


**Feature**

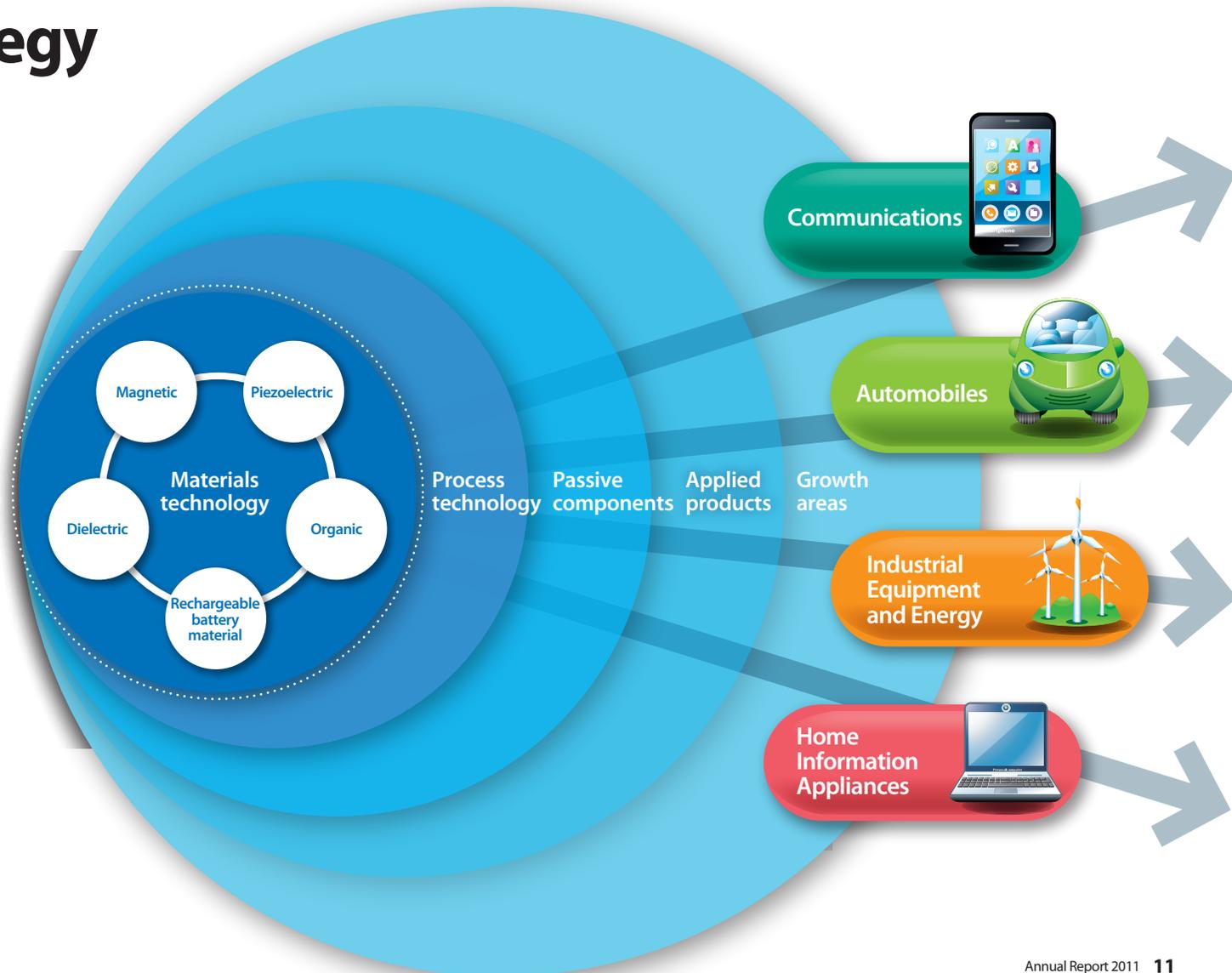
# TDK Growth Strategy

## —The Role of M&A

Ever since TDK was founded, its product innovation has centered around two key skills, namely materials technology, linked to the development of ferrite, and process technology, enabling high-precision processing of devices on a micro scale. The result is an impressive palette of electronic components for a wide range of applications.

In recent years, the company has focused its technological and development prowess on high-growth sectors including communications, automobiles, industrial equipment and energy, and home information appliances. It is also actively pursuing an expansion of its technology scope through mergers and acquisitions.

As a result, the TDK Group's lineup includes a wide range of high value added parts in areas such as smartphones, hybrid and electric vehicles, and wind and solar power generation. We will continue to push the boundaries of technology while building products that reflect the spirit of true craftsmanship. This is the TDK approach aimed at further growth.



2005



Japan

M&A partners  
**Lambda Power Group****Strategy 1**Strengthening  
the Communications  
SectorIntensified development  
of power supplies for  
communications  
infrastructure (base  
stations for mobile  
communications, etc.)

China

M&A partners  
**Amperex Technology  
Limited (ATL)**Development and  
manufacture of  
rechargeable batteries for  
mobile phones

2006



Thailand

M&A partners  
**Magnecomp Precision  
Technology  
Public Co., Ltd. (MPT)****Strategy 2**Strengthening  
the Automotive  
SectorFoster synergy with TDK  
in DC-DC converter  
sector for  
next-generation eco cars  
such as HEV, EV, and  
PHEV**Strategy 3**Strengthening  
the Industrial  
Equipment and  
Energy SectorPromote development of  
high-efficiency,  
high-reliability power  
supplies and related parts  
for industrial equipment**Strategy 4**Strengthening the  
Home Information  
Appliances SectorDevelop and manufacture  
rechargeable batteries for  
notebooks and tablet  
computersAchieve internal  
manufacturing of  
suspensions as key parts for  
HDD magnetic heads,  
improve competitiveness

2008



Germany

M&A partners  
**EPCOS Group**A broader product lineup of  
high-frequency  
components focused on  
SAW filters and  
strengthening of the  
customer baseExpand business operations  
by supplying passive  
components such as  
injectors for fuel injection  
systems and sensors to car  
makersExpand lineup of various  
capacitors for power  
facilities and smart meter  
parts; strengthen customer  
baseExpand activities in RF  
components and similar  
technology, for multi-functionality  
and multi-band support in mobile  
devices such as smartphones.  
Enhance flexibility and innovation  
capabilities.

▶P13

In short and mid term, correspond  
to enhanced electrification of cars,  
mid to long term, intensify  
relations with car makers to  
support development of  
next-generation eco cars to  
maintain long-term growth.

▶P14

Supply passive components for  
natural energy sector including  
solar and wind power, develop  
advanced technology for Smart  
Grid applications.

▶P15

Pursue leading-edge HDD  
magnetic head development to  
realize higher HDD density.  
Further increase storage  
capacity to meet market needs.

▶P16

## Strategy

## 1

## Strengthening the Communications Sector

## Developing High Value Added Devices for Advanced Mobility and Portability

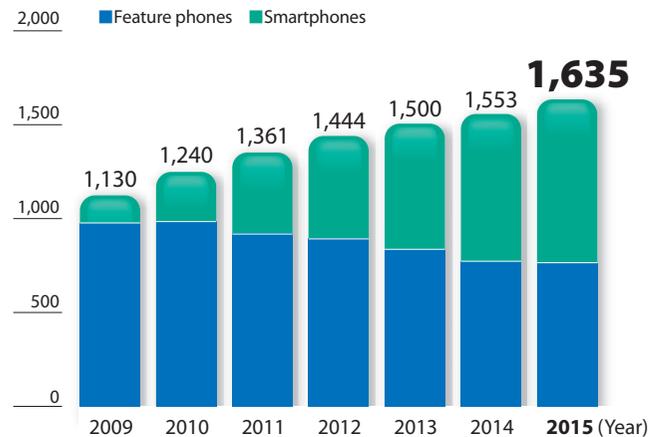


The mobile phone sector is evolving at a rapid pace. Integration of a large number of functions as exemplified by smartphones is becoming ever more prevalent, while multi-band support for different communication standards and frequency ranges is another major industry trend.

As a result, the market for electronic components used in such products has also expanded dramatically. This extends from some developed regions to the newly emerging economies and countries all over the world.

The market potential of the communications sector is believed to be immense.

Projected market for feature phones and smartphones (Unit: million units)



Source: Future Market Outlook of Key Devices for Mobile Phone of New Generation 2011, Fuji Chimera Research Institute, Inc.



### Contributing to progress in the mobile phone sector through advanced passive components

Currently, about half of all mobile phones worldwide use the GSM communication standard, but this is rapidly changing, with advanced countries moving towards next-generation standards such as W-CDMA and LTE that support higher speeds and greater data throughput volumes.

With a view to enabling roaming, and aiming to lower costs through international standardization, mobile phone manufacturers are increasingly adopting multi-band support whereby a single model can work with various communication standards and frequency bands used in different countries. Smartphones and other advanced mobile phones tend to include a range of sophisticated functions including high-quality photo and video shooting, TV viewing capability and more. This means that the electronic components used in such devices must be increasingly compact and lightweight. With a view to this business environment, EPCOS was brought into the TDK Group in 2008, bringing with it valuable expertise in the area of high-frequency components that are crucial for the progress of mobile phones. By combining the



### Module technology boosts competitiveness in the coming multi-band age

As multi-band support progresses, a single mobile phone requires a great number of parts in order to operate in different frequency bands. To solve this dilemma, TDK is promoting modular technology based on the so-called semiconductor embedded substrate approach.\*2 This technology will allow the grouping of components by function, facilitating the

technological power, product innovation potential, and market presence of TDK and EPCOS, the TDK Group further enhanced its competitiveness in the communications sector.

The group is supplying a wide range of components to mobile phone manufacturers worldwide, including SAW filters\*1, multilayer ceramic chip capacitors, common mode filters, antennas, and inductors.

development of mobile phones with smaller dimensions and higher integration. Integrating components into compact modules also frees up valuable space that can be used to increase battery capacity for longer talk times.

Furthermore, TDK is continuing to develop highly integrated RF components and DC-DC converters. To strengthen the Group's position in the battery sector, various companies have been brought into the fold. They include Amperex Technology Limited, which possesses valuable know-how in the development and manufacturing techniques for rechargeable batteries, and Nitto Denko (Shanghai), a company producing rechargeable battery material separators.

\*1 SAW filter: Surface Acoustic Wave filter. A filter device that selects an electrical signal using acoustic waves that propagate on the surface of a piezoelectric substrate.

\*2 Semiconductor embedded substrate: Component integrating ICs and other parts as well as wiring on a ceramic substrate.

### Major products for the communications sector



Multilayer ceramic chip capacitors



Inductors



SAW filters/  
High-frequency modules



Frame-integrated antennas

## Strategy

## 2

## Strengthening the Automotive Sector

## Corresponding to enhanced electrification of cars and Supporting the Development of Next-Generation Eco Cars

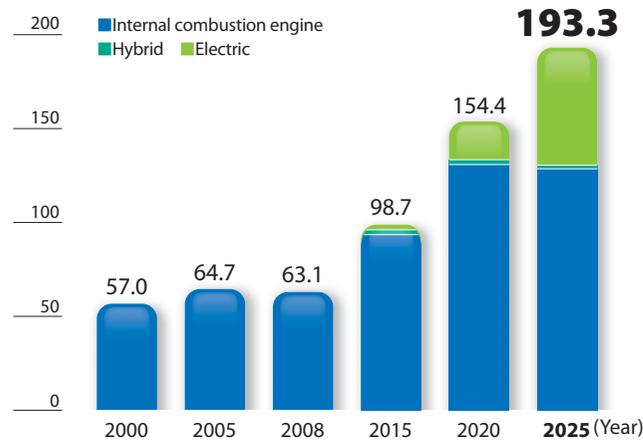


Current automobiles can be likened to "moving electronic devices" in which a wide array of electronic components help to make driving safer, more pleasant, and less of a drain on precious natural resources.

Protection of the environment has become a top concern, as exemplified by hybrid electric vehicles (HEV), electric vehicles (EV), and plug-in hybrids (PHEV). The shift toward the next generation of environment-conscious cars with electric motors is in full swing, requiring the production of a large number of electronic components for the drive and control systems in these vehicles.

The demand for such products in the automotive sector is expected to increase further in the near future.

Projected market for automobiles (Unit: million units)



Source: "Future Projection Report—The Automobile Industry 2011-2025" (by Sakae Tanaka, Nikkei BP Consulting, December 2010)



## Supporting automotive electrics with a wide product range

The electronic components used in automobiles are critical for safety. Not only must they be highly resistant to vibrations and shocks, their overall reliability must be on a level far surpassing general-application products.

TDK has played a pioneering role in developing such components, thanks to its valuable technological expertise in a number of fields. Chip components guaranteed to withstand high temperatures, noise control components for automotive LANs, ferrite magnets for compact motors, and metallic magnets for drive motors are just some of the many products TDK supplies to the automotive sector, earning the company a reputation for outstanding reliability.

EPCOS joined the Group in 2008, further broadening TDK's automotive lineup. Piezo actuators now control fuel injection with high precision by utilizing the piezoelectric effect, in which changes in voltage and dimensions are linked together. Sensors reliably detect parameters such as exhaust gas or passenger compartment temperatures, contributing to both

better fuel economy and more pleasant driving. Such high-performance electronic components provide car manufacturers with the flexibility to create better products.



## Promoting intensive technological research targeting the next generation of eco cars

In the automotive sector, business cycles tend to be longer than other areas, and a medium- to long-term approach is called for.

While meeting strict requirements for environmental performance, the entire TDK Group is actively applying its expertise and technological know-how towards the development of new solutions in the HEV, EV, and PHEV arena. Together with car manufacturers around the world, we are focusing on development that looks as far as 10 to 20 years into the future.

Neodymium magnets have already

enabled more compact and efficient drive motors while sensors permit highly precise assessment of electric currents for more economic driving. These and other products are expected to contribute to improved performance over many years to come. Another vital area of development is DC-DC converters, which turn the high voltage from the main battery bank into the lower voltage required by the electronic circuitry.

Smaller dimensions and higher efficiency contribute to lower power consumption and weight reduction in electronic components. After Lambda Power joined the TDK Group in 2005, TDK is developing electronic parts to support the further "electrification" of the automobile. The company is concentrating on high-speed battery charger power supply systems for plug-in vehicles, as well as on the development of various other components for the eco car of the future.

## Major products for the automotive sector



Ferrite magnets / Neodymium magnets



HEV DC-DC converter



Power supplies for battery chargers



Current sensors



Inductors



Multilayer ceramic chip capacitors

Strategy

3

### Strengthening the Industrial Equipment and Energy Sector

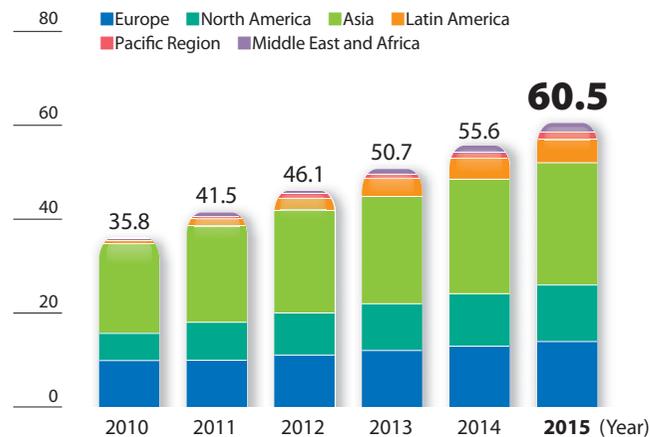
### Contributing to Renewable Energy Utilization and the Smart Grid



Solar power, wind power, and other renewable energy sources are becoming ever more important in the fight against global warming and the depletion of natural resources.

However, technology to efficiently store and distribute the generated power is extremely important to make efficient use of these inherently unstable sources. One such approach currently being pursued worldwide is the so-called Smart Grid, designed to optimize the balance between supply and demand. Progress here in turn accelerates the need for electronic components.

Projected distribution of wind power installations by area (Unit: Gigawatts)



Source: GLOBAL WIND 2010 REPORT, Global Wind Energy Council



#### Promoting the wider use of natural energy

To distribute the power generated by solar or wind power installations, the direct current (DC) from such sources must be converted into alternating current (AC) to be fed into the grid at high voltage. The converter and inverter circuitry that performs this task makes use of a large number of electronic components.

TDK offers a broad product palette in this area, including inductors, multilayer ceramic chip capacitors, transformers, and magnets. Following the acquisition of EPCOS, additions have been made to the lineup including aluminum electrolytic capacitors and film capacitors, which are key components in inverters. The range now covers a broad spectrum, meeting the need for electronic components in the environmental energy field. TDK is one of very few companies worldwide in this position.



#### Technology evolves toward the Smart Grid

Smart Grid implementations are currently gaining traction all over the world. Innovative technology is the key factor that will enable its widespread acceptance.

Building upon the synergy between TDK and EPCOS, we plan to meet the expected increase in product demand linked to smart meters, units designed to precisely assess the power consumption of individual households. Advanced high-frequency modules, SAW devices, and other communication components will also be required in this field.

Meanwhile, the group member TDK-Lambda is currently applying its expertise to the development of bidirectional DC-DC converters and related products for the Smart Grid.



#### Advancing the TDK presence in the new energy market

The fields of solar and wind power generation have so far been dominated by European countries such as Germany and Sweden, but a trend toward worldwide participation is clearly evident. The TDK Group has identified the next-generation energy sector as an important market segment. While making use of global cooperation among our bases, we will work towards developing new technologies and bolstering our product lineup in this area. We also intend to strengthen the cooperative framework with generator manufacturers.

#### Major products for the energy sector



EMC filters



Aluminum electrolytic capacitor



Film capacitor



Multilayer ceramic chip capacitors



Transformers



Large-sized Neodymium magnets



Angle sensor

Strategy

4

## Strengthening the Home Information Appliances Sector

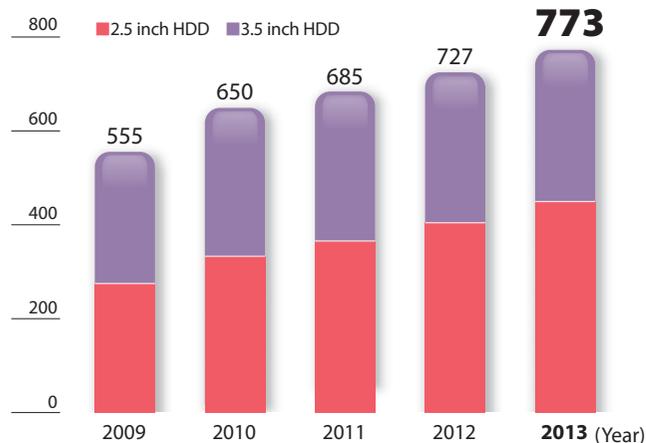
### Leading the Revolution in Magnetic Head Technology for Hard Disk Drives (HDDs)



HDDs have grown immensely in storage capacity thanks to various technological breakthroughs, leading to their widespread use for a broad range of applications. Meanwhile, next-generation storage media in the form of NAND type flash memory and SSDs are expected to partially replace HDDs in some areas.

However, data centers are becoming increasingly common, and the globally linked information society must handle steadily rising data volumes. Thanks to their low cost per storage unit, the demand for HDDs can be expected to show further steady growth.

Projected market for hard disk drives (HDDs) (Unit: million units)



Source: Japan Electronics & Information Technology Industries Association Report (2011)



#### Trailblazing the development of smaller HDDs with higher capacities

TDK is a leading manufacturer of magnetic heads for HDDs. The company has close cooperation agreements with HDD manufacturers the world over, and has played a pioneering role in developing today's extremely small, high-capacity HDDs. TDK boasts cutting-edge technology that enables the creation of highly advanced value added products.

To fit more data on an HDD, it is essential to increase the storage density per area unit. This in turn requires higher-performance magnetic disks and miniaturization of the magnetic heads that read and write data. At the same time, sensitivity must also be improved. GMR heads utilizing a magnetic resistance effect and tunnel magnetoresistive (TMR) heads are two examples where TDK's advanced thin film process technology was successfully applied.

In 2006, Magnecomp Precision Technology Public Company Limited became a TDK subsidiary, bringing to bear its expertise in suspensions for magnetic heads. This increased the ratio of key components manufactured in-house and



#### Combining high storage capacity with improved storage quality

The demand for higher capacity and higher storage quality is constantly on the rise. However, with current perpendicular magnetic recording, the limit of storage density is considered to be on the order of 1 Tbps. To meet these ever increasing needs, TDK is developing so-called thermal-assist magnetic heads.

This type of magnetic head uses laser-based heat irradiation to temporarily reduce coercive force and thereby facilitate the recording process. The principle is expected



#### Wide product palette for non-HDD applications

TDK also offers various passive components for use in computers, tablets, audiovisual devices, and other home information appliances.

The acquisition of Amperex Technology Limited in 2005 broadened the lineup with the addition of rechargeable batteries, which are being offered for notebook computers and tablets.

In future, the product range is to be further expanded to meet the varied requirements of manufacturers of home information appliances.

#### Major products for the home information appliance sector



Power supply inductors



Multilayer ceramic chip capacitors



Thin-film common mode filters



Magnetic heads