

Realize a Sustainable Society



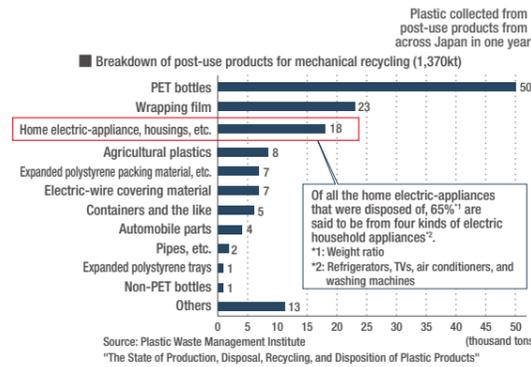
Reusing Plastic in Used Home Appliances for New Home Appliances The Mitsubishi Electric Group's "Closed-loop Recycling" Initiative

The Mitsubishi Electric Group, which aims to realize a sustainable society, has set out achieving a recycling-oriented society as one of its priority initiatives in an effort to solve environmental issues. The Group promotes the "3Rs"; reduce, reuse, and recycle, and engages in recycling of plastic in used home appliances as a business.

A heightened interest in the issue of waste plastic in Japan and overseas

Unlike natural organic matter, ocean plastic waste remains in the ocean without decomposing. As can be seen by ocean plastic receiving attention as a major cause of marine pollution, issues surrounding waste plastic have globally become more serious. Even when it is recycled, most plastic is downgraded to fuel or daily goods in many cases. Therefore, the value of used plastic as a material needs to be improved so as to use it at a higher level. In Japan, 1.37 million tons of plastic is collected from used products annually (results for fiscal 2019). Of this, 180,000 tons is plastic collected from home electric-appliances, housings, etc., accounting for a large percentage.*

* Source: Plastic Waste Management Institute



What is the Mitsubishi Electric Group's "Closed-loop Recycling" initiative?

Since 1999, which was before the enforcement of the Home Appliance Recycling Law in Japan in 2001, the Mitsubishi Electric Group has been operating the industry's first home appliance recycling plant to promote the recycling business. Since 2010, the Group has been fully implementing "closed-loop recycling," in which plastic collected from used home appliances is reused in Mitsubishi Electric's new home appliance products. In this recycling system, it is important to collect as much plastic without foreign matter as possible from products composed of diverse materials.

Hyper Cycle Systems (HCS), a home appliance recycling plant, and Green Cycle Systems (GCS), a plant which sorts plastic, play the main role in this initiative. HCS first disassembles used home appliances and then crushes them with machines. The crushed home appliances are then sent to GCS, which sorts and collects plastic.

Through collaboration between HCS, GCS, and Mitsubishi Electric's plants and laboratories to reclaim plastic used in home appliances at a level of quality equal to virgin materials and which can be utilized again for new home appliances, the Mitsubishi Electric Group continues to endeavor to further improve its "closed-loop recycling" system.

Producing "Materials" for reclaimed plastic by disassembling and crushing home appliances -Initiatives at Hyper Cycle Systems (HCS)-

HCS receives nearly 800,000 units of home appliances, etc. annually. Disassembly work starts from components that are easily removable from the home appliance manually. As each product has a different specification, workers use the know-how they have accumulated to separate large components, such as motors and compressors, and toxic substances, such as CFCs and mercury, one by one. Large sections of products that cannot be disassembled manually are crushed using a grinder, and then metals, such as iron, copper, and aluminum, are isolated and recovered using magnetic forces etc. The remaining plastic after recovering metals is called "mixed plastic" as it is not composed of a single material and has various foreign matter in it. Because mixed plastic is useless in Japan, much of it has been exported.

The Mitsubishi Electric Group focused on the value of this mixed plastic. It is finely crushed to a manageable size using HCS's unique fine crushing technology so that it can easily be handled in the sophisticated sorting process, and is then sent to GCS which is responsible for the post-process in which "material" for reclaimed plastic is processed.

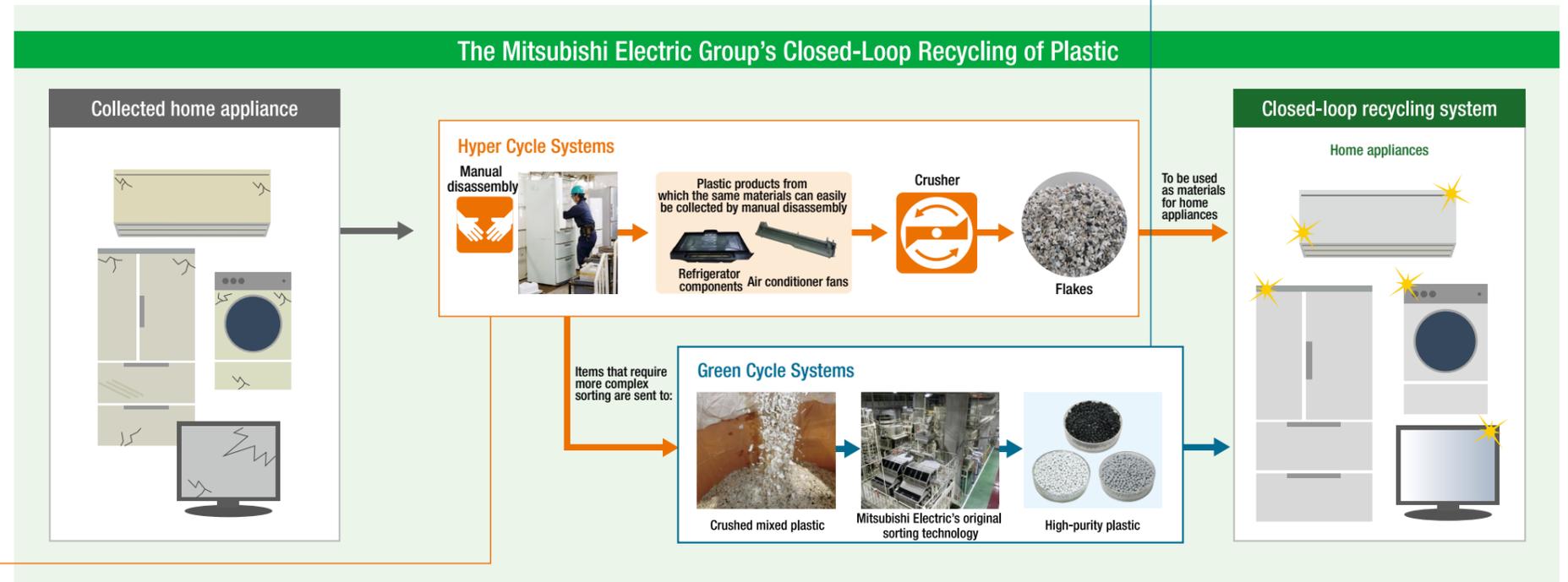
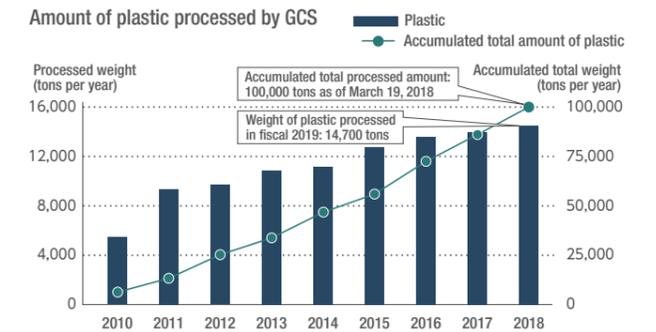
The vegetable containers and door pockets in a refrigerator are typical examples of simple plastic which is easily recyclable and HCS sends these through the recycling process.



Using proprietary sorting technology to sort and recover high-purity plastic from mixed plastic -Initiatives at Green Cycle Systems (GCS)-

The mission of GCS is to remove foreign matters from procured mixed plastic, sort and recover mixed plastic by type, and produce high-purity plastic that can be put into the Mitsubishi Electric Group's closed-loop recycling system at low cost. GCS has been developing technologies required for pursuing this mission one after another in collaboration with Mitsubishi Electric's laboratories. The Mitsubishi Electric Group was the first in Japan to successfully put high-purity sorting of polypropylene (PP), polystyrene (PS), and acrylonitrile-butadiene-styrene (ABS), the three main types of plastic used in home appliances, into practical use. GCS has so far processed an accumulated total of 100,000 tons of mixed plastic. Today, almost 80% of procured mixed plastic is put into material recycling as "high-purity plastic" with the same level of quality as virgin material. Of this 30% is used for home appliances manufactured by Mitsubishi Electric, realizing closed-loop recycling. The remaining 70% of reclaimed plastic is also utilized at various

locations as material used in distribution or as construction material in Japan which requires high quality (fiscal 2019 results).



VOICE (Recycling business supervisor)



Nobuyuki Tsuboi
 President
 Green Cycle Systems Corporation

When we first started the business, the material recycling rate of plastic was around 55%. Because improving the recovery rate while maintaining high-purity in reclaimed plastic is difficult, the Group united to review all kinds of processes and make steady improvement efforts and finally achieved the current recycling rate of 80%.

GCS's ultimate goal is to improve the value of material, put as much reclaimed material as possible into Mitsubishi Electric's new home appliances to be manufactured, thereby increasing the rate of closed-loop recycling, while reducing the cost of its home appliance products at the same time. In collaboration with Mitsubishi Electric's plants and laboratories, we will continue to expand the scale of closed-loop recycling. Replacing virgin material with recycled material is not easy as it requires changes of product design and so on. I believe that the Mitsubishi Electric Group was able to steadily undertake the transfer to making more use of recycled materials because of its clear policy which reflects how seriously the Group considers environmental issues.