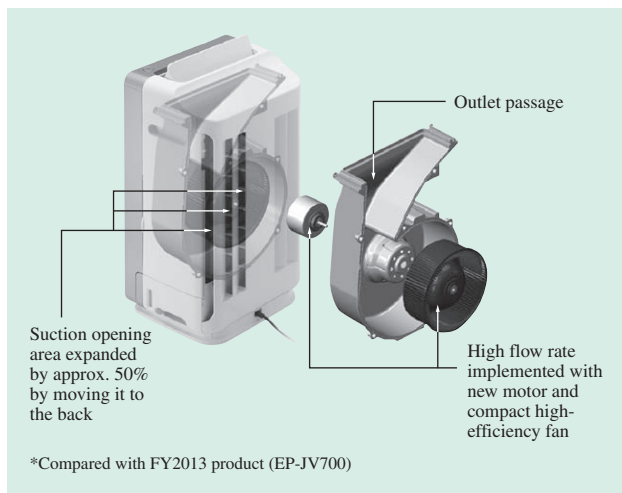


Fig. 14—Mechanisms Implementing High Flow Rate Dust Collection System.

High flow rate was implemented by using a new motor, a compact high-efficiency fan, and an optimized blowing passage. Flow resistance was also reduced by expanding the area of the suction opening.

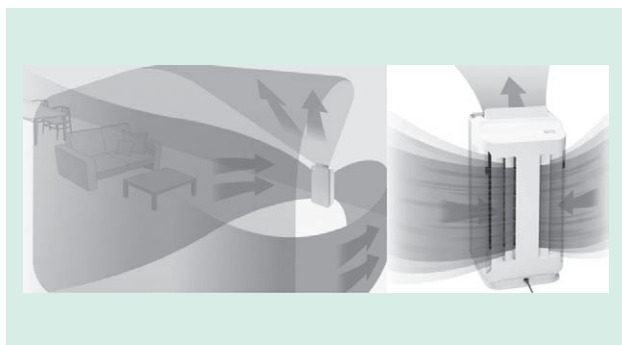


Fig. 15—Wide Range Air Intake.

Airflow control that can take advantage of the large air capacity was achieved.

to the back, and the opening area was expanded by 50% over the previous 2013 model (EP-JV700). This increased the air flow rate and successfully achieved an applicable floor space of 68 m² (EP-KVG900) (see Fig. 14).

Furthermore, Hitachi developed a high flow rate dust collection system that takes advantage of high flow rate characteristics. In this system, the flow pattern is optimized to discharge upward and to suck into the suction area in the back from a wide area, thereby achieving quick operation with reliable dust collecting performance (Fig.15).

Sensing Technology

Hitachi applied a previously used dust sensing method toward the development of “PM2.5 sensing” control.^{*5} With “PM2.5 sensing” control, flow rate is automatically controlled in association with the concentration of microparticles. When the concentration of microparticles is high, the high flow rate enables the system to quickly clean the room's air. Once the room's air is clean, the air flow is reduced so that the sound is no longer noticeable. The room is monitored in this state, and the cleanliness level is displayed using three colors (red, orange, and green) based on the concentration of microparticles (see Fig. 16).

It was confirmed that the microparticle removal speed with “PM2.5 sensing” control implemented is approximately twice as fast as automatic air purification operation without “PM2.5 sensing.”^{*6} (see Fig. 17).

*5 Sensor detects microparticles that are 0.5 μm or larger.

*6 Comparison of time required to reduce initial concentration of approximately 1000 μg/m³ to 35 μg/m³. Automatic air purification operation: approximately 38 minutes, PM2.5 sensing control: approximately 20 minutes. Tested particle: tobacco smoke.

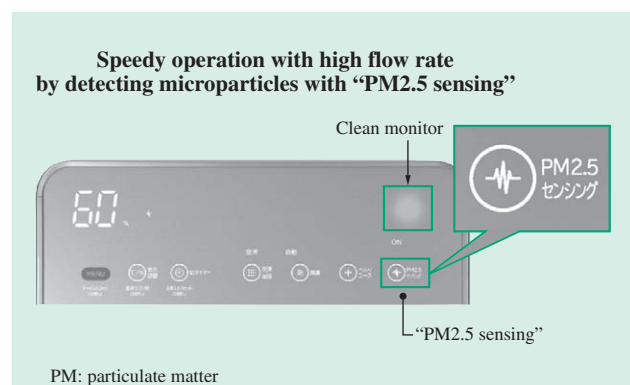


Fig. 16—PM2.5 Sensing Control (EP-KVG900).

Sensing technology that can take advantage of high flow rate characteristics was developed.

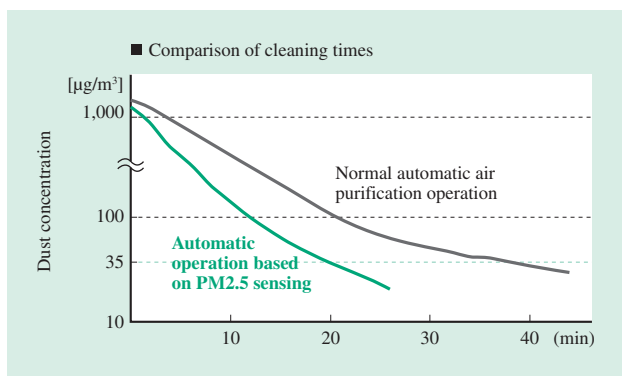


Fig. 17—Cleaning Performance Comparison.

Approximately twice the cleaning speed of automatic air purification operation was achieved with the automatic PM2.5 sensing operation.

Maintainability and Cleanability

According to the results of Hitachi's surveys, approximately 60% of consumers mentioned ease of maintenance as a priority for their next purchase (see Fig. 13). Not only does the air purifier capture a room's dust, but it also has a three-layer structure with a high-efficiency particulate arrestance (HEPA) air filter that captures bacteria, mold spores, and other minute particles,^{*7} a deodorization filter that adsorbs odors, and a prefilter that captures large dust clumps. Of these layers, the prefilter is the one that needs to be maintained most frequently. To improve the maintainability of this prefilter, a stainless coated filter with a smoother surface has been applied to make it easier to clean dust and stubborn oily smoke residue than was the case with previous prefilters. As for the maintainability of the humidification water tank, the lid of this tank has an easy-to-remove structure that allows for easy access to all internal corners for easy cleaning.

High-quality Glass Touch Panel

This newly developed EP-KVG900 model offers superb ease-of-use features such as high-quality design and cleanability, and uses reinforced glass that already has a track record in refrigerators and other products, as well as an electrostatic capacitive glass touch panel control system. The use of reinforced glass helps prevent scratching while providing excellent cleanability at the same time (see Fig. 18).

The air purifier described above (EP-KVG900) was developed to meet the needs of consumers in Japan and other Asian countries, and was released in Japan

*7 High-performance filter that is used to remove minute grit and dust particles from the air.



Fig. 18—High-quality Glass Design (EP-KVG900).

The use of reinforced glass provides a high-quality feel along with improved cleanability.

in October 2014. Hitachi plans to modify the detailed specifications of this base product and gradually introduce it into international markets in the future.

CONCLUSIONS

This article described a rice cooker aimed at satisfying the changing needs of Japanese lifestyles, and an air purifier developed from a global perspective to meet both Japanese and international needs.

Although these examples were quite different, developing products from the consumer's perspective is a common theme for all product development. Hitachi will continue uncovering new consumer needs and developing products to satisfy them.

REFERENCE

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