

Research and Development

Toyota Industries aggressively engages in R&D in a variety of fields for the purpose of achieving sustainable growth. Our R&D activities are mainly focused on product development and improvement conducted independently by each division, and comprehensive research done by the Corporate Technical Center.

Toyota Industries has a diversified range of businesses, and each of its business divisions has distinctive technological strengths, core technologies and market characteristics. In order to develop new products efficiently, it is imperative that the development department of each division carries out product improvement, technology development and applied research. Each division also has its own engineers, experimental facilities and research laboratories.

The Corporate Technical Center takes the initiative in basic R&D in the materials field as well as research in the latest technologies, such as electronics. The Center engages in R&D together with each division or independently, depending on the research themes. We also collaborate with Toyota Central Research & Development Laboratories, Inc., an R&D facility of the Toyota Group, and other outside R&D institutions, including universities. In addition, in July 2003 we set up the New Electronics Department within the Corporate Technical Center, establishing a structure to deal with new business endeavors in the electronics field.

In January 2003, Toyota Industries combined the Technical Planning Department, which was responsible for company-wide technological management, and the Business Development Department, which was charged with creating new businesses, and established the Business Planning Department within the Corporate Center to promote new business development and quicker decision-making with regard to new businesses and technological management. This department engages in the lateral transfer of technologies among the different divisions and the examination of new technology development themes in order to establish a strong and efficient corporate R&D structure. It

also utilizes the long-accumulated technological know-how and outside network (both people and information) of each division to systematically and continually explore the potential for new products and services that may become future pillars of our business.

"E-Lab," our IT research laboratory completed in May 2002, serves as a support organization for the information system division as well as our R&D facility for information technology. The lab is responsible for researching digital simulation technologies with a view to reducing lead-times from development to manufacture to shipment. It is also involved in developing an optimal network system for joint development of parts with suppliers, and for parts procurement.

BT Industries AB ("BT Industries") has its own R&D facilities, which engage mainly in warehouse equipment research. TOYOTA Material Handling Company ("TMHC") conducts technological exchanges with BT Industries, and is examining the feasibility of jointly developing key parts of materials handling equipment.

At TIBC Corporation, one of our subsidiaries, our joint venture partner Ibiden Co., Ltd. contributes to product development, while Toyota Industries offers support in the manufacturing technology field. ST Liquid Crystal Display Corp., our affiliate accounted for by the equity method, benefits from the product development technologies of Sony Corporation, our joint venture partner, and our own manufacturing technologies.

Research and development expenses were ¥29.7 billion in fiscal 2003, a decrease of ¥0.3 billion (0.9%) from the previous fiscal year, and accounted for 2.8% of consolidated net sales, a decrease of 0.3 percentage points. By segment, research and development expenses were ¥18.7 billion in the Automobile Segment, ¥9.3 billion in the Materials Handling Equipment Segment, ¥1.1 billion in the Textile Machinery Segment and ¥0.6 billion in the Others Segment.

The following are some of the new products unveiled in fiscal 2003.

Automobile Segment

Electrically driven CO₂ car air-conditioning compressor
HFC-134a, the hydrofluorocarbon most commonly used as a refrigerant for car air-conditioning compressors at the moment, is effective in preventing the destruction of the ozone layer. However, its global-warming potential is 1,300 times that of CO₂. Toyota Industries developed jointly with DENSO Corporation a car air-conditioning compressor that uses CO₂ as a refrigerant, presumed to be effective in remedying both problems. This CO₂ compressor is incorporated in the fuel-cell hybrid vehicles developed by Toyota Motor Corporation, which were delivered to the Japanese government in December 2002.



CO₂ compressor

Materials Handling Equipment Segment

GENEO-E (7FBE outside Japan)

In January 2003, Toyota Industries started domestic marketing of the GENEO-E, its greatly improved 1-2 ton three-wheel electric counterbalanced forklift truck series. The product was subsequently introduced into markets in Australia, Asia, the Americas and Europe. The GENEO-E incorporates TMHC's proprietary computer control



GENEO-E (7FBE)

technology, System of Active Stability (SAS) for greater operability and stability, and an AC-drive system for excellent power control under driving and loading/unloading.

Textile Machinery Segment

JAT710 air-jet loom

The JAT610 is Toyota Industries' best-selling air-jet loom. In January 2003, we started marketing the JAT710, an improved version of the JAT610. The product boasts greater energy efficiency, with 20% less air consumption, higher speed and 30% lower vibration than the older model. It is capable of running at speeds of up to 1,250 rpm when the reed space is 190 cm and the machine is equipped with a positive cam motion.



JAT710

RX240NEW-EST compact-yarn ring spinning frame

In October 2002, we commenced sales of the RX240NEW-EST, our latest compact-yarn ring spinning frame. This machine is equipped with a state-of-the-art compact spinning system, which allows for a smooth collection of fleece fibers through the condensing device, consisting of suction slit and perforated apron. The RX240NEW-EST produces quality yarn with low hairiness and high evenness by eliminating the spinning triangle at the delivery section of the front roller.



Compact spinning system



RX240NEW-EST