Rebuilt Technology for High-quality Reuse of Automotive Electrical Parts

The automotive industry is eagerly embracing work on the '3Rs' as a way to promote sustainability and protect the environment. Drawing on the advantages it enjoys as a manufacturer of genuine parts, Hitachi Automotive Systems, Ltd. has developed a rebuilding technology system rooted in the technologies it uses to design and manufacture its own electrical parts (alternators and starters). The system produces rebuilt parts with the same appearance and functionality as new genuine parts. Various models of electrical parts are collected from automobile dealers and repair shops and subjected to a comprehensive set of specialized processes by highly skilled cross-trained workers. These processes cover everything from sorting, to dismantling, inspection, reuse, rebuilding, and testing. This system has been used for the past 25 years as a way to recycle collected electrical parts and sell them as vehicle service parts to automobile dealers and repair shops. It helps enable the high-quality reuse of automotive electrical parts.

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1. Introduction

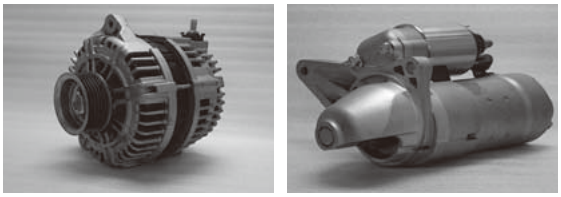
The worldwide growth of environmental awareness in the 1990s resulted in work on the '3Rs' (reduce, reuse, recycle) being seen as an increasingly important responsibility for manufacturers. Today, the old view of consumption based on disposable products is being replaced by a greater emphasis on environmental protection as a way to achieve sustainability. Hitachi Automotive Systems Co., Ltd. has responded to this trend by promoting its parts rebuilding business for automotive electrical parts. The company's parts (alternators[*1] and starters[*2]) are collected from automobile dealers and repair shops, then brought to a plant where rebuilding processes give them back the same appearance and functionality as new genuine parts.

Hitachi Automotive Systems has been repairing electrical parts since before the start of its parts rebuilding business, but previously had customer satisfaction problems such as meeting service parts delivery deadlines and maintaining quality. These problems arose because repair staff visited dealers and repair shops directly and did repairs on-site, and because each repair was handled individually (failed parts were collected from individual customers). To address these issues, the company started using rebuilding to repair electrical parts. It began with alternators and starters. These components are made up of several different types of parts and are easy to dismantle and

*1 AC generators that use the driving force of the engine to supply the power needed to the vehicle.
*2 Motors needed to start the engine.

Figure 1 — Completed Rebuilt Parts

Shown here are two typical examples of completed rebuilt parts, an alternator (left) and a starter (right).



reassemble, making them ideal for use in rebuilding. Rebuilding consists of bringing together the collected electrical parts at a plant and subjecting them to a comprehensive set of rebuilding processes. Using this approach lets the company offer customers higher-quality rebuilt parts without missing delivery deadlines. **Figure 1** shows a completely rebuilt alternator and starter.

Hitachi Automotive Systems started its parts rebuilding business in 1994. In the 25 years since, the company has drawn on its expertise as a genuine parts manufacturer to help enable the high-quality reuse of automotive electrical parts by manufacturing and selling rebuilt parts.

2. Overview of Electrical Parts Rebuilding Business

2. 1 Repair Procedure

The procedure for repairing electrical parts in the rebuilding system is as follows:

(1) Failed parts are collected from automobile dealers and repair shops.

(2) Collected parts are sorted into about 230 models.

(3) Parts are dismantled.

(4) Components are inspected to separate the reusable parts from the non-reusable waste parts.

(5) Reusable parts are cleaned for reuse. Afterwards, they are painted or plated to restore their appearance.

(6) Products are assembled from rebuilt and new parts, and then inspected.

(7) Products that pass inspection are packaged and shipped.

2. 2 Work Flow

Figure 2 shows the rebuild work flow. Each step in the flow from collection of failed parts to rebuild is described below.

Figure 2 — Rebuilding Work Flow

This diagram illustrates the work flow used for the parts rebuilding done by Hitachi Automotive Systems Co., Ltd.

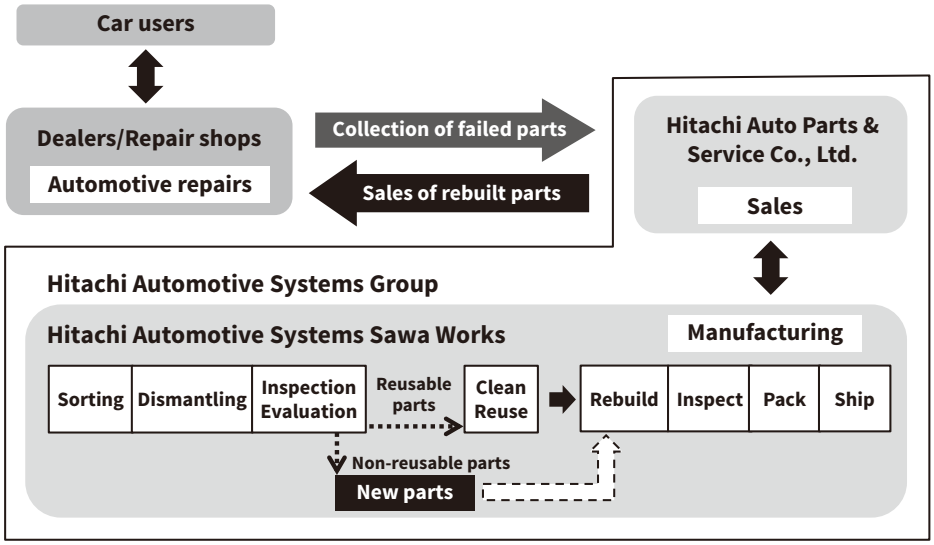


Figure 3 — Rebuilt Part Shipment Label
Labels indicating to return parts without dismantling are affixed to rebuilt parts packing boxes.

(1) Collection of failed parts

Hitachi Auto Parts & Service Co., Ltd. (the sales representative for Hitachi Automotive Systems) collects failed alternators and starters from automobile dealers and repair shops. The electrical parts are not dismantled at this point since dismantling needs to be done by specialists to prevent damage that would render the parts unfit for reuse. To enable problem-free collection, the return method of each rebuilt part sold is written on its shipping label (see **Figure 3**).

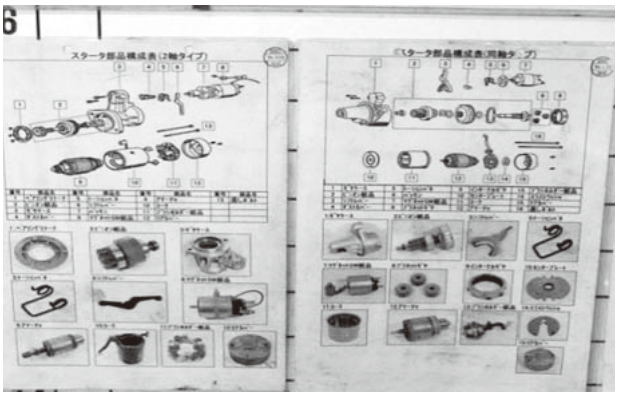
(2) Sorting

The collected electrical parts are brought together at the Hitachi Automotive Systems Sawa Works and sorted into about 230 different models of items handled as rebuilt parts.

(3) Dismantling

Using dismantling instructions like the example shown in **Figure 4**, the collected parts are sequentially dismantled starting from the part's exterior. A number of special techniques are used in the dismantling process, such as extracting easily deformable parts with low reusability by purposely deforming highly reusable covers for removal. The dismantling work is done by hand since there is a large mix of handled models and a small quantity of each.

Figure 4 — Electrical Parts Dismantling Instructions
The dismantling procedure for a typical electrical part.



(4) Inspection, evaluation

The dismantled parts are checked for deformations, scratches, wear, and other imperfections, then sorted into usable parts and unusable waste parts. The usable parts are broken down by type, and stored as reusable parts. This work is handled alongside dismantling by cross-trained workers with advanced skills.

(5) Cleaning, reuse

The usable parts are cleaned before the rebuilding work begins. Appearance is of high concern for covers since they are visible on the product surface. After cleaning and drying, covers are shot-blasted to remove imperfections and corrosion from their exteriors. Their exteriors are then painted and rustproofed to prevent a mismatched appearance when rebuilt covers are combined with new parts. For built-in parts such as rotors, stators, actuators, and yokes, functionality is of high concern. Their functionality is checked against the parts rebuilding assessment criteria, then their appearance is restored. Pulleys are also visible on the product surface, making their appearance important. They are replated, then restored by filing to fix any fine scratches. These processes produce rebuilt parts with the same functionality and appearance quality as new parts.

Figure 5 — Covers being Shot-blasted
Since appearance is of high concern for covers, they are shot-blasted to remove exterior imperfections and corrosion after washing/drying.

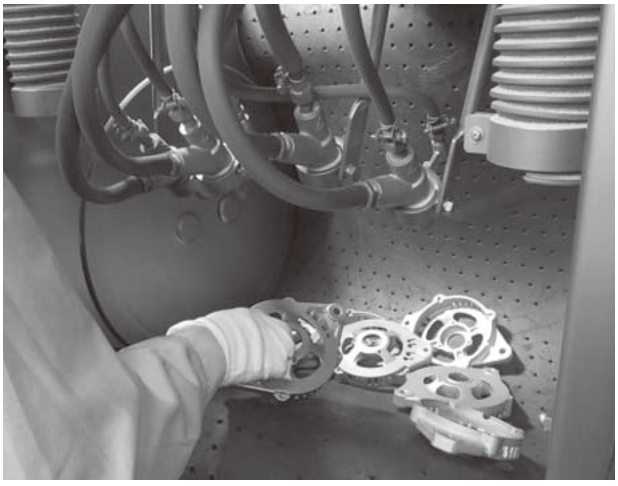


Figure 6—Inspection Process
A worker inspecting an assembled part.

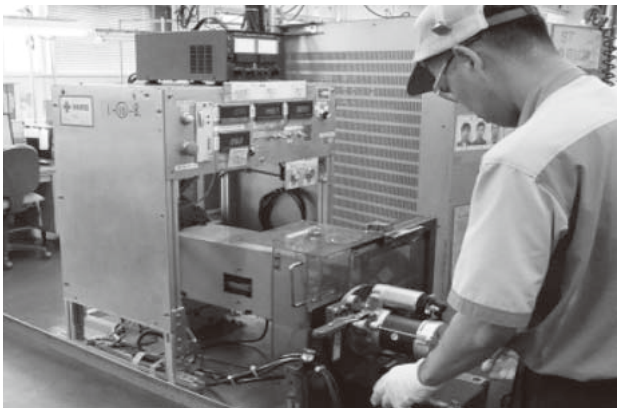


Figure 5 shows shot blasting work being done on covers.

(6) Rebuilding, inspection

Rebuilding and inspection are done using rebuilt and new parts, following the same manufacturing drawings used for new genuine parts. Just as for the dismantling, inspection, and sorting processes, the work is done by cross-trained workers with advanced skills. The processes create parts that maintain the same quality as new genuine parts. **Figure 6** shows the inspection process.

(7) Packaging, shipment

Electrical parts that pass inspection are individually packaged and sold as rebuilt parts to automobile dealers and repair shops through Hitachi Auto Parts & Service.

3. Conclusions

Hitachi Automotive Systems uses its expertise as a manufacturer of genuine automotive electrical parts to manufacture and sell rebuilt parts with the same appearance and performance quality as new genuine parts. The rebuilding and inspection work is done by cross-trained workers with advanced skills, and is tailored to the detailed structures of the company's own electrical parts, component improvement histories, inspection methods, and quality criteria. About 40% of the failed electrical parts collected are now used in rebuilt parts. In FY2018, 31,476 failed parts (about 160 metric tons) were processed, helping reduce waste by about 60 metric tons.

The company's parts rebuilding business received official recognition for its longstanding contribution to the high-quality reuse of automotive electrical parts when it won the Award of the Director-General of the Industrial Science and Technology Policy and Environment Bureau at the FY2016 Awards for Resources Recirculation Technologies and Systems given by the Resource Recycling Promotion Center of the Japan Environmental Management Association for Industry.

Hitachi Automotive Systems will continue using its parts rebuilding business to help promote the rebuilding and reuse of automotive electrical parts and the reduction of industrial waste.

Author

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Environment Protection Department, Standard Operation Unit, MONOZUKURI Management Division, Hitachi Automotive Systems, Ltd. *Current work and research:* Overall environmental work of Hitachi Automotive Systems.