What should today's technological innovations look like if they are to solve social problems and bring an ideal future into reality?

In the course of promoting CSR, the TDK Group attaches great importance especially to solving social problems through the use of its unique technologies. What kind of society should we envision as an ideal future? What would be the technological innovations to achieve such a future? What path should the TDK Group take?

Six developers, researchers, and engineers, all responsible for TDK's technologies in the renewable energy field, have gathered together for a roundtable discussion.



- Hiroaki Hasegawa, Assistant Manager, EDLC Group, New Business Promotion Office, Production Engineering Center, TDK Corporation
- Mitsunari Suzuki
- Assistant Manager, Energy System Development Group, Devices Development Center, TDK Corporation
- Kazuki Iwaya
- New Energy Systems Department R&D Division, TDK-Lambda Corporation
- Taeko Tsubokura, Chief Researcher, Ferrite & Metallic Materials Group, Material & Process Development Center, TDK Corporation
- Yoshihiko Ohash
- Yoshiniko Unashi, Chief Researcher, EDLC Group, New Business Promotion Office, Production Engineering Center, TDK Corporation Tomohiko Kato,
- istant Manager, Energy Device Development Group, ices Development Center, TDK Corporation

Thinking of the ideal society of the year 2020

"Sharpen TDK's core technologies and contribute to the evolution of new social infrastructures" is TDK's mediumterm vision that the company has established starting in 2012. The environment and energy area is one of TDK's focus areas. TDK recognizes its role to contribute to bringing a sustainable society to reality through the application of the core technologies that it has accumulated.

Searching for common issues, the six developers,

researchers, and engineers discussed what society might look like if we extend the present into 2020. The year 2020 is the target year for the TDK Environmental Action 2020. Various concerns were expressed, for example, "advancing depletion of oil and other fossil fuels may result in a more uncertain period" and "an accelerated increase in the world population may force everybody to scramble for water, food, crude oil, minerals, and other resources of limited supply." The concerns vividly highlighted the worldwide anxiety about the deteriorating amount of resources and energy on the earth.

Next, as the participants envisioned an ideal society of 2020, they suggested, for example, "a recycling-oriented society that uses resources from the earth for production but returns them back to the earth after use" and "a society where electricity is available equally to everybody regardless of whether it is an advanced or advancing country." Another view was "a self-sufficient society where electricity generation and consumption are balanced at the home and community level." Apparently, distributed-energy systems that do not depend on centralized large-scale generating facilities are drawing much attention in recent years. Numerous comments that followed reflected TDK's on-going emphasis on development of products to meet such a trend.

Possible technologies to make up for various "shortages"

Sharing a common vision of 2020, the six technical professionals explored the practical question: "What then would be required to turn that vision into reality?" Liberally inspired opinions were exchanged. Energy problems were recognized as hurdles that must be surmounted. The discussion zeroed in on the availability of renewable energy, such as solar energy, wind power, and hydro-energy as alternatives to fossil fuels. Nuclear power is being reviewed in various countries after the Great East Japan Earthquake. A strong view came out in our discussion, "it is absolutely necessary that we switch from nuclear power to natural energy.'

With attention focused on the reuse of resources, we heard such opinions as "we should be conscious of precious resources around ourselves. For example, we can collect old mobile phones that many of us have at hand to recover a great amount of rare earth elements." The background to such opinions is the fact that the continuously growing global use of mineral resources is threatening their sustainability, as in the case of fossil fuels. Taeko Tsubokura, who works on development of magnets that use no

dysprosium, explained, "The neodymium magnet, now widely used in wind turbines and HEV/EV drive motors, use dysprosium, which is a rare earth mineral, for resistance to heat." Ms. Tsubokura was enthusiastic about bringing a dream to reality, "The key to achieving both heat resistance and coercive force is grain refinement of the sintered body without depending on a dysprosium composition. My team wants to contribute to solving resource problems by making concerted efforts to develop and start manufacturing neodymium magnets without dysprosium.

The discussion also addressed the meaning of affluence and human welfare from the ordinary citizen's perspective, "It is important to find value in a simple lifestyle." A profound discussion on solving the water problems followed.

Technological innovations that address energy problems

The subject switched to the question: "How can technologies contribute to solving social and environmental problems?" The participants fired positive opinions at one another. Here again, concerns over energy problems dominated the floor. It was stated that, "Natural energy

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From left: Mitsunari Suzuki, Taeko Tsubokura, and Yoshihiko Ohashi

now is converted into electricity at an extremely heavy conversion loss. How can this loss be ever improved, and the conversion efficiency raised closer to 100%?" "The consumer may be conscious of saving power, but I wish there were a device that automatically suppresses consumption above a necessary level." These fields are obviously the very fields where TDK is developing magnets, power supplies, wireless power transfer, current sensors, and others, and may capitalize on its strength. Wireless power transfer is a wireless energy supplying system using no electrical cables. There have been some wireless power transfer systems using electromagnetic induction for charging electric toothbrushes and personal handyphone system. The problem with these systems was that the distance between the charger and the device to be charged was limited. Engaged in the development of wireless power transfer, Mr. Suzuki explained, "I am tackling a project of freeing people of the world from connecting cumbersome cables to charge their batteries. I am also exploring ways to reduce energy loss especially in charging large power batteries like those used in EVs." Mitsunari Suzuki will continue tackling the issues at hand, hoping that the year 2020 will find wireless power transfer used so commonly in the world that people can charge their batteries very simply no matter where they go.

The electric double-layer capacitor (EDLC) and the separators, TDK's product and material, respectively, also drew much attention. It is difficult to stably supply solar and other natural energy, and consequently requires technologies to store it. If a highly efficient storage is

een from different parts of the world Availability of Renewable Energy in the Year 2020 To expand our perspective worldwide, we asked persons in charge of different regions for their views, which we shared with the participants at the round table discussion. **02** What do you think would be the problems of society in 2020? What do you think society will be like in Europe, China, Japan, and the U.S.? Takuji Fukuda Marc Picard Deputy General Manager, Corporate Planning Regional Distribution Sales Manager, Distribution Sales Group Greater China Sales Business Group TDK (Shanghai) International Trading Co., Ltd. TDK Corporation of America A1 The world will continue to see additional strain and demand on its energy supply. The U.S. will need to embrace energy conservation measures, develop renewable energy, and find environmentally safe ways to extract natural resources. A1 China will be the heaviest energy-consuming country in the world. I think the country will have made every effort to build a resource-saving and environmentally friendly society based on a "strategy of sustainable development." The resultant proportion of renewable energy consumption is expected to be about 15% by then. A2 The U.S. is committed to improve its energy policies and what is now needed is a coordinated effort between the government and the private sector. In order to efficiently supply electricity to meet the demand, it will be necessary to develop and spread high-performance smart grids through technical innovations in electronics. A2 I can think of various problems stemming from over dependence on coal-fired power generation and the consumption of various resources. The Chinese Government has declared to reduce CO2 emission by 40 to 50%. I would expect the use of wind power and solar energy to be increasing continuously. Shigeru Ogiya Klaus Franz VP Direct Sales Industry, Sales Manager, Industry / Energy Department, Industry Segment Development Division TDK Electronics Europe GmBH Electronic Components Sales & Marketing Group, TDK-EPC Corpora A1 The production and distribution of renewable energy becomes almost reality, while Europe will be a front runner in terms of renewable energy. In particular, I think that by 2020 large-scale smart energy systems will be in wide use. A1 I speculate that residential photovoltaics will be in wide use and wind turbines will be installed mainly at sea. I think prevalence of smart meters will have advanced the optimum and visualized mode of electric power consumption and made further savings in electricity. A2 In order to address the issue of instability in renewable energy generation, smaller-size-components, such as all capacitors and inductors, with improved high-currency and high frequency compatibility will be required. In addition, technology will need to be developed that can support power stabilization across countries in the EU for example by batteries. A2 I believe Japan needs to address deregulation of trading electric power among power companies, development and reduction of the price of high-efficiency inverters and coils, and establishment of a nationally accessible power grid. In terms of the country's geographic features, I feel the floating-type wind turbines and small-scale water power generators are plausible.

available, energy becomes relocatable, enabling use of a required amount at a required time with no concern for the location or time. The concept behind the "smart grid" (the power transmission grid of the next generation) is based on distributed power sources. We heard, "Storage technologies for locally-produced energy will become especially important in the future." Tomohiko Kato undertakes the development of materials for the separators which are to keep the anode and the cathode apart in a battery. Mr. Kato told us, "With today's demand for highcapacity, long-life batteries using no rare earth elements, I want to seek out ideal, highly durable materials and threedimensional structures for separators. I also wish to tackle the development of process technologies that would yield little waste. I will continue to undertake many kinds of development that would render the TDK technologies useful to a multitude of people and contribute to solving energy problems."

Envisioning an ideal future, and thinking of what to accomplish now from a long-term perspective

Contribution to solving the social problems through the use of TDK products and technologies is the paramount proposition given in the Group's CSR. Today's society faces problems of enormous magnitudes in its energy sector. Technological innovations that address these problems are

2012 CSR Activities Report

TDK is committed to R&D in TDK original technologies and products based on its materials technology. They range from basic research to development of applications for new products. TDK aims at contributing to solving social problems through the development of rare earth element-saving/-free magnets, miniaturized thin-film RF components, power capacitors, and others. In the environmental field, TDK has expanded the sales ratio of the environment-conscious products "ECO LOVE products"* beyond 30% in FY2012, doubling that of FY2010. TDK will focus on the next-generation information and communications market and the energy related market. By concentrating its technological resources on these markets, TDK will be contributing to the evolution of social infrastructures.

* Environment-conscious products with high environmental impact reduction effects and that are industry leaders are certified as ECO LOVE products, and ECO LOVE products with effects at the highest levels in the industry are certified as SUPER ECO LOVE products. For information on environment-conscious products from TDK, please visit our web site: http://www.global.tdk.com/csr/ecolove/index.htm

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From left: Kazuki Iwaya, Tomohiko Kato, and Hiroaki Hasegawa

of absolute necessity.

As social responsibility demanded business initiative for achieving a sustainable society, the role that TDK should play toward the future has expanded significantly. TDK's opportunity for showing solid presence in the renewable energy market has also expanded. There was a comment, "I have felt the importance of stopping occasionally, while I busily discharge my daily duties, to envision an ideal future, and think of what I should accomplish now." It drew many approvals and proved to be an opportunity to confirm the importance of a medium to long-term vision.



Haruhiko Ando

Intellectual Property Strategy Head Quarters, Cabinet Secretariat, Visiting Professor, University of Electro-Communicati



Save the earth with your unique and ecology-friendly materials technologies! The Cabinet's Intellectual Property Strategic Program 2012 points out that, in the current age of global networks, the innovation-initiating mechanism has evolved into an open, global, and flat system. If a company in a dynamic business ecosystem makes its corporate motto to "contribute to culture and industry through creativity" and creates novel values out of materials, it must promote bonds with outside organizations in science and technology while bringing out the best in the power of internal human capital. TDK has developed business centered on ferrites through a venture with the university that originated them. The company treasures its global circle of human capital.

I wish to offer three suggestions for TDK to be the trailblazer in the super ecology-friendly business in the world. First, beyond HAL (High-Anisotropy field Layer) review all material losses throughout the supply chain, and become a strong but trim company. Second, using the core technologies as the basis, save the earth with ecology-friendly super technologies. Examples are in-wheel motors, superconductor-based wind turbine generators, and state-of-the-art HDDs for ecology-friendly cloud computing. Finally, get a head start in "the fourth-generation R&D paradigm" by taking full advantage of "big data." With the Company's emphasis on university collaboration and great track records in various fields, including giant magnetoresistance (GMR) technologies, I believe TDK will have great success in overcoming many challenges. I look forward to seeing TDK in action.