

## Special Feature 1

# Strengths of Our Materials Handling Equipment Business Aiming for Sustainable Growth

Since launching the production of lift trucks in 1956, the Materials Handling Equipment Business has grown into Toyota Industries' mainstay business through increased product appeal, an improved ability to provide excellent services and an enhanced network. In the meantime, the development of the global economy, innovation of information-related technologies and expansion of e-commerce and other new industries have generated new, growing needs in the logistics field. Toyota Industries has responded to such needs and assisted customers in increasing logistics efficiencies by not only offering materials handling equipment as well as logistics systems and equipment but also by focusing on logistics improvements and solutions.

This Special Feature highlights the strengths and initiatives of our Materials Handling Equipment Business that strives to expand business by combining lift trucks and logistics solutions.

**Distribution and manufacturing industries**

**Distribution center**

**Seaport**

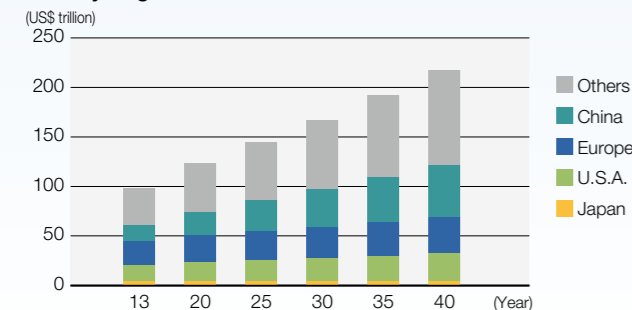
**Airport**

Toyota Industries' materials handling equipment as well as logistics systems and equipment support logistics operations of customers worldwide at distribution centers, manufacturing sites, seaports, airports and other locations.

### Environment Surrounding Logistics

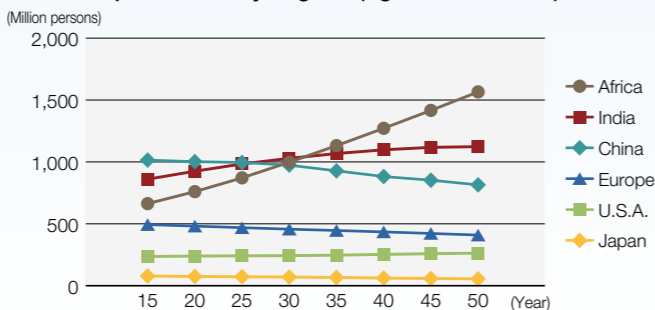
The need for higher logistics efficiencies is growing, driven by an expected increase in logistics volume over the medium to long term on the back of further growth of the global economy, coupled with a rise in labor costs mainly in emerging countries and labor shortages in developed countries. Besides conventional logistics operations using lift trucks, an expansion of e-commerce has increased the need for handling smaller parcels. In this way, customers' logistics-related needs have also become increasingly diversified.

#### GDP by Region



Source: Produced by Toyota Industries based on the U.S. Energy Information Administration's International Energy Outlook 2017

#### Labor Population in Key Regions (Ages from 15 to 64)



Source: Produced by Toyota Industries based on the United Nations' World Population Prospects (2017 Revision)

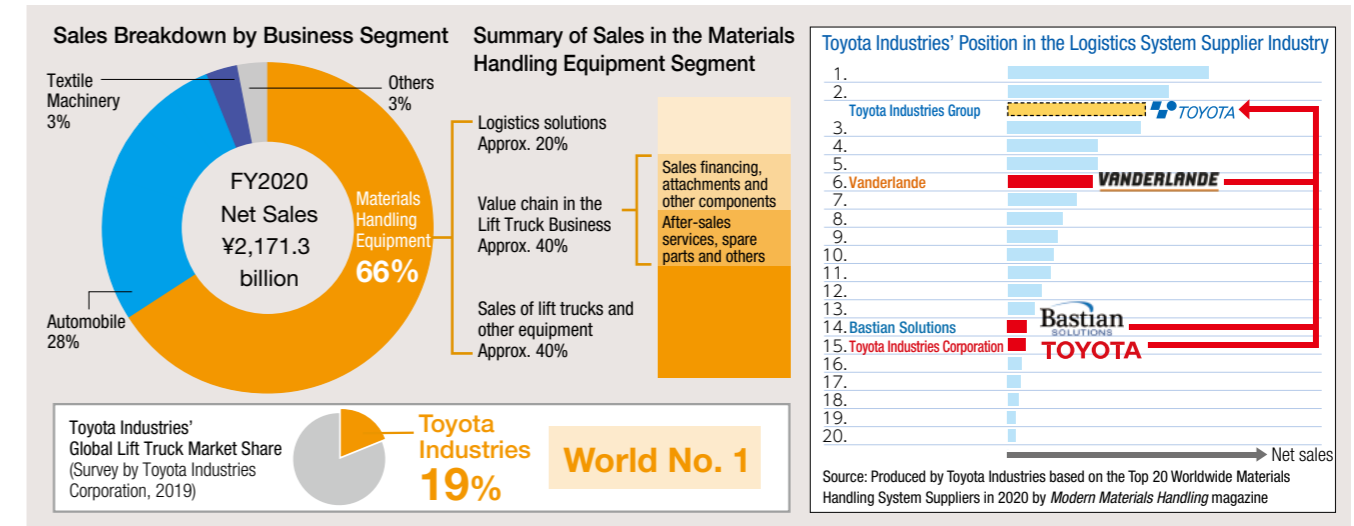
## Status of the Materials Handling Equipment Business

### Business Composition

The Materials Handling Equipment Business is Toyota Industries' core business, accounting for 66% of total sales. Lift trucks, our mainstay product, enjoy the world's No. 1 market share\*, while our Logistics Solutions Business is one of the largest in the world\*. Sales of equipment and those from our stock-type business generating relatively stable revenue, such as after-sales services and sales financing, respectively account for about 40% of total sales in the Materials Handling Equipment Segment. We are working to achieve maximum results by leveraging our business structure we have strengthened to date.

Logistics solutions, on which we have been focusing in recent years to respond to emerging needs, make up a rather small portion of the total sales of the Materials Handling Equipment Business. However, we believe that the business has great growth potential and have been collaborating with two subsidiaries, which we acquired recently, directed toward expansion.

\* Survey by Toyota Industries Corporation



### Initiatives for Future Growth

Innovation spurred by CASE (connected, autonomous, shared and electric) technologies in the automobile industry is also advancing in the materials handling equipment industry. Based on our broad product lineup and accumulated know-how in logistics improvement, we are strengthening our initiatives in this area for further growth.

**Connected:** Systems that offer advanced operational management by connecting lift trucks and other equipment to the Internet and collecting relevant data have become popular mainly among large-order customers. In addition to increasing the efficiency of logistics operations, these systems visualize and analyze such variables as the operational status and battery consumption of each lift truck and help improve safety and save energy.

**Autonomous:** Lift trucks are used for logistics operations mostly in plants and warehouses. Because they operate in such limited locations, work standardization and automation are easier compared to automobiles. We added automated guided forklifts (AGF) to our lineup in the 1980s and have been accelerating the development of products that leverage our automation technology in response to the growing need for higher logistics efficiencies.

**Solution:** At Toyota Industries, "S" is defined as "solution," through which we seek to solve logistics issues and make proposals for increasing efficiencies. In this endeavor, we go a step beyond straightforward automation. We have been strengthening initiatives on a global basis to provide logistics solutions that are suited to the type and scale of customers' businesses, accurately capture their individual needs and that are packaged as optimally designed systems.

**Electric:** The introduction of electric lift trucks has started early on in the materials handling equipment industry as customers in certain sectors are required to satisfy zero emissions and other clean performance standards. Currently, more than 60% of lift trucks sold in the world market are electric. At Toyota Industries, the ratio is more than 70%. We respond to customers' diverse needs by developing and increasing the lineup of products, including models equipped with lithium-ion batteries and fuel cell lift trucks.

Among our CASE initiatives, the following pages provide example initiatives in the "S" (solution) and "A" (autonomous) fields, which have been drawing increasing attention from customers.



Operational management system



Fuel cell lift truck

## Example 1 Initiatives in the Logistics Solutions Field

With the acquisition of Bastian Solutions LLC and Vanderlande Industries Holding B.V. in 2017, we set up a structure to offer an even broader range of logistics solutions to more customers. The three companies, including Toyota Industries, have been working together and successfully created new business opportunities.

### ■ Collaboration of Bastian and Vanderlande in the Development of Image Recognition Technology

At warehouses and distribution centers, order picking to pick up ordered items from stock storage is one of the most important operations and reducing pick-up errors is essential in increasing productivity. Many processes at logistics sites have already been automated and contributing to higher productivity. However, automation of the order picking process has not proceeded, as picking up correct items of varying forms and materials poses a technical challenge.

Bastian and Vanderlande, which each develops automated picking systems independently, have formed a joint team to accelerate the development of advanced technologies that satisfy market demand. Instant recognition of the location and shape of an item and its stored position is crucial in ensuring the correct picking up of items whatever their shapes are and however they are stored. As such, automation of the process requires advanced image recognition technology. The joint team is mainly engaging in the development of this technology and aiming for early commercialization by increasing accuracy through feasibility tests using order picking robots of each company.

We will continue to deepen the collaboration between the two companies and develop technologies and systems that will contribute to greater logistics efficiency.



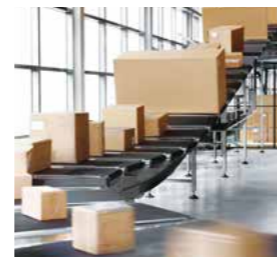
Example of image recognition

### ■ Working Together in Japan for a Global Delivery Service Operator through the Collaboration of Vanderlande and Toyota Material Handling Japan

One of the important customers of Vanderlande is the world's largest-class operator engaging in international delivery services. Up to the present, Vanderlande has built systems for the operator's distribution centers in many countries, but lacking a base in Japan, had not been able to support them in this regard. On the other hand, Toyota Material Handling Japan, which is responsible for Toyota Industries' Lift Truck and Logistics Solutions Businesses, has been developing and selling materials handling systems and equipment in Japan, but in some cases could not fully satisfy customer needs, including the above-mentioned operator, due to its limited system and equipment lineup.

Meanwhile, Toyota Industries has appealed the strengths of the entire Group encompassing Bastian and Vanderlande to a broad audience through trade shows and other opportunities. At the same time, we have concentrated on the establishment of a structure to sell and provide support services for a wide range of Vanderlande's equipment and systems in Japan.

These efforts have enabled us to offer the full spectrum of logistics systems in Japan, including those of Vanderlande, and we received an order from the said operator for the first time for a project for a distribution center in the country.



Vanderlande's CROSSBELT SORTER



Link to sorter details.

In the Logistics Solutions Business, Group companies complement each other in terms of geographical coverage and the size and business category of target customers through increased collaboration within the Group, and we can now offer solutions that combine the "hardware" and "software" of each company. Collaboration with the Lift Truck Business has increased opportunities to offer an even broader set of logistics solutions to customers using our lift trucks. Based on our comprehensive strengths, we seek to accurately respond to our customers and further realize business expansion.

## Example 2 Initiatives Related to Automation

Since starting the production of lift trucks in 1956, our efforts have been geared toward logistics automation in the future. We started producing magnetic-type automatic guided vehicles (AGVs) and AGFs in the 1980s and have since been working to increase the lineup in this area. Toyota Industries' AGVs accurately capture the varying needs of each logistics site, such as carrying industrial products in plants or warehouses, conveying baggage at airports and transporting large containers at seaports, thereby contributing to customers' improved logistics efficiencies.

Going ahead, we will further bolster the development of AGVs and AGFs while leveraging our image recognition and other cutting-edge technologies and promoting collaboration with external organizations.

### ■ Taking on a Challenge of Automating Outdoor Operations

Capitalizing on our technology and know-how for autonomous driving obtained through the development of AGVs and AGFs for indoor use, we have been developing technology for automated operations outdoors, for which needs are growing.

We have conducted outdoor feasibility tests of our AGFs at several locations, including a facility shipping agricultural products. Outdoor automated operations pose a far greater challenge than indoor operations because of uneven surfaces and irregular cargo locations. We have also carried out two autonomous driving tests of our towing tractors, which transport baggage and other items at airports, under different conditions. Our focus is to promote the development of systems that can ensure safe and smooth automated operations and cargo transportation at a place crowded with various types of vehicles.

In the future, we will repeatedly conduct feasibility tests on automated operations of lift trucks and various materials handling equipment for swiftly achieving their practical use.



AGF feasibility test

### ■ Evolution of AGVs

Utilizing AGVs for which we have been engaging in the development for many years, we are making efforts in achieving a more advanced level of logistics automation. With distribution centers becoming increasingly larger, one challenge is to reduce the workload of operators carrying items during a process that involves picking up ordered items from storage shelves. In response, we have utilized our experience in AGV development to create an autonomous logistics robot that tracks the picking operator at a certain distance and can be summoned or directed to a specified location at the beginning or end of work. We are accelerating our development efforts for its commercialization based on the results of feasibility tests undertaken at logistics sites of our customers.

Among our products for use in airports, for which we expect growth in the number of users over the medium term, we have been focusing on the commercialization of autonomous AGVs. An autonomous baggage handling system developed by Vanderlande, in particular, has already gone into full-scale operation in Rotterdam The Hague Airport. The system can flexibly accommodate layout changes on the operating route and system expansions. Efforts are also underway to integrate AGVs manufactured at one of our lift truck production bases in Europe into the system. We are stepping up efforts to increase its use mainly at hub airports around the world as an epoch-making system that replaces conventional conveyors.



Autonomous logistics robot



Autonomous baggage handling system used in airports



Link to system details.

### Message from the Director

Logistics needs have become increasingly diversified and have continued to change. Leveraging our experience and know-how accumulated while working with customers worldwide, we seek to develop products and services that go a step ahead of the times and offer optimum solutions to individual customers. Fueled by an accelerated expansion of the e-commerce market as a result of the spread of COVID-19 and other factors, needs in the logistics solutions field are on the rise, which in turn is expected to advance the mechanization and automation of logistics operations. As a response to the changing environment, we are working to expand business by further strengthening the collaboration of Bastian, Vanderlande and Toyota Industries, each of which possesses different strengths. We aim to become the world's leading logistics solutions provider to help customers resolve their logistics-related issues by harnessing our strengths in engaging in the two businesses of lift trucks, for which we enjoy the world's top market share, and logistics solutions, for which significant growth is expected in the future.



Yojiro Mizuno  
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