REVIEW OF OPERATIONS BY SEGMENT

AUTOMOTIVE

THERMAL SYSTEMS



RESULTS

Sales in Thermal Systems dipped 4.7% to ¥830 billion. However, sales grew 8.6% after excluding the effects of a change in the fiscal year-ends at overseas subsidiaries and affiliates in the previous year. This increase was primarily the result of higher global car production, with more than half of this increase coming from the Americas. In addition to higher sales to Japanese automakers, Thermal Systems succeeded in expanding sales to GM and Volkswagen AG.

MAIN PRODUCTS

- Climate Control Products
 Air conditioning systems for cars, buses, and construction equipment, truck refrigeration units, and air purifiers
- Engine Cooling Components
 Radiators, cooling fans, intercoolers, oil coolers, front-end modules, and cooling modules

NEW PRODUCTS

- Front-end modules integrating a radiator, condenser,
 electric fan, engine inter-cooler, and front-frame carrier
- The world's first non-fluorocarbon air conditioner using CO₂ as refrigerant

- Slimmer, more efficient evaporators, condensers, and heater cores for air conditioning systems and radiators for engine cooling
- The world's first hot gas heater system, employing components used in the air conditioner cooling cycle to create an auxiliary heat source

OVERVIEW

Car air conditioners account for more than 80% of sales in Thermal Systems, and DENSO car air conditioners have consistently held the top spot in the global market since 1990, currently boasting a market share of around 25%. DENSO is aiming to boost its share of the global car air conditioner market to 30% by 2005, based on efforts to increase overseas sales. A clear roadmap has been created to achieve this objective: increasing business in European and Asian markets, which are projected to grow as more cars are fitted with air conditioners; expanding sales in the United States; and developing cost-competitive next-generation products. DENSO is also continuing to strengthen its supply framework in every major region as part of its efforts to boost market share. In the year under review, manufacturing capabilities were strengthened in the Czech Republic, Turkey, South Korea, and China. Plans are also on the table to establish a sixth thermal product facility in North America. Meanwhile, the development of innovative air conditioners that further enhance cabin comfort, consume less energy, and use natural refrigerants continues. The past year saw major strides in this area with the development and launch of pioneering climate control products such as a non-fluorocarbon CO₂ air conditioner and a hot gas heater system.







AIR CONDITIONING UNIT

COMPRESSOR FOR NON-FLUORO-CARBON CO₂ AIR CONDITIONER COOLING MODULE

POWERTRAIN CONTROL SYSTEMS



PERCENTAGE OF NET SALES

RESULTS

Sales in Powertrain Control Systems grew 2.7% to ¥515 billion, or 11.6% excluding the effect of the new fiscal periods overseas. This increase was mainly attributable to higher sales in Japan and North America. Gasoline engine-related components, including VCT components, ignition stick coils, fuel injectors, and exhaust gas sensors sold well to the Big Three, Toyota, and Honda Motor Co., Ltd.

MAIN PRODUCTS

- Diesel Engine-Related Products
 Diesel engine management systems and their constituent components (common rail systems, and others)
- Gasoline Engine-Related Products
 Gasoline engine management systems and their constituent components (fuel injectors, fuel pumps, VCT components, throttle bodies, air flow meters, ignition coils, exhaust gas sensors, ceramic substrates, and others)
- Transmission Control Components
 Automatic transmission (AT) control valves, and AT solenoids

NEW PRODUCTS

- Diesel common rail systems achieving the world's highest injection pressure of 1,800 bar and five injections per combustion stroke
- · Long-life iridium spark plugs for natural gas engines

- Fuel injectors capable of delivering a fuel spray of 50-micron particles
- Accelerator pedal module with a non-contact sensor that uses a Hall IC to detect accelerator pedal travel
- Miniature AT linear solenoid components achieving a 70% reduction in solenoid size compared to previous components
- Highly precise purge valves to prevent leakage of hydrocarbon emissions from fuel tanks
- ECUs for the world's first adaptive front lighting system that automatically adjusts the direction of headlights to improve visibility during nighttime cornering

OVERVIEW

Powertrain Control Systems develops and manufactures a wide variety of products for both gasoline and diesel powertrains.

The product lineup encompasses the whole powertrain process, from air induction through combustion and exhaust.

DENSO is working to increase sales centered on components for gasoline engines and common rail systems for diesel engines, as well as enhancing its global supply framework.

In the past year, in addition to the domestic production of common rail systems, manufacturing got under way in Hungary, while production of these systems is also set to begin in Thailand in 2004. Similarly, VCT component manufacturing is also becoming more global, with the start of production in Hungary and Mexico.

Looking ahead, DENSO is targeting further advances in engine fuel efficiency and working to meet increasingly stringent emission regulations. One product currently in development is a next-generation common rail system that uses piezo injectors. This system will help to further reduce concentrations of harmful substances in emissions and reduce diesel engine noise.



SUPPLY PUMP FOR COMMON RAIL SYSTEM



VCT COMPONENT



CERAMIC SUBSTRATES

ELECTRONIC SYSTEMS



RESULTS

Sales in Electronic Systems slipped 2.1% to ¥346 billion, but increased 6.6% excluding the effect of the irregular reporting periods at overseas subsidiaries in the previous year. More than half of this increase came from Japan, where engine ECUs and automotive sensors were standout performers. Most of the remaining increase primarily came from Asia, on the back of strong sales of engine ECUs and instrument clusters.

MAIN PRODUCTS

- Body Electronics Products
 Instrument clusters, integrated climate control panels,
 smart keys, remote keyless entry controllers, rear and corner sonars, car security systems, and body ECUs
- Engine-related Components
 Engine ECUs
- Electronic Components and Devices
 Microcontrollers, hybrid ICs, relays, and semiconductor sensors

NEW PRODUCTS

- Head-up displays for the night view system, the first product of its kind in the industry offering infrared assisted vision
- The world's first integrated component combining an electronic driver unit and an ECU for common rail systems
- Inertial sensors for vehicle stability control with controller-areanetwork (CAN) protocol capabilities

OVERVIEW

Electronic Systems develops and manufactures engine ECUs, a wide range of body ECUs, instrument clusters, semiconductor sensors, and related IC components. Instrument clusters is just one of the product categories where DENSO has captured the leading global share, maintaining this position for more than ten years. DENSO also started production of instrument clusters in China in the past year, a promising market for these components. With a growing trend towards automotive component systemization and modularization, electronic systems are becoming more complex—electronic components are now unquestionably the basic building block of the modern automobile. DENSO's broad knowledge base across all automotive fields, and its years of experience in developing both hardware and software, will be key to its future, competitiveness. In order to rapidly develop the kinds of products society and automakers need, Electronics Systems is enhancing cooperation with other DENSO business segments and partners outside the Group. It is also working to generate higher sales overseas as it aims to become the global leader in the automotive electronics field.







INSTRUMENT CLUSTER

ENGINE ECU

INERTIAL SENSOR

ELECTRIC SYSTEMS



PERCENTAGE OF NET SALES

RESULTS

Sales in Electric Systems declined 6.4% to ¥270 billion, but increased 3.2% excluding the effect of the irregular reporting periods in the previous year. This increase was primarily achieved on higher sales of driving control and safety products, such as airbag sensors and ECUs, ABS actuators, and electric power steering systems. In addition to sales growth in Japan, sales to Japanese automakers based in the Americas also rose.

MAIN PRODUCTS

- Engine-related Components
 Starters and alternators
- Components for HEVs
 Integrated starter generators (ISGs), DC-DC converters,
 battery ECUs, electric power steering motors and ECUs
- Driving Control and Safety Products
 Airbag sensors and ECUs, ABS actuators and ECUs, laser radars and ECUs for ACC systems

NEW PRODUCTS

- Side impact sensors (SIS) for airbag sensing systems,
 50% smaller than previous components
- Japan's first rollover detection system that automatically deploys side-curtain air bags in the event of a rollover
- Brake control units that control braking as part of vehicle stability control (VSC) and ACC systems

- Japan's first semiconductor wheel speed sensor capable of detecting reverse rotation
- The world's first millimeter-wave radar and ECUs for pre-crash safety systems, which automatically tighten passenger seatbelts in the instant before a collision
- Electronic front sensors for airbag systems

OVERVIEW

Electric Systems is focusing on winning more overseas business. In particular, this strategy is based on expanding sales in North America and Europe of value-added, cost-competitive electric components, such as segment conductor (SC) alternators. SC alternators, launched in 2000, are lightweight components capable of efficiently generating a higher power output, and are expected to become the next de facto standard. Production of these components got under way in the United States in the past year.

DENSO is aiming to become a leading global supplier of HEV products, based on extensive experience in developing components in this field, particularly ISGs. R&D projects are currently focused on developing a new family of HEV products designed to meet the emerging needs of automakers and society.

As car safety becomes an increasingly important selling point for automakers due to growing consumer concerns, Electric Systems is channeling resources into the promising, high-growth field of driving control and safety. In the past year, DENSO launched a number of innovative new products in the area of passive safety, including a pre-crash safety system and a brake control unit. Next-generation products, such as SIS and ACC radar components, which are more cost-competitive, smaller, and more functional than preceding versions, were also launched.



SEGMENT CONDUCTOR (SC) ALTERNATOR



INTEGRATED STARTER GENERATOR (ISG)



MILLIMETER-WAVE RADAR



RESULTS

DENSO's small motors business increased sales to ¥172 billion, up 2.7%, or 9.6% excluding the effect of the irregular reporting periods in the previous year. Sales were boosted by higher production by Japanese automakers based at home and abroad, particularly at their operations in North America and Asia.

MAIN PRODUCTS

Windshield wiper systems, windshield washer systems, power window motors, and other automotive motors

NEW PRODUCTS

- Motors for variable gear ratio steering systems—these systems enhance steering responsiveness in reaction to vehicle speed
- Smaller, lighter power window motors using internal clutches to prevent reverse drive
- Electric fan motors smaller and lighter than previous components
- Quieter and lighter motors for automotive blowers
- Lighter, next-generation car sunroof motors

OVERVIEW

DENSO's small motors are developed and manufactured by Group company ASMO Co., Ltd. ASMO's motors for windshield washer systems, power windows, and automotive blowers already boast the leading global position in their respective product categories. To maintain its market lead, the company is accelerating the development of environmentally friendly motors, and lighter, highly efficient motors for emission control and fuel efficiency systems. In the year under review, all brushes for motors were switched to lead-free versions, and new, advanced motors for variable gear ratio steering systems were also launched.

ASMO will seek to further expand sales and market share by winning new business in Europe and North America, with a particular focus on motors for windshield wiper systems and power windows. Although production is carried out globally in six areas—Japan, North America, Europe, China, South Korea, and the ASEAN region—steps to further enhance this framework will focus on the latter three areas. Current plans call for building a new small motor plant in South Korea, to be managed by DENSO PS Corporation.







WINDSHIELD WASHER SYSTEM



POWER WINDOW



RESULTS

During the year, ITS-related operations became an independent business segment, a move that reflects the importance DENSO attaches to this field. Sales of car navigation products, electronic toll collection (ETC) systems and other on-board communication equipment, previously included in Electronic Systems, have been transferred to this segment. Sales of these products grew 5.8% to ¥60 billion, up 8.0% excluding the effect of the irregular reporting periods in the previous year. This was due to higher sales of car navigation systems to Toyota, GM, Ford, and Jaguar Cars Ltd. ETC products benefited from Japanese government initiatives to encourage the use of ETC systems on the nation's expressways.

MAIN PRODUCTS

 Car navigation systems, ETC on-board equipment, and advanced vehicle operation systems (AVOS)

NEW PRODUCTS

- Four new versions of ETC on-board equipment, including market-leading compact models and models aimed at the lower end of the market
- Data communications modules for the Toyota G-BOOK telematics system
- Navigation boards for car navigation systems that link the car to providers of vehicle security monitoring services

OVERVIEW

DENSO continues to win high acclaim for its car navigation products. This was evidenced by a survey carried out by JD Power and Associates in the past year that ranked a DENSO car navigation system number one in customer satisfaction for the second year running. While the development of new DENSO car navigation products continues, DENSO formed a joint venture with Robert Bosch GmbH of Germany to develop large-scale integrated (LSI) circuits and other core components for the next generation of car navigation and multimedia systems. DENSO is aiming to win a greater share of the global market for car navigation products by focusing on expanding sales in Europe, the United States, China, and South Korea; all are areas with real potential for growth.

DENSO's ETC on-board equipment has already captured the top position in the domestic market. In the year under review, DENSO broadened its product lineup with four new models, including new lower-end versions and more choice on specifications. Centered on these products, DENSO will seek to capture an even larger share of the market in Japan. Other developments in the year saw the launch of new data communications modules for Toyota's G-BOOK telematics system. Also in the ITS area, DENSO participated in field tests with a range of public and private organizations, such as the Internet ITS Project, aimed at realizing the enormous possibilities offered by ITS technology.

As the car becomes increasingly integrated into information networks and demand for higher levels of automotive safety grows, this business segment will continue to expand. DENSO will develop new technologies and products that respond to these trends, based on its pool of expertise in car navigation and communication technologies.







CAR NAVIGATION

ETC ON-BOARD EQUIPMENT DATA COMMUNICATIONS MODULE

NON-AUTOMOTIVE

INDUSTRIAL SYSTEMS AND ENVIRONMENTAL SYSTEMS



RESULTS

Sales in Industrial & Environmental Systems grew 10.8% to ¥53 billion, or an increase of 17.2% excluding the effect of the irregular reporting periods in the previous year. This strong performance primarily reflected strong sales growth of DENSO's groundbreaking CO₂ refrigerant heat-pump water heater.

MAIN PRODUCTS

- Automatic ID Data Capture Devices
 Bar code handy scanners and handy terminals, QR code scanners and handy terminals, smart cards and reader/ writers, radio frequency-identification (RF-ID) systems, and security systems
- Factory Automation (FA) Products
 Mobile robots, industrial robots, and programmable controllers
- Refrigeration and Air-Conditioning Systems
 Cooling units for electronic devices (mobile phone base stations, PCs, and others), kerosene heat pumps, and spot cooler/heaters
- Environmental Systems
 CO₂ refrigerant heat-pump water heaters, automatic faucets,
 and electrically powered kitchen systems

NEW PRODUCTS

- New bar code handy terminals with large, high-definition color screens, using the Windows (R) CE. NET operating system
- CO₂ refrigerant heat-pump water heaters, incorporating the world's first CO₂ ejector cycle system to improve heat pump efficiency

OVERVIEW

DENSO's industrial systems are developed and manufactured by Group company DENSO Wave Incorporated. DENSO Wave is applying technology and expertise nurtured over many years by DENSO in the automotive field to manufacturing, logistics, and services. In the past year, this company worked to launch new products and services aimed at growing business related to QR code, a proprietary two-dimensional code technology that DENSO developed in 1994. This paid off with the signing of a major contract with the Coca-Cola Group to begin using QR code. Recently, demand is growing rapidly for services allowing movie- and concert-goers to use QR codes displayed on their mobile phone screens as credits and tickets. In response, DENSO Wave has launched new fixed QR code scanner devices for use at concert venues and movie theaters.

In environmental systems, DENSO is developing a broader lineup of appealing products to drive growth. The CO₂ refrigerant heat-pump water heater, employing technology used in DENSO car air conditioners, is the first product of its kind for household use. This water heater reduces CO₂ emissions by approximately 50% compared to a conventional combustion-type water heater. New products slated for launch include water heaters for apartment and condominium buildings, floor heaters, and dryers for bathrooms.



BAR CODE HANDY TERMINAL



INDUSTRIAL ROBOT



CO₂ REFRIGERANT HEAT-PUMP WATER HEATER