

—Product Development Exploiting Combined Strengths of Diverse Businesses— Development of New Lift Trucks Fitted with Engines Having Significantly Greater Environmental Performance

As economic activities expand, flows of commodities increase and become more active. Active, yet smooth commodity flows support people's daily life.

Smooth commodity flows are ensured by lift trucks, for which Toyota Industries enjoys the world-leading market share* in unit sales.

In October 2013, we released new internal-combustion lift trucks in North America. This special feature sheds a spotlight on how we leveraged the combined strengths of our diverse businesses in developing these models.

* Survey by Toyota Industries Corporation

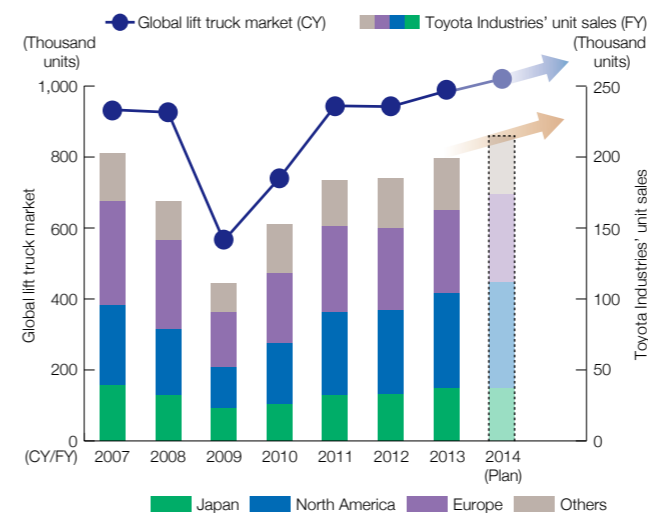


Continued Growth in Lift Truck Market

Since commencing production of lift trucks in 1956, we have been providing optimum products to customers and responding to their needs through our enhanced sales and service networks. In the fields of electric-powered and internal-combustion lift trucks, we offer an extensive lineup of products ranging from small to large models and currently hold the world-leading market share in unit sales.

After showing a drastic decline following the global recession triggered by the collapse of Lehman Brothers in 2008, the global lift truck market returned to a growth path in line with an upswing in the global economy, reaching a level of 1 million units in 2013. Going forward, a continued recovery of the global economy and the subsequent rise in logistics volume will add greater importance to the role that lift trucks play in supporting commodity flows.

Global Lift Truck Market and Toyota Industries' Unit Sales



CY: calendar year ended Dec. 31; FY: fiscal year ended March 31 of the following year (Survey by Toyota Industries Corporation)

Growing Need for Greater Environmental Performance in Internal-Combustion Lift Trucks

Demand for electric lift trucks is growing among customers handling materials in such indoor logistics sites as warehouses and plants. Demand for powerful internal-combustion lift trucks, on the other hand, still remains strong among customers operating outdoors or handling heavy loads.

Recently, environmental awareness has been growing on a global scale. Coupled with efforts in various industries to reduce logistics costs, internal-combustion lift trucks are now required to offer greater fuel efficiency and pass increasingly rigorous emission standards, which have been applied to lift trucks and other materials handling equipment by a number of countries.

Since starting the development of internal-combustion lift trucks about 60 years ago, we have been constantly seeking to enhance the appeal of our products in the areas of functionality, safety and reliability as well as in terms of environmental performance, including fuel efficiency.

Internal-combustion lift trucks with capacities of 3.5 to 8.0 tons are one of the core groups of products we offer in the field of lift trucks and have been used by customers in such industries as paper, transportation and lumber for a variety of manufacturing and logistics activities.

Against this background, we undertook efforts to greatly enhance our product appeal, including newly developed engines, under the key concept of "Attain the Industry's Top-Level Environmental Performance" and implemented a model change starting from North America in 2013.

Development of Lift Trucks with Even Greater Product Appeal

The new lift trucks are fitted with our newly developed industrial engines that offer improved environmental performance in the form of considerably higher fuel efficiency. Other contributing factors to improved fuel efficiency are modifications made to the drive and hydraulic systems.

We also added changes to the truck body in an effort to enhance overall performance. We reviewed the functioning of a mast, which supports the lifting and lowering of a fork carrying cargo, and redesigned its shape. The result was excellent forward visibility, which in turn contributed to ensuring enhanced workability and safety during operation. We also used our ingenuity in the rearrangement of the space surrounding the operator's seat and the shape of cabin openings, thus successfully improving operator comfort and accessibility.



Redesigned mast

Moreover, we divided the lift truck body into six modules, including left and right frames, cabin (operator's seat) and powertrain (drive system). This will enable us to add new models or change specifications more quickly in the future, which we hope will lead to a shorter development period.

Developing Industrial Engines Leveraging Years of Experience and via Collaboration among Business Divisions

Our newly developed industrial engines that feature significantly higher environmental performance were the key to success in developing these new lift trucks.

The Materials Handling Equipment Division and the Engine Division have been closely collaborating in the

development of lift truck engines. By quickly and accurately capturing the needs of lift truck customers and reflecting these needs in engine development, the two business divisions are efficiently creating engines that are ideal for lift trucks.

Since launching production of engines in 1953, we have produced a variety of engines for automobiles as well as for lift trucks and other materials handling equipment. Currently, we manufacture automobile engines, including KD diesel engines that are installed in the Innovative International Multi-purpose Vehicle (IMV) series of Toyota Motor Corporation (TMC); VD diesel engines fitted mainly in the Land Cruiser; AR gasoline engines primarily for the RAV4; and industrial engines, including Y gas/gasoline engines.

In addition, we also have been playing a major role in the development of diesel engines and accumulating technology and know-how concerning automobile and industrial engines.



Engine development

Engines Featuring Significantly Improved Environmental Performance

Our newly developed Toyota 1KD industrial diesel engine offers 23%*1 lower fuel consumption. It also features 43%*2 downsized displacement compared with the current model, enabling easier mounting on lift trucks. For the 1KD diesel engine, an internally developed turbocharger greatly contributed to lower fuel consumption and downsized displacement and allowed us to clear emission standards without relying on diesel particulate filters (DPF) that are generally used to remove particulate matter (PM).



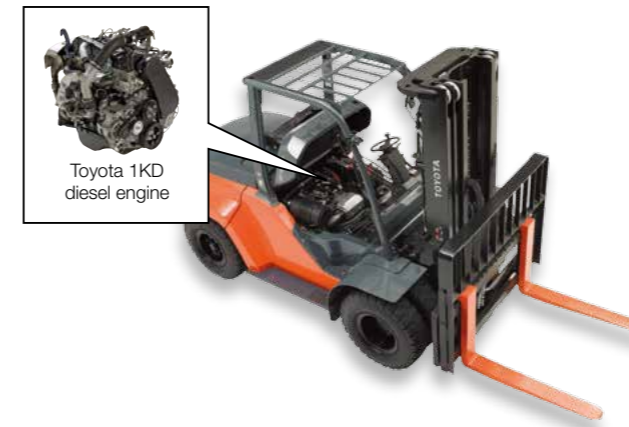
Turbocharger

While being able to remove PM, DPF must use fuel to burn PM accumulated in the filter in order to restore their filtering performance, the process of which may require downtime of lift trucks. A structure without DPF eliminates the need for this fuel and work procedures, thereby contributing to greater fuel efficiency and better productivity.

Moreover, industrial engines need to operate for a longer period of time in a more demanding environment compared with automobile engines and thus require a highly durable turbocharger. To develop a component used to compress

air, we applied our compression and machining technologies that we have cultivated in the field of car air-conditioning compressors. By utilizing a range of technologies and know-how accumulated in other business divisions, we were able to develop a more durable and compact turbocharger.

*1: Rated fuel consumption compared with the previous model (15Z, 280 g/kWh)
*2: Compared with the previous model (15Z, 5,204 cc)



Enhancing Development of Industrial Engines

In 2013, we successively developed three industrial engine models. Leveraging our years of experience and combined strengths of our diverse businesses, these engines have attained significantly higher environmental performance.

The Toyota 1KD diesel engine and Toyota 1FS gas/gasoline engine are installed in 3.5- to 8.0-ton capacity internal-combustion lift trucks that underwent a model change and were marketed in North America. The Toyota 1ZS diesel engine is fitted in 1.5- to 3.2-ton models.

We expect the need for more compact industrial engines with cleaner emissions will grow both in developed countries, where rigorous emission standards equivalent to

those for automobile engines will be enforced, and in emerging countries, where emissions will become subject to more stringent control. We aim to raise the competitive edge of our industrial engines and extend their use from lift trucks produced in-house to other industrial equipment fields. Specifically, we will promote sales of our engines for such industrial equipment as construction and agricultural machinery.

Further Accelerating Development of Lift Trucks by Drawing on Our Strengths Derived from Diverse Businesses

The 3.5- to 8.0-ton capacity internal-combustion lift trucks incorporating our total strengths were released in October 2013 in North America. We will expand sales of these models globally, first to Europe and then to Japan. We seek to satisfy the diverse needs of customers by fine-tuning our product lineup and specifications to the characteristics of respective markets.

In addition to the Engine Division and the Compressor Division highlighted in this feature story, the Materials Handling Equipment Division is facilitating collaboration in the areas of foundry, one of the elemental technologies associated with lift trucks, and electronics, which is closely related to the development of electric lift trucks.

By capitalizing on our strengths generated by these diverse businesses, we will continue to focus on the development of lift trucks that capture customer needs.



Event for dealers held in Chicago to announce the release of new models

Specifications of New Industrial Engines

(Survey by Toyota Industries Corporation)

Model	Diesel				Gas (LPG)/gasoline	
	Toyota 1KD	(Previous model) 15Z	Toyota 1ZS	(Previous model) 3Z	Toyota 1FS	(Previous model) 1FZ
Cylinder type	In-line 4-cylinder	In-line 6-cylinder	In-line 3-cylinder	In-line 4-cylinder	In-line 4-cylinder	In-line 6-cylinder
Displacement	2,982 cc 43% smaller than the previous model	5,204 cc	1,795 cc 48% smaller than the previous model	3,469 cc	3,685 cc 18% smaller than the previous model	4,476 cc
Maximum output*3	55 kW (2,200 rpm)	55 kW (2,000 rpm)	41 kW (2,200 rpm)	42 kW (2,200 rpm)	66 kW (2,550 rpm)*5	63 kW (2,350 rpm)*5
Maximum torque*3	300 Nm (1,200-1,500 rpm)	275 Nm (1,800 rpm)	200 Nm (1,600 rpm)	200 Nm (1,600 rpm)	290 Nm (1,200-1,400 rpm)*5	294 Nm (1,200 rpm)*5
Fuel consumption*3 *4	215 g/kWh 23% lower than the previous model	280 g/kWh	221 g/kWh 20% lower than the previous model	276 g/kWh	233 g/kWh 10% lower than the previous model	259 g/kWh
Major applications	Lift trucks, construction equipment, agricultural machinery, etc.					

*3: Values provided for reference purpose only *4: Rated fuel consumption *5: Using liquefied petroleum gas (LPG)

