Technology

Index

"Develop people before making products"
The founder Konosuke Matsushita spoke these words.
"A company is its people. No business will grow without securing the proper personnel "
In the past and in the future, what moves the world is nothing other than "people."

We have things to accomplish.
We have responsibilities to fulfill.
There are things that can only be done by Panasonic Group, which has been developing and expanding worldwide products and services by always staying close to our customers' lives.

Our mission is to embody the desires of people around the world making further contributions toward creating an ideal society and lifestyles while solving global social issues.

Panasonic Group will contribute to meet various challenges with its people and technologies.

Look ahead to the “Future,” keep taking on challenges.

Panasonic Holdings Corporation

Corporate Strategy Sector
Technology Strategy Group

Technology Sector
Technology Planning Office
Business Development Office
Center for Better Employee Experience
Technology Division
Manufacturing Innovation Division
Platform Division
Product Analysis Center

Panasonic Corporation

Design Division

China & Northeast Asia Company
- Engineering & Quality Division
- Design Center

Living Appliances and Solutions Company
- Living Products Innovation Division
- DX･Customer Engagement Promotion Division

Heating & Ventilation A/C Company
- Innovation Center
- Global Platform Development Center

Cold Chain Solutions Company
- Solution Businesses Promotion Department

Electric Works Company
- Solution Development Division
- R&D Division
- Field Engineering and Manufacturing Innovation Division

Panasonic Automotive Systems Co., Ltd.

- R&D Division
- R&D Planning Center

Panasonic Entertainment & Communication Co., Ltd.

Panasonic Housing Solutions Co., Ltd.

- Innovation Division

Panasonic Connect Co., Ltd.

- R&D Division
- Manufacturing Innovation Division

Panasonic Industry Co., Ltd.

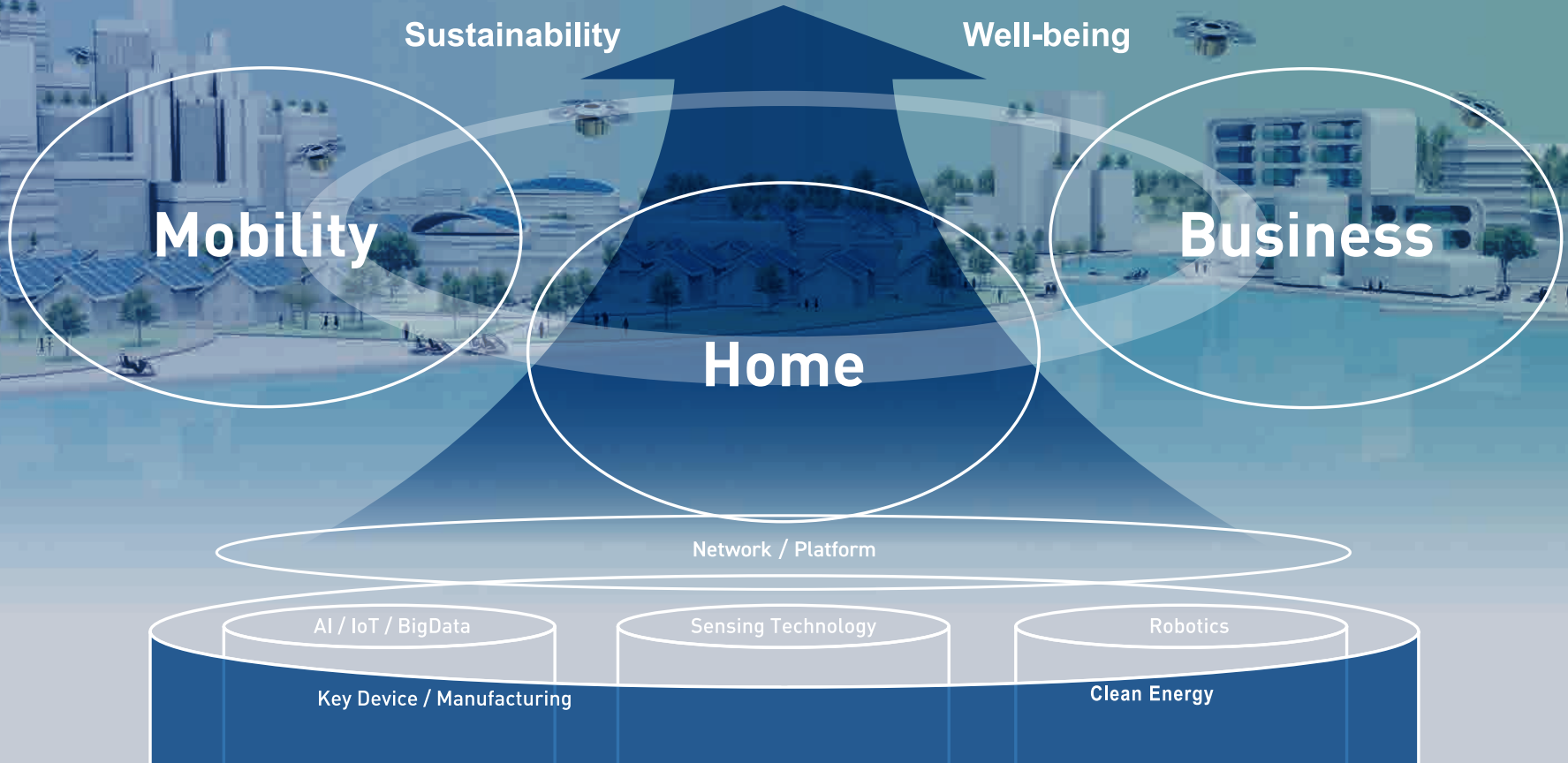
- Engineering Division

Panasonic Energy Co., Ltd.

- Energy Research & Development Center
- Cell Development Division
- System Development Division
- Technology & Manufacturing Strategy Office

03 R&D Outlook-1

Aim to an “ideal society and lifestyles” while solving global social issues



03 R&D Outlook-2

Aim to an “ideal society and lifestyles” while solving global social issues

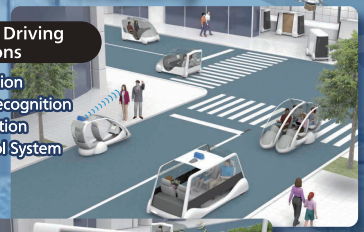
Sustainability

Well-being

Mobility

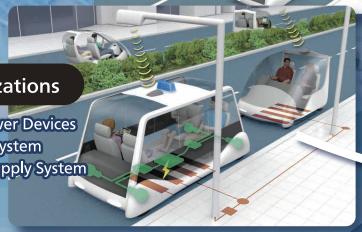
Autonomous Driving / Solutions

- Obstacle Detection
- Human State Recognition
- External Perception
- Dispatch Control System



Energy Optimizations

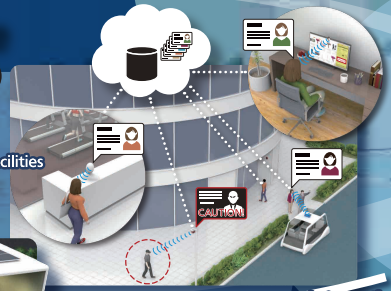
- Next-Generation Power Devices
- Lithium Ion Battery System
- Contactless Power Supply System



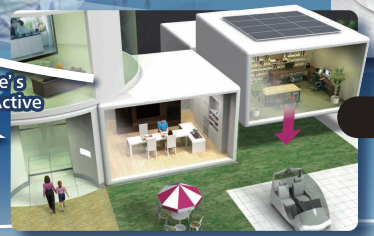
Home

Lifestyle Noticed Everyday

- Face Authentication In/Out
- Face Settlement Self-checkout
- Identification of Membership Facilities
- Detection of Suspicious Persons



Everyone's Free and Active



Origin of Life

- Lifestyle Data Analysis
- Emotion Estimation
- Variable House

Integration of External Services with Lifestyles

Business

Next-Generation Stores and Facilities

- Unmanned Service Pot (Automatic Settlement)
- Unmanned Delivery Robotics
- Automatic Inventory/Replenishment
- Behavioral Prediction

Improving Plant and Logistics Efficiency

- Improvement of Work Capacity (Power, Efficiency Assist)
- Autonomous Mobile Robot
- Logistics/Transport Robots

Network / Platform

AI / IoT / BigData

Sensing Technology

Robotics

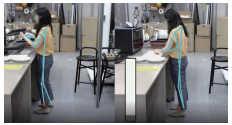
Key Device / Manufacturing

Clean Energy

04 Technologies-1

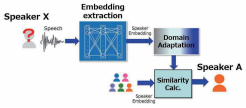
AI / IoT / BigData

Activity Sensing



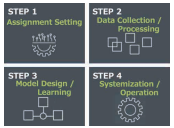
The Activity Sensing Technology specializes in the understanding of human behavior in context by the processing and analysis of data from sensors in home. More comfortable and personalized services in the home can be offered through this technology.

Speaker Identification



Accurate extraction and identification of speaker features enables non-contact identification by voice, contributing to the provision of detailed services in consideration of hygiene and privacy.

Data Analysis



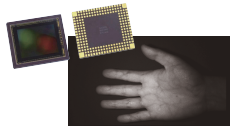
Using data analysis that supports AI assignment setting, data collection, model design and systemization, we are able to improve business operations and create new business by using data stored in the company.

Autonomous Driving Service

Under the coexistence environment with residents, delivery services that also serves as a technology verification, using autonomous driving and remote control of multiple robots are currently demonstrated in Fujisawa SST, etc.

Sensing Technology

Sensing Camera



In addition to high image quality, high sensitivity, and high resolution, near-infrared light is used, for example, to detect blood vessels that are usually invisible. By visualizing normally invisible objects, this camera can be used for a variety of sensing applications.

Multimodal Authentication

By combining and complementing multiple AI functions, advanced sensing functions are realized. We provide speedy solutions that contribute to problem solving through the evolution of AI technology.

High-Resolution Video Analysis

Technology for measuring the deflection and vibration of infrastructure such as bridge with imaging analysis. Contribute for labor saving and suitable maintenance.

Emotion Recognition

Realize an indoor environment that leads people to better conditions with biometric and behavioral sensing technologies that can understand their conditions including inside such as emotions.

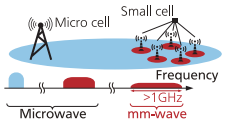
Digitalization

Nessum

nessum

In the expanding IoT society, Internet connectivity is the key. "Nessum" enables secure and easy connections between devices on existing lines such as control, coaxial and power lines, as well as short-range high-speed radio.

Fifth Generation Mobile Communication

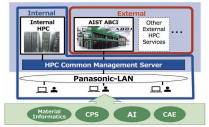


Methods/technologies have been developed for high-capacity, high-speed, and low-latency next-generation communication networks, where various frequency bands and radio systems can be used simultaneously or by switching. This creates a radio environment suitable for the IoT age.

Security Platform for IoT Market

Develop cybersecurity technology to monitor data of automobile, house, factory and building and to detect unknown attack by AI for building the foundation for IoT era.

High Performance Computing



Utilization of HPC platform composed of both internal and external HPC systems realizes high-throughput material informatics, CPS, AI training, and CAE, leading to accelerated digitalization of business and R&D.

Supportive Technologies

Digital / Cloud Technology

Panasonic Digital Platform

Optical Device Technology

Ultra-short-focus projection lens for video projectors

Video /Audio Technology

Digital Camrea / Omnidirectional array microphone consisting of many directional microphones

B2B Device Technology

Industrial devices

Lighting Technology

Lighting system using laser technology / Next-generation headlight

Biological Science Technology

Panasonic's beauty technology: nanocare "Oyasumi Navi" app creating an optimal air-conditioned sleep environment

04 Technologies-2

Robotics

Housekeeping / Nursing-care Robots

Technologies cultivated through development of Industrial robots have been utilized in new products. There is the challenge of developing new markets with new products, such as a cleaning robot that demonstrates superior performance in cleaning tough corners, and a training robot for improving walking function.

Social Issue-solving Robots

Robots are developed for solving human labor shortage due to aging and decrease in working population. Autonomous delivery robot that full-automatically derivers item like medicines or specimens in hospitals and mobility robot that improve the convenience of moving people and luggage at airports have been realized.

Physical Augmentation

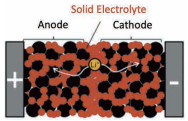
Robotics to maintain and enhance physical functions such as senses and muscle strength. Support without sense of incongruity by accurately guessing human intention.

Kansei Augmentation

By utilizing the elemental technologies of robots, we aim to change the state of the human mind, such as enjoyment and concentration, and to achieve well-being for each individual.

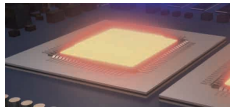
Key device / Manufacturing

All Solid State Batteries



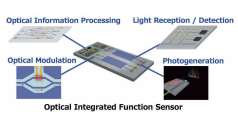
Novel solid-state electrolytes with high safety have been successfully developed. We will challenge to realize all solid state batteries with exceeding performances in safety, energy-density, and charging speed over conventional rechargeable batteries.

Phononic Devices



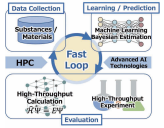
Extraordinary high heat flow controllability can be achieved through phononic devices with nano-scale periodic structures (phononic crystals), which will contribute to solving thermal issues associated with carbon-free society in the AI/IoT era.

Photonic Integrated Devices



Next-generation sensors will be created through the development of new materials and process technologies for integration; and the demonstration of innovative sensing by means of cutting-edge laser technology, light-receiving technology, and optical modulation technology.

Materials Informatics



Innovation in material development has been realized through the use of cutting-edge AI technologies and HPC* Rapid repetitive cycles of data collection, learning & prediction, and evaluation accelerate the discovery of novel materials with target properties and help cut the overall R&D time in half.

※HPC: High Performance Computing

Clean Energy

Energy Creation

Home Power Generation: Using hydrogen and oxygen, electricity can be generated at home according to the energy demand of each household, creating an eco-lifestyle a step ahead of the times.

Energy-storage

Development of a system using high capacity storage batteries was proactively promoted to create an increasingly secure/comfortable life with power storage.
Power-storage system, Automotive lithium-ion battery system.

Pure Hydrogen Fuel Cell

Pure hydrogen fuel cells have been put into practical use for the hydrogen society. Several pure hydrogen fuel cells are in operation at the RE 100 Solution demonstration facility H2 KIBOU FIELD, located at the Kusatsu site in Shiga Prefecture.

Energy-management

Electricity can be saved simply by using home appliances based on Panasonic's proprietary "ECONAVI" technology, which is capable of detecting wasted electricity and automatically saving electricity. Each home appliance thinks wisely and saves electricity.

Supportive Technologies

Heat utilization technology

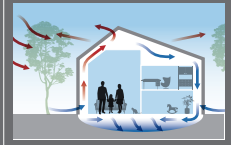
Air to Water

Absorption Refrigerator

Material/Device Technology

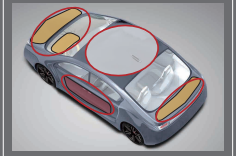
nverter compressor,
Polypropylene-fiber reinforced resin

Comfortable Air Control Technology



Thermal insulation technology,
Thermal discharge technology,
Purification technology,
Antimicrobial technology

Material Production Technology

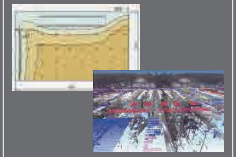


Functional materials for motor vehicle

Environmental Core Materials

High Biomass
Cellulose Fiber
Molding Materials

Simulation Technology



Illuminance distribution simulation technology,
3D factory modeling technology

Our Activity

Challenge Activities

■Support for corporate culture reform and co-creation
・Creating new experiences by supporting the challenges of diverse employees

EXL(EX Lab)


Panasonic Laboratory Tokyo


Panasonic Laboratory Fukuoka

■Promotion of innovation
・World-class technology and business leaders, mainly in Silicon Valley, create new products and services with a sense of speed and initiatives.
・Contributing global innovation and business growth by organic linkage between business, technology, and creativity

Toward a New Stage

Training ourselves by various measures as well as conducting joint research activities with various universities and research institutions, and creating innovative new products and business models

Open Innovation

■Joint research: Universities and research institutions worldwide
Outside Japan
・imec(Belgium), MIT(USA), Stanford University(USA), TNO(Netherlands) etc.
Inside Japan
・Cooperation with over 400 national research institutes and university laboratories
・Panasonic research centers have been established on campuses at The University of Tokyo, Kyoto University, Osaka University, Kyushu Institute of Technology, University of Fukui, and joint researches are carried out.

■Collaboration and Co-creation: Breaking away from self-reliance / Emphasis on speed / Win-win relationship building
Establishment of New Business Creation Schemes(2022)
- Investments in the U.S. Venture Investment Fund "WiL Ventures III, L.P."
- Established Vieureka Co., Ltd., through joint investment
- Make IP information "Intangible Asset" and co-create with partners

vieureka


Vieureka camera

External Activities Related to Academic Societies and Industrial Policy

■Academic society activities and paper submission
・Taking on the challenge of the world's top-level publications (Nature, Science, ECCV, etc.)

■Standardization activities
・Setting up sites in North America, Europe, China, and Singapore to promote standardization activities globally.
・International Standard : IEC(electrical and energy system), ITU(communication system), ISO(automotive & robotics etc.)
・Forum/Consortium: 3GPP(5G/6G)、CSA(IoT)、WBCSD(Avoided Emission, Carbon Footprint)
・Global government policy : European Commission(Green by Digital), China(new energy car)

■Joining in national projects in Japan
・Cabinet Office: Cross-ministerial Strategic Innovation Promotion Program(SIP)
・Ministry of Education, Culture, Sports, Science and Technology: JST* Research and development program of basic research and core technology (Moonshot, CREST, A-STEP etc.)
* JST: Japan Science and Technology Agency
・Ministry of Economy, Trade and Industry: NEDO* energy / environmental technology, and industrial technology projects
* NEDO: New Energy and Industrial Technology Development Organization
・Ministry of Internal Affairs and Communications: Research and development for information and communication technology

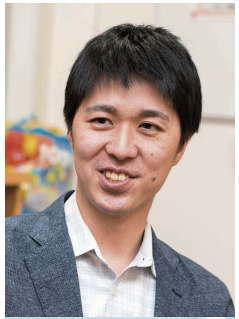
R&D Human Resources Development Program

■Training Programs for Core-technology Enhancement
・Rank-based Technical Training Programs for Enhancement of Core-technology
・Technology Exchange Workshop in the Company for Cross-value Innovation

■Hands-on Growth Programs for Supporting Challengers
・Domestic and International Studying Abroad
・Horizontal Company-wide Resource Exchange

	Technical training programs						Rank-based training programs	Management training programs
	IoT/Robotics				Energy			
	Digital AV & NW	Cloud technology	AI technology	Mechanical control	Power electronics	Material & devices		
Expert	System architecture school		Expert course		Power electronics practical school	Material & devices TOP school	Technology school for management	Technology management training
Practical	Digital & NW practical school	IoT and Cloud technology practical school	Practical course on the Job	Mechanical control practical school	Power electronics practical school	Material & devices practical schoo		Technology strategy training
Fundamental	In-company technical training courses for each technology field (170 courses)					Material & devices step-up school	Technology school for mid-level engineers	
	Practical technology training of new employee for each technology field							

Innovators



Ryuji Sakata Joined in 2012

Technology Division, Panasonic Holdings Corporation

I majored in aerospace engineering, which had nothing to do with information technology. However, as I was handling data processing programs in my research, I became interested in information technology, and after joining the company, I was assigned to an information systems section. I understood the importance of acquiring skills to make use of various data, and apart from my work, I improved my skills through competitions and so on in the community "Kaggle" where data scientists from all over the world gather, and I was able to obtain the title of Grandmaster in June 2019. Based on this experience, I am currently working on developing algorithms that collect and analyze data when mobile batteries are in use to improve convenience. I am also a lecturer at AI training courses and contribute to the development of AI human resources.

Kyourei Ri Joined in 2014

Process Automation Business Division, Panasonic Connect Co., Ltd.

I was born in Harbin, Heilonglong Province, China. While attending a Japanese university, I worked hard to earn a living by working part-time to study Japanese, and as an overachiever, I received the privilege of tuition exemption for four years. When I met the "implementation machine" that is expanding globally at the company information session for job hunting, my heart fluttered. A mounting machine is an equipment that places electronic components on a printed circuit board at high speed and accurately. I joined the company because I wanted to be involved in this equipment development. In my third year at the company, I worked as a project leader in new product development, and now I am developing core technologies for supply parts units to make the plant's mounting line the world's first "unmanned". I want to gain confidence that I can do it if I work hard, and become an engineer who can be active globally.

Ryohei Yoshida Joined in 2017

Infotainment Systems Business Division,
Panasonic Automotive Systems Co., Ltd.

I want to make products that propose the ideal way of cars such as electric vehicles and autonomous driving. I joined the company knowing that Panasonic is also working on in-vehicle. After working on the hardware design of the display unit for Europe, I am now in charge of the electrical circuit design for the domestic development of the display audio unit for automobiles (with functions other than car navigation) such as video and music. In automotive units, where strict standards are set, the area in which dedicated semiconductor ICs are installed is becoming smaller and smaller. My opportunity to show skills is whether I can think of the optimum arrangement for preventing the interference of communication between ICs in a unit and the retention of heat as if I were solving an advanced puzzle, and finish the assembly of technologies in different areas as one system.

Yoshie Takao Joined in 2011

Solution Development Division, Electric Works Company, Panasonic Corporation

When I was in graduate school, I was immersed in research and club orchestra every day, and I had a desire to do various things. I joined the company because I was attracted by the wide range of business areas where all the living spaces related to people's lives can be provided by Panasonic products. I have been engaged in the development of Home IoT related equipment in the department that develops electrical materials for houses, and are now developing for the next development of "AiSEG2" that supports energy saving, time saving, crime prevention, etc.Having experienced marriage and childbirth, I would like to see the needs of living spaces as life stages change from the perspective of working mothers, and create value that closely matches the lives of customers with Home IoT technology.

Yoichiro Ikegami Joined in 2011

Kitchen Appliances Business Division, Living Appliances and Solutions Company, Panasonic Corporation

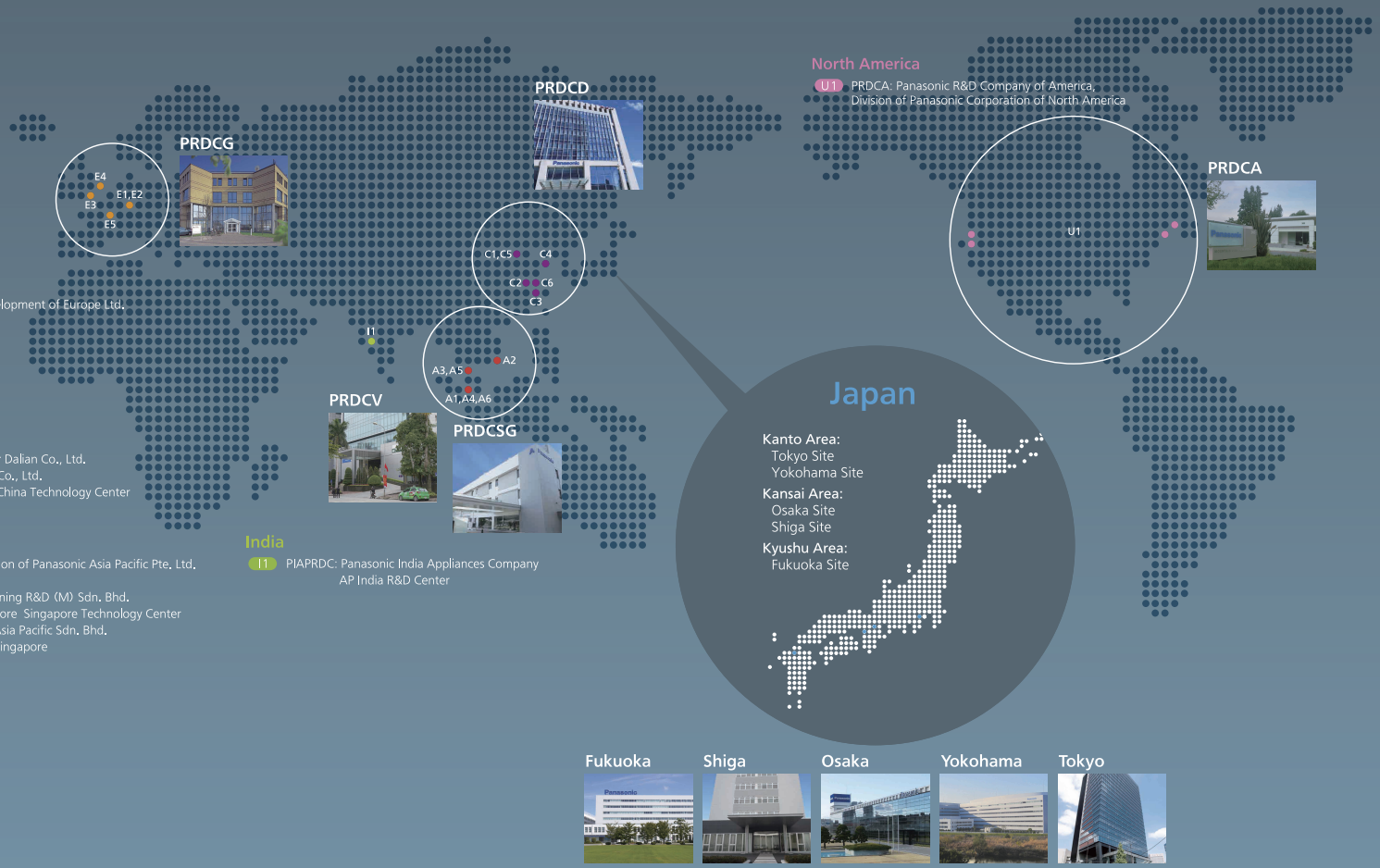
"I want to make something amazing." It was an impulse that had been in the back of my mind since I was a child. I like to think about how to make people think "interesting" rather than making things themselves. My dream was to "make amazing home appliances," and I joined Panasonic because I had the image of developing various home appliances. I am thinking of the benefits that can be provided for all cooking activities, not just for home appliances alone, but for the entire kitchen space. Currently, I am in charge of managing the implementation development of "Kitchen Pocket", an integrated application for kitchen appliances, and developing new functions. "Creating something that has never been done before" is finally my dream entrance.

Mizuho Kawakami Joined in 2016

Manufacturing Innovation Division, Panasonic Holdings Corporation

I am engaged in the development of equipment to manufacture "Rechargeable batteries for vehicles" that will accelerate the shift to environmentally friendly vehicles. I liked robots since I was a child, so I joined the club when I was a student, and also participated in the robot contest. My goal is to "I want to contribute to society by making useful products using the equipment I designed." To this end, we are working to ensure that our facilities are optimized by working on equipment specifications with the parties involved in the ordering process within the Group. Through these activities, I feel more responsible for my work. I feel that it is only Panasonic that can develop its own equipment together with the ordering party by making full use of its many advanced technologies.

07 Global R&D Map



Europe

- E1 PRDCG: Panasonic R&D Center Germany, GmbH
- E2 PLDC: Panasonic Langen Development Centre
- E3 IDSC: Integrated Digital Service Center
- E4 PMCDE: Panasonic Mobile Communications Development of Europe Ltd.
- E5 PIMEC: Panasonic IMEC Center

Greater China

- C1 China & Northeast Asia Company
- C2 PRDCS: Panasonic R&D Center Suzhou Co., Ltd.
- C3 PAPCN : Panasonic Appliances (China) Co., Ltd.
- C4 PSDCD: Panasonic Software Development Center Dalian Co., Ltd.
- C5 PASCN : Panasonic Automotive Systems (China) Co., Ltd.
- C6 PICN-CNTC: Panasonic Industry (China) Co., Ltd China Technology Center

ASEAN

- A1 PRDCSG: Panasonic R&D Center Singapore, Division of Panasonic Asia Pacific Pte. Ltd.
- A2 PRDCV: Panasonic R&D Center Vietnam Co., Ltd.
- A3 PAPARADMY: Panasonic Appliances Air-Conditioning R&D (M) Sdn. Bhd.
- A4 PIDSG-SGTC: Panasonic Industrial Devices Singapore Singapore Technology Center
- A5 PAPRADAP : Panasonic Appliances R&D Centre Asia Pacific Sdn. Bhd.
- A6 PAPRADSG : Panasonic Appliances R&D Center Singapore

India

- I1 PIAPRDC: Panasonic India Appliances Company AP India R&D Center

North America

- U1 PRDCA: Panasonic R&D Company of America, Division of Panasonic Corporation of North America

History of Technology

1920 • • • • • • • • • 1970 • • • • • 2000 2005 2010 2015~


Double Cluster Socket (1920)


Direct-drive Turntable (1970)


DVD Recorder (2000)


IPS liquid crystal display TV (2005)


Ultra Accuracy 3-D Profilemeter (2010)

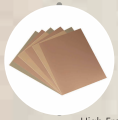

4K+ Laser Projector (2015)


IoT PLC
(Broadband over Powerline Communication)
Adopted as IEEE 1901a (2019)


Bullet-shaped
Battery-powered Bicycle Light
(1923)


Thin Radio (1977)

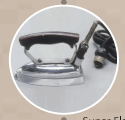

In-flight full AVOD
entertainment system (2002)


High-Frequency capable material
for multilayer printed witing boards
(2006)


Flexible crystalline graphite sheet
(2010)


Autonomous Delivery Robot
(2016)


Cellulose Fiber composite resin (2020)


Super Electric Iron (1927)


Camcorder with Automatic
Image Stabilizer (1990)


Gyro Sensor (2004)


System LSI "UniPhier" (2007)

Ni-MH Battery for HEVs (2011)


large current Power Choke Coil
(2016)


Robotic Mobility PiiMo (2020)


First 3-tube Radio (1931)


Ultraprecision Glass-Molded
Aspheric Lens (1996)


All-metal Induction
Heating Cooker (2002)


0.18μm FeRAM for
contactless cards (2007)


CO_2 Refrigeration System
(2013)


nanoe™ X device (2016)


Vacuum heat insulating glass
"Glavenir" (2021)


Zinc Oxide Varistor ZNR (1968)


2nd generation mobile phone
(1996)


Dual Layer Blu-ray Disc Recorder
(2004)


Household fuel cell (2009)


Ultra-short-throw lens for
projection (2014)


Face Recognition Engine (2017)


Conductive polymer aluminum
electrolytic capacitor (2021)


Dry Battery "NEO Hi-Top" (1969)


HIT structure solar cell (1997)


Slanted Drum-Type Washer-Dryer
(2004)


nanoe Air Purifer (2009)


3D Blu-ray Disc Recorder
(2014)


High voltage & high capacity
cut-off DC contactor "EV Relay"
(2018)

Pursuit of "Better Life" will change the future.

Our basic business philosophy of "make the lives of people around the world richer and happier through business" is at the core of everything we do.
Although we have changed the shape of our business in line with the times, we continue to value the people's desire of better life.

"We aim to contribute to development of the world by providing convenient, reassuring, and comfortable lifestyles in various fields globally."

And with the recent renewal of our company operating system, we aim to clarify the societal issues that need to be solved and accelerate our R&D and the creation of new businesses.

We take our customers' feedbacks and requests seriously, always put ourselves in their shoes, to make "contributions" that far exceed their expectations through our technologies.

We also hope to create an environment that encourages challenges so that Panasonic Group's technologies can shine even brighter.

And we hope you look forward to the exciting R&D possibilities we offer in the years ahead.

Tatsuo Ogawa
Panasonic Holdings Corporation
Executive Officer
Group Chief Technology Officer (Group CTO)
In charge of Pharmaceutical Affairs

Panasonic

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