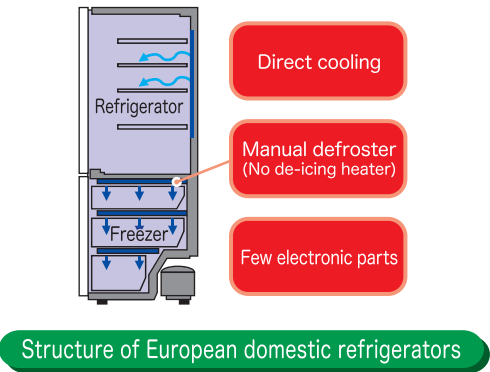


Technological Development of Fluorocarbon-Free Products

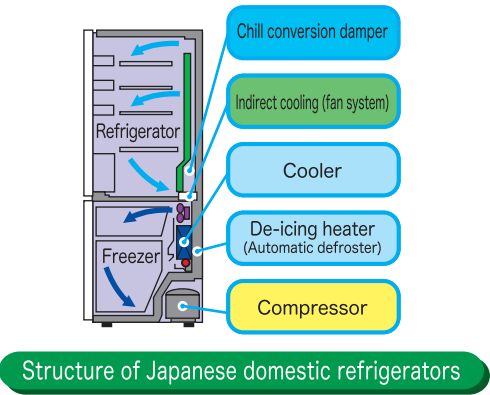
Issues Concerning the Introduction of Fluorocarbon-Free Refrigerators in Japan

Since the hydrocarbon refrigerant isobutane is inflammable, the prevention of explosion in case of leaks was an issue regarding its use.

Most European domestic refrigerators operate upon the "direct cooling method", in which the inside is directly cooled by the chill from the cooler, and no defroster is installed inside. Therefore, there is no threat of ignition due to the heat from the defroster, even in the case of a gas leak. For this reason, the use of isobutane was accelerated in domestic refrigerators made in Europe.



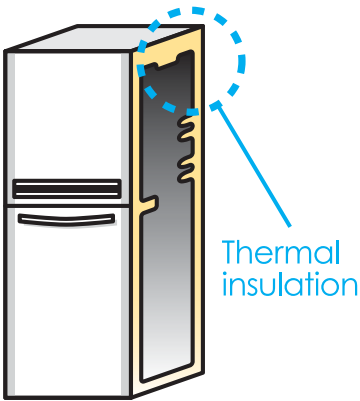
However, in Japan, frost can build up inside the refrigerator due to high humidity. Therefore the "indirect cooling method", which forcibly circulates the chill from the cooler by using a fan was introduced, and de-icing heaters (automatic defrosters) were installed inside refrigerators. Refrigerators in Japan are mostly large- or medium-sized, the quantity of refrigerant filling tending to be large, and there are many wooden houses. For these reasons, extra care was required in the adoption of isobutane, in order to avoid fires.



Fluorocarbon-Free Technology

Domestic refrigerator manufacturers developed various technologies and made structural improvements in order to enable the use of fluorocarbon-free refrigerants.

In order to minimize the use of the inflammable isobutane and avoid refrigerant leaks, various measures were taken such as developing technologies for reducing the quantity of refrigerant filling, the use of ultrasonic welding for the outside of the refrigerator, structures with the minimum number of welds, technologies using electric parts which do not ignite the refrigerant in case of leaks, and explosion prevention structures. As a result, the use of isobutane refrigerants was achieved.



Thermal Insulation of Refrigerators

In the past, CFC and HCFC were used as foaming agents of thermal insulation for refrigerators. Fluorocarbons were excellent substances as foaming agents, but as they were recognized as environmentally unfriendly, foaming agents for refrigerators are becoming fluorocarbon-free. Today, hydrocarbons (cyclopentane) are used as foaming agents in most of the refrigerators made in Japan.

Major National Policies

Many schemes are being put into place in order to encourage the use of fluorocarbon-free refrigerators.

1) Labeling Fluorocarbon-Free Appliances

Based on the "Rationalization in Energy Use Law", a "Standardized Energy Saving Label" is affixed to domestic appliances meeting energy-saving standards, providing easily to understand information on the energy-efficiency of the product to the consumer. A fluorocarbon-free mark is printed on this label along with energy-saving information (energy saving labeling system, multiple grade evaluation system, rough estimate of annual electricity charges, etc.) enabling the consumer to distinguish fluorocarbon-free products from products that use fluorocarbons.



2) Purchasing Initiative Taken by Governmental Entities

Based on the "Law Concerning the Promotion of Procurement of Eco-Friendly Goods by the States and Other Entities (Law on Promoting Green Purchasing)" requiring Government Entities to purchase environmentally friendly products, government entities have to follow the "Evaluation Criteria" listed below, when purchasing domestic refrigerators. " Factors for Consideration" are matters that are recommended for consideration but are not compulsory.

Evaluation Criteria and Factors for Consideration for Electric Refrigerators, etc., from the Law on Promoting Green Purchasing (extract)

Evaluation Criteria	① Omitted
	② No substance that depletes the ozone layer shall be used as a refrigerant or as an insulation foaming agent .
	③ No hydro-fluorocarbon (alternative fluorocarbon) shall be used as a refrigerant or as an insulation foaming agent.
	④ Omitted
Factors for Consideration	① Substances with the smallest possible impact on climate change should be used as refrigerants or insulation foaming agents .
	②～⑤ Omitted

Source: Basic Policy on the Promotion of Procurement of Eco-friendly Goods (Partly revised by the Cabinet on 5th February 2008)

When purchasing a domestic refrigerator or freezer, it is important to make sure that it is fluorocarbon free and energy-efficiency in order to gain further climate benefit.