

# Creating Ever-Better Cars



Development Management Headquarters  
Yuzo Konishi  
Director, Senior Managing Officer

## Imagining the Smiles and Excitement of our Customers

By creating ever-better cars, we aim to provide mobility freedom and happiness to everyone. For this purpose, we are working to develop a wide range of products that include minivans, SUV, commercial vehicles, commuter vehicles, assisted mobility vehicles for elderly and disabled persons, and the COMS single-occupant EV that delivers even greater environmentally-friendly living convenience.

Our customers' smiling faces



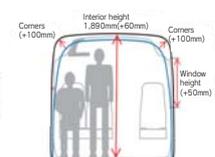
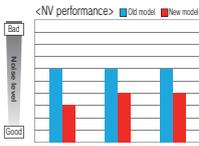
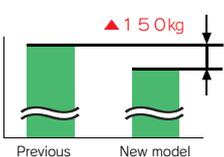
## Creating a Better Coaster

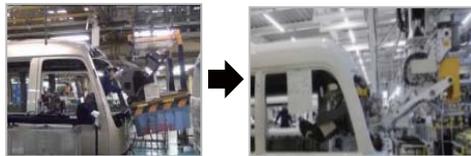
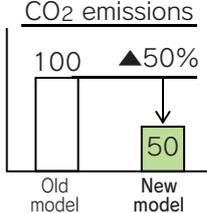
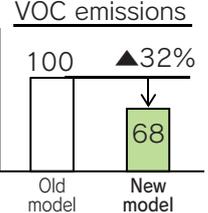
### A Project to Make a Better Coaster that Involved the Entire Company

Here we will introduce the project for the new-model Coaster – the first model change by the CV Company. As the first model change to the Coaster in 24 years, we paid careful attention to opinions from the customers, and worked to improve comfort, safety, and environmental performance in order to create a vehicle that exceeded customer expectations. (Introduced starting on the following page (P9 – P13).)



New-model Coaster  
(Released January 2017)

<p><b>Close Attention to Customer Input</b></p>  <p>Investigation of Road Environments (Papua New Guinea)</p>  <p>Public buses (Hong Kong)</p> <p>P.9</p>	<p><b>Pursuit of Comfort</b></p>  <p>Larger interior space</p>  <p>Improved NV performance</p> <p>P.9</p>	<p><b>Extensive Safety Features</b></p>  <p>First use of side-slip prevention</p>  <p>Improved overturning performance</p> <p>P.10</p>	<p><b>Earth-Friendly Environmental Performance</b></p>  <p>Efforts to reduce weight</p>  <p>Expanded use of recycled materials</p> <p>P.11</p>
---	---	--	--

<p><b>Creating ever-better plants</b></p> <p>( Friendly to people and the environment )</p>	<p>(Before) Manual work (Now) Automated machinery</p>  <p>Automated installation of the instrument panel module greatly reduces assembly work in the interior.</p>	<p><b>CO<sub>2</sub> emissions</b></p>  <p><b>VOC emissions</b></p>  <p>Reduction in CO<sub>2</sub> emissions from the new-model Coaster production line</p> <p>P.12 ~ 13</p>
---	---	---

# Creating Ever-Better Cars

## Creating a Better Coaster

### Close Attention to Customer Input

The Coaster is used in more than 110 countries and regions around the world. Overseas, it has earned a reputation for high reliability that is able to withstand harsh service environments such as deserts and resource extraction sites. A total of approximately 550,000 Coasters have been sold since its initial release.

### Investigating roads, environments, and manners of use in countries around the world

The developers themselves travel to countries around the world in order to investigate the road conditions, environments, and manners of use where the vehicles are actually used, and to directly receive customer input and apply it to future product development.



Coaster driving on rough, unpaved roads (Papua New Guinea)



Coaster used in desert areas (Algeria)



Coaster used for rental car customer transport in Okinawa (Naha Airport)



Coaster as a public bus (Hong Kong)

### Paying attention to valuable opinions and unfiltered comments of our customers

In response to a variety of opinions received from customers, the developers themselves travel to the markets and observe the way that the vehicles are used in the market, obtain direct input from the customers, and carry out new development.

#### <Main comments received from customers>

- A roomier interior space
- Continued long model life and conventional design
- Want storage space around the driver's seat.
- Want improved safety systems.
- Reliable use without breakdowns

#### Comment by a new-model Coaster developer



Product Planning Center Akihide Usami

At the first full model change in 24 years, in order to further improve the reliability that we developed with the Coaster over its long history, we always kept in mind how the customers actually use the vehicles in the market.

### Pursuit of comfort

#### [A roomy interior space]

The interior height was raised by 60 mm and the interior was expanded to the sides by an amount sufficient to place elbows on the windows (approximately 40 mm). The side window heights were also increased by 50 mm, and other steps were taken to provide a comfortable interior space with an open feel.

#### [Seats with a high-grade feel]

The "EX" seats add double stitching to a seat covering made from a combination of synthetic leather and fabric to produce a high-grade feel. Low-rebound urethane is used as the cushion material, improving the fitting feel when seated.

#### [Comfortable interior space]

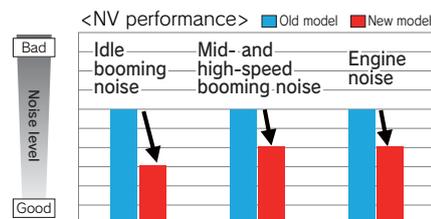
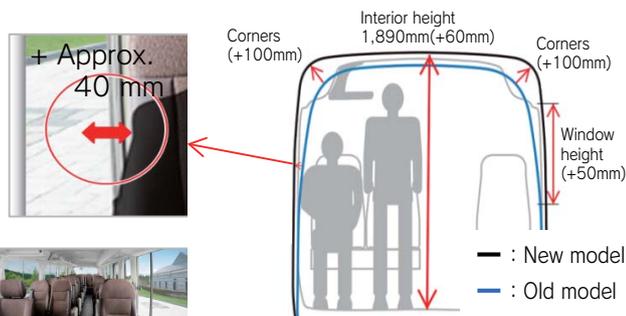
Improved body rigidity, the addition of sound insulation around the engine, an optimized layout, and other improvements have resulted in an improved level of quietness performance.

#### [Functional cockpit]

For the driver's seat, we expanded the front window opening, enlarged the field of view, and optimized the layout of function switches and storage compartments around the seat in order to minimize movement of the driver's line of sight, creating a cockpit that allows the driver to more easily concentrate on driving.

#### ["Modern and Tough" eye-catching exterior design]

A simple yet eye-catching modern design was adopted featuring prominent rounding of the top roof sides. The square body shell expresses the roominess of the interior. The character line which divides the top and bottom of the sides and the reinforced underbody around the tires produce a sturdy body that provides solid support to the cabin.



# ■Creating Ever-Better Cars

## Creating a Better Coaster

### Extensive Safety Features

We aim to create vehicles that will transport customers safely and securely to their destinations and back home again. We are continuing with development to produce this kind of vehicle.

#### [V S C (Vehicle Stability Control)]

The new Coaster is the first of its class in Japan to utilize VSC to prevent side-slip when cornering and ensure stability while driving.

<Image of VSC operation>

Conditions of front wheel side-slip (no VSC)

VSC helps to reduce the phenomenon that causes the vehicle to drift to the outside of a turn.



### Verifying suitability in a wide range of road surfaces and environments

Based on the results from on-site investigations and input from the customers, we simulated all kinds of road surfaces, environments, and manners of use around the world, and conducted repeated tests in a laboratory, on a test course, etc. in order to achieve high durability.



Hydraulics vibrate an actual vehicle on the tester, reproducing road surface conditions in order to evaluate durability performance.

### Aiming to protect customer safety by mitigating damage in the event of a collision

#### [Conformance with ECE standard\*1 R66\*2 (roll-over performance) – global safety evaluation standard]

The use of a rib bone frame\*3 and high-tension steel sheet gives the new Coaster conformance with the "ECE standard R66" global safety evaluation standard for bus body strength, and steps were taken to protect the passenger space in the event that the vehicle rolls over.

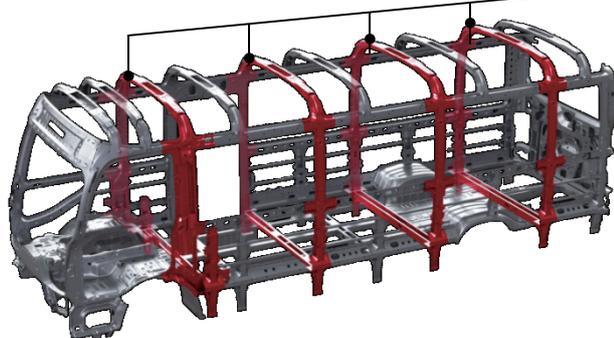
<Roll-over performance evaluation>



Testing with actual vehicles [Video]

- \*1: Economic Commission for Europe regulations
- \*2: Unified regulation for strengthening of bus top structures, prescribed in ECE standards
- \*3: Rib bone frame

An integrated structure that connects the roof reinforcement members and side pillars in order to increase strength and rigidity



#### Comment from a collision safety evaluator

Vehicle Collision Safety Development Dept. Ryota Shimizu



The Coaster has the largest occupancy of any Toyota vehicle. The desire to ensure the safety and security of these many passengers was a large part of the vehicle development. I am confident that this vehicle can mitigate damage to the occupants even in the event of a roll-over.

#### [Safety measures in special vehicles for children]

Special seatback cushions in the rear seats lessen the impact that occurs if a schoolchild hits the seat. A protector was also installed behind the driver's seat to improve the safety of children sitting in the front row.



Seatback cushions



Protector (front row behind driver's seat)



Protector (front row on left side)

Results of a dedication to making safe cars

# Creating Ever-Better Cars

## Creating a Better Coaster

### Earth-Friendly Environmental Performance

We understand that the issues of energy and global warming are important environmental problems that may have a major effect on humanity and ecosystems. Based on cooperation among related divisions, we are developing technologies and working from the initial design stage in order to create environmentally friendly vehicles.

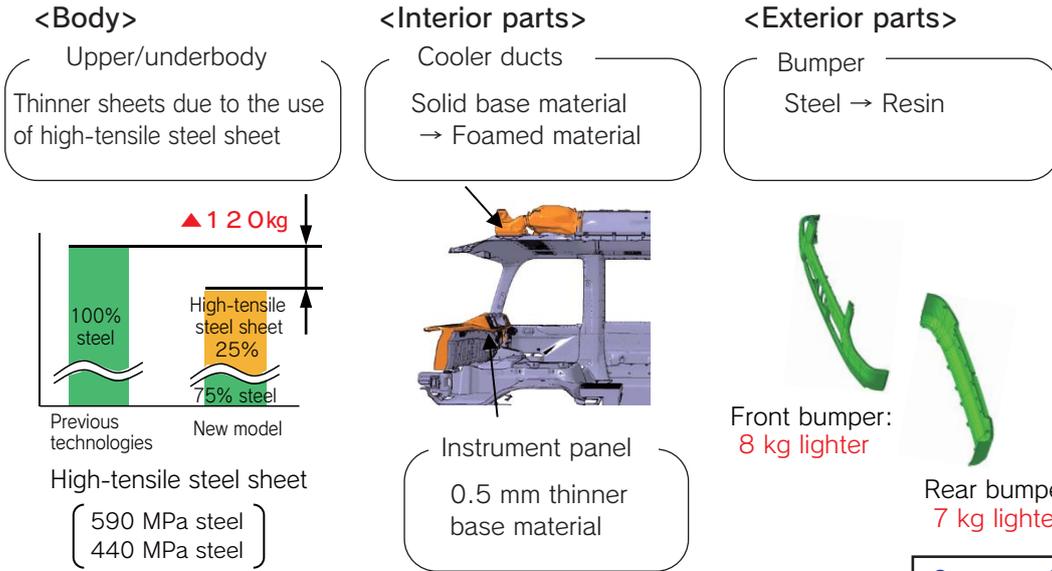


Discussions aimed at reducing Coaster weight involving officers of the development and production engineering divisions

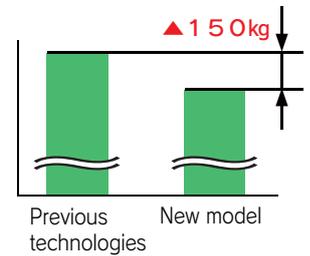
### Development of weight reduction technologies that contribute to top-class fuel economy performance

[Main programs for reducing the weight of body and interior/exterior parts]

By changing to high-tensile steel sheet, foamed base materials, resins, and thinner sheets, we achieved a weight reduction of 151 kg. Based on CAE analysis, we have achieved a high-level balance of body strength, including a rib bone structure, and lighter weight.



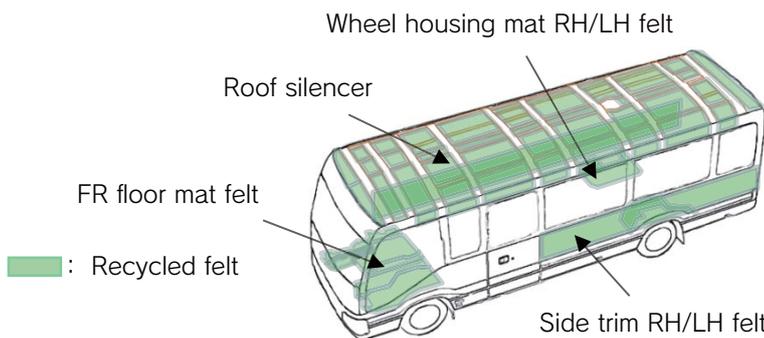
### Total coaster weight reduction



### Expanding the Use of Recycled Materials

[Expanding use of recycled materials recovered from the market]

The Coaster uses recycled felt, increasing the use of recycled materials.



### Comment from a new-model Coaster developer

Body Design Div. Kenichi Kaneda



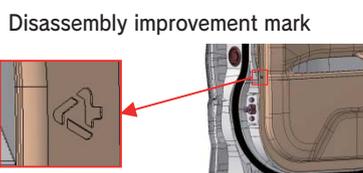
By making active use of high-tensile steel sheet in the body frame members, we were able to reduce sheet thickness and ensure safety while also reducing weight.

### Use of the Latest Technologies for Improving the Ease of Vehicle Dismantling

So that the used vehicles can be more effectively recycled, the latest improvements were actively incorporated beginning from the design stage to make the structure easy to separate and dismantle.

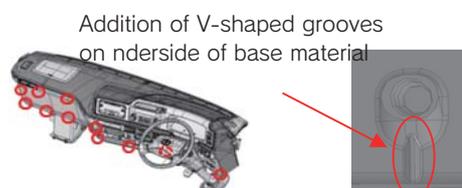
[Door trim that is easier to remove]

A position for starting removal is set, and a disassembly improvement mark is added.



[Instrument panel that is easier to remove]

A fracture structure was adopted with V-shaped grooves that make the panel thinner at the fastening points. This allows the structure to be easily removed by pulling on it forcefully.



[Wire harnesses that are easier to remove]

A harness layout was adopted for easy removal without interference with other parts, together with yellow tape that improves the visibility of the removal positions.



# Creating Ever-Better Cars

## Creating a Better Coaster

### Creating Ever-Better Plants

The new-model Coaster production line that was launched at Gifu Auto Body Co., Ltd. in January 2017 includes many quality improvements resulting from improvements focused on ease of assembly beginning from the development stage, carried out jointly by Development, Production Engineering, Production, and with the cooperation of the suppliers.

#### [Assembly process: Improved instrument panel installation work]

<Previous model>

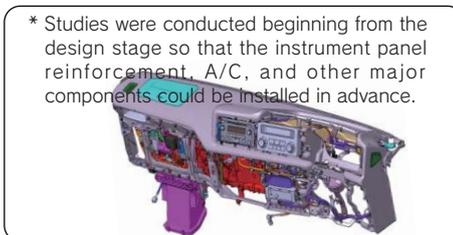
- Some of the instrument panel components were installed in advance into the interior, and the remaining components were then carried in by operators and assembled manually.

<New model>

- The instrument panel has been modularized\*, and is installed by automated machinery from the front window opening, greatly reducing the amount of assembly work required in the interior.



<Comment from an operator>  
Because we had to carry in the parts manually, we had to be very careful not to scratch them while working.



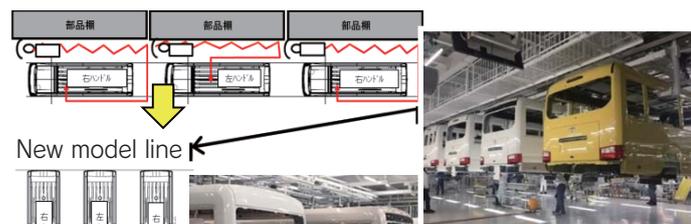
\* Studies were conducted beginning from the design stage so that the instrument panel reinforcement, A/C, and other major components could be installed in advance.



#### [Assembly process: Shortened line length (body sideways transport line)]

Sideways body transport was adopted for the trim line and underbody line where much interior work occurs, shortening the process length and reducing the distance that operators must walk.

Previous model line

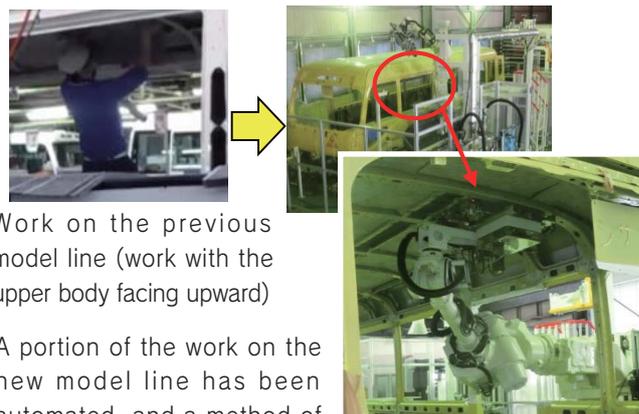


New model line



#### [Automation of difficult work (roof silencer application)]

A silencer (soft non-woven fabric) is applied to the entire roof (interior side) during the assembly process as a noise countermeasure.



Work on the previous model line (work with the upper body facing upward)

A portion of the work on the new model line has been automated, and a method of using a robot arm to apply the soft fabric was established.

#### [People-friendly interior assembly methods (improvement to seat installation workability)]

The installation of many seats into the interior of a micro bus is a major issue. The Coaster includes 14 seats.

(Comment from an operator)  
Space is narrow and contact is likely.



Work on the previous model line (installation of one seat at a time from the narrow passenger entrance)

(Comment from an operator)  
The large window opening makes it possible to install the seats without worrying.



On the new model line, each row of seats (2 seats: Single seat A and double seat B) is installed at once through the large side window openings.

#### Creating an assembly plant that is comfortable to work in Comment from an engineer

Vehicle Planning & Production Engineering Div. Tsuyoshi Kawai



The people are the most important part of an assembly plant. Through a focus on people-friendly work and repeated trial and error, we succeeded in finding the ideal approach to processes and equipment.

Assembly Section, Gifu Auto Body Co., Ltd. Toshihiro Fukuta



We carried out preparation for manufacture by focusing on minimizing everything (equipment investment, space, work man-hours, etc.)! We will continue to aim for further product and process improvements in the future.

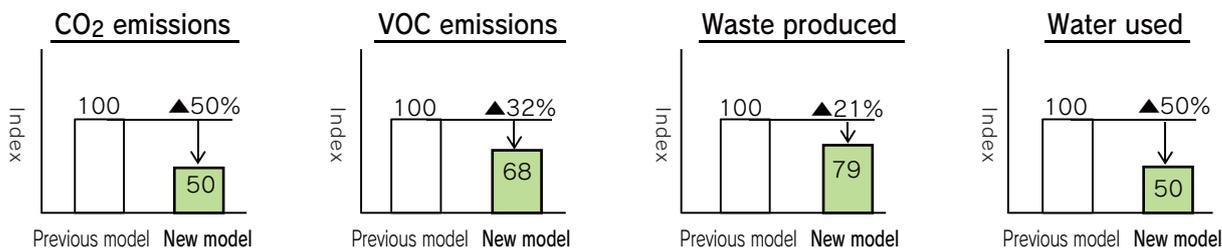
# Creating Ever-Better Cars

## Creating a Better Coaster

### Creating Ever-Better Plants

Aiming for production with little environmental impact, together with the model change and process renovation, the new-model Coaster line was improved by innovating the method of production and changing the product specifications and structure to create a more environmentally friendly and better plant.

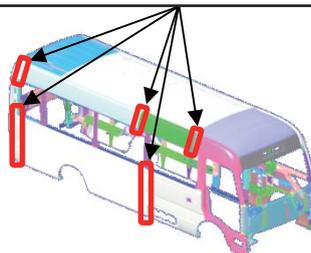
#### Reductions on the Coaster production line (primary units)



#### [Example: Sheet machining process]

Laser welding was introduced, a method that consumes less energy than conventional spot welding. The spot welds were changed from pressurized welding to non-contact welding to improve the finish quality, allowing the polishing process to be eliminated.

Change from spot welding to **high-speed laser welding!**



#### Welding CO<sub>2</sub> emissions



<Before (previous model)>      <Now (new model)>

**Spot welding**  
Materials are joined by heating which is caused at the electrode by pressure and large electrical current.  
(Contact welding → Spot marks occur.)

**Laser welding**  
Materials are joined by heating that is produced by a focused laser beam.  
(Non-contact welding)

Spot mark polishing process

(Abolished)

#### Comment from a technical developer

Body Assembly Engineering Div. Takatoshi Ito



We were responsible for all stages of development from initial development to line installation, and succeeded in creating a new benchmark technology. In the future, we will continue to develop production technologies for creating even-better vehicles that will please the customers, and creating even-better plants.

#### [Example: Painting process]

As a result of developing a method for changing to 3-wet painting and using color tape at painted locations, the painting booth and drying oven processes which produce large amounts of CO<sub>2</sub> have been shortened by 1/2, also reducing the energy used in production and VOC contained in the paint. A large amount of masking was also eliminated.

Change from masking + 2nd top coat to **tape application!**

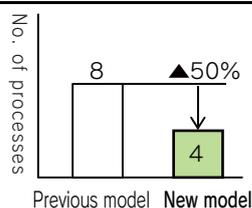


Applying masking + Top coat

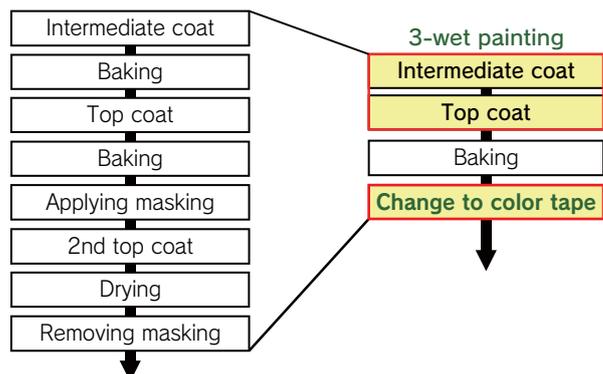


Tape application

#### Shortening of painting process



<Before (previous model)>      <Now (new model)>



#### Creating a painting plant that is comfortable to work in

Surface Finishing Engineering Div. Masato Miura



By focusing on ease of working from the beginning and utilizing technical innovations, we succeeded in creating a painting plant that looks much different from previous plants. In the future, Development, Production Engineering, and Manufacturing will join together to study and achieve ever-better plants for creating ever-better cars.

## Assisted Mobility Vehicles and Special Purpose Vehicles to Meet a Wide Range of Needs

# Providing Mobility Freedom and Happiness to Everyone

We are developing assisted mobility vehicles that can be enjoyed by disabled persons, as well as by elderly persons, nursing caregivers, and family members, and are also developing and providing a wide range of special purpose vehicles that are built to meet market needs.

### Assisted Mobility Vehicles and Units

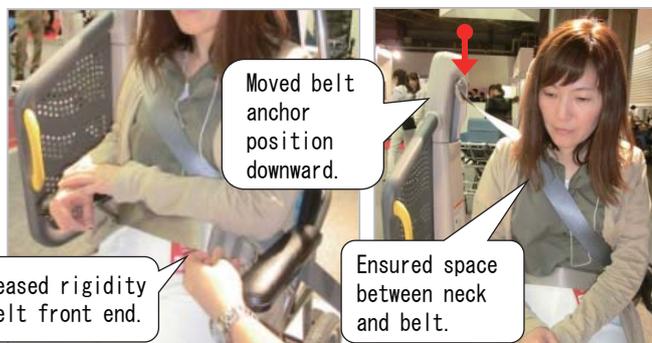
In order to satisfy our customers, we visited nursing care facilities, facilities for the elderly, and dealerships to see how our products are actually used and to acquire user opinions – information which we apply to product development.

#### Activities for investigating how customers use our products and applying the results to development

We have developed and marketed the Hiace wheelchair specification vehicle equipped with a wheelchair lift unit that improves ease of use by the customers.



<Application to development of the Hiace wheelchair specification vehicle>



Increased rigidity of belt front end.

Seatbelt that is easy to pass through the wheelchair

Ensured space between neck and belt.

Seatbelt aligned with shoulder

#### Input from customers

- When the caregiver attaches the seatbelt to a person in a wheelchair, passing the belt through the wheelchair wheels is difficult and time-consuming.
- When the seatbelt is fastened to a person in a wheelchair, it sometimes contacts the neck of elderly users.

### Promotion activities in Japan and overseas

We are actively carrying out promotion activities in Japan and overseas so that more people know about these vehicles.



A Toyota Auto Body employee explaining by demonstration (Barrier-free exhibition in Osaka)



Experiencing an assisted mobility vehicle (China (Beijing) International Exhibition of Rehabilitation, Nursing & Healthcare)

#### Comment from a developer of assisted mobility vehicles

Conversion & Mobility Vehicle Center Fukutoshi Nokubi



Because these vehicles are used to take persons to and from day care services and welfare facilities every day, we aimed to develop a product that was convenient for both wheelchair users and caregivers, and could be used with confidence. We will continue developing products that ensure high levels of safety and reliability in the future.

Lineup of Assisted Mobility Vehicles and Equipment

### Special Purpose Vehicles

Our subsidiary Tokai Utility Motor Co., Ltd. proposes a variety of utility vehicles to meet a wide range of customer applications.



Mobile sales vehicle



Airport baggage transport vehicle



Patrol vehicle with snowplow

Lineup of Special Purpose Vehicle Equipment

Activities of Tokai Utility Motor Co., Ltd.

## Environmentally Friendly Cars (Ultra Compact EV COMS, Fuel Cell Vehicles)

# Preparing for a New Kind of Automotive Society

The ultra compact EV COMS that is environmentally friendly and easy to drive is being used for a variety of purposes.

We are also working to develop and produce the core components for Toyota's fuel cell vehicles that are leading the way to a hydrogen society.

## Ultra compact EV COMS

### Used for a wide range of purposes

The environmentally friendly, compact, and highly maneuverable COMS is a car suitable for short-range mobility for purposes such as deliveries, sales, or shopping.

In Tokyo, a field trial is being conducted by the Ministry of Land, Infrastructure, Transport and Tourism by installing special spaces for car sharing arrivals and departures close to train stations. COMS are being used in a growing number of places, including as a means of transportation for mechanics at airports and other facilities where space is limited.



Beverage deliveries  
(Yakult)



Sharing vehicle  
(Times Car PLUS × Ha:mo)



Airport grounds transport  
for mechanics  
(JAL Engineering)

### Verification testing

We are utilizing the Ultra-Compact Mobility Certification System of the Ministry of Land, Infrastructure, Transport and Tourism and are conducting verification testing of a package delivery COMS with increased cargo capacity, as well as a two-seater COMS for government services and ride-sharing purposes.



Nagoya City, Aichi Prefecture  
Package delivery COMS (Japan Post)



Toyota City, Aichi Prefecture  
Two-seater COMS (sharing)

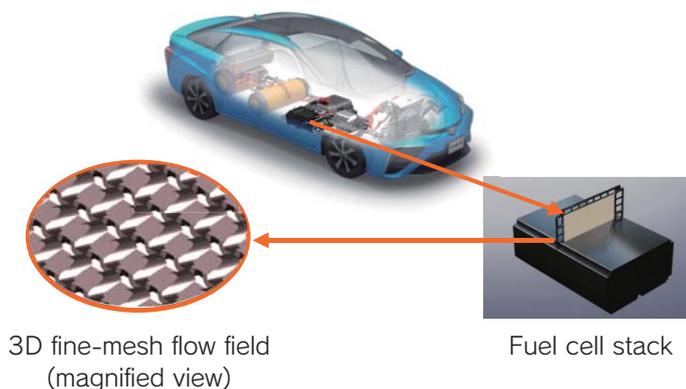
## Fuel Cell Components

### Development and production of fuel cell components

The world's first 3D fine-mesh flow field that was developed by our company is a core component in the fuel cell stack of the Toyota Mirai fuel cell vehicle.

Machining of the 3D fine-mesh flow field utilizes the ultra-precise, high-speed stamping technology that was developed by Toyota Auto Body, and is capable of producing extremely fine 3D lattice structures.

<Toyota Mirai fuel cell vehicle>



3D fine-mesh flow field  
(magnified view)

Fuel cell stack

(Image provided by Toyota Motor Corporation)

## Creating High Quality Cars

# Delivering High Quality Products by Putting the Customer First

We are working to create global No. 1 quality products that our customers can always use in safety and with confidence. We check for customer input regarding actual products in markets around the world, and carry out daily activities for improvements and preventive action, and work to ensure that all employees share the understanding that "quality is the lifeline of a company".

## Putting Customer First into Practice Throughout the Company

To set the Customer First, Quality First, and Genchi-Genbutsu (going to see the actual site and actual object) ideals deeply into the minds of all of our employees, we regularly conduct quality lectures and exhibit quality case studies, and provide multi-level quality training. This is intended to ensure that employees understand the need to improve the quality of their work in order to satisfy the customers, and apply this understanding to their everyday work.

### <Quality Month: Message from the President>

I would like to sincerely thank everyone in the company for working together in large numbers of new product projects and activities to improve quality.

Our mission is "creating ever-better cars that continue to support lives around worldwide, for people and for the world". Our company is responsible for everything from global product planning and development to vehicle production.

The key principles on which this mission is founded are **Customer First**, **Quality First**, and **Genchi Genbutsu**. However in fact we are still causing inconvenience to a large number of our customers.

At this exhibition, we look back at problems that occurred in the past. I ask that everyone renew their understanding of the need to improve the quality of our work in order to satisfy the customers.

### <Quality case-study exhibition>



Exhibition of case-studies using actual objects

## Applying Customer Input to Our Products

We utilize a genchi-genbutsu approach to obtain input directly from customers around the world and apply it to product development. Continuing from the previous year, during fiscal year 2016, staff from our Quality Assurance Division conducted investigations of how our products are used in the market in order to identify customer and market needs.

### <Examples of genchi-genbutsu investigations of customer opinions by the Quality Assurance Division for the Coaster and next-model project>



The Land Cruiser and LX have gained the most trust in harsh environments...



Sharing market information with agents (Russia)



Careful pre-delivery check



Visit to a dealership's new-vehicle inspection center (Japan)



Examples of Quality Programs: JiKotei Kanketsu (built-in quality with ownership) activities, EDER activities, customer evaluations

## Topics

Australia "2017 4×4 of the Year" award and achievement of Australia ANCAP5☆ rating (top rank)

### Award in Australia!

As a result of safety and marketability improvements and expanded variations, we were awarded the Australia "2017 4×4 of the Year" award. (Awarded to: Double Cab)



### Further improvements to safety

The Land Cruiser 70 has been used continually by customers around the world. We developed a "single cab pickup truck" that features further safety improvements.

We applied the results from genchi-genbutsu investigations and customer requests to our products.

(Collision safety)



(Acquired Australia ANCAP5☆ rating in Oct. 2016.)

## Working Together with Our Suppliers

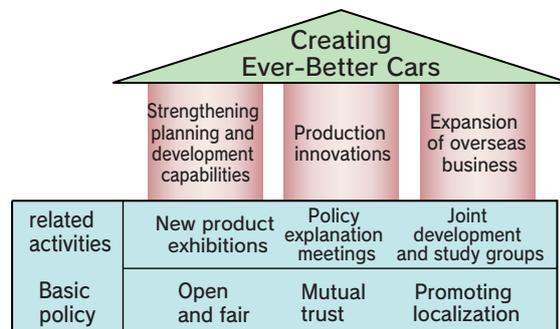
# Aiming to Create Ever-Better Cars

We are engaged in purchasing activities that are based on open and fair transactions, aiming for co-prosperity based on relationships of mutual trust with our suppliers, as we work to create ever-better cars.

## Basic Approach to Purchasing

We provide open and fair bidding opportunities to all suppliers in Japan and overseas that would like to do business with Toyota Auto Body, regardless of their nationality, size, or lack of previous transactions.

For this purpose, we have established a Basic Purchasing Policy and engage in global purchasing activities that aim to achieve the Customer First ideal in partnership with our suppliers.

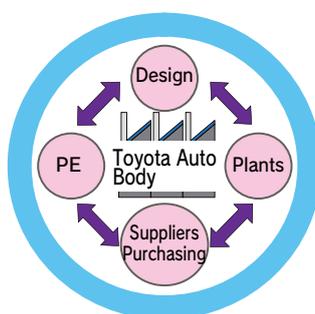


Towards creating ever-better cars

## Aiming to Create Ever-Better Cars

### New ideas for product development and manufacturing in conjunction with all members of the supply chain

When the time for a model change approaches, in addition to creating a wide range of bidding opportunities, we also hold part workshops so that suppliers can examine the parts and understand our system of vehicle production, as well as other events such as exhibitions of new technology proposals from suppliers. In cooperation between Toyota Auto Body and all members of the supply chain, we are carrying out activities to develop new ideas for creating ever-better cars.



Creating ever-better cars by centralizing the four key areas (Cross-functional development operations)



VA study meeting with the 1st-tier and 2nd-tier suppliers

## Sharing information with suppliers

In order to share changes at our company and our purchasing policy with suppliers, we hold the Purchase Policy Presentation Meeting (March of each year), Management Lecture (twice annually), and CSR Study Meeting (twice annually), and other meetings.

To make clear what we expect from our suppliers, we have created and implemented the Supplier CSR Guidelines and Green Purchasing Guidelines.



Supplier exhibition

## Programs that Support Purchasing Activities

### Educational activities using study meetings with supplier participation

We are conducting education activities with a wide range of study meetings conducted through the Shatai Kyowakai, a cooperative meeting of suppliers. These include research meetings, exhibitions, and the Transport Study Meeting and Safety and Health Liaison Meeting that are intended to eliminate accidents.

### Applying the results from supplier questionnaire surveys to our purchasing activities

In order to further reinforce our system of open and fair transactions and relationships of mutual trust, we ask approximately 340 suppliers to evaluate our company's purchasing activities, and obtain opinions and requests that are applied to future purchasing activities.



Exhibition of excellent case-studies from the Kyowakai



Mutually sharpening our skills at the Transport Study Meeting