

## Research and Development

Based on its founding spirit of “Be ahead of the times through endless creativity, inquisitiveness and pursuit of improvement,” Toyota Industries undertakes strategic R&D activities aimed at ensuring sustainable future growth rather than just improving short-term business results.

Toyota Industries’ R&D activities can be broadly divided into two categories: Product development and improvement carried out independently by each division, and R&D, conducted mainly by the Corporate Technical Center, that is separate from the work of business divisions and is carried out from the perspective of a company-wide management strategy.

Toyota Industries has a diverse range of businesses, and each of the Company’s divisions has its own distinct technological strengths, core technologies and market characteristics. To efficiently develop new products attuned to customer needs, it is

essential that product improvement, technology development and applied research activities be undertaken mainly by the technical departments of each division. Accordingly, each division has its own staff of engineers, experiment facilities and research laboratories, and engages in vigorous technology development activities in accordance with product development plans.

The Corporate Technical Center plays a leading role in basic R&D in materials fields — basic to all divisions — as well as conducts R&D in such new fields as leading-edge electronics, including power electronics devices, radio tuners, organic light-emitting diodes (OLEDs) and wireless LAN modules. The Center engages in R&D together with each division or independently. It also collaborates with Toyota Central Research & Development Laboratories, Inc., an R&D facility of the Toyota Group, and other outside R&D institutions, including universities.

The following are some of the new products and technologies developed by Toyota Industries in fiscal 2004.

### Automobile Segment

#### Two-Way Compressor

We developed jointly with DENSO Corporation (“DENSO”) and started production of a two-way compressor with a built-in motor for use in air conditioners for hybrid cars. This compressor is driven alternately by the engine during driving and by a built-in motor during engine stop. This achieves a balance between fuel efficiency and comfort when the car air-conditioner is turned on. The compressor is installed in Toyota Motor Corporation’s (“TMC”) Estima Hybrid, which was re-introduced to the market in July 2003 after a minor change, and Alphard Hybrid, which was launched in the same month.



#### Electrically Driven Air-Conditioning Compressors for Hybrid Cars

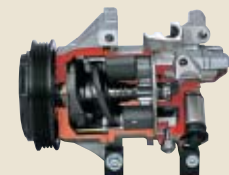
We also developed jointly with DENSO and started production of an electrically driven car air-conditioning compressor for hybrid cars. This compressor is driven by a built-in motor, unlike conventional compressors that are belt-driven by the engine. As a result, the air conditioner can remain on even when the engine is turned off, ensuring both interior comfort and fuel economy for idling stop vehicles such as hybrid cars.

The optimized shape of the scroll and other innovations allow the electrically driven compressor to improve the compression efficiency of the refrigerant and minimize energy loss for optimum performance. What’s more, this compressor is 40% smaller and lighter than previous electrically driven compressors. It is installed in the new Prius, a hybrid car introduced by TMC in September 2003.



#### Rotary Valve-Type Variable Displacement Compressor (5SER09)

We developed jointly with DENSO and began production of a rotary valve-type variable displacement compressor (swash plate type). The use of a rotary valve intake, instead of the traditional lead intake valve, gives the compressor excellent cooling capabilities and quiet running. The compressor is installed in TMC’s Sienta, which was introduced in September 2003.



The Business Planning Department, part of the Corporate Center, is responsible for the promotion of new business development and technology management. To establish a strong and efficient corporate R&D structure, the Business Planning Department engages in lateral transfers of technologies among the different divisions and examines new technology development themes. Concurrently, it deploys the accumulated technological know-how and external networks (both human 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 that serves as a base station for the information system department, undertakes various R&D activities. It carries out research on digital simulation technologies with the aim of shortening product development times as well as reducing lead-times from development to manufacture and shipment. It is also developing an optimal network system for joint development of parts with suppliers, and for parts procurement.

BT Industries, our largest subsidiary, operates its own independent R&D facilities, which focus primarily on warehouse equipment research. TMHC, a Toyota Industries in-house company,

conducts technological exchanges with BT Industries and is considering the feasibility of jointly developing key parts for such materials handling equipment as forklift trucks. Aichi Corporation also has its own independent R&D facilities for the development of special-purpose vehicles.

At our subsidiary TIBC Corporation, our joint-venture partner Ibiden Co., Ltd. contributes to product development, while Toyota Industries provides expertise in manufacturing technology fields. ST Liquid Crystal Display Corp., an equity-method affiliate established as a 50-50 joint venture with Sony Corporation (“Sony”), receives technologies and personnel in product development from Sony, and know-how and personnel in production management and technology fields from Toyota Industries.

In fiscal 2004, R&D expenses amounted to ¥29.6 billion, a decrease of ¥0.1 billion (0.5%) from the previous fiscal year, and accounted for 2.5% of consolidated net sales, a decrease of 0.3 percentage point. By segment, R&D expenses were ¥15.8 billion in the Automobile Segment, ¥10.6 billion in the Materials Handling Equipment Segment, ¥1.2 billion in the Textile Machinery Segment and ¥2.0 billion in the Others Segment.

## Materials Handling Equipment Segment

### CBT Series of Compact Tow Tractors

In November 2003, we started domestic sales of the CBT Series of compact electric tow tractors for transporting loads inside factories and warehouses. Consisting of three models, the CBT tow tractors are electrically powered in consideration of work environments inside warehouses and similar facilities. The two CBT models with 4-ton towing capacity are available in sit-down and stand-up types, while the model with a 6-ton towing capacity is a sit-down type. Use of a high-output motor provides the appropriate power and a large-capacity battery enables extended operation times. These tow tractors also feature designs that emphasize comfort and ease of operability for the driver.



## Electronics Business

### White OLED

Toyota Industries has developed a world-class white OLED that achieves an excellent balance between outstanding color reproduction, brightness and life span. Using this technology, we have completed prototypes of a white OLED backlight for LCD panels and an OLED display (white OLED + color filter). Our OLED creates white using a three-color light emission technique (red, green and blue), enabling more faithful color reproduction compared with conventional white OLEDs (which emit orange and bluish green lights) or white light-emitting diodes. We are currently working hard to improve the technology prior to commercialization, and first aim to supply assembly makers for applications in portable devices such as mobile phones and digital cameras.

