Business Activities

Materials Handling Equipment

As a market leader with an extensive knowledge of global logistics needs, Toyota Industries provides a range of materials handling equipment, mainly lift trucks, and logistics solutions to customers.

Strengths

- An extensive logistics-related product lineup both in the fields of materials handling equipment (internal-combustion lift trucks, electric lift trucks, fuel cell (FC) lift trucks, etc.) and materials handling systems (automated storage and retrieval systems, automatic guided vehicle (AGV) systems, automated lift trucks, etc.)
- Software development capability to create such systems as a warehouse management system that comprehensively manages distribution center operations, from acceptance to stock and shipment, and optimally controls materials handling system equipment
- In-house development and production of key components of lift trucks, including engines and motors
- High technological capabilities, including those linked to environmental and safety performance
- Production know-how that ensures high levels of quality and production efficiency
- No. 1*1 in lift truck unit sales in the world
- Global, well-developed production, sales and service networks
- Total support services encompassing IT-based maintenance and inspection as well as operational management
- A wealth of experience and know-how accumulated in the Logistics Solutions Business

*1: Survey by Toyota Industries Corporation

Opportunities

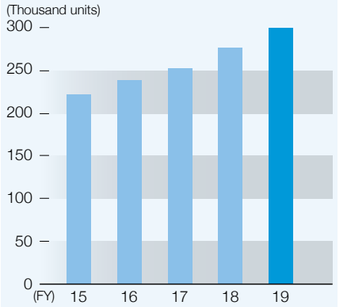
- An expansion of global logistics volume in line with an increase in the world population and economic growth
- Rising need for higher logistics efficiencies prompted mainly by soaring labor costs and labor shortages
- Expanding business domains mainly facilitated by a growth in e-commerce transactions
- Growing need for products with high energy savings and low environmental impact, driven by a rise in eco-consciousness and stricter environmental regulations

Risks

- Restrained capital investment due to a slowing economy
- Lower sales prices caused by intensifying competition
- Change in business environment triggered by an expanding market of low- to mid-priced lift trucks

Net Sales	FY2018		FY2019	Operating Profit	FY2018		FY2019
	¥1,283.0 billion	→	¥1,466.6 billion		¥104.9 billion	→	¥114.6 billion

Materials Handling Equipment Sales



Business Overview in Fiscal 2019

In the Materials Handling Equipment Business, the lift truck market in 2018 as a whole continued to expand globally, driven by strong sales in Europe and China. Amid this operating climate, Toyota Industries worked to strengthen production and sales activities matched to respective markets and rolled out new products. Consequently, unit sales of lift trucks for fiscal 2019 increased by 23,000 units, or 9%, to a total of 300,000 units over the previous fiscal year. As the need for higher logistics efficiencies remained strong, underpinned by an increase in logistics volume and a rise in the number of large logistics bases, Toyota Industries made efforts for further business reinforcement through collaboration with logistics solution subsidiaries in the United States and Europe. As a result of these activities, net sales in fiscal 2019 totaled ¥1,466.6 billion, increasing ¥183.6 billion, or 14% year-on-year.

Business Structure

Toyota Industries' Materials Handling Equipment Business is operated under a two-organization structure: Toyota Material Handling Group (TMHG) responsible for the Lift Truck Business and Toyota Advanced Logistics Group (TALG) engaging in the Logistics Solutions Business. TMHG and TALG collaborate with each other to achieve overall growth of the Materials Handling Equipment Business while reinforcing individual businesses.

Toyota Material Handling Group (TMHG)

Toyota Industries assists customers worldwide in attaining greater logistics efficiencies by undergoing changes over time as a market leader in the materials handling equipment and logistics fields and by delivering logistics solutions optimally tailored to their specific needs.

Under the TMHG management structure, we engage in the Lift Truck Business under the TOYOTA, BT, RAYMOND, CESAB and Tailift brands. Mutually utilizing the development and sales strengths of each brand, TMHG is promoting business on a global scale.

We basically carry out product development in three regions, namely Japan, North America and Europe. Based on this structure, we develop and manufacture products in each region, which are matched to the specific local needs and characteristics, and ensure quick product delivery to customers.

At the same time, we seek greater product appeal by conducting in-house development and production of key components of lift trucks, including engines and motors.

In addition to supplying such high-quality products, we have established a structure to support customers throughout our entire value chain that encompasses from selling products and providing after-sales services through our extensive networks to offering sales financing operations. Going forward, we will contribute to greater logistics efficiencies based on our comprehensive strengths in satisfying varying needs of customers worldwide. On the sales front, we are seeking to obtain large orders by responding to demands of customers who conduct business globally while undertaking sales activities matched to the specific conditions of each market. In terms of services, we assign experienced and knowledgeable service personnel and utilize leading-edge information technology (IT) to provide finely tailored services to customers. Our service personnel visit customers on a periodic basis and provide maintenance services to prevent troubles from occurring. When a problem does occur, they swiftly make a visit to the customer and promptly take appropriate action. We are also strengthening our internal sales financing operations mainly in Europe, the United States and other developed countries in order to respond to customers' wide-ranging needs in the area of equipment sales.

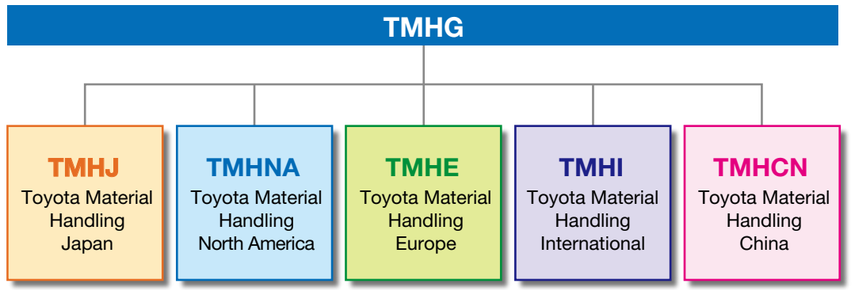
Toyota Advanced Logistics Group (TALG)

Following an expansion of the e-commerce market, providing solutions to diverse and complex logistics issues for distribution centers has become a pressing task, and needs for logistics solutions have been growing globally.

Amid this environment, we go a step beyond just providing a broad range of materials handling equipment and associated software programs and are reinforcing our Logistics Solutions Business to more meticulously satisfy each customer's varying needs by leveraging our logistics improvement know-how accumulated to date.

Under the TALG management structure, the Logistics System Engineering Department of Toyota Material Handling Japan, which mainly engaged in business in Japan, and two companies that joined the Toyota Industries Group in 2017, namely U.S.-based Bastian Solutions LLC and Netherland-based Vanderlande Industries Holding B.V., are promoting business while leveraging their individual strengths.

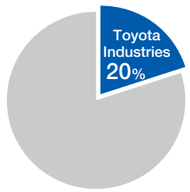
■ Toyota Material Handling Group



The Toyota Material Handling Group possesses several brands such as TOYOTA, BT and RAYMOND and engages in business by dividing the world into five areas: TMHJ (Japan), TMHNA (North America), TMHE (Europe), TMHI (Asia, Australia, etc.) and TMHCN (China).

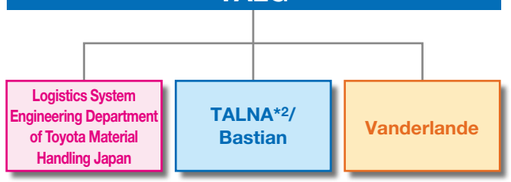
■ **Toyota Industries' Global Lift Truck Market Share**

(Survey by Toyota Industries Corporation, 2018)



World No.1

TALG



*2: Toyota Advanced Logistics North America

Under TALG, Logistics Engineering Division of Toyota Material Handling Company, Bastian and Vanderlande work together to promote the Logistics Solutions Business on a global scale while leveraging their individual strengths.

Business Activities in Fiscal 2019

With the continued growth of the world's lift truck market in 2018, we worked to enhance the product appeal of our mainstay lift trucks and reinforce our sales networks. We also strove to offer reliable after-sales services, enhance responsiveness to large-order customers and provide solutions to achieve greater logistics efficiencies through the introduction of distribution systems.

As an effort to meet the diverse needs of customers in the field of lift trucks, we proactively deployed new products in each region and have been increasing the lineup of telematics-integrated models and automated models for more efficient fleet operations. To appeal the attractiveness of our products to a broader audience and secure contact points with customers, we actively participated in exhibitions held in various parts of the world. For promoting sales, we reinforced sales of equipment and spare parts through each brand's Website to provide greater convenience to customers.

In the logistics solutions field, we formulated an outline of our strategy to promote coordinated activities as TALG. We will make maximum use of TALG's resources and provide logistics solutions unique to the Toyota Industries Group to customers worldwide.

Meanwhile, Aichi Corporation, which possesses the top brand*3 in the field of aerial work platforms in Japan, posted higher sales to the leasing industry, driven by an increase in capital investment for construction work. On the other hand, sales declined in the electric power, telecommunications and railway industries. As a result, Aichi's overall sales were on par with the previous fiscal year.

*3: Survey by Aichi Corporation

Aichi Corporation's aerial work platform

Activities of TMHG

Japanese Market

With the Japanese lift truck market continuing steady growth in 2018, Toyota Industries posted record-high unit sales in fiscal 2019 at 47,000 units, attaining a 9% increase year-on-year. Unit sales of Toyota Industries' lift trucks maintained the top position*4 in calendar 2018 for the 53rd consecutive year.

An expansion of the e-commerce market in recent years has given rise to an increase in new construction of larger distribution centers. Coupled with changes in the business environment caused by, for example, labor shortages, these developments have further increased the needs for logistics solutions that can offer greater logistics efficiencies and a higher degree of automation at logistics sites. To respond to these needs, Toyota Industries established in June 2018 the Toyota Material Handling Customer Center (CC) Osaka, a large consulting-based logistics show room, in Suita City, Osaka. Our first customer center, CC Tokyo*5 opened in 2001, and the second one, CC Aichi*6, have been well recognized by customers, receiving an increasing number of visitors every year. CC Osaka, our third base to disseminate information on our logistics solutions, serves to create closer ties between the TOYOTA brand and customers in western Japan.

Toyota Material Handling Customer Center Osaka

Within CC Osaka, we exhibit many of our latest logistics systems, equipment and technologies and present to customers the future logistics solutions envisioned by Toyota Industries. Specifically, we re-create various logistics sites, including a large distribution center fully automated with robotics technology and a production line that can flexibly respond to changes in production items and volumes, to showcase example solutions that capture the logistics issues of each business category. We also devise ways for customers to experience and visualize the functionality, ease of use and improvement effects of our products through oral explanations by dedicated staff along with visual exhibitions using virtual reality (VR) and augmented reality (AR) technologies.

Re-creating a large distribution center

In September 2018, Toyota Industries participated in Logis-Tech Tokyo 2018. Under the concept of "More Innovative and Beautiful Logistics for Japan—Opening a Brand-New World of Logistics Aesthetics," we operated the largest booth among the participating companies and displayed our advanced technologies and product appeal that have been further enhanced after the joining of Vanderlande and Bastian. Through these exhibitions, we showcased our global Logistics Solutions Business, which we promote on a Group-wide basis, to some 35,000 visitors.

Toyota Industries' booth at Logis-Tech Tokyo 2018

*4: Survey by Toyota Industries Corporation based on data published by Japan Industrial Vehicles Association
*5: Ichikawa City, Chiba Prefecture
*6: Takahama City, Aichi Prefecture (within Toyota Industries' Takahama Plant)

North American Market

In the expanding North American lift truck market, Toyota Industries remained the market share leader*7 in 2018 with combined unit sales of TOYOTA and RAYMOND brands of approximately 98,000 units, a record-high, up 10% from the previous fiscal year. In addition to lift truck sales, parts sales and orders for after-sales services remained strong.

Toyota Industries is proactively releasing new products both under the TOYOTA and RAYMOND brands to satisfy various customer needs. Toyota expanded its warehouse product offerings with the introduction of the 8-Series Order Picker. Toyota's new electric towing tractor utilizes high-output, high-efficiency drive motors to provide comparable performance to internal-combustion engine models and is an ideal solution for airports and cargo terminals. As for aerial work platforms, in addition to a scissor lift which is compact yet allows working at a greater height, a vertical type was added to the lineup to provide more options to customers. The vertical type realizes a smaller turning radius thanks to a shorter wheelbase, achieving higher operability in confined spaces.

8-Series Order Picker

Raymond rolled out the industry's tallest*8 Model 7530 Reach-Fork electric lift truck with integrated technologies and telematics. To respond to the industry need to automate end of line and P&D (pick up, drop off), Raymond also started offering a new stacker automated lift truck combining unparalleled vision technology.

Toyota Industries is also enhancing the lineup of entry-level models, with Tailift products handled by Toyota and Lift-Rite products marketed by Raymond. We have been working to increase recognition for these products through promotional campaigns and other means. These models are also available on our Websites, thereby responding to customers' needs to make purchases over the Internet.

Model 7530 Reach-Fork electric lift truck

In reinforcing collaboration between the Lift Truck Business and Logistics Solutions Business, we started selling and servicing Bastian products through our Toyota sales network. At ProMat 2019, North America's largest materials handling trade show held in Chicago in April 2019, Toyota, Raymond, Tailift, Bastian and Vanderlande joined together with collaborative displays to showcase both their individual and collective strengths to respond to the logistics issues of all customers.

Toyota Industries will continue to leverage the strengths of TOYOTA and RAYMOND brands and further accelerate the development of technologies utilizing automation, telematics and other cutting-edge technologies. In addition, we seek to expand our business by meeting customers' needs for greater logistics efficiencies through deeper collaboration within the logistics solutions field.

*7: Survey by Crist Information & Research, LLC, 2018
*8: Survey by Raymond Corporation

Toyota Industries' booth at ProMat 2019

European Market

Despite a slowdown in Sweden, the three Baltic countries and Turkey, the European lift truck market sustained growth overall in 2018, with strong growth in Germany, the Netherlands and Poland. In response to growing customer needs for automated and connected logistics solutions, Toyota Industries worked to enhance corresponding products and services. As a result, we posted unit sales of 95,000 units

TMHE's exhibition space at CeMAT 2018

in fiscal 2019, up 3% over the previous fiscal year.

CeMAT 2018, the world's premier intralogistics and supply chain event, was held in April 2018 in Germany. Toyota Material Handling Europe (TMHE), our European base for materials handling equipment, exhibited the newly launched offerings which help customers to improve efficiency, such as the Toyota Traigo80, a heavy-duty electric lift truck; in-house assembled lithium-ion batteries for electric range; and T-Stream, a new after-sales service tool developed in cooperation with Microsoft.

During the exhibition, TMHE also announced that all electric warehouse trucks produced at a plant in Sweden will be standard "smart trucks" integrating telematics capabilities and started producing this model in November 2018. Smart trucks accumulate such data as running distance and hours of operation immediately upon installation, making it easier to monitor fleet operations and determine maintenance timing based on the operation status. Customers can also analyze the data to improve the efficiency of their fleet operations. TMHE intends to maintain and reinforce its market leading position by proactively incorporating leading-edge technologies to provide new value to customers.


Smart truck

Toyota Industries' products have gained high recognition in Europe. The newly launched electric lift truck Toyota Traigo80 was recognized with two design awards, the 2018 German Design Award and the iF Design Award for its high energy efficiency, maneuverability and multi-pallet handling. In addition to awards for the Traigo model, the Pallet Drone, an autonomous pallet truck, obtained an iF Design Award in the discipline Professional Concept in the Mobility category for its advanced control technology.


Toyota Traigo80

In the area of sustainability, TMHE was awarded "Best Group Engagement" by EcoVadis, an international organization providing sustainability ratings of suppliers. TMHE was first evaluated at a group level by EcoVadis in 2012 and has expanded its annual EcoVadis assessments to 26 entities in Europe since then. In 2017, its four European plants, 21 national sales companies and the group as a whole were awarded 11 Gold, 13 Silver and two Bronze ratings.

In 2018, TMHE renewed its company strategy and recognized "automation," "connectedness" and "productivity" services as new priority areas for further business growth. Needs for automated and other logistics solutions are expected to increase in relatively small local markets as well. In response, TMHE has established a logistics solutions competence hub in Austria, the first base in Europe to appeal its logistics solutions capabilities to customers, and will work to capture demand in this region.

ALOMA*9 and Chinese Markets

Toyota Industries covers the ALOMA markets of some 60 countries in Asia, Latin America, Oceania, the Middle East and Africa as well as the Chinese market. We are serving these markets with a lineup consisting of TOYOTA, BT, RAYMOND and Tailift brands.

In 2018, both the ALOMA market (in all regions) and Chinese market expanded. Amid such conditions, Toyota Industries released new products and enhanced its sales and after-sales service structures. Unit sales consequently increased 15% over the previous fiscal year to 60,000 units in fiscal 2019.

In the electric lift truck field, for which needs have been growing, we released a number of new products, including four-wheel electric lift trucks, standing reach-type electric trucks, warehouse lift trucks equipped with lithium-ion batteries and electric towing tractors for use in airports. At the same time, we proactively appealed the functionality and characteristics of our products to customers. As a result, sales of electric lift trucks in the ALOMA market showed an increase of 13% over the previous fiscal year.


New electric towing tractor

To reinforce after-sales services to customers in Asia, we started implementing the Global Mobile Service Solution (GMSS), an internally developed mobile service system utilizing Internet of Things (IoT) technology. GMSS links Toyota Industries, dealers in each country and customers' fleet information by using cloud services. By centrally managing maintenance and repair information of lift trucks, the system improves the efficiencies of preventive maintenance and regular maintenance activities. Starting with Asia, we plan to implement GMSS throughout the world. In addition to our already superior product quality and durability, we seek to reinforce our after-sales services and pursue greater operational efficiencies for customers by minimizing the downtime of their fleets.


GMSS mobile service system

As a total solution provider, Toyota Industries has been strengthening efforts to respond to every logistics need of customers in the ALOMA market. In 2018, in collaboration with a new partner, we started selling storage racks, which makes it possible to offer lift trucks and racks in major countries in the ALOMA market. We offer a solution optimized to the layout and operation of a customer's logistics facility, providing greater convenience and helping customers achieve higher efficiencies.

With a view to responding to expanding and diversifying customer needs in the ALOMA and Chinese markets, Toyota Industries will continue to establish and enhance sales and after-sales service structures in these regions. Simultaneously, as the leading manufacturer of materials handling equipment, we will utilize IoT and other advanced technologies and further enhance our product lineup in order to provide comprehensive logistics solutions jointly with our dealers in each country.

*9: ALOMA is a Toyota Industries term for Asia, Latin America, Oceania, Middle East and Africa.

Activities of TALG

Logistics System Engineering Department of Toyota Material Handling Japan

In Japan, the aggravating issue of labor shortages has prompted efforts for labor and work savings in distribution warehouses, pushing up needs for automated logistics systems. Amid this environment, we developed an autonomous vehicle (AV) that does not require the installation of magnetic guides needed for AGVs and initiated a feasibility test. Among the existing AVs, our Key Cart small carrier offers both an autonomous driving feature and price competitiveness, making it easy to be introduced into a logistics site. Another AV, the AiR-series autonomous intelligent mobile robot, provides a feature to track the picking operator and help to resolve labor shortages by reducing the work load. As a new business domain, we are also carrying out the development of an autonomous conveying system that carries drugs and test samples in a hospital and baggage containers in an airport.


AiR-series autonomous intelligent mobile robot

Bastian

On the back of strong needs for logistics automation in not only the e-commerce sector but also in the manufacturing and retail sectors in North America, Bastian has been receiving orders from customers in a broad range of business categories and expanding sales. To handle increasing orders, at a new plant the company initiated the production of conveyors that have already been produced in-house. By increasing production capacity of conveyors, a key item in a logistics system, Bastian aims to reduce delivery time and further improve product quality.

In addition to its capabilities for system development and integration, Bastian has strengths in its ability to develop cutting-edge technologies. At MODEX 2018, a logistics systems and equipment trade show held in Atlanta in April 2018, the company presented its ULTRA loading and unloading robot, which drew a great deal of attention from customers around the world. Bastian delivered the ULTRA for the first time at the end of 2018 to a leading food manufacturer in the United States.


ULTRA exhibited at MODEX 2018

Bastian has been reinforcing collaboration with dealers of TOYOTA and RAYMOND brands in North America. In the future, Bastian will increase its capability to provide logistics solutions to lift truck users as a member of the Toyota Industries Group.

Vanderlande

Among logistics sites in Europe and the United States, which are Vanderlande's primary markets, an expansion of the e-commerce market and labor shortages have caused a sharp increase in needs for automated systems. Under such conditions, Vanderlande has obtained large orders for warehouse logistics and parcel/postal services from such companies as Amazon and DHL, and has been steadily increasing orders and sales.

In the airport business, Vanderlande has delivered its systems to more than 600 airports around the world. With orders for systems from new large airports, the company has been achieving further growth. Based on its long-standing relationship of trust with customers, Vanderlande has concluded continuous servicing contracts with existing customers, including Heathrow Airport in the United Kingdom.


Baggage handling system (Heathrow Airport)

The sharp increase in orders has made the recruitment of new personnel and swift human resources development an urgent task for Vanderlande. Accordingly, in January 2019 the company opened a new training center within the head office premises and started providing a range of educational programs aimed at globally maintaining its superior capabilities to propose logistics solutions and provide excellent services.

Vanderlande is also accelerating efforts to introduce its products into Japan through TMHJ, including identifying customer needs and establishing required sales and service structures.

Automobile

In the fields ranging from vehicle assembly to engines, car air-conditioning compressors and car electronics, Toyota Industries continues to meet the expectations and trust of its customers.

Strengths

- Highest-level production efficiency and quality among all Toyota-affiliated automobile body manufacturers (Vehicle assembly)
- An agile structure to undertake all aspects from planning and development to production within a plant (Vehicle assembly)
- Know-how on the development and production of diesel engines and turbo chargers (Engine)
- Highly efficient production of high-quality gasoline engines, including those for use in hybrid vehicles (HV) (Engine)
- Ability to develop excellent products with greater fuel efficiency, quieter operation, compactness, light weight and easiness to mount on vehicles (Car air-conditioning compressor)
- Global top-share* products for use in a full range of vehicles, from internal-combustion vehicles to HVs, plug-in hybrid vehicles (PHV), electric vehicles (EV) and fuel cell vehicles (FCV) (Car air-conditioning compressor)
- Global production structure based on the concept of local production and local consumption (Car air-conditioning compressor)
- Higher technological capabilities accumulated through the development and production of products for Toyota Motor Corporation (TMC), external sales and internal use (Car electronics)
- Development, production and top-level quality of electronic parts and devices for electrified vehicles (Car electronics)

* Survey by Toyota Industries Corporation

Opportunities

- Increasing needs for energy-saving products due to stricter environmental regulations and growing environmental consciousness
- Sales expansion in each sector in line with growth of the automobile market

Risks

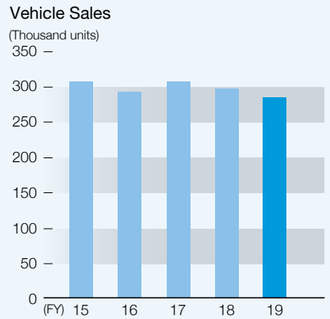
- Shrinking of the automobile market caused by economic slowdown
- Customers becoming reluctant to buy energy-saving products following less stringent environmental regulations
- A drop in product competitiveness due to the yen's appreciation or a rise in raw material costs

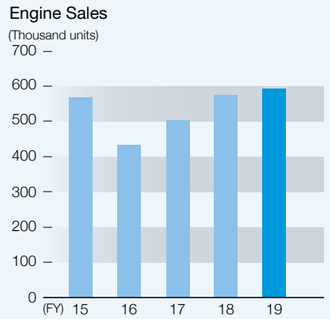
Net Sales

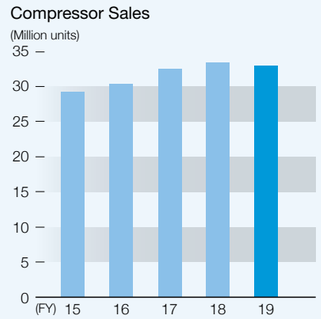
FY2018		FY2019
¥595.0 billion	➡	¥610.7 billion

Operating Profit

FY2018		FY2019
¥29.6 billion	➡	¥6.8 billion







Vehicle

Business Overview in Fiscal 2019

While sales were slightly down in Europe, the automobile market remained on par with the previous fiscal year on a global basis.

In fiscal 2019, unit sales of the Vitz (Yaris outside Japan) and the RAV4 decreased by 13,000 units, or 4%, from the previous fiscal year to 285,000 units. Net sales, on the other hand, increased by ¥10.3 billion, or 14% year-on-year, to ¥82.4 billion as production of the new RAV4 was launched in November 2018.

Highest-Level SEQCD to Contribute to Production of Toyota Cars

Toyota Industries' comprehensive strengths lie in the highest level of safety, quality, cost and delivery among all Toyota-affiliated automobile body manufacturers. In fiscal 2019, we received the Toyota Quality Control Award from TMC for seven consecutive years. We will remain committed to further strengthening our already superior level of safety, the environment, quality, cost and delivery (SEQCD). We also are working to leverage our ability to quickly start up production and a flexible structure in terms of vehicle models and production volume to contribute to production in Japan of Toyota vehicles.

Development and Production of Plastic Glazing

Toyota Industries' plastic glazing has been used in the panoramic roof of TMC's hybrid vehicle Prius α (Prius + in Europe and Prius v in North America).

The panoramic roof retains the beautiful surface quality typical of a glass roof yet is approximately 40%* lighter than its glass counterpart, improving vehicle fuel efficiency, which has become increasingly important, and thus contributing to the reduction of CO_2 emissions.

Toyota Industries will continue to develop attractive new products that leverage the distinctive characteristics of plastic glazing.

* Survey by Toyota Industries Corporation

Transfer of Vitz Production to Another Company—"Thank You, Vitz"

Toyota Industries had manufactured TMC's Vitz (Yaris outside Japan) for almost 20 years since January 1999. In September 2018, the production of the Vitz was transferred entirely from Toyota Industries to Toyota Motor East Japan, Inc.

"Thank You, Vitz" ceremony

TOPIC

The new RAV4 is TMC's fifth-generation global strategic vehicle. For this vehicle, Toyota Industries was involved in vehicle planning and upper-body development and assumed our first-ever role of spearheading production lines ahead of any other plants producing the new model around the world. It was a large project, involving switching the production lines for the previous RAV4 to those for the new model. It also required converting compact car production lines that had produced the Vitz into medium-class lines for the new RAV4. Building on our past experiences, we were able to launch production in a sequential manner in November 2018. These production lines are even more eco-friendly and boast a higher production efficiency than the previous lines. Several ideas generated within our plant have been highly recognized and adopted in other TMC plants.

Going ahead, we will further improve our product planning capability in addition to our existing strengths in SEQCD and intend to play more important roles as a leading plant producing compact sports utility vehicles (SUV) within the Toyota Group.

Production line for the new RAV4

Engine

Business Overview in Fiscal 2019

We discontinued the production of AR gasoline engines in June 2018. However, the launch of new A25A and M20A gasoline engines and increased sales of GD diesel engines pushed up unit sales in fiscal 2019 by 19,000, or 3%, over the previous fiscal year to 593,000 units. Net sales increased by ¥9.7 billion, or 10% year-on-year, to ¥108.4 billion.

Highly Acclaimed by Customers Worldwide

Toyota Industries' diesel engines are mounted in a variety of Toyota vehicles, including the Toyota Land Cruiser series, the world's renowned full-fledged four-wheel drive (4WD) model, and TMC's Innovative International Multipurpose Vehicle (IMV) series targeting emerging countries. Their high performance and reliability have gained strong market recognition. Currently, our mainstay products are in-line 4-cylinder GD diesel engines and V-type 8-cylinder VD diesel engines. GD diesel engines equipped with a turbocharger specifically and optimally designed and manufactured in-house are manufactured in Japan and by Toyota Industries Engine India Pvt. Ltd. (TIEI), a consolidated subsidiary in India. In fiscal 2019, we increased our production capacity of GD diesel engines in Japan, for which needs are increasing.

GD diesel engine

Turbocharger
(mounted on GD diesel engine)

Developing Competitive Engines in Industrial Fields

Toyota Industries' engines are highly renowned for their reliability and excellent environmental performance in industrial fields as well. These engines are used for a wide variety of applications, including our lift trucks, and adopted by many customers such as GHP*1 manufacturers in Japan and CHP*2 manufacturers worldwide. These engines offer downsized displacement compared with conventional models with equivalent output, resulting in higher fuel efficiency, cleaner emissions and a reduction in size. In 2017, our engine was adopted for the first time in the construction machinery field. We will continue to expand sales into this and other fields.

*1: Short for gas heat pump; air conditioner driven by a gas engine
*2: Short for combined heat and power; co-generation system

Toyota 1ZS diesel engine

Turbocharger
(mounted on Toyota 1ZS diesel engine)

TOPIC

In 2018, Toyota Industries launched production of two gasoline engines that are based on the Toyota New Global Architecture (TNGA)*3, namely the 2.5-liter A25A in October and 2.0-liter M20A in December. These new engines are mainly fitted in the new RAV4 manufactured at the Nagakusa Plant in Aichi Prefecture.

With the advancement of car electrification, we have added an HV version of the A25A engine to our lineup. The basic framework of all these engines was totally revamped based on the TNGA concept, and their renewed structure offers both excellent driving performance and environmental performance. In preparing to produce these engines, we incorporated our improvement know-how accumulated in the production of AR engines, the predecessor model. Simultaneously, we shared the new method and other information among relevant departments to swiftly identify and resolve issues. Through these efforts, we were able to smoothly launch production within a short period of time.

We will improve product quality and productivity further and contribute to the creation of "ever-better cars" by TMC both through diesel engines and gasoline engines.

*3: Development policy and method for vehicle creation based on a modular platform

2.5-liter A25A engine for HVs

2.0-liter M20A gasoline engine

Seeking Engines with Greater Product Appeal

Following the Paris Agreement adopted in December 2015 at the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), and with some countries announcing their shift from internal-combustion vehicles to electrified vehicles, there has been a growing need for engines with even greater fuel efficiency and cleaner emissions for HVs, PHVs and other electrified vehicles as well.

Diesel engines, on the other hand, enjoy an enduring popularity particularly as a power unit suited for SUVs and such commercial vehicles as pickup trucks, as they offer excellent basic performance of high fuel efficiency and high torque at low speed.

Aiming for further evolution of internal-combustion engines, we will continue to seek the world's highest-level combustion efficiency and develop more fuel-efficient and cleaner engines.

Car Air-Conditioning Compressor

Business Overview in Fiscal 2019

In fiscal 2019, unit sales of car air-conditioning compressors decreased 440,000 units, or 1%, from the previous fiscal year to 32.98 million units, affected by lower sales in Europe and Japan despite an increase in sales in China and other emerging countries. Net sales were down ¥5.2 billion, or 1%, from the previous fiscal year to ¥346.2 billion.

Development Efforts Centered around Energy Savings and Car Electrification

We expect continued growth of the car air-conditioning compressors market on the back of the expanding automobile market and an increase in the number of vehicles fitted with an air conditioner. In order to reinforce this business, we will channel resources into both types of compressors, namely compressors for internal-combustion vehicles, which are still mainstay products for the time being, and compressors for electrified vehicles, for which we anticipate stronger demand in the future.

More stringent fuel efficiency standards have been enforced across the world, driving needs for higher fuel efficiency both for internal-combustion vehicles and electrified vehicles. Our variable-displacement type compressors for internal-combustion vehicles, which are renowned for high fuel efficiency and reduced weight, have been adopted by the world's leading automakers, including TMC, Daimler AG, General Motors Company (GM), Volkswagen AG and Hyundai Motor Company.

6SES14 compressor
(variable-displacement type)

In the United States, our SES series became the first compressor to be approved under the country's off-cycle credits program. The program gives off-cycle credits to technologies that can effectively improve fuel efficiency under its emissions regulations. We have since been working to increase the number of models equipped with the SES series compressors.

For electric compressors, for which growth in demand is expected over the medium to long term, we are differentiating them in accordance with the needs of individual electrified vehicles ranging from HVs to EVs. To ensure the quietness of operation, which is important in all types of electrified vehicles, we are conducting sensory evaluation through actual driving tests and quantitative evaluation using a soundproof wind tunnel that can re-create the conditions of actual driving. These evaluations are carried out at our new Kameyama Proving Ground (test driving course) opened in Mie Prefecture in 2018. In response to the expected increase in EVs, we are devising measures against electromagnetic noise that could affect home electric appliances during charging. We utilize simulation technologies to swiftly create designs suited for various vehicles and offer solutions to problems by leveraging the insight, which we, as the leading compressor manufacturer, have accumulated through interactions with a number of automakers.

Soundproof wind tunnel installed at the Kameyama Proving Ground

Besides TMC, Ford Motor Company, Renault S.A.S., Honda Motor Co., Ltd., Nissan Motor Co., Ltd. and other automakers, which are already using our electric compressors in their respective HVs, PHVs and EVs, we will continue to ramp up our efforts to expand sales to other automakers around the world.

Developing Next-Generation Products

Following car electrification and widespread use of autonomous driving technology, there has been a growing need to cool electronic devices, batteries and other heat-emitting components. In response, Toyota Industries plans to conduct development for using the cooling function of a compressor not only for vehicle interior air conditioning but also for key components. Besides this cooling functionality, we intend to utilize our core technologies to expand our business domain into core components for drive systems.

TOPIC

Based on compression technology used in compressors, we have developed an oxygen-supplying air compressor and hydrogen circulation pumps for FCVs, which have been fitted in TMC's MIRAI FCV. The invention of an FCV air compressor by Toyota Industries received the Japan Patent Office Commissioner's Award in the National Invention Commendation 2018 hosted by the Japan Institute of Invention and Innovation. As an FCV runs on

electric energy generated through the chemical reaction between oxygen and hydrogen, an air compressor that takes in, compresses and sends air (oxygen) to an electricity generation unit is a key component of an FCV and greatly affects its performance. We utilized our compression technology cultivated in developing car air-conditioning compressors and developed an air compressor with the world's first six-lobe helical root-type rotor. By increasing the number of lobes of a rotor and twisting them, we achieved continuous and efficient air compression from low speed to high speed. The award recognized its contribution to the quicker acceleration and longer driving range of the world's first mass-produced MIRAI FCV. For the ultimate goal of realizing a hydrogen-based society, we will continue to improve the performance of components fitted in an FCV to help increase the popularity and use of FCVs.

Oxygen-supplying air compressor for FCVs

Increasing Competitiveness by Creating Production Facilities In-House

Achieving high levels of fuel efficiency and reliability requires high-precision processing technologies for compressors for both internal-combustion vehicles and electrified vehicles. Toyota Industries realizes high-speed and high-precision machining by leveraging its know-how accumulated through responding to the stringent demands of automakers worldwide and by developing devices from processing machines to associated cutting tools in-house.

Establishing Optimum Global Production and Supply Structures

To respond to growing demand for variable-displacement type compressors triggered by the enforcement of more stringent fuel efficiency standards, we are proceeding with augmentation of corresponding production capacities and commenced local production of key functional parts at our production bases in North America.

In Europe, the ASEAN region and China as well, we are expanding production capacities and increasing the ratio of locally procured parts to accommodate growing demand for car air-conditioning compressors.

We have also set up a system that allows design and production engineering departments to work as one team and increase production capacities in a phased manner. Through this system, we make efficient investment according to the production volume.

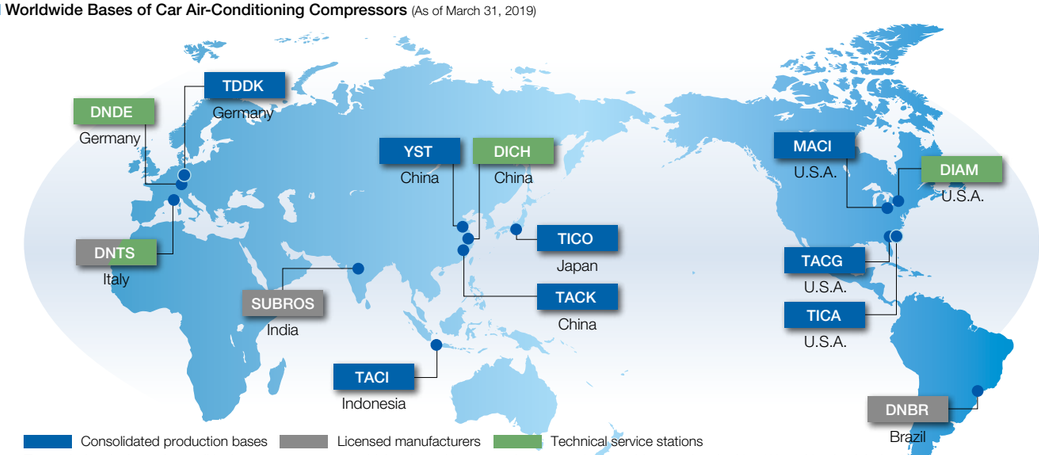
TOPIC

TD Deutsche Klimakompressor GmbH (TDDK), our consolidated subsidiary in Germany, started its operation as a base to supply car air-conditioning compressors to Europe in April 2000. In August 2018, it marked a milestone, reaching cumulative production of 50 million units. TDDK currently produces variable-displacement type compressors with high fuel efficiency. In fiscal 2014, TDDK started design and evaluation operations locally and has been recognized highly by automakers for its ability to reduce development lead time.

TDDK will continue to play an important role as one of the global production and supply bases of Toyota Industries.

Ceremony to commemorate TDDK for reaching cumulative production of 50 million units

■ **Worldwide Bases of Car Air-Conditioning Compressors** (As of March 31, 2019)



Toyota Industries' car air-conditioning compressors are widely adopted by automakers around the world, garnering the No. 1*4 position in global sales.

*4: Survey by Toyota Industries Corporation

Car Electronics

Business Overview in Fiscal 2019

Net sales of car electronics products increased, primarily supported by sales of DC-DC converters, DC-AC inverters and other devices mainly to TMC.

Steadily Expanding Roles of Our Devices for Electrified Vehicles

Toyota Industries develops and produces electronic devices for electrified vehicles, including HVs, PHVs, EVs and FCVs. In addition to TMC, we are promoting new business to other automakers across the world.

Auxiliary Power Source Devices

A DC-DC converter converts the high voltage of HV, PHV and EV batteries into a lower voltage level to supply power to standard electrical devices such as lights and wipers. For the fourth-generation Prius, by developing the world's first*5 thick copper substrate with excellent heat dissipation capability, we reduced the volume and weight of the product.

DC-DC converter mounted in the Prius

An on-board charger converts AC voltage from the power grid into DC voltage of high-voltage batteries in vehicles and is necessary for charging EVs and PHVs, for which the market is expected to expand in the future. Starting with TMC's Prius PHV, we are promoting sales to various automakers.

Additionally, we have started production of DC-DC converters and on-board chargers outside Japan in response to increasing global production needs.

A DC-AC inverter is a power source device equipped to use home electric appliances in a vehicle. The 1.5-kW type, in particular, can operate appliances that require more power, such as rice cookers and hot plates, allowing use as an emergency power source in a disaster in addition to camping and other outdoor applications. The role of a vehicle as a power source has drawn much attention as we experienced a number of disaster-induced power outages in Japan in fiscal 2019.

On-board charger mounted in the Prius PHV

We will proceed with the development and production of DC-AC inverters as a key component that adds new value to electrified vehicles. (See Special Feature 2 on pages 26–29 for details.)

In addition, we supply power source devices for TMC's MIRAI FCV and FCVs of automakers around the world.

*5: Survey by Toyota Industries Corporation

Core Components for Drive Systems

The fourth-generation Prius offers a 4WD model for the first time in the series and is fitted with our rear inverter for 4WD. This product converts the DC voltage of HV batteries to AC voltage and feeds power to the 4WD rear motor. The adoption of a forced air-cooling system eliminates the need to install cooling water piping, thereby providing greater ease in mounting the inverter on vehicles. The inverter also features quieter operation as it is mounted near the rear seat.

4WD rear inverter mounted in the Prius

Charging Infrastructure

Toyota Industries sells public-use charging stands and home-use charging units for PHVs and EVs, which were jointly developed with Nitto Kogyo Corporation. Currently, we are conducting an IoT feasibility test at IKEA Nagakute in Aichi Prefecture. We are linking charging-only sub-stands and a main control stand, which offers charging functionality as well as communication, billing and other features, and remotely controlling optimum charging.

Charging stand for PHVs and EVs

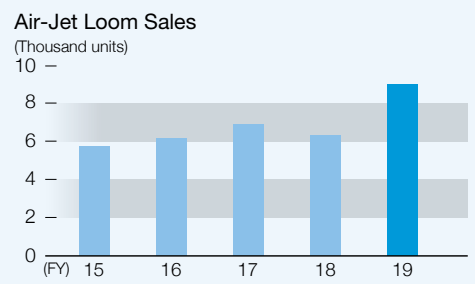
Contributing to a Low-Carbon Society

The electrification of vehicles and materials handling equipment is expected to become more widespread with the enforcement of more stringent fuel efficiency standards by many countries and higher environmental consciousness among customers. We will reinforce our planning, development, production and sales structures in the fields of HVs, PHVs, EVs and FCVs with the aim of contributing to a low-carbon society.

Textile Machinery

Carrying on the philosophy of founder Sakichi Toyoda, which reflects his strong commitment to manufacturing, Toyota Industries responds to a broad range of needs with its extensive product lineup, from air-jet looms, for which we enjoy the world-leading market share* in unit sales, to ring spinning frames and roving frames.

* Survey by Toyota Industries Corporation



Strengths

- Broad product lineup both in the spinning and weaving machinery fields
- Global, well-developed service network
- World-leading market share* in unit sales of air-jet looms
- Ability to develop products that excel in high-speed operations, reliability and energy-saving performance

Opportunities

- A rise in textile demand in line with an increase in the world population
- Further increasing applications in industrial textile products
- Increasing need for high-quality and highly functional yarn and textile products, following the economic growth of emerging countries

Risks

- Changes in each government's policies concerning promotion of the country's textile industry
- Economic slowdown
- A decline in capital investment due to a drop in raw cotton and/or yarn prices
- Weaker sales due to intensifying competition

	FY2018		FY2019
Net Sales	¥65.5 billion	➡	¥76.3 billion
Operating Profit	¥6.1 billion	➡	¥7.3 billion

Business Overview in Fiscal 2019

The textile machinery market was weak in some countries in Asia but remained strong in China. Unit sales of air-jet looms increased 2,700 units, or 43% year-on-year, to 9,000 units. Net sales were up ¥10.8 billion, or 17%, over the previous fiscal year to ¥76.3 billion.

Growing Needs for Air-Jet Looms

Toyota Industries' air-jet looms are adopted by customers in China, India and many other countries. Produced fabrics are used broadly for towels, shirts and other clothing purposes as well as in industrial products such as materials for electronic substrates and vehicle airbags. Recently, an increase in mobile electronic devices has driven the need for fabrics of woven glass fiber for use in electronic substrates, and it is anticipated that applications for air-jet looms will expand further. On the sales front, the recent adoption of more stringent water quality regulations in China has prompted demand to replace water-jet looms with air-jet looms. In response, we plan to expand sales of air-jet looms by appealing their high environmental performance.

Reinforcing Position as a Leading Manufacturer of Quality Measurement Instruments for Fiber, Yarn and Fabric

Uster Technologies AG, a Swiss-based consolidated subsidiary manufacturing quality measurement instruments for fiber, yarn and fabric, made Israel-based Elbit Vision Systems Ltd. (EVS) into a subsidiary in 2018. EVS develops and produces inspection instruments for textile fabrics. The acquisition has made Uster the world's only* manufacturer to offer quality measurement instruments for every stage of textile products from raw cotton to yarn and fabrics. Capitalizing on this unique strength, Uster intends to further reinforce its position as a leading manufacturer of quality measurement instruments for fiber, yarn and fabric.

Taking Part in the Largest International Textile Machinery Trade Show in Asia

In October 2018, Toyota Industries participated in ITMA ASIA + CITME 2018, Asia's largest international textile machinery trade show. The show was held in Shanghai, China, which is one of the largest textile markets in the world.

At Toyota Industries' booth, we exhibited the JAT810 air-jet loom equipped with our original electronic shedding device, and the demonstration of the high-speed weaving of complex-patterned fabrics was well received by many visitors. We also displayed special design yarn samples created by the RX300 high-speed ring spinning frame to showcase its versatility to produce various types of yarn from ordinary to decorative yarn.

At Uster's booth, EVS's fabric inspection instrument was exhibited for the first time under the Uster brand, along with Uster's yarn quality measurement instruments, and drew the attention of many visitors. Through various textile machinery exhibitions, we will continue to appeal to customers our technological capability to meet their needs and reinforce our brand strength to gain greater trust from them.

Uster's booth bustling with many visitors

Staff who participated in the trade show