CEO’s Message

2020 saw the global spread of COVID-19 and frequent natural disasters arising from climate change, including torrential rains in Japan and hurricanes and cold spells in North America. On the other hand, it was also a year when digital transformation (DX) made progress in our daily lives and all kinds of industries, and the importance of semiconductors, which are essential for information and communication technologies (ICT), became prominent. Applications expanded for the displays that link people and data, and additional advances in technological innovation were made. As a result of the spread of the IoT, AI, 5G and other technologies, a data-driven society accelerates at an unprecedented pace. With the rising efforts to solve global environmental problems progress, "digital and green" is now a major trend around the world.

Under the circumstances, applying our expertise as an equipment manufacturer developed through being an industry leader and using all management resources, including our employees who both create and fulfill company values, we will contribute toward achieving the societal shared value of balancing “digital and green.” We also endeavor to practice our Corporate Philosophy, “We strive to contribute to the development of a dream-inspiring society through our leading-edge technologies and reliable service and support” while expanding medium- to long-term profit and continuous corporate value enhancement.

We deeply appreciate your support for Tokyo Electron and look forward to your continued support and patronage.

Toshiki Kawai
Representative Director, President & CEO

Corporate Philosophy

We strive to contribute to the development of a dream-inspiring society through our leading-edge technologies and reliable service and support.

Management Policies

The Management Policies highlight the management values that Tokyo Electron (TEL) regards as essential to achieving the objectives defined in its Corporate Philosophy. They express the logic that underscores our eight general rules of management.

TEL Values

TEL Values highlight the values and codes of conduct as Tokyo Electron.

Vision

The Vision describes TEL’s medium-to-long-term business aspirations and the direction of TEL’s near future.

A truly global company generating high added value and profits in the semiconductor and flat panel display industries through innovative technologies and groundbreaking proactive solutions that integrate diverse technologies.
The History of TEL

For approximately half a century, TEL has tirelessly pursued the newest technologies and innovations.

The electronics industry was still in its infancy in 1963 when young trading firm employees—Tokuo Kubo, Toshio Kodaka and others—turned entrepreneurial. Aiming to become the first semiconductor equipment manufacturer in Japan by establishing a number of subsidiaries responsible for services, we formed TEL-Thermco Engineering Co., Ltd. in 1968 with a proven American semiconductor equipment manufacturer. Through this joint venture, TEL gradually acquired technologies for developing and manufacturing its trading expertise. Aiming to become the first semiconductor equipment manufacturer in Japan by establishing a number of subsidiaries responsible for services, we formed TEL-Thermco Engineering Co., Ltd. in 1968 with a proven American semiconductor equipment manufacturer.

TEL-Thermco Engineering Co., Ltd. developed the world’s first high-pressure oxidation furnace. The history of TEL has always been in sync with the history of the semiconductor industry.

The evolution of semiconductors

- 1963: Tokyo Electron Laboratories, Inc. is established in Akasaka, Minato-ku with capital of five million yen invested by Tokyo Broadcasting System, Inc.
- 1964: TEL acquires importing and selling rights for diffusion furnaces manufactured by Thermco Products Corp. (U.S.) and begins sales in Japan.
- 1965: Concludes an agency agreement with Fairchild Semiconductor Corp. (U.S.) to sell Fairchild’s IC testers in Japan.
- 1968: A joint venture with the Thermco Products Corp. (U.S.) is established in Japan.
- 1970: Complete domestic production of diffusion furnaces becomes possible at TEL-Thermco Engineering Co., Ltd.
- 1976: TEL-Thermco Engineering Co., Ltd. develops the world’s first high-pressure oxidation furnace.
- 1990: TEL marks a major move into development and marketing of FPD production equipment.
- 2006: TEL receives Tokyo Stock Exchange’s Twelfth Annual Award for Excellence in Disclosure for the second time since 1999.
- 2021: TEL cited as the "Most Honored Company" for the sixth year in a row (institutional investor’s All-Japan Executive Team Rankings).

From the 1990s onwards, TEL reinforced its group company structure in Japan by establishing a number of subsidiaries responsible for services, manufacturing, and other functions. TEL’s overseas operations—which began in 1980 to support Japanese semiconductor manufacturers venturing abroad—also expanded in the 1990s, resulting in a broad network of overseas TEL subsidiaries that offered direct sales and support in the fast-growing global market. Around this time, our overseas sales exceeded domestic sales, turning TEL into a truly global company.

In 2015, TEL introduced the Medium-term Management Plan with a financial model for achieving world-class profitability, and renewed the corporate logo to emphasize a fresh start. With the spread of 5G, AI, and IoT, our society is becoming increasingly data-driven. As semiconductors and FPDs are the enablers of the digital society, the market for semiconductor and FPD production equipment is also entering a new phase of growth. As an equipment manufacturer, TEL is resolved to help society achieve the balancing of “digital and green” while increasing the corporate value even further.
**TEL’s Projection of the Future**

TEL’s focus is on two core product categories: semiconductor and FPD production equipment. Building on the technological expertise and know-how that we have been cultivating since its inception over 50 years ago, we strive to contribute to the development of a dream-inspiring society.

**The roles of semiconductor are shifting from “selling products” to “selling value”**

Everything is connected in the IoT age, including cars, traffic systems, and medical devices. Today, semiconductors are ubiquitous in personal electronic devices such as PCs and smartphones and are also essential to diverse application servers and data centers that are the backbone of the 5G and 6G infrastructure. As our society becomes increasingly data-centric, “selling value” rather than “selling products” will become the key drivers of semiconductor demand, bringing the semiconductor production equipment market into a phase of higher growth.

**Semiconductor Market Size to More Than Double in the Next Decade**

The semiconductor market size is expected to exceed about US$1 trillion by 2030, more than doubling the level in 2020, which was around US$440 billion. The foundation of this enormous market is the semiconductor production equipment industry. With the need for a wide variety of new technologies at the nano level, as the leader in technological innovation, TEL’s role within the industry is becoming more critical than ever.

**Digital and Green Transformations Contributing to the Development of a Dream- Inspiring Society**

The spread of ICT, the progress of DX, and the movement toward decarbonization—all of these are part of a global drive to build a “digital and green” society, and technological innovation of semiconductors are critical to its success. The pursuit of advanced semiconductors—with larger capacity, higher speed, higher reliability, lower power consumption, and more—is never-ending. Similarly, displays are expected to evolve further as an interface between people and data, which also requires technological innovation to continue. Through our commitment to both these business areas of production equipment, TEL will keep contributing to the development of a dream-inspiring society.
The semiconductor and FPD markets are entering a new growth phase as these devices gain recognition as the critical building blocks of social infrastructure. Today, semiconductors and FPDs are required to perform higher and faster with lower power consumption than ever before. In order to provide high-value-added and competitive manufacturing equipment for these devices in a timely manner, advanced R&D capabilities that are extensible to future technology generations are required. TEL emphasizes the Shift Left approach in R&D, which means investing significant resources (technological, human, and financial) at earlier stages. We then work with our customers to formulate a technology roadmap and develop whatever technologies necessary to attain the goal. Our ability to anticipate customers’ needs in the next-generation and beyond ensures timely delivery of high-quality products featuring exciting new technologies.

TEL’s R&D Goals

Taking the future market growth into account, TEL has been planning R&D approximately 400 billion yen in the three years starting from fiscal 2020. Our vigorous R&D programs deliver next-generation products with cutting-edge technologies.

R&D Facilities

TEL has been expanding its R&D capabilities by cooperating with technology consortium in Japan and abroad, with a view to enabling further innovations. Examples include participation in a world-class research hub that is developing hardware for next-generation AI, cooperation with BRIDG—a Florida-based non-profit public-private partnership, and tighter collaboration with imec on extreme ultraviolet (EUV) lithography. TEL’s external collaboration is far-reaching, covering everything from the development of fast-evolving technologies/applications to their introduction to the market. We are also working with academia, including major universities in Japan. TEL is collaborating with the National Institute of Advanced Industrial Science and Technology (AIST), which is one of the largest institutes in Japan, in wide-ranging fields, including research on magnetoresistive random access memory (MRAM).
R&D

R&D Sites
Addressing multi-polar needs for ultimate nanoscaling

TEL Digital Design Square
Opened in November 2020
(Sapporo City, Hokkaido)

Aiming to enhance its DX capabilities, TEL recently relocated its software development office in Sapporo to a new building. The move aims to incorporate advanced AI and IoT technologies into TEL’s products and develop unprecedented high value-added technologies to benefit our society. The creative use of the office space and the latest facilities stimulate state-of-the-art software development ideas and support the recruitment and training of data scientists/analytics necessary for the implementation of DX.

Miyagi Technology Innovation Center
Building to be completed in September 2021
(Taiwa-cho, Kurokawa-gun, Miyagi)

TEL is constructing this center to accelerate the development of advanced etching technology—one of the critical areas in semiconductor manufacturing. The center is designed to become an advanced research facility that sparks new innovations by integrating technologies from diverse fields. Among the features of this center are the lab area that encourages co-creation with business partner, a training center for customer, and an open innovation area.

New Development Building
To be completed in spring 2023
(Nirasaki City, Yamanashi)

To meet the growing demand for semiconductors, TEL is planning to add a new development building. The functions to be fulfilled at this building will include the development of deposition and gas chemical etch systems that are critical to semiconductor manufacturing and the development of patterning and process integration technologies that are vital to the continued scaling of integrated circuits.

Manufacturing

TEL develops and manufactures equipment mainly at its manufacturing subsidiaries in Japan. One of our major strengths lies in our ability to control the entire production flow—from the early product development phase to design, manufacturing, and quality assurance phases. The integrated nature of our processes allows us to capture and incorporate our customers’ technological needs quite early in the development phase, resulting in timely delivery of the precisely needed products. Our production division is responsible for three types of activities: designing to order (e.g., customizing the equipment’s design specifications to meet the customer’s precise technological needs), designing of manufacturing processes (e.g., designing processes that assure efficient and high-quality production of equipment), and high-volume manufacturing (i.e., producing high-quality equipment in large volume and on schedule).

As semiconductors and FPDs become more advanced, customers’ requirements are growing more sophisticated. To keep producing equipment of ever-higher quality, TEL has been promoting company-wide TPM* activities for over a decade. This initiative aims to thoroughly eliminate inefficiency and wastefulness from our manufacturing operations to improve productivity and influence the employees’ mindset and behavior. Both our employees at production lines and those in administrative positions participate in this movement, uniting the company in a pursuit of improvement and transformation.

To deliver the Best Products and Best Technical Service possible in a timely manner, TEL is constantly taking on the challenges of new production technology. To participate in this movement, uniting the company in a pursuit of improvement and transformation.

Sales

Making sales starts with gathering information on customers’ needs and business trends and discerning what kinds of equipment and technologies are in demand. We at TEL consider it vital to adhere to the “customer first” principle, and we take full advantage of our rock-solid technical services to benefit our customers. It goes without saying that business does not come our way unless customers put trust in our salespeople. TEL has formed strong partnerships with our customers and is engaged in intense sales activities day by day in a global field. Sometimes our salespeople are asked to deliver new equipment that does not yet exist. In such cases, the sales department starts a development project jointly with the marketing and engineering departments. Then we go about making proposals to customers, building prototypes, installing and validating them, and so on. Often it takes over a year before the equipment is finally delivered to customers to complete the sale. The domain of sales involves a multitude of complex technologies from which a new technology proposal must be put together. Taking advantage of the challenging spirit and the respect for taking ownership that are innate to TEL’s culture, we will continue to provide the Best Products and Best Technical Service that can win the trust of our customers around the world.

* TPM: Total Productive Management (Maintenance)
Technical Services and Support

Committed to pursuing the Best Technical Service possible in a constantly changing business environment, TEL is ensuring that its technical services and support will bring satisfaction to all customers around the world. Anticipating the shifting trends and diversifying customer needs, we are also constantly upgrading its global support capabilities.

Advanced Field Solutions

At TEL, we refer to technical service and support of before-and-after delivery as “field solutions.” Our field solutions business takes advantage of an installed base of approximately 76,000 units — the largest in the industry. We also employ the latest technologies, including the TELeMetrics™ remote servicing solution, the latest wearable devices, and predictive maintenance based on machine learning. We assure high equipment availability through total technical services and support, including everything from delivery and installment of equipment to after-sales maintenance services.

Assorted Services to Address Diverse Needs

- Sales/procurement/warranty/total support services on new and refurbished equipment for small-diameter wafer processing (including 200 mm)
- Genuine spare parts supply and repair services
- Engineering services/support
- Equipment upgrade services

TELeMetrics

The TELeMetrics service connects the equipment installed at customers’ sites with TEL’s servers via communication lines, allowing us to remotely analyze the equipment data to improve productivity. The functionality of the equipment, deterioration of parts over time, and differences among equipment are monitored and analyzed from diverse angles using TEL’s unique technical know-how and professional tools, enabling us to identify any problems and offer appropriate solutions in real time. TELeMetrics can help minimize equipment downtime and stabilize operations.

*Images viewed through smart glasses.
**Semiconductor Manufacturing Process**

- **Deposition**
- **Lithography**
- **Etching**
- **Cleaning**

**Oxide/Nitride film deposition**
- Thin films such as silicon dioxide, silicon nitride, and others are deposited by thermal oxidation, CVD*, and ALD** on the wafer surface.

**Photoresist* coating**
- The wafer is coated at a high speed to a thin layer of photoresist, which is coated uniformly on the surface.

**Exposure**
- To transfer the integrated circuit pattern into a wafer, equipment called stepper irradiates UV light on the wafer. This process is repeated many times to create a single wafer with multiple chips.

**Development**
- Exposed photoresist is removed to leave a pattern on the wafer. The remaining photoresist is washed away.

**Ashing/Cleaning**
- The remaining photoresist is etched away to expose the pattern, and the wafer is cleaned to remove any residual photoresist.

**Isolation Formation, Gate Formation**
- Another dielectric layer is laid on top, and contact holes (vias) are opened in the layer to connect different circuit layers.

**Contact Formation**
- Another dielectric layer is laid on top, and contact holes (vias) are opened in the layer to connect different circuit layers.

**Interconnect Formation**
- The wiring pattern, which connects individual transistors, is deposited over the gate layer so that metal wires can be laid on top. Another wiring pattern is then opened in the dielectric layer, and the wiring is completed.

**Module**
- The completed transistor is separated from other circuits using a process called “debounding”. The circuit is then cleaned and inspected.

**Testing**
- Each integrated circuit is tested as a wafer probe to find any failed circuits.

**Coater/Developer**
- This equipment performs tasks such as coating the wafer with photoresist and developing the exposed photoresist.

**Plasma Etch System**
- A plasma etch system is used to remove, etch, and pattern the wafer surface.

**Cleaning System**
- A cleaning system is used to remove residual photoresist and other contamination from the wafer.

**Interconnection**
- The wafer is bonded to the substrate, and the wiring pattern is completed.

**Package/Assembly**
- The completed semiconductor is then packaged and assembled into a module.

**FPD Production Equipment**
- FPDs are ubiquitous today as they are commonly used as an interface between humans and data in PCs, flat-screen TVs, and smartphones.

**FPD Equipment**
- TEL develops and manufactures semiconductor production equipment covering all major chip-making processes.

**Optimizing Manufacturing on a Global Scale with Innovative Technologies and Unique Initiatives**

**CPP COLUMN**

**Semiconductor Production Equipment**
- Semiconductors are critical components of diverse electronic applications, including PCs, smartphones, automobiles, and home appliances. To manufacture these, TEL develops and manufactures semiconductor production equipment covering all major chip-making processes.

**FPD Production Equipment**
- FPDs are ubiquitous today as they are commonly used as an interface between humans and data in PCs, flat-screen TVs, and smartphones.

**Corporate Profile**
- TEL's strength lies in its broad equipment portfolio covering four sequential processes that are critical, namely deposition, Coater/Developer, etch, and cleaning. TEL's equipment is designed for FPD manufacturers with particular needs for high resolution, thinness, lightness, flexibility, low power consumption, larger screen size, and so forth.
Business Operations Spanning the World

TEL operates its business in countries and regions across the world. We are supporting the global electronics industry with its expansive business presence in Japan, the U.S., Asia, and Europe.

World Top 10 Semiconductor Production Equipment Manufacturers CY2020 Revenue Ranking

Source: VLSI Research, May 2021

Net Sales (FY2020) Billion yen

Semiconductor Production Equipment 1,315.2
FPD Production Equipment 83.7
Total 1,399.1
Net Income 242.9

Composition of Net Sales by Region (FY2020)

Net Sales (FY2020) Billion yen

China 28.5%
Korea 20.4%
Taiwan 17.9%
Japan 14.1%
North America 10.9%
Europe 4.5%
Others 3.7%

Reinforcing Customer Contact

With the purpose of delivering technologies, support, and solutions more speedily to our customers in Japan and abroad as required, TEL has organized global structures for enhancing our response to customers. Precise understanding of the customers’ problems and requirements in product development and manufacturing allows timely feedback to our principal bases of operations, enabling streamlined delivery of high value-added products and services. Because we must keep responding to society’s needs as they arise, we put great value on building relationships of trust with our customers.
TEL’s Sustainability Programs for the Continued Advancement of Society

Under the corporate philosophy of “We strive to contribute to the development of a dream-inspiring society through our leading-edge technologies and reliable service and support,” TEL is pursuing sustainable operations in accordance with the requirements of corporate governance, legal compliance, and ethical conduct. At the same time, we are making medium- to long-term efforts to enhance value of corporate share by contributing to develop and resolve issues for industry and society through our business operations.

TEL’s Material Issues (Key issues)
TEL has been making an all-out effort to overcome these challenges. TEL has identified four material issues that need to be addressed as priority concerns. These include the three pillars of its medium-term management plan—product competitiveness, responsiveness to customers, and higher productivity—as well as management foundation which encompasses such elements as the employees (who are the source of our growth), corporate governance, compliance, and risk management (which underlie the foundation of corporate management), and human rights and environmental activities (that are essential to the sound and sustainable business operations).

SDGs Initiatives at TEL
To help attain the Sustainable Development Goals (SDGs) through its business, TEL has clearly defined the goals to be achieved in relation to each of the four material issues at hand.

Sustainability Initiatives
Environment
TEL has revised medium-term environmental goals for 2030, and TEL is working to protect the global environment by reducing the environmental impact through its products and business sites while also offering innovative technologies that aid the development of more power-efficient electronic devices. TEL has also launched E-COMPASS*, a supply chain sustainability initiative for the semiconductor and FPD production equipment industries.

Human Rights Initiatives
Responsiveness to customers
Propose customer optimal solutions
Contribute to customers production of leading-edge devices
Ensure safety for customers
Customer satisfactions
Higher productivity
Constantly pursue higher management efficiency
Enterprise Resource Planning system
Operational efficiency and automation
Smart equipment
Improvement of quality in the value chain

Management foundation
Corporate Governance
Health and safety
Human rights
Risk management
Compliance
Employee growth
Diversity & Inclusion
Work-life balance

Initiatives in Material Issues

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<th>Material issues</th>
<th>Main initiatives</th>
<th>SDGs initiatives</th>
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| Product competitiveness | - Build a sustainable society by creating innovative technologies  
 - Provide products and services that are conscious of the environment  
 - Collaborating with partner companies, consortiums and academias | - Promote energy saving products |
| Responsiveness to customers | - Contribute to customer innovation  
 - Promote sustainable form of production and consumption throughout product life cycles  
 - Establish partnership with customers | - Propose customer optimal solutions |
| Higher productivity | - Contribute to sustainable economic growth promoting productivity  
 - Establish sustainable form of production and consumption by streamlined business operations and quality management  
 - Create new values by collaboration with customers | - Contribute to customers production of leading-edge devices |
| Management foundation | - Strive to facilitate human-focused employment (decent work)  
 - Pursue diversity and equality among people and in the workplace  
 - Develop highly effective governance  
 - Reduce the environmental burden of the entire value chain  
 - Establish sustainable supply chain | - Ensure safety for customers |

Medium-term Environmental Goals for 2030

- **Products**
  - Reduce per-wafer CO₂ emissions (vs. 2018)
    - **30% reduction**
  - Plants and Offices
    - Total CO₂ emissions (vs. 2018)
      - **70% reduction**
- **Renewable energy use 100%**

E-COMPASS: Environmental Co-Creation by Material, Process and Subcomponent Solutions

*TEL is setting up an effective corporate governance structure with strict management oversight to attain sustainable growth. We are also reinforcing its risk management activities to better understand and properly respond to diverse business-associated risks. TEL’s Code of Ethics offers employees a guideline of acceptable behaviors, advocating and raising awareness about regulatory compliance and corporate ethics.

External Recognition

No. 1 in ROESG Rankings among Japanese companies
TEL ranked number 1 among Japanese companies in the second ROESG Rankings* (2020 edition) implemented by Nikkei Inc. and QUICK Corp. ESG Research Center. ROESG is an index that integrates ROE (Return on Equity), which is an indicator of capital efficiency, and ESG (Environmental, Social, and Governance), a non-financial index of sustainability. TEL’s superior capital efficiency and dedication to ESG engagement earned a significantly high score.

*“Kenzo Kikou Shimbun,” March 28, 2021

Outstanding Health & Productivity Management Organization in 2021
In a certification program held jointly by the Ministry of Economy, Trade, and Industry (METI) and the Nippon Kenko Kagi, TEL was recognized for the third year in a row as an Outstanding Health & Productivity Management Organization in 2021. Under TEL’s Wellness Declaration issued in February 2012, we have promoted Eat-Rest-Walk-Talk programs designed to maintain and improve the employees’ health in cooperation with occupational health physicians, public health nurses, and health insurance societies. TEL will continue to promote work-life balance actively while also reinforcing healthcare support and guidance according to each employee’s state of health.

TEL’s sustainability initiatives have been selected high acclaim from rating agencies around the world, and we have been chosen as a constituent of major global ESG investment indices.

TEL FOR GOOD
TEL FOR GOOD is a brand name for TEL’s social contribution activities. The four focus areas of these activities are innovation and technology, education, environment, and community involvement. TEL hosts various social contribution events and programs, donations, and volunteer activities around the world under this brand.