

Business Briefing Functional Products business

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Furukawa Electric Co., Ltd.

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Projections of future sales and earnings in these materials are "forward-looking statements."

Management offers these projections in good faith and on the basis of information presently available.

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FURUKAWA ELECTRIC CO., LTD.

1. Basic policy and strengths
Lineup of functional products that support 5G and a sustainable society
2. Review of the 2020 Medium-term Management Plan
3. Market overview
4. Future outlook and net sales forecast
 - a) AT & Functional Plastics Division
 - b) Thermal Management Solution & Products Division
 - c) Memory Disk Division
 - d) Copper Foil Division

Aim for co-creation with the customer, and continue to provide solutions Utilizing the ability to propose and develop new products that meet customer needs and that support 5G and the sustainable society



Lineup of functional products that support 5G and a sustainable society

More resilient infrastructure / increased communication traffic



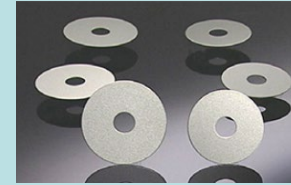
Tape for 5G next generation devices



Smart cities/ High performance troughs



Thermal dissipation for CPUs

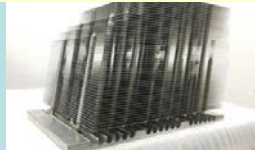


Aluminum HDD blanks

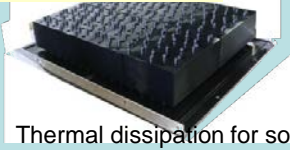


Electrolytic copper foil for printed wiring boards

Carbon free society / renewable energy



Thermal dissipation for high speed rail



Thermal dissipation for solar power



Troughs for slopes



Copper foil products produced using [solar power](#)



MD products produced using [hydroelectric power](#)

Realize cities that remain functional during disasters / disaster prevention & mitigation



Square EFLEX



Mats for evacuation shelters



Fire resistant foam

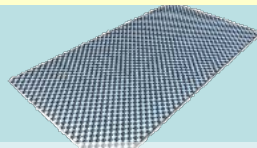


Exterior wall penetrations

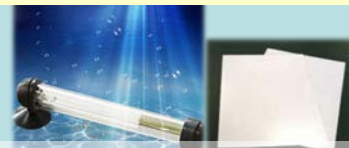


Moisture activated waterproofing

Safe, peaceful, rewarding society/ antibacterial & antiviral



Antiviral foam



UV reflective sheets for disinfection

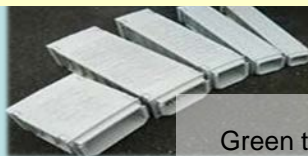


Desk partitions



Face shields

Recycling based society / environmental recycling



Green trough



EFCELL packaging material



EFCELL office supplies



Styrofoam recycling: EFLEX filler

Social issues

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



7 AFFORDABLE AND CLEAN ENERGY



11 SUSTAINABLE CITIES AND COMMUNITIES



3 GOOD HEALTH AND WELL-BEING



12 RESPONSIBLE CONSUMPTION AND PRODUCTION

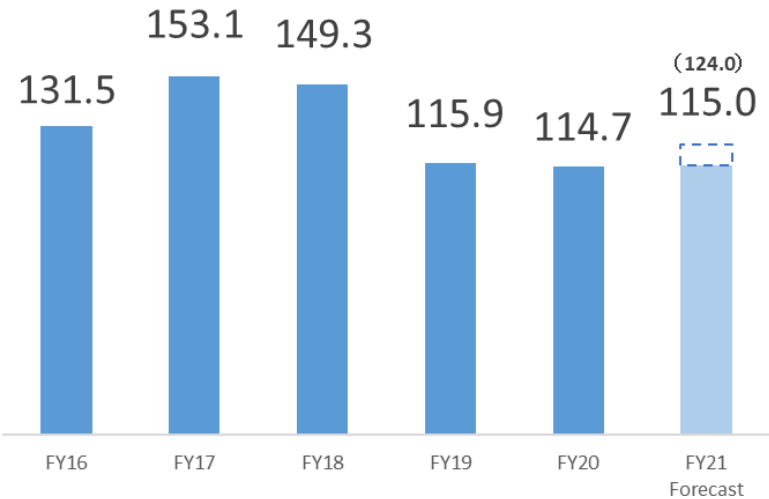


Review of the 2020 Medium-term Management Plan

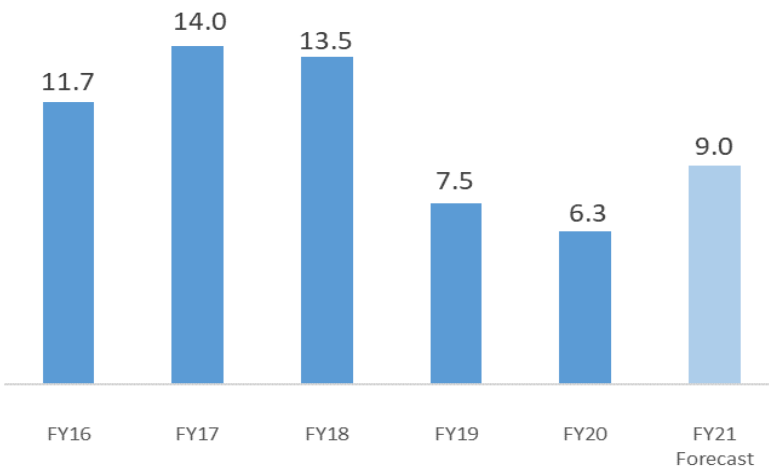
※Functional Products includes the listed subsidiary Totoku Electric Co., Ltd.

Net sales
(JPY billion)

(Based on the old accounting standards)



Operating income
(JPY billion)



	Topics
FY2016	<p>Increased semiconductor and data center demand (FY2016-FY2017) 【AT, Thermal, MD, Copper foil】 Higher semiconductor and data center demand provided a tailwind 【MD】 Continued advancements in customer service with a focus on FUM established in 2015 【Copper foil】 Realized the benefits from restructuring operations in Japan</p>
FY2017	<p>【AT】 Benefits of developing multiple uses for tape started to appear 【Functional plastics】 Launched the square EFLEX with the aim of entering the market for eliminating utility poles 【Thermal】 Data center ranked at the top for the first time in terms of net sales in each market 【MD】 Thinner products increased, leading to a rapid rise in storage capacity of HDD 【Copper foil】 Steadily expanded high frequency compatible copper foil and copper foil for batteries</p>
FY2018	<p>Although semiconductor and data center demand steadily increased, demand weakened in H2 due to trade friction and other issues 【AT】 Memory shipments (monetary basis) peaked in H2 【Functional plastics】 Entered the fireproof and waterproof market. Started development of skill-free products 【Thermal】 Launched the world's first stainless steel vapor chamber 【MD】 Data center demand rapidly grew and remained strong until the rebound at the end of 2018 【Copper foil】 Impacted by the slowing global economy from H2 caused by the trade friction</p>
FY2019	<p>Although data traffic increased, the shortage of processors had a negative impact 【AT, Thermal, MD】 Lack of processors put the brakes on the businesses 【Functional plastics】 Increased revenue from duct insulation following the installation of air conditioning in public schools 【Copper foil】 Significant drop in manufacturing capacity due to the fire at the Taiwan subsidiary, as well as the impact of the large typhoon and other events</p>
FY2020	<p>Supply chain collapsed due to the global COVID-19 pandemic and lockdowns in each country 【AT, Thermal, MD】 Firm semiconductor and data center demand 【Functional plastics】 Active renewable energy market in Japan 【Thermal】 Established an integrated production plant in the Philippines for manufacturing thermal management products for the US 【Copper foil】 Started restoring manufacturing at the Taiwan subsidiary affected by the fire</p>

(*Includes the impact of the sale of the listed subsidiary FCM Corporation in December 2018)



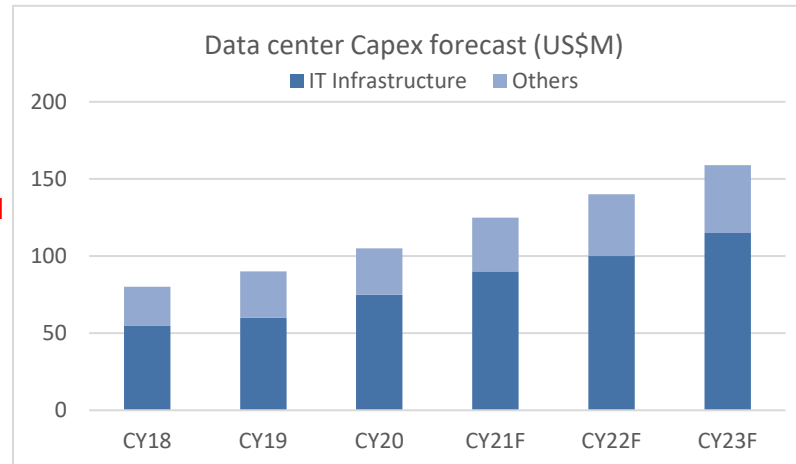
Source: i-scoop

Provide “well-differentiated” products to the trend markets

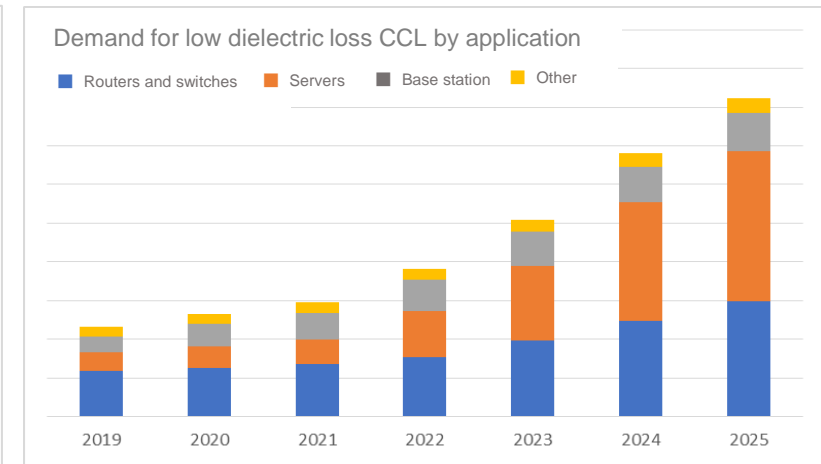


Source: Global semiconductor statistics; figures from 2020 are estimates

Source: WSTS



Source: Omdia



Source: Furukawa Electric estimate

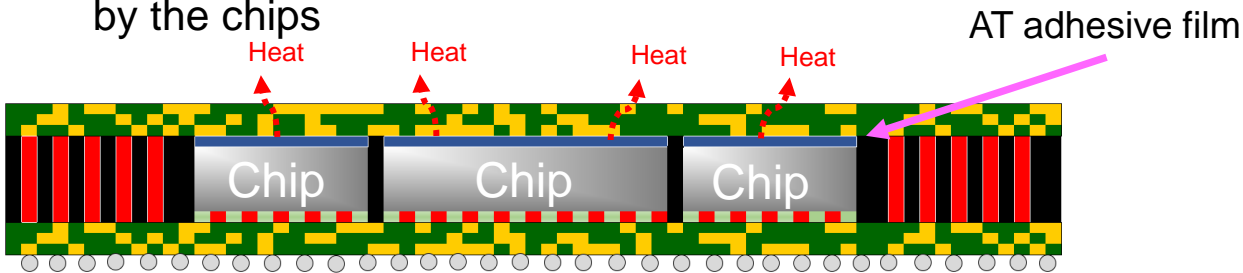
Contribute to further evolution of semiconductors through “heat conduction” and “adhesion” technology



- ✓ As semiconductor chip density increases, **heat generation** becomes an issue
- ✓ With 3D arrangements resulting from increased data volume, **wafers are becoming thinner**

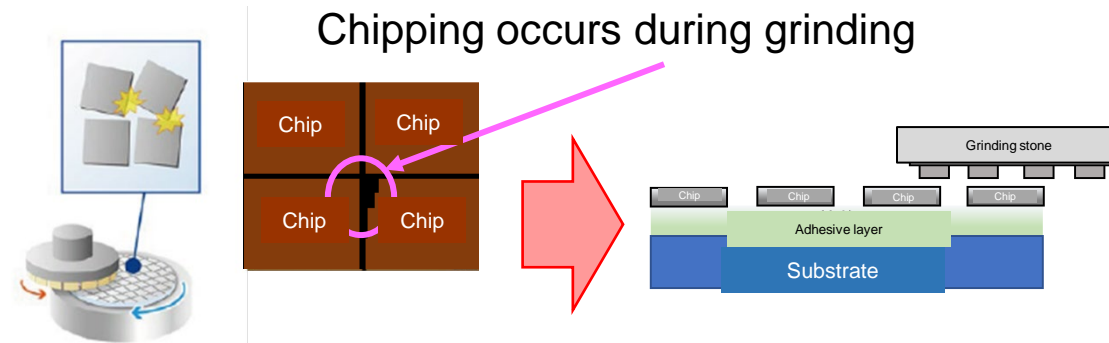
Heat resulting from increased chip density

Package gets hot due to heat generated by the chips



Dissipate heat from the semiconductor chip using adhesive film with good thermal conductivity

Chipping due to thinner wafer thickness



Optimize the conditions by controlling the physical properties of the adhesive and base film

**Contribute to increased
infrastructure resilience
in Japan**



**Realization of next
generation
infrastructure**

Propose products for renewable energy, elimination of utility poles
and labor saving

Square EFLEX



Short EFLEX



Plastic hand hole

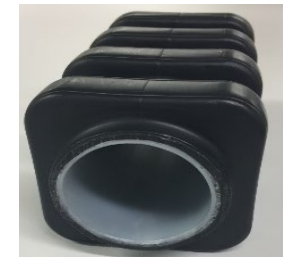


Aqua connector



Expand to
telecommunications

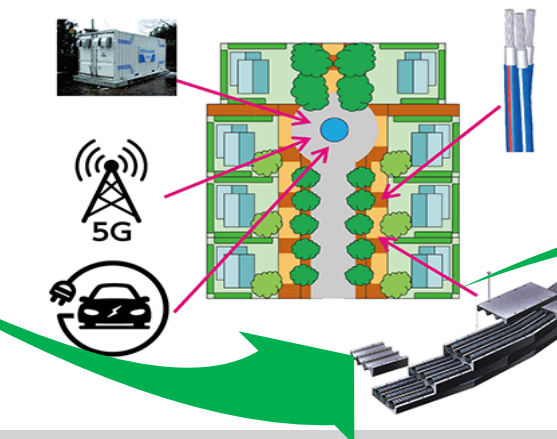
Square DW EFLEX
Conform to overseas
specifications



Heavy load troughs

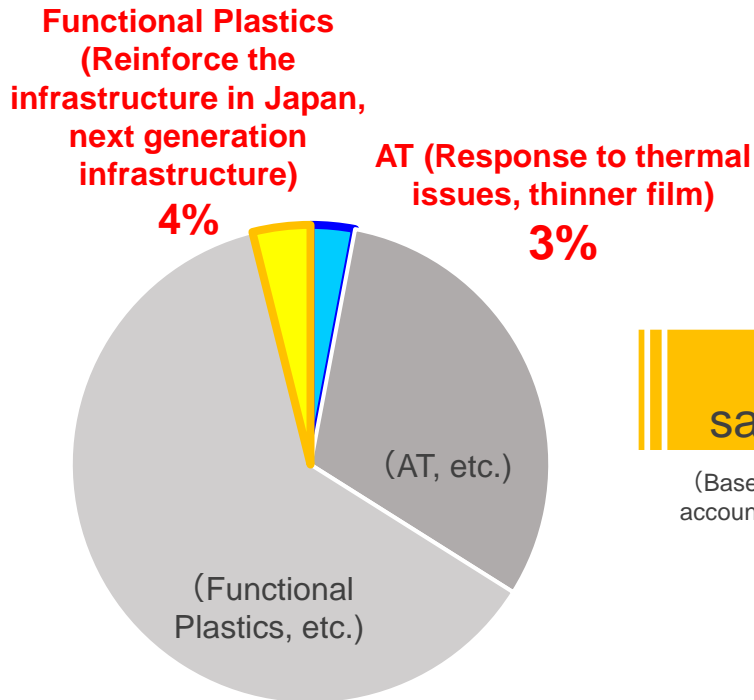


Smart cities

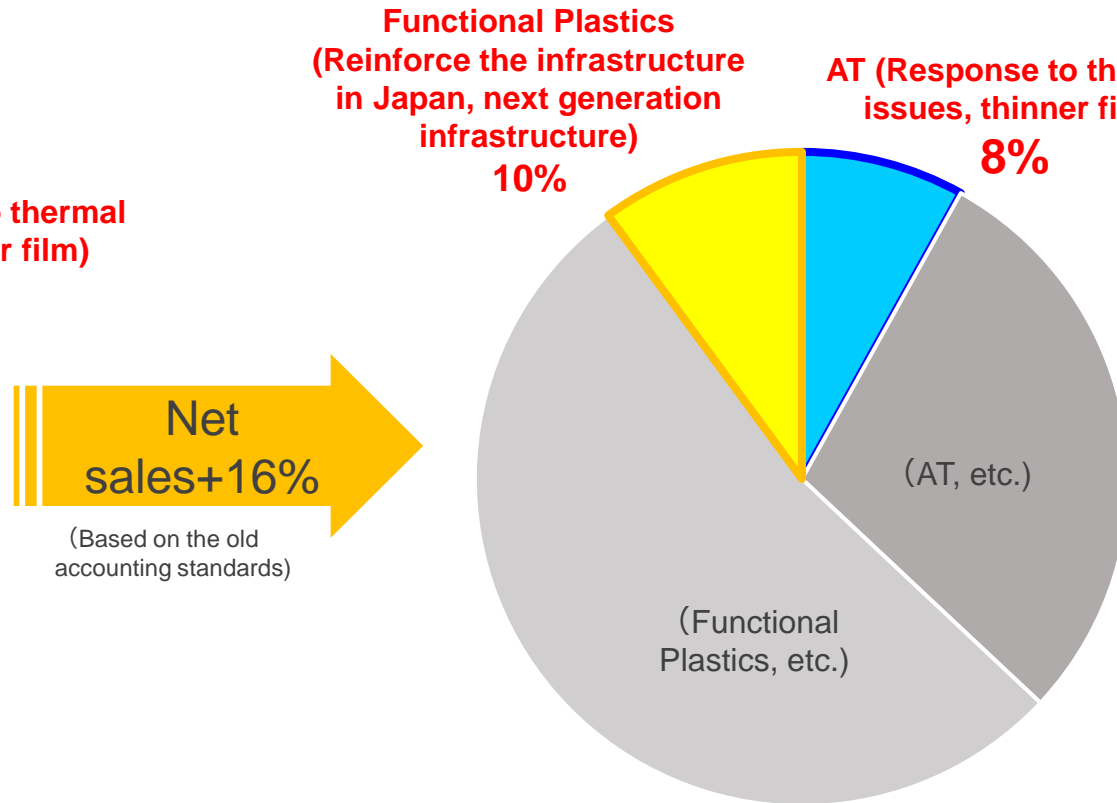


【AT & Functional Plastics】 Net sales forecast

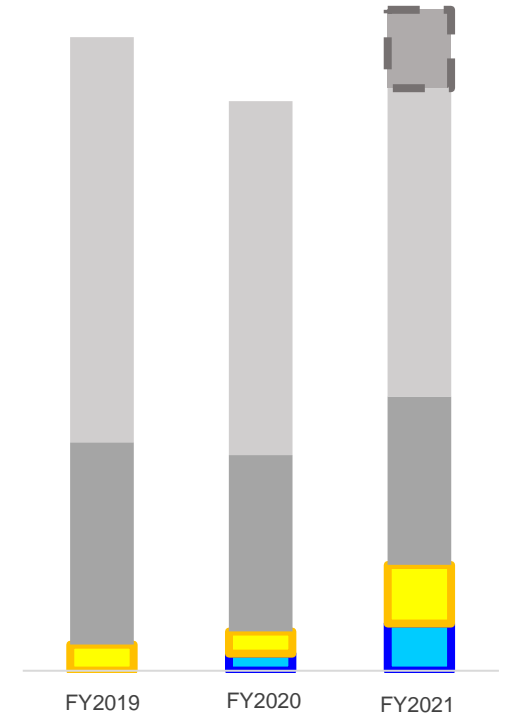
FY2020



FY2021



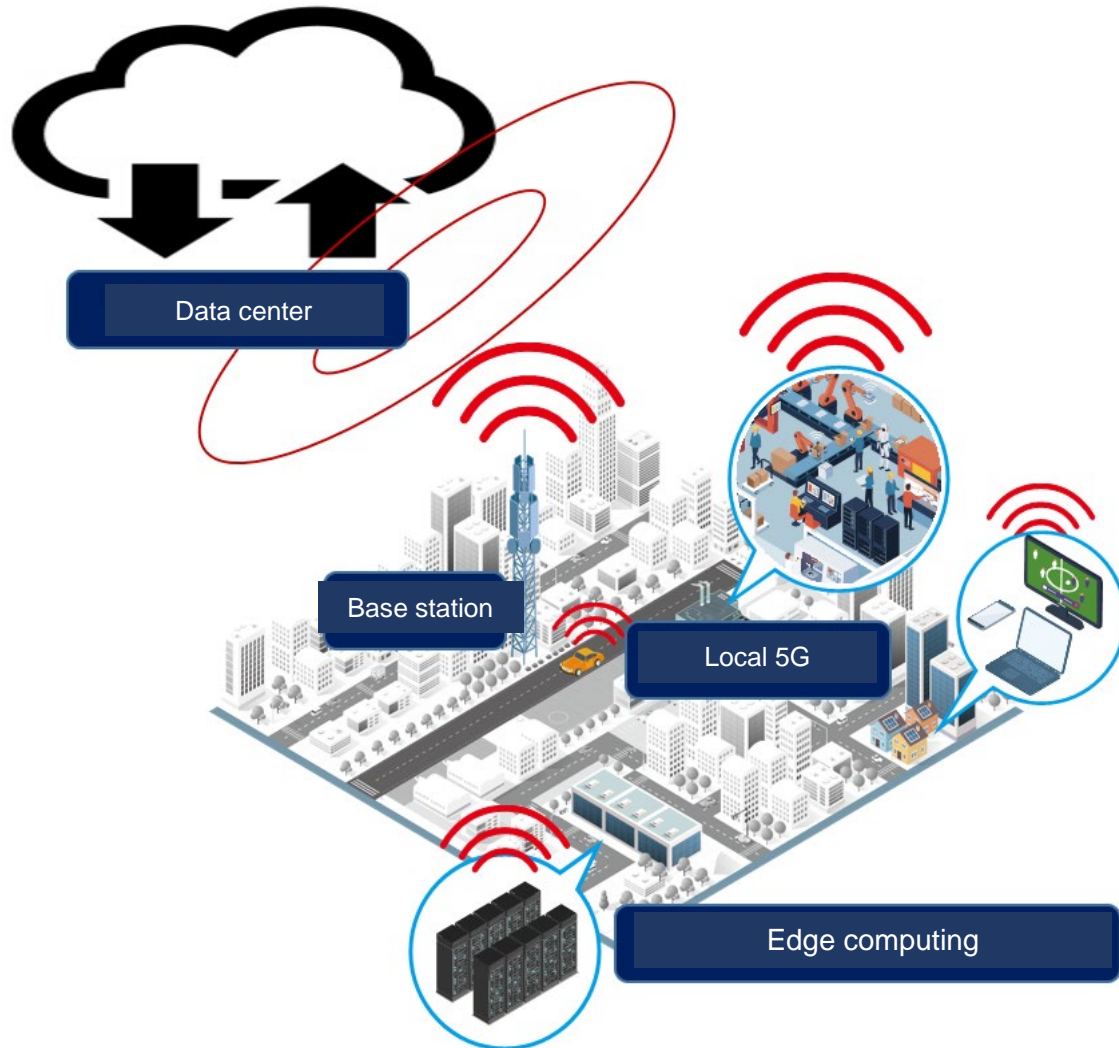
Net sales+16%
(Based on the old accounting standards)



- Functional Plastics, etc.
- (AT, etc.)
- Functional Plastics (Reinforce the infrastructure in Japan, next generation infrastructure)
- AT (Response to thermal issues, thinner film)

【Thermal Management Solution & Products】 Future outlook

As data traffic increases, the need (quality & quantity) for telecommunications infrastructure (data centers, base stations, etc.) will also increase



More heat generated by CPUs, GPUs, etc.



Telecommunications infrastructure market (data centers)

Provide **air conditioning through high performance heat pipes & sinks and 3D vapor chambers**



Need for **smaller and lighter weight** in base stations



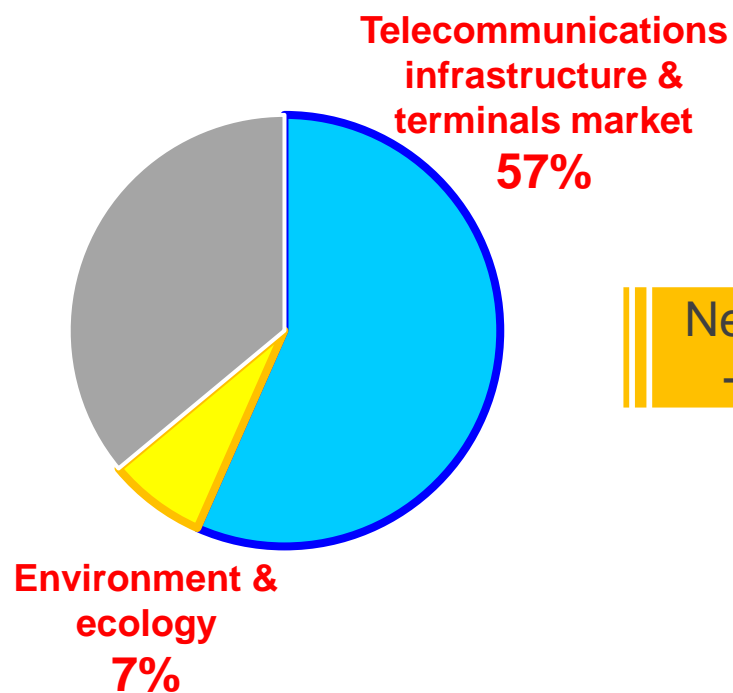
Telecommunications infrastructure market (base stations)

Provide **one-stop solutions** that include the use of **heat pipes and large vapor chambers**

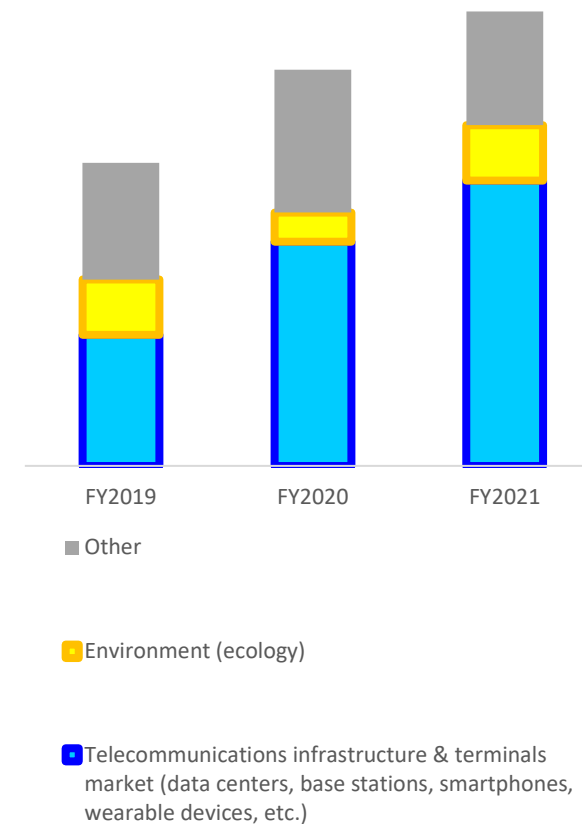
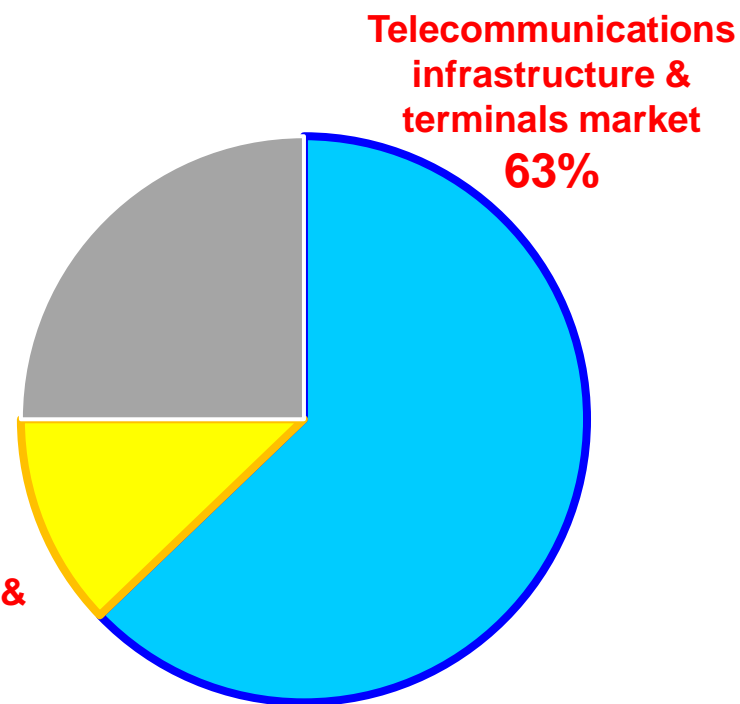
Net sales forecast

FY2020

FY2021

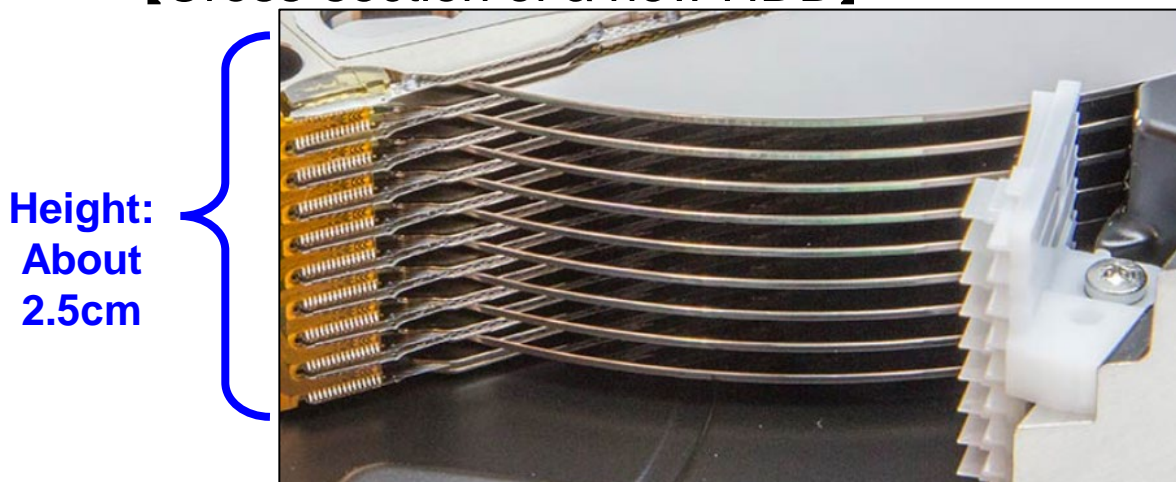


Environment & ecology
12%



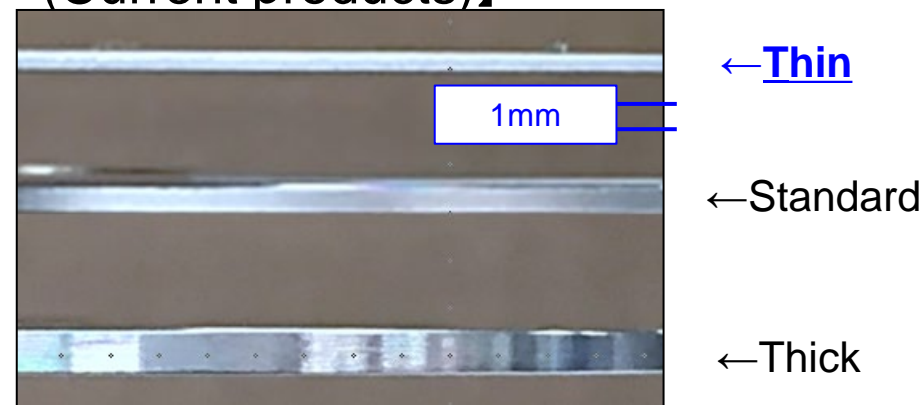
As blanks become thinner, grow by responding to customer needs through well-differentiated materials

【Cross-section of a new HDD】



Number of disks continues to increase, and there are now HDD with 9 disks
(Image※: 18TB model with 9 disks)

【Comparison of blank thickness (Current products)】



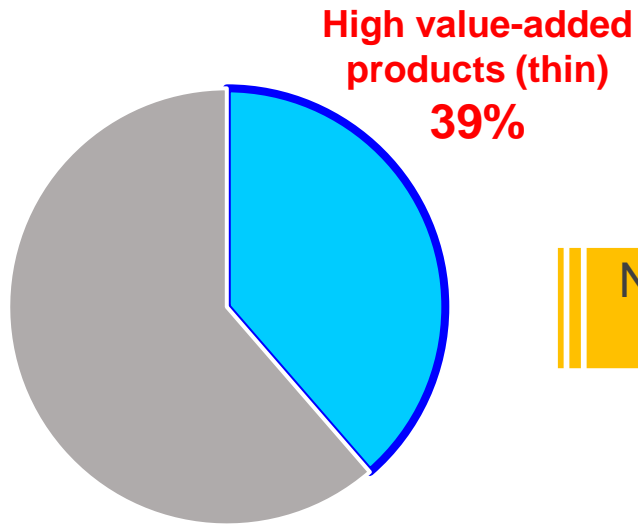
(Thin disks have a thickness of less than 1mm; Images are all Furukawa Electric blanks)

- ✓ As data volume increases, HDD will continue to be equipped with more disks per unit
- ✓ As the number of disks increases, each disk will need to be thinner
- ✓ Respond to the customer need for “thinner disks”, and fulfill market expectations by launching well-differentiated new materials

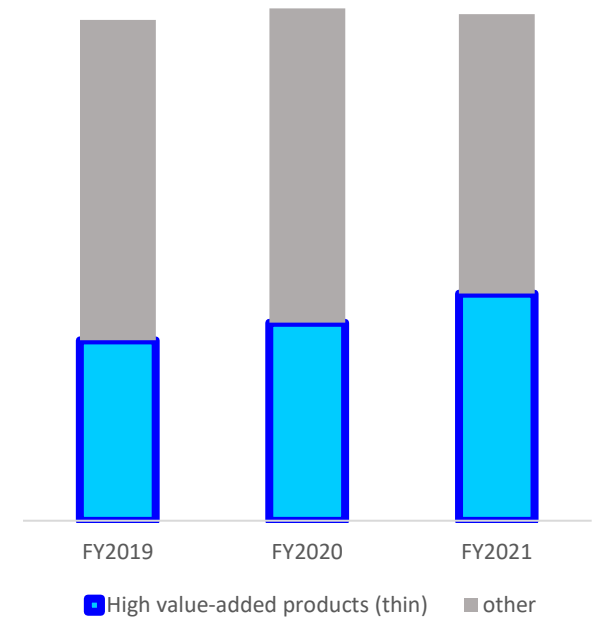
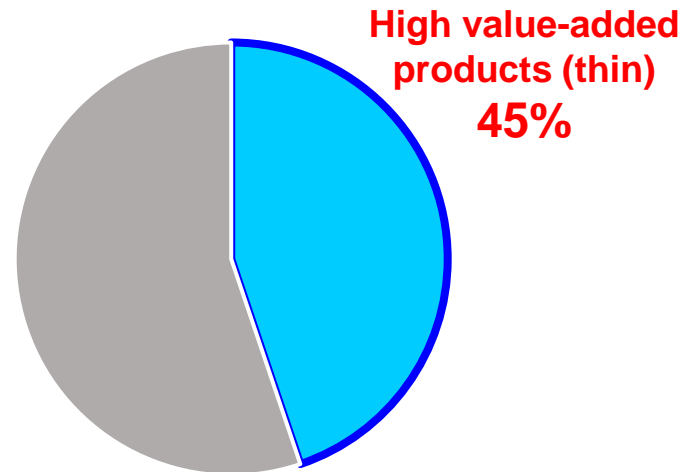
※Image: Excerpt from Western Digital Blog
<https://blog.westerndigital.com/hdd-magic-20tb-18tb/>

【Memory Disk】 Net sales forecast

FY2020



FY2021

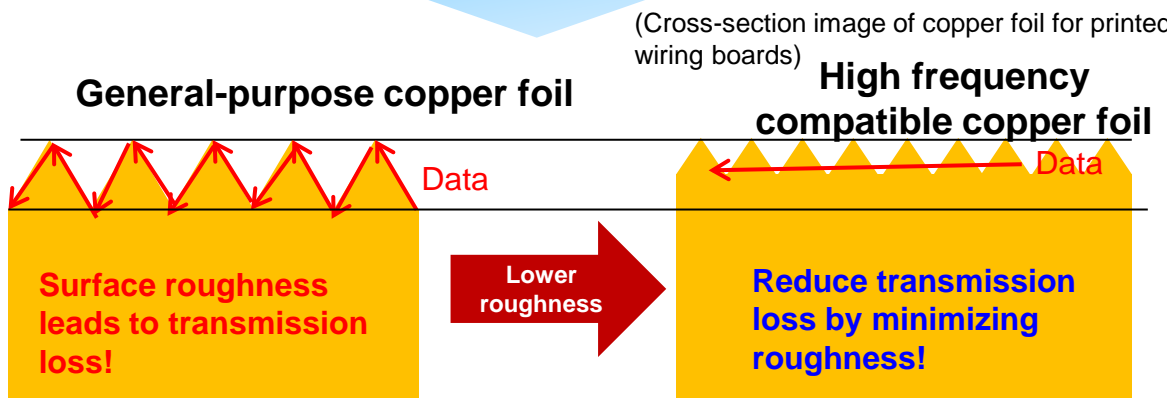


Development and launch of copper foil for high frequency circuit boards that reduces transmission loss

As data traffic increases, transmission by the circuit boards in switches, routers, servers and other devices will need to be in high frequency range



Reduce transmission loss

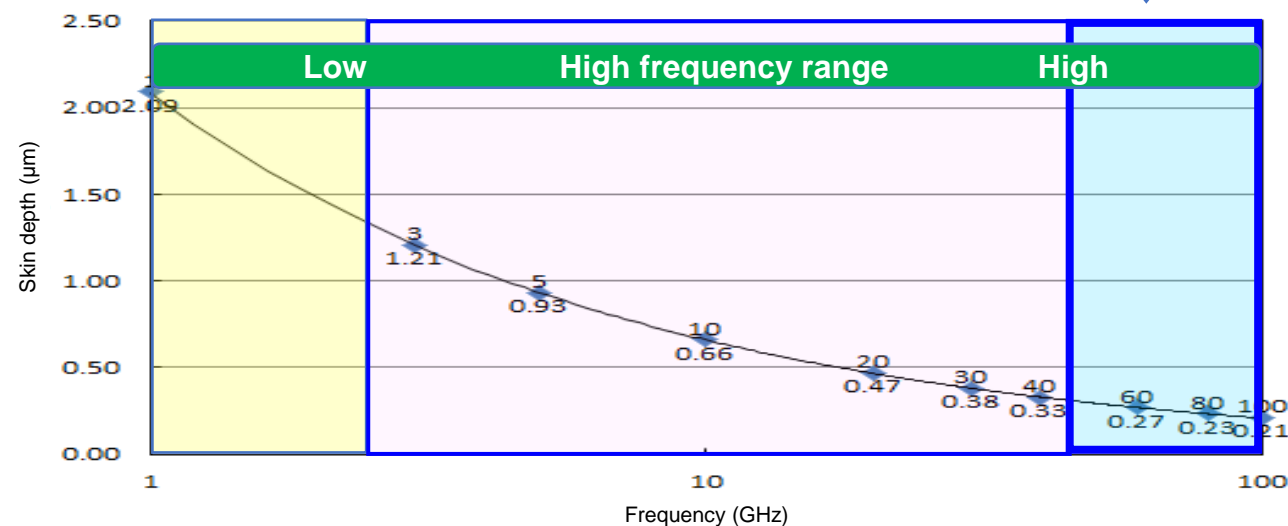
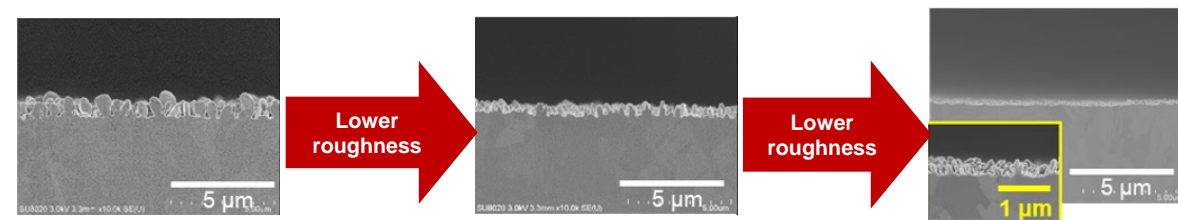


(Cross-section image of copper foil for printed wiring boards)

① High frequency compatible copper foil (Reduced roughness)

② High frequency compatible copper foil (Low roughness)

③ High frequency compatible copper foil (Ultra-low roughness)

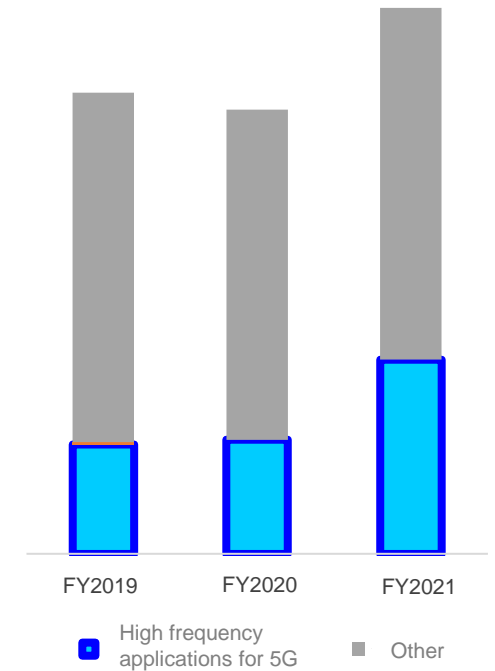
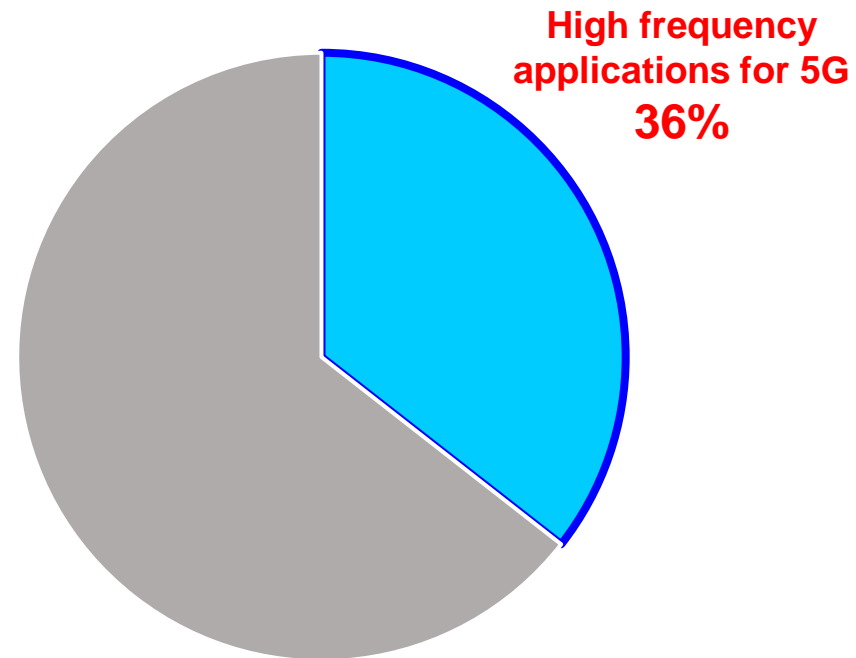
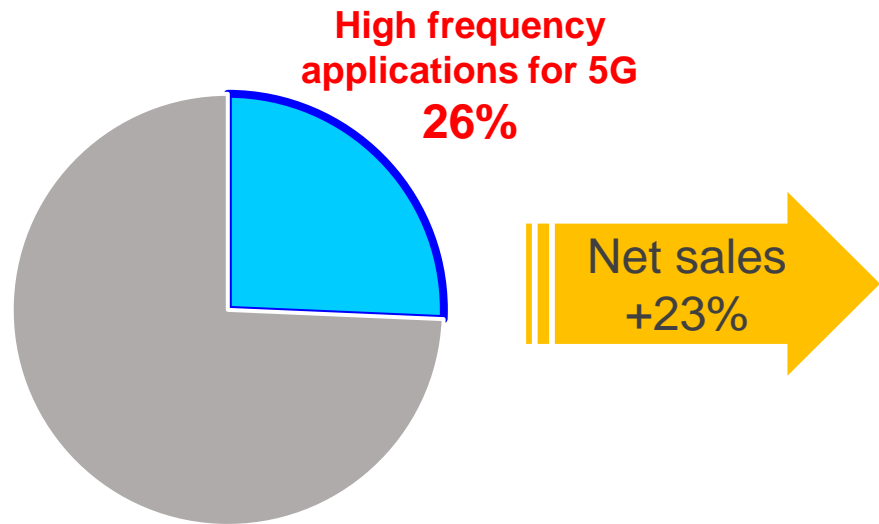


✓ Focus on the development and commercialization of next generation high frequency compatible copper foil that achieves both **lower transmission loss in the high frequency range** and **good adhesion to plastic circuit boards** by **reducing the foil surface roughness**

【Copper Foil】 Net sales forecast

FY2020

FY2021



Thank you very much
for your attention.

Bound to  ***Innovate***

【FY2021 (Year zero of the 2025 Medium-term Management Plan) basic policy (directed toward achieving Vision 2030)】

By focusing on differentiation, provide well-differentiated products to the growing markets (trend markets)
 Entering the era of coexistence with COVID-19, quickly strengthen development and manufacturing capability to enable flexible responses to the rapidly changing market conditions



【Strengths as a division】

- Strong technology development capability for high performance products
- Rapid, thorough service that combines engineering and sales

【Issues and initiatives】

- Maintain and improve the design/development capabilities for continuing to generate well-differentiated technology
- Optimize the locations with consideration for the BCP
- Restore the damage caused by the fire at the Taiwan copper foil plant

【External environment – Main revenue opportunities】

- Growing telecommunications infrastructure demand resulting from increased data traffic and establishment of 5G
- Contribute to the realization of a sustainable society

【External environment – Main risks】


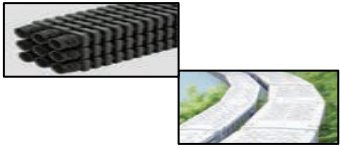



- Changes to the supply chain caused by political factors (including geopolitical risk)
- Disruption to the global economy caused by a natural disaster or new pathogen/ virus

【Future outlook】

- Demand in the telecommunications infrastructure market will continue to expand due to the increasing data traffic and further establishment of 5G. We will quickly respond to the changing customer requirements and continue to develop and provide high performance (well-differentiated) products.
- Through products directed at Society 5.0 for SDGs, we will contribute to the realization of a sustainable society and work to expand the new product domains that will become the foundation of future profits.



Appendix – Product overview

	AT* & Functional Plastics *AT : Advanced Technology Tape		Thermal Management Solution & Products	Memory Disk	Copper foil	
						
Renewable energy		•	•			
Telecommunications infrastructure	•	•	•	•	•	
Disaster prevention and mitigation		•				
Products	<ul style="list-style-type: none"> • Tape for semiconductor process 	<ul style="list-style-type: none"> • Cable protective pipes • Troughs made from recycled materials • Insulation materials 	<ul style="list-style-type: none"> • Copper, etc. including heat sinks and heat pipes 	<ul style="list-style-type: none"> • Aluminum blanks for HDD 	<ul style="list-style-type: none"> • Electrolytic copper foil for printed wiring boards 	<ul style="list-style-type: none"> • Electrolytic copper foil for batteries
Applications	<ul style="list-style-type: none"> • Surface protection, immobilizing, etc. during semiconductor wafer processing • Semiconductor chip stacking in flash memory 	<ul style="list-style-type: none"> • Protective pipes for underground cable • Troughs for holding cables • Insulation for air conditioning ducts 	<ul style="list-style-type: none"> • Heat dissipation and cooling of CPUs and power semiconductors, electronics components, high output LED lighting, etc. 	<ul style="list-style-type: none"> • HDD for data centers, desktop computers, surveillance cameras, etc. 	<ul style="list-style-type: none"> • Wiring boards for communications devices and electronic devices 	<ul style="list-style-type: none"> • Cathode material in lithium ion batteries for electric vehicles, smartphones, power tools, etc.
Customers	<ul style="list-style-type: none"> • Semiconductor manufacturers • Foundry manufacturers 	<ul style="list-style-type: none"> • General construction companies and subcontractors • Railroads • Highway public corporations and road subcontractors • Air conditioning duct manufacturers 	<ul style="list-style-type: none"> • Data center and telecommunications base station operators • Smartphone and PC manufacturers • Manufacturers of power conditioners for railroads and solar power • Lighting equipment manufacturers, etc. 	<ul style="list-style-type: none"> • HDD substrate manufacturers 	<ul style="list-style-type: none"> • Wiring board material manufacturers • Lithium ion battery manufacturers 	