

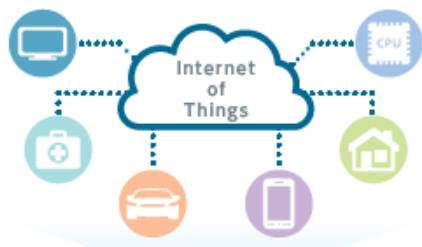


Ferrotec Holdings Corporation

Our Business Strategies and Policy for Sustainable Management

Wednesday, July 8, 2020

Recognition of Semiconductor Market Trends



Recognition of our Situation Amid the COVID-19 Pandemic (Regarding Business Opportunities)

1. In China, COVID-19 spread in late January, and employees resumed work and the production operation rate was affected mainly in February. Accordingly, the pandemic is estimated to slightly affect the results of Chinese subsidiaries from Jan. to Mar. 2020 (the results of the parent company from Apr. to Jun. [1st quarter] of FY3/21).



2. As it took significant time for some Chinese competitors to regain normal production operation rate, our company backed up the production of new customers in the equipment parts cleaning. (As a result, new customers increased.)

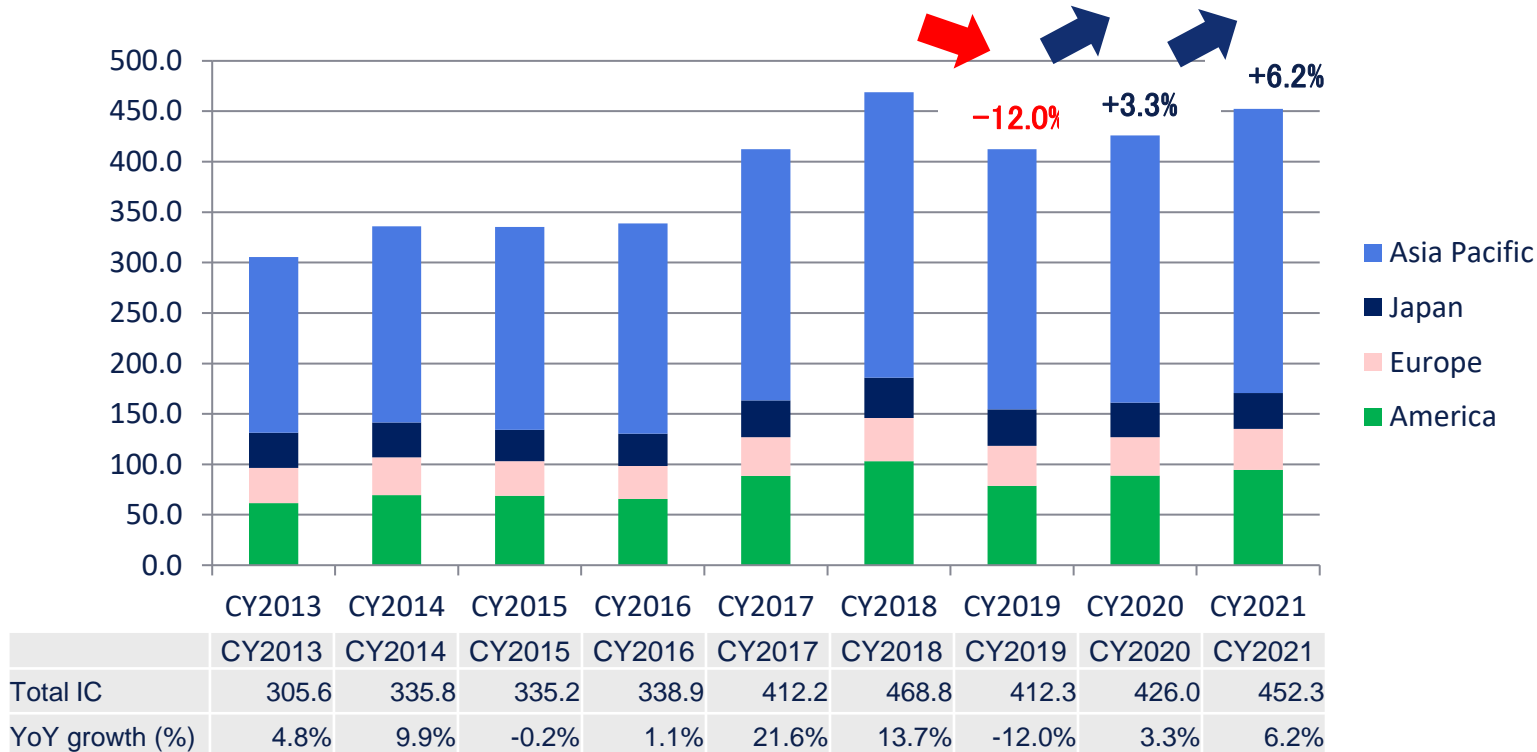


3. As mentioned above, it is considered that the COVID-19 pandemic produces favorable effects on the semiconductor market, where the capacities of servers will become insufficient around the world, the demand for 5G infrastructure will grow, and there will be popularization of remote control, medical robots, etc. Under the assumption that people will have to coexist with COVID-19 for some period until a vaccine is developed, local medical examination systems will be established in China, too. (We will contribute to solving social issues, by supplying temperature control thermo-electric modules for PCR testing equipment.)

Semiconductor Market Forecast by Region:

It has been growing in 2020 from the correction phase at -12.0% in 2019

(Billion USD)

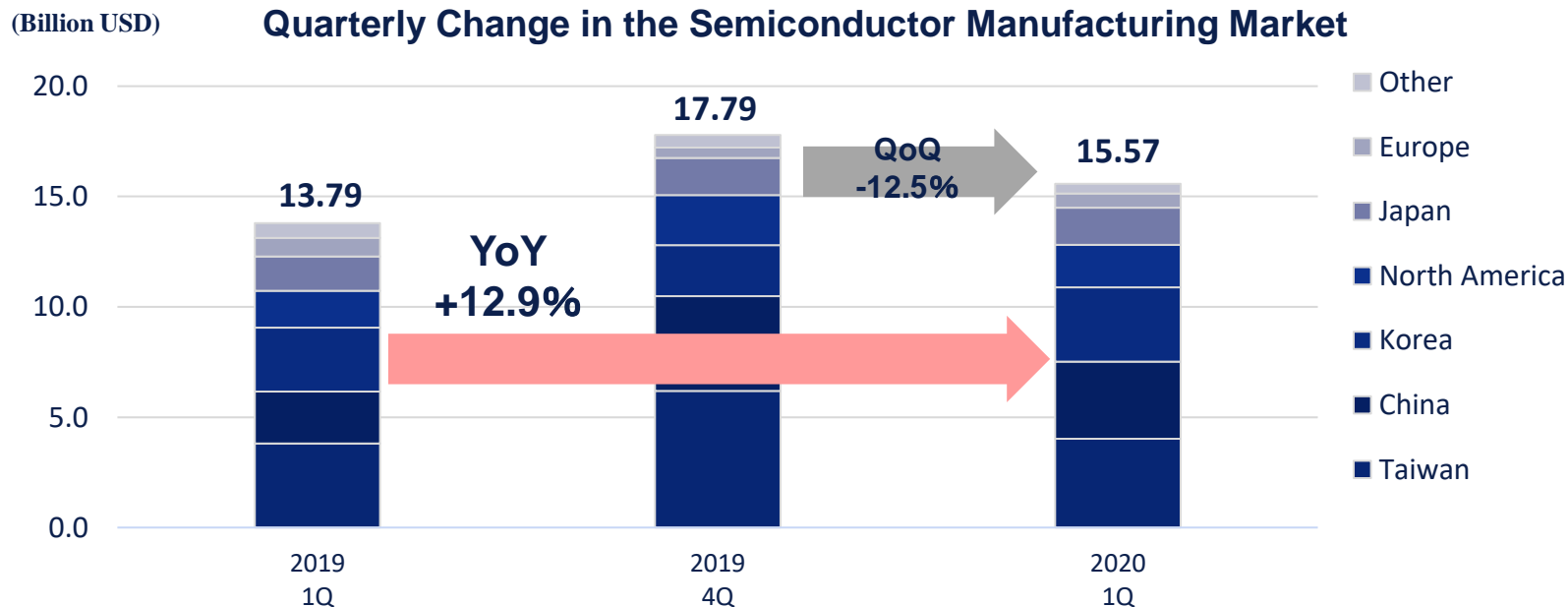


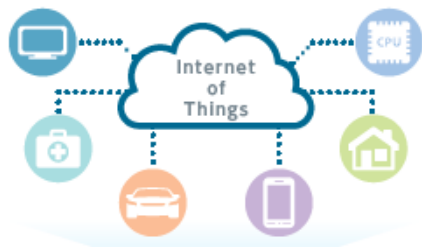
*Prepared by us based on data published by the WSTS Japan Council (June 9, 2008).

*CY = Calendar Year (CY2013 = 2013)

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- Due to COVID-19, in the first quarter of FY3/21, the market scale declined from the previous quarter, but grew year on year.





Performance

The mid-term management plan will be revised, and reported later

Despite the impact of COVID-19, the semiconductor market is expected to grow again toward 2021.

Product strategy

Improvement of the business portfolio

To strengthen our recurring-revenue business and automotive domain, while allocating resources to semiconductor-related products, which sell well.

Capital investment

Capital investment peaked in FY3/20

We will keep enhancing production capacity for materials, cleaning, power substrates, etc. whose demand is strong.

The investment in large-diameter wafers for semiconductors subsided, and we will enter the stage of recouping the investment in some years.

Return to shareholders

We will plan to increase dividends, when our business performance improves

We pursue stable dividends as a basic policy, and manage business while considering the return to stakeholders.

Intensive points



What is “Made in China 2025?”

This is a national project announced by the Chinese government in May 2015, and corresponds to the 1st stage of the project for strengthening domestic manufacturing, which is scheduled to end in 2049.

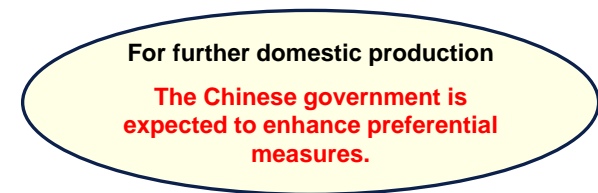
→The Chinese manufacturing industry aims to shift from the advantage in quantity to the advantage in quality, by overcoming the shortage of innovation capacity.

1. Participation in national projects in the semiconductor field

- ★Utilization of national and provincial technological centers and preferential measures based on national projects
- ★Pursuit of the cutting-edge technologies and products that cannot be imitated by Chinese enterprises

2. Planning for restructuring the group of Chinese subsidiaries and procurement of funds for growth

- ★Discussion on the establishment of a holding company that manages multiple Chinese subsidiaries and its functions
- ★Clarification of cutting-edge technologies and businesses to grow and to be strengthened and diversification of schemes for procurement of funds for growth



- China announced that it would concentrate on the construction of new infrastructure, which will strengthen our new promising domains including 5G, AI, and data centers. The semiconductor-related market is expected to keep growing.

Domains emphasized in the construction of new infrastructure in China



AI



IoT



5G



**Block
chain**



**Data
centers**

Etc.

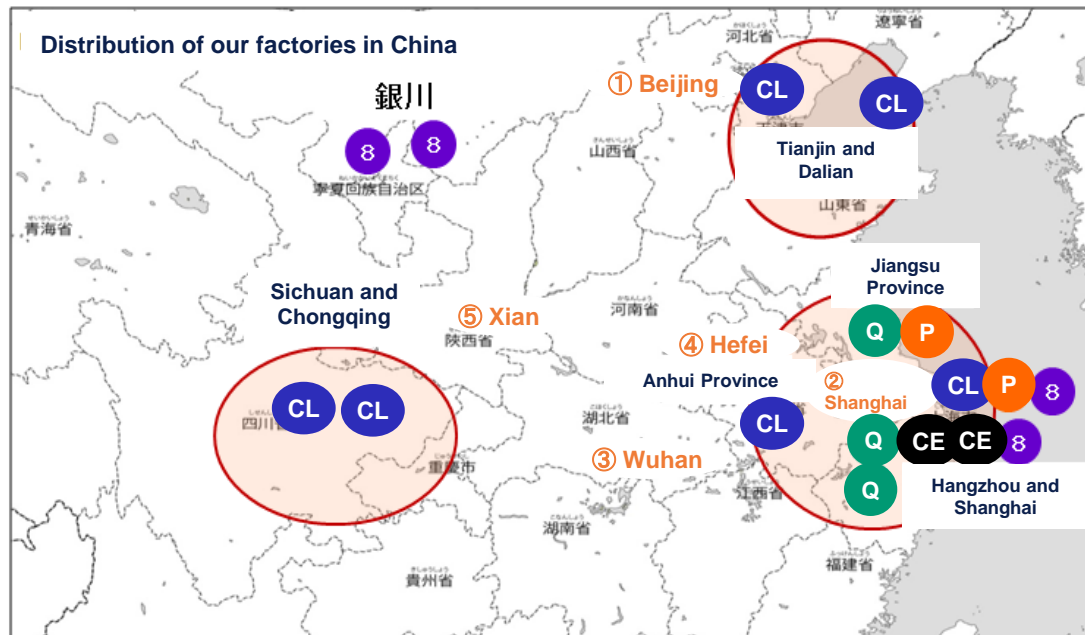
The sales of 12-inch semiconductors in China are estimated to grow considerably, in the cutting-edge fields, including high-end smartphones, 5G, and data centers, and the legacy-system field, including power devices and IoT.

We will contribute to the growth of the market assuming domestic production and expand business by establishing production bases in the vicinity of major footholds of Chinese semiconductor enterprises and improving customer satisfaction.

★Major footholds of Chinese semiconductor enterprises

(1) Beijing (2) Shanghai

(3) Wuhan (4) Hefei (5) Xi'an



Major industrial area

8 8-inch factory
(Shanghai, Yinchuan×2,
Hangzhou)

Q Quartz factory
(Hangzhou, Changshan, and
Dongtai)

CE Ceramics factory
(Hangzhou×2)

CL Cleaning factory
(Shanghai, Tianjin, and
Sichuan×2, Dalian and Anhui
province)

P Power Semiconductor
Substrates
(Shanghai, Dongtai)

- Most of the new factories completed in China in 2018-2019 are for the increase of production output, and entering the full-scale manufacturing stage.

Major plants in China recently completed and commenced operations



**Quartz and DCB Factory
(Dongtai, Jiangsu Province)**

Completed in November 2018



**Quartz Factory
(Changshan, Zhejiang Province)**

Completed in October 2018



Ingot Factory (Yinchuan No. 2)

Completed in May 2019



**200 mm Wafer Factory
(Hangzhou)**

Completed in November 2019



**Cleaning Factory
(Anhui Province)**

Completed in January 2019



**Cleaning Factory
(Chongqing No.2)**

Completed in January 2019

Our lineup of semiconductor-related products



Vacuum feedthroughs

*Semiconductor and FPD production equipment parts (market share: 65% (largest))

★Mid-term strategic products

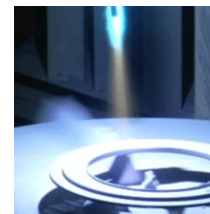


Silicon wafers

*Monthly production capacity- 6 inch: 400 thousand, 8 inch: 100 thousand

Plan to increase production of 8 inches by 350 thousand sheets and 12 inches by 30 thousand sheets over the medium term

★Mid-term strategic products



Machinery Parts Cleaning

*Focus on the Chinese market (Market share in China: 60% (largest))

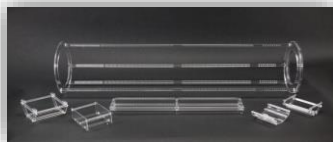


Metal Precision Machining

*Growth forecast due to increase in future customers (factories) in China

Jigs and consumables for semiconductor manufacturing equipment (our mainstay material products)

★Medium term strategic products



Quartz



Silicon parts



Ceramics



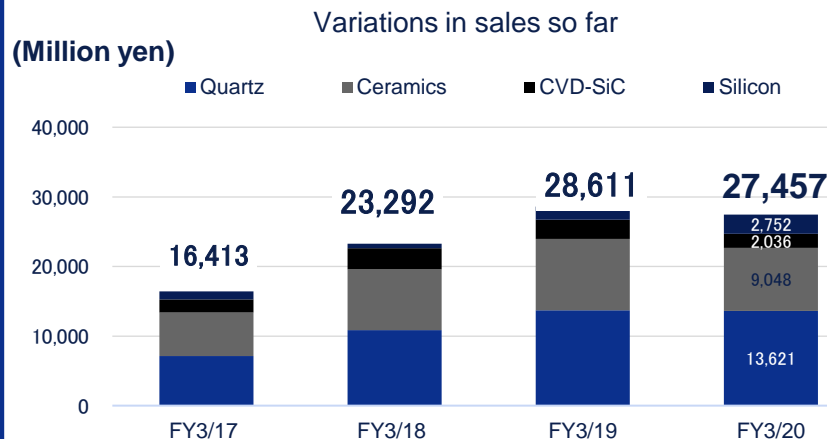
CVD-SiC

Our strengths: not only capital investment-linked products (vacuum feedthroughs), but also a lineup of **repeat consumables** (materials) and **services** (equipment parts cleaning) **linked to the production and operation of semiconductor device manufacturers.**

Semiconductor materials



*The strategic products are quartz, ceramics, CVD-SiC, and silicon.



■ As for semiconductor materials, the demand for consumable materials is strong, so the ratio of linkage to the production operation rate of semiconductor manufacturers is high (some are investment-linked ones).

■ In 2019, sales were almost unchanged from the previous year, despite the adjustment of the semiconductor manufacturing equipment market.

■ In 2020, the impact of COVID-19 is not ignorable, but the demand is estimated to be healthy, thanks to the expansion of demand for 5G and data centers related to telecommuting.

- Among materials, the sales of quartz are projected to grow steadily (as the demand for consumable materials is firm). *The demand for quartz is estimated to exceed the latest peak in 2018.
- We will establish a system for increasing production output with factories in Hangzhou and Changshan, Zhejiang and Dongtai, Jiangsu, China, and Yamagata City, Japan.



Pyro-processing of quartz by veteran engineers



Machining of quartz, whose production amount will be increased

- As for ceramics and CVD-SiC, we have the advantage in developing “materials and technologies for processing and coating” in Japan.
- Hangzhou Factory in Zhejiang, China plans to enhance the capacity to produce fine ceramics, which are in high demand.

Hyogo: Development and mass-production of fine ceramics



Hangzhou in China: Mass-production of fine ceramics



Ishikawa: Mass-production of machinable ceramics



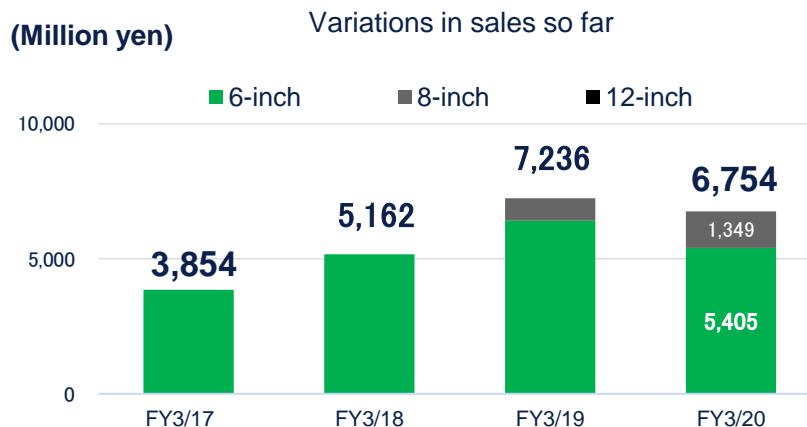
Ishikawa: Development of fine and machinable ceramics



Okayama: Development and mass-production of CVD-SiC

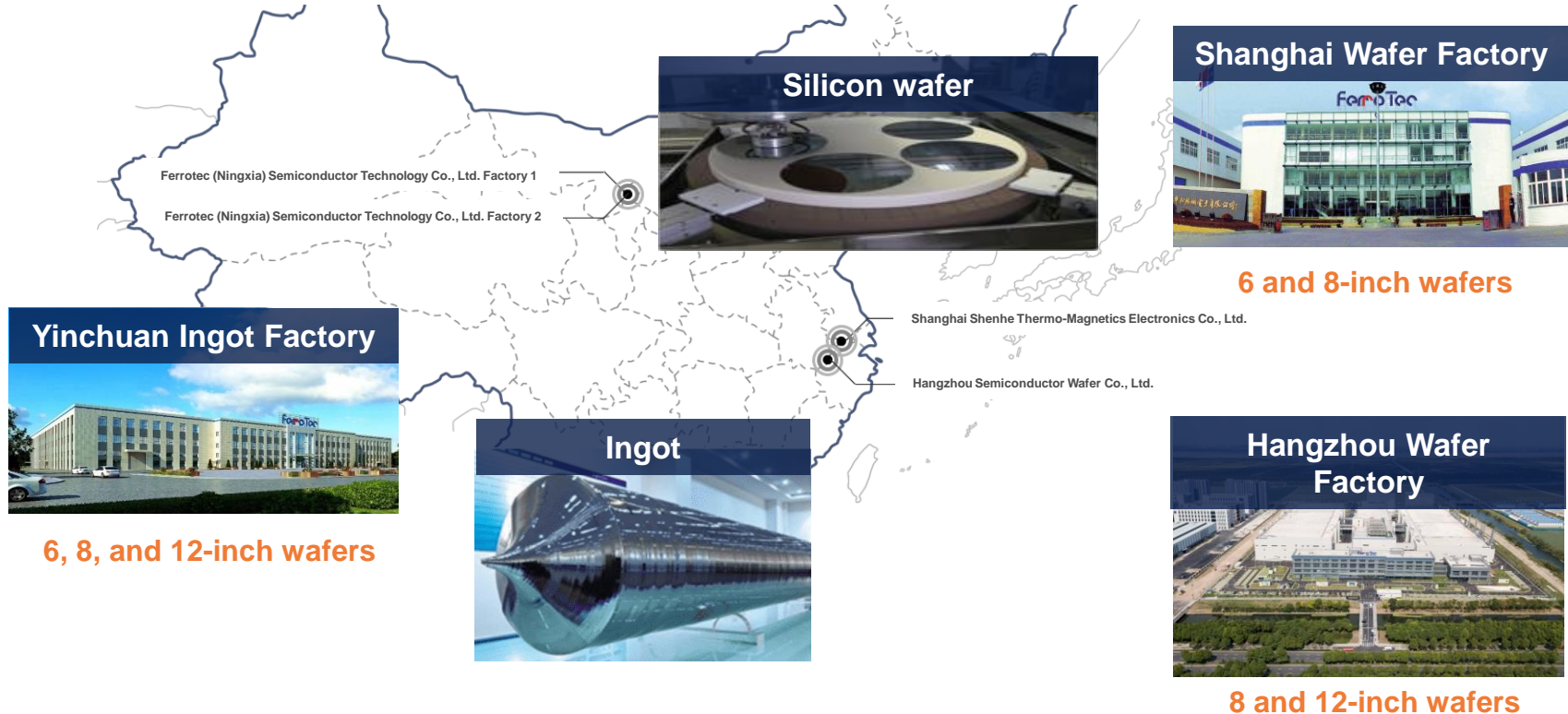


Semiconductor wafers



- In 2019, sales were sluggish in the second half, as the demand for power devices and automobiles was stagnant.
- As for 6-inch wafers, demand is currently strong, and factories are working at full throttle. We aim to increase production output by 60,000 wafers to 460,000 wafers per month in the second half.
- As for 8-inch wafers, we are strengthening our system for direct sale. We are making the products of the new factory in Hangzhou approved by clients. We aim to establish a system for increasing production output from 100,000 wafers to 200,000 wafers per month within this term.
- As for 12-inch wafers, we are making the products approved by several semiconductor manufacturers in China. Mass-production is to be started in the second half.

- We are making 8-inch and 12-inch wafers of the factory in Hangzhou approved and increasing mass-production.



New Business: We are entering the wafer recycling market with a joint venture with a governmental fund of Tongling, Anhui, China

- **As domestic production of semiconductors in China was accelerated**, the demand for recycling of monitor wafers (used before the start of mass-production) grew rapidly, and we decided to launch a service of recycling monitor wafers.
- Schedule (tentative): The factory is to be completed in Nov. 2020, **trial production will begin in Jan. 2021, and mass-production will be started in Apr. 2021.**

■ Details of this business

- ✓ The resources for the wafer business and the know-how for the cleaning business will be utilized. We will form a technological alliance with a partner for the film removing process.
- ✓ Our subsidiary and the investment fund of Tongling, Anhui, China will conduct joint investment, and their shareholding ratio is 7:3.
- ✓ Investment amount: About 7.65 billion yen (the first term)
- ✓ Target monthly output: About 100,000 wafers

*Ultimately, we aim to produce about 200,000 wafers per month (details are TBD).



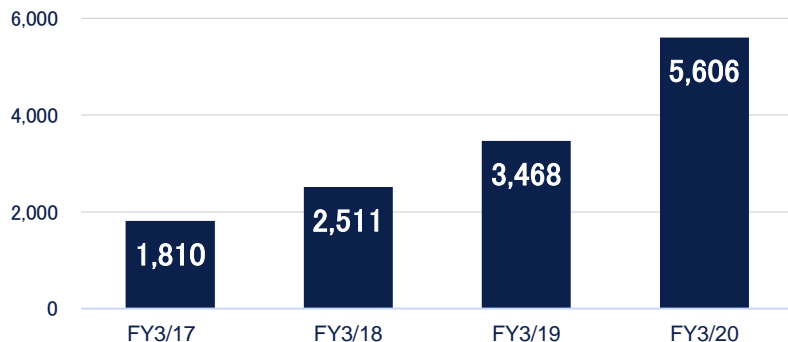
Wafer recycling factory under construction in Tongling, Anhui

Equipment parts cleaning



(Million yen)

Variations in sales so far

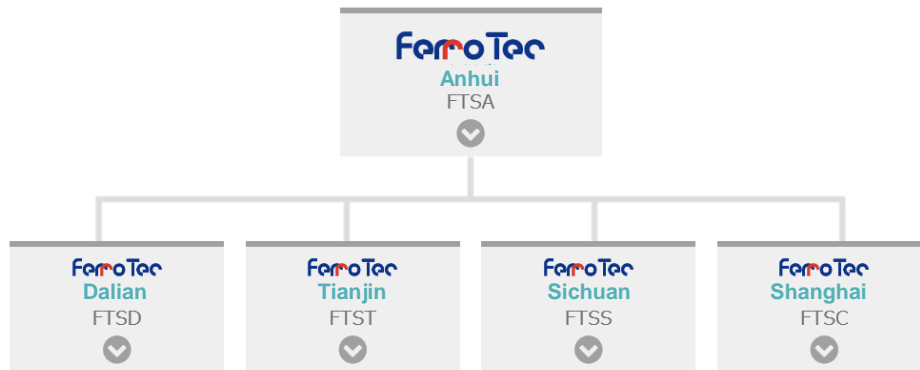


- **This business is targeted at the Chinese market.** Its scale has been growing steadily year by year, in response to the expansion of production by semiconductor and FPD (organic EL and liquid crystal) manufacturers.
- Since this business is a recurring-revenue type that depends on clients' production operation, like semiconductor materials, we can readily secure stable sales (the business is expected to keep growing steadily).
- Since we are increasing the cleaning volume with 5 bases and 6 factories, our market share in China is approaching 60%.
- With meticulous marketing and services for semiconductor makers, we will strive to offer the wafer recycling service (new business) to the same clients.

- The governmental fund of Tongling, Anhui will co-invest, and we aim to realize a project for expanding the business.
- Since Chinese semiconductor and FPD makers will launch new projects one after another, we plan to increase the cleaning volume in Tongling.

★For the equipment parts cleaning, we will restructure our organization with the factory in Tongling, Anhui controlling the other factories.

★To offer meticulous services in the vicinity of client facilities (5 bases and 6 factories)



Lineup of our electronic device-related products

Thermo-electric modules



*As temperature adjustment devices, thermo-electric modules are increasingly used in the fields of automobiles, semiconductor manufacturing equipment, communications, medical biotechnology, consumer products, etc.

(Market share: 36% (TOP))



DNA amplification (bio)

To check the existence of pathogens that cannot be observed with a microscope
<PCR method>

*Polymerase Chain Reaction

Power semiconductor substrates



★Mid-term strategic product

*In response to **the global trend of power consumption reduction**, the demand from clients needing power semiconductors is growing. (DIRECT COPPER BONDING technology for bonding a copper circuit to an aluminum ceramics substrate)

Application of power semiconductors



Ferrofluid



*Used in a wider range of fields, including automobile speakers, high quality sound TV speakers, and smartphone vibration
(Market share: 80% (TOP))



Adopted for **high-quality sound headphones**

*To stabilize vibration,
to actualize deep bass and realistic sensation

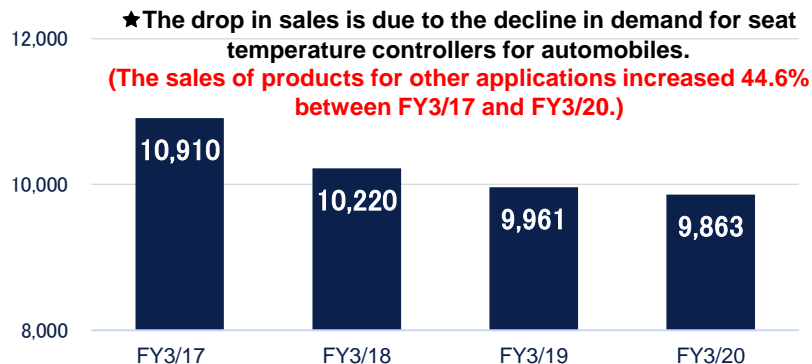
Thermo-electric module



- It is our core technologies, and products are used for a variety of purposes.
- The demand for products **for 5G communication devices** is expected to grow (In China, 5G communication stations are scheduled to be built at 600,000 spots by the end of 2020.)
- As digitization is progressing with consumer products (wearable devices), IoT, home appliances, etc., the purposes of use of thermo-electric modules and the demand for them are increasing.
- Recently, the demand for products to be used in equipment for PCR testing for COVID-19 has grown.

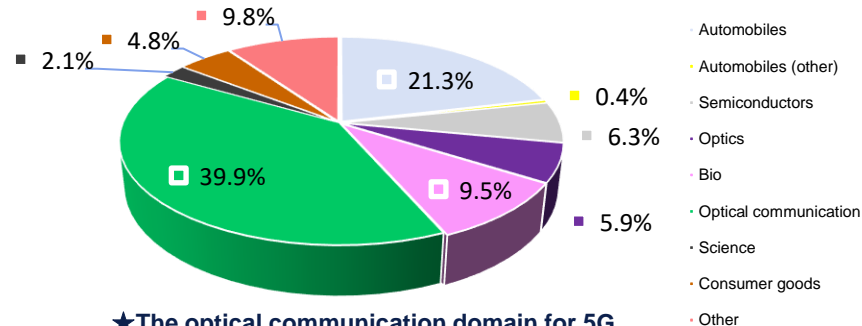
(Million yen)

Variations in sales so far



Ratios of purposes of use of thermo-electric modules in FY3/20

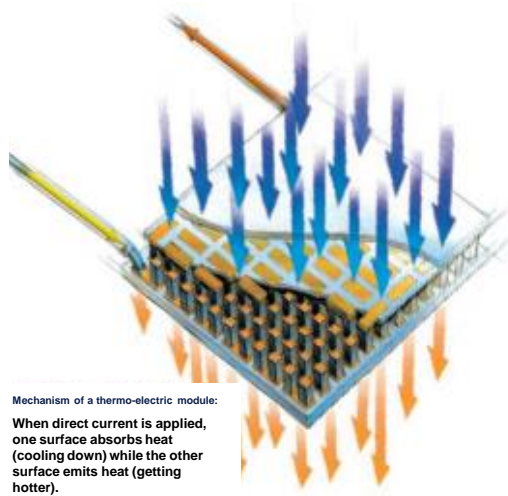
*Power substrates excluded



★The optical communication domain for 5G communication devices is expanding.

The generation and absorption of heat are controlled with electric current

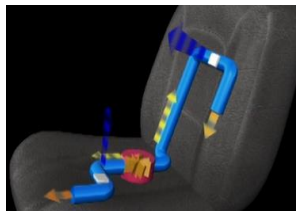
A thermo-electric module is a plate-like semiconductor element that harnesses the phenomenon in which heat transfers from one metal to the other one when electric current is applied to the joint between the two metals. Namely, this element can control the generation and absorption of heat with electric current, and a familiar product has been developed by utilizing it.



Thermo-electric module



Communication devices
*We expect a lot from 5G infrastructure.



Seat temperature controllers
*For automobiles



Shaver Facial massager



DNA amplification (bio)
To check the existence of pathogens that cannot be observed with a microscope
<PCR method>
*Polymerase Chain Reaction

Thermo-electric modules are being adopted for controlling the temperatures of underwear and jackets.

***The demand for thermo-electric modules for wearable products is expected to grow remarkably.**

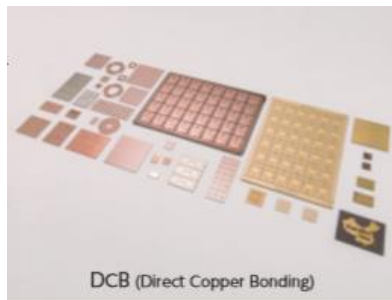


Jackets that can get cooler and hotter
(prototype)



Our exhibition booth at Automotive World 2020 (Jan. 2020)

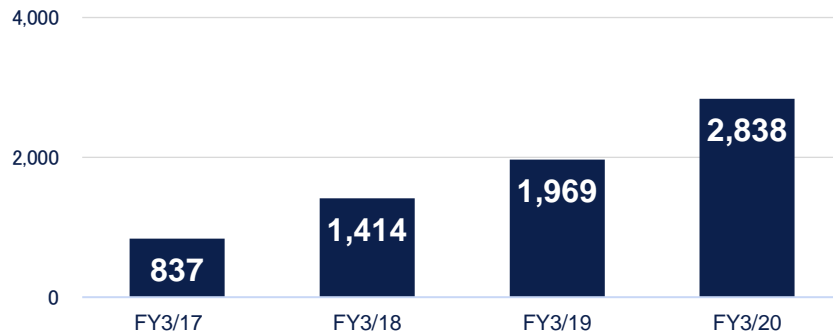
Power semiconductor substrates



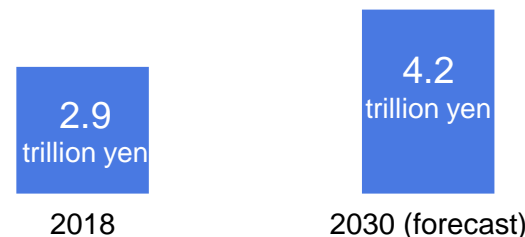
- As there is a global trend of power consumption reduction, **our business is growing steadily.** (The scale of the power semiconductor market is estimated to be 4.2 trillion yen in 2030.)
- Due to the trade friction, etc., **our market share in China expanded.** An increasing number of global makers are adopting our products.
- The clients are mainly in Europe, Japan, and China.

(Million yen)

Variations in sales so far



Global market of power semiconductors

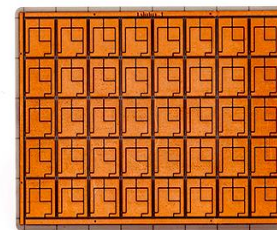


*Produced by our company with reference to the data of Fuji Keizai.

- As demand is estimated to increase also in the automobile field, we will release AMB substrates in addition to DCB substrates.
- The power semiconductor substrate factory in Dongtai, Jiangsu is expanding its production capacity, and sales are estimated to keep growing in the next and following terms.
(Production capacity in 2020: 600,000 DCB substrates and 100,000 AMB substrates at Shanghai and Dongtai Factories)

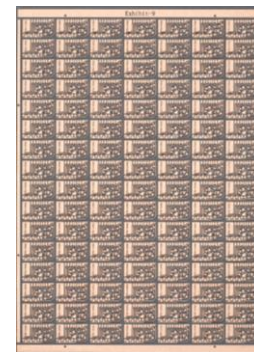


★As the demand for in-vehicle devices grew, the demand for AMB substrates increased.



DCB substrates
(Direct Copper Bonding)

Material: Alumina ceramics



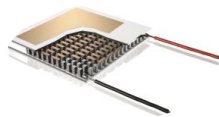
AMB substrates
(Active Metal Brazing)

Material: Silicon nitride

Promotion of Automotive Project



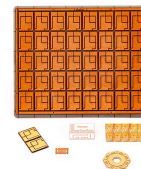
Our products that can be used for in-vehicle devices



Thermo-electric module



Ferrofluid



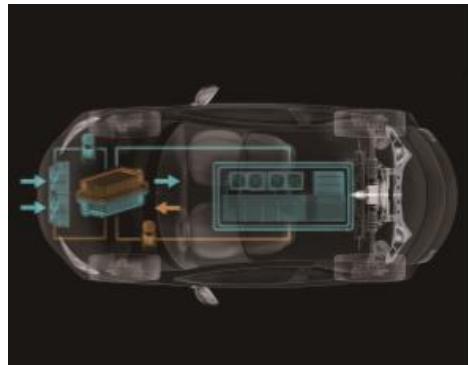
Power semiconductor substrates

- By utilizing the strengths of our products, including the heat dissipating/cooling property of thermo-electric modules and the sealing property of ferrofluid, we will expand the business of in-vehicle devices, in which the demand for semiconductors will increase.
- Our products are used for various purposes, including the temperature control of CMOS sensors and lithium ion batteries, and cup holders.
- We have already established an independent section, and started enhancing marketing, with the aim of achieving sales of about 20 billion yen by the end of FY3/24. (Current sales: About 2.5 billion yen)



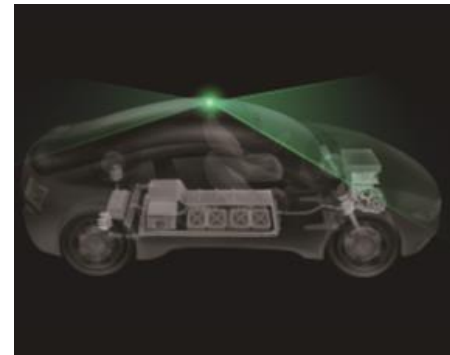
Thermo Electric CMOS Cooler for ADAS

CMOS image sensors are used for cameras in ADAS. Dark current noise is produced in a CMOS image sensor if temperature rises. By using thermo-electric modules, it is possible to control the temperature of CMOS image sensors with their compact, lightweight and convenient properties.



Thermo Electric Battery Heater Cooler

Batteries used for EVs, HEVs, PHEVs, etc. are very sensitive to temperature. High temperatures affect the lifespan of each battery, while low temperatures affect the performance of each battery. By using thermo-electric modules, it is possible to control the temperature of the batteries with their compact, lightweight, convenient and efficient properties.



LiDAR

By irradiating an object with a laser while scanning and observing the reflected laser, it measures the distance from that object and identifies the properties of that object. Heat makes it difficult to conduct accurate measurement with a laser. By using thermo-electric modules, it is possible to control the laser source and stabilize measurement precision.

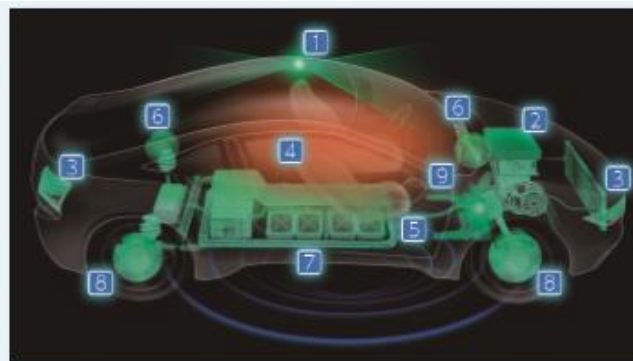
In-vehicle device-related business

Ferrotec Material Technologies Corporation, which is growing mainly in the semiconductor market, will promote our core technologies of thermo-electric modules (Peltier element), ferrofluid, etc. for the automobile market, which is expected to see significant changes in applications, such as EVs, PHVs, and automatic driving systems.



Thermo Electric Cup Holder

By using thermo-electric modules, it is possible to make compact, lightweight cup holders have the heat-retaining/cooling function easily. They can keep cold drinks cold and warm ones warm.



Thermo-electric module applications

- 1 Laser radar
- 2 Battery cooling
- 3 Laser headlights
- 4 Seat cooling system
- 9 ADAS GPU CPU CMOS GPU cooler CMOS cooler
- 10 Steering heater cooler
- 11 Cup holder
- 12 HUD (Head-up Display)

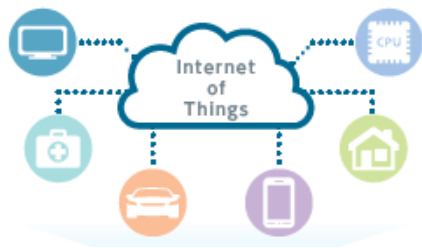
Magnetic fluids and applications

- 2 Engine suspension
- 4 Seat suspension
- 6 Suspension around the foot
- 7 Hzero® high-precision DC sensors for monitoring SOCs
- 8 Hzero® composite wheel in motor
- 13 Touch Panel & Center
- 14 Audio

Power semiconductor substrates and applications

- 2 Engine Engine control
- 3 Bodies Headlamp control Room lamp control
- 5 Powertrain HEV motor control Brake control Transmission control Steering control

Our Corporate Philosophy and Sustainable Management



Name	New position	Current position
Akira Yamamura	Representative director and Chairman	Representative Director and President
He Xian Han	Representative Director and President, Group CEO	Representative Director and Vice President

To develop a new “Ferro Culture” while emphasizing sustainable growth under the unchanged corporate ethos of Ferrotec

Under the corporate principles, our company will intensify our ESG (environment, society, and governance) efforts, to attain sustainable development goals (SDGs) following the global trend.

Corporate Principles

**Strong commitment to our customers
Excellence in engineering precision solutions
Delivering superior quality, value and service**

Agreeing with clients' philosophies for sustainability-oriented management and social contribution policy, we will help them attain their goals with our products and services.

We will actively promote environmentally friendly activities and try to contribute to the settlement of global environmental issues with our products.

We aim to contribute to society in the manufacturing field by utilizing our core technologies, and become a growing enterprise winning the trust of all kinds of stakeholders, including clients, shareholders, employees, business partners, and local communities.

E: Environment



To be aware of environmental pollution, and contribute to the reduction of greenhouse gas emissions

•To contribute to environmental measures by supplying products

•Environmentally friendly business activities
(ISO14001/Eco Action 21)

S: Society



To contribute to everyone's health maintenance and promotion by utilizing our core technologies

•DNA/blood analysis using thermo-electric modules.
To contribute to the medical and health domains, including in-vitro diagnostics, with ferrofluid



By supplying components in the high-tech field, we will innovate technologies related to semiconductors and automobiles and contribute to infrastructure development

•To contribute to digital infrastructure development through IoT, AI, etc. with materials, silicon wafers, etc. In addition, we will respond to the automotive technological innovations, including EVs and automatic driving



Use and training of various human resources

•To secure excellent personnel and help them develop their careers

Improvement in employees' engagement

•Preparation of a lively working environment

G: Governance



Compliance with laws and strengthening of risk management

•To educate employees about the compliance with laws and the whistle-blowing division, and manage risks while assuming emergencies



Active disclosure to stakeholders

•Disclosure of mid/long-term management strategies (continued)
•Evaluation and improvement of the effectiveness of the board of directors

Basic policies:

- ★ To swiftly respond to the needs from customers, shareholders, and business partners, and contribute to the sustainable development of society by growing our company.
- ★ To aim to achieve sustainable corporate growth by developing an environment where employees can pursue ingenuity and work lively, thus increasing productivity and motivating employees.

◇ Intensive measures for enhancing the organizational capability and human resources of our group

1. To improve the functions of subsidiaries inside and outside Japan and the capability of developing technologies

- ▣ To strengthen the marketing, technological, manufacturing, HR, financial, and accounting functions of each subsidiary
- ▣ To develop new materials and technologies, and establish a development division and an R&D center in each subsidiary

2. To secure excellent personnel and improve educational systems

- ▣ To increase patent applications, and invite doctors and researchers (while promoting collaborative development with universities)
- ▣ To improve communication skills for maximizing group synergy (diversity strategies)
- ▣ To develop educational systems for upgrading information security and IP management functions globally

- The forward-looking statements in this document are based on information available as of the date of publication of this document and assumptions concerning uncertain factors affecting future results.
- Actual results may differ materially from these forecasts due to various factors. Such factors include, but are not limited to, international conditions, economic conditions, product supply and demand trends, raw material prices and market conditions, and exchange rates.
- Quantitative targets and capital investments in these materials represent medium-to long-term strategies and visions, and are not performance forecasts. We undertake no obligation to update any information with respect to these matters.
- For official forecasts, please refer to the disclosure of financial results based on the Tokyo Stock Exchange Regulations.

<Inquiries>

IR Office, 03-3281-8186

Thank You

