Development of New Businesses to Address Future Social Needs

The EBARA Group has put forth a business strategy policy of optimizing its business portfolio in order to maximize its corporate value with an eye to 2030. In accordance with this policy, we are creating new businesses based on the issues gleaned from our outlook for the world of the future and on a global, market-oriented perspective. We aim to earn greater corporate value by leveraging EBARA's strengths and helping resolve the material issues defined in E-Vision 2030. In this special feature, we will provide an overview of efforts to create new businesses along with examples of specific initiatives in fields pertaining to food and the elimination of oil dependency.

New Business Initiative 1

Preventing Oceanic Pollution and Resolving Food Issues through Development of Inland Aquaculture Technologies

New Business Initiative 2

Ending Dependence on Oil with Fossil-Fuel Free Biotechnologies

Background for New Business Creation

New Forward-Looking Ambition Sparked by Rekindling the Founding Spirit

EBARA traces its roots back to a start-up company launched from a university that was established for the purpose of manufacturing Inokuty-type volute pumps. In the years that followed, EBARA employees continued to ambitiously tackle new challenges, driven by the Founding Spirit of "*Netsu to Makoto*" (Passion and Dedication) that has inspired us to embrace originality and ingenuity since the Company was founded through the practical application of Japan's first domestically manufactured pump. This ambition spurred us forward to engage in fields such as fuel cells and wind power generation before their popularization. Unfortunately, we also experienced many failures, as we were unable to successfully steer these businesses to growth and were eventually forced to retreat from them altogether. We cannot deny that the trauma of past failures lingers in the EBARA of today in the form of an, albeit small, aversion toward new businesses. Meanwhile, EBARA has launched E-Vision 2030, which calls on us to address five material issues and maximize corporate value with a view of the world a decade from now. Realizing this vision will require a rekindling of the Founding Spirit in employees to spark new ambition for tackling emerging social issues through new businesses. We are taking measures to stimulate interest in the development of new businesses among all EBARA employees by soliciting ideas through an open application system and recruiting staff volunteers. The creation of new businesses is imperative to awakening our dormant spirit of ambition throughout the Company and is a core pillar of the business strategies that will be key to the realization of E-Vision 2030. Based on this recognition, we are seeking out means of providing new, future-oriented solutions.

Steps for New Business Creation

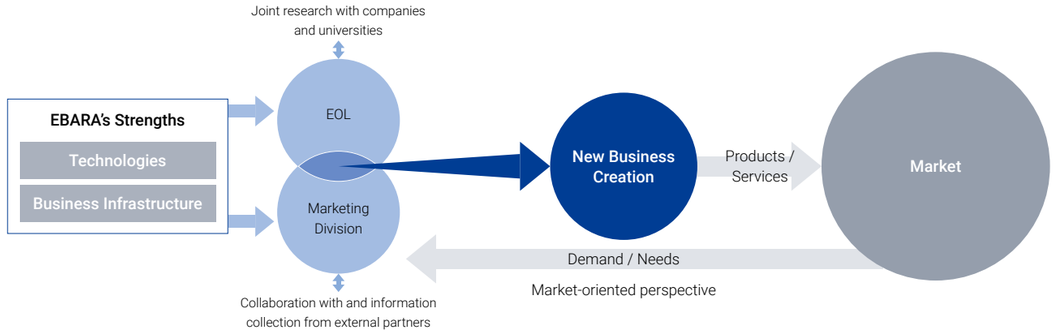
Development of New Businesses Utilizing Internal and External Strengths

Our basic strategy toward developing new businesses is to utilize EBARA's technologies to provide solutions to customers based on an understanding of global social needs founded on a market-oriented perspective. The first step in this process will be to search out new needs and potential business ideas. We then will identify the types of products and services that will meet these needs and examine the technological and infrastructure strengths that EBARA can utilize to realize practical application of these products and services from a global, Groupwide perspective. Next, we will need to reinforce our business structure in terms of marketing and R&D functions in order to link the identified needs and business ideas to solutions for customers. Technologies and strengths contained within the Company will form the foundation for these efforts. However, if there is a need to supplement these assets with additional technologies and insight necessary for commercialization requirements and ideas, we will not hesitate to look outside of the Company. In this manner, we intend to take a flexible and proactive approach toward collaborating with, investing in, and acquiring external research institutions, start-ups, and other companies. Through the Ebara Open Laboratory (EOL)*, we perform prototyping in research and development jointly with external research institutions and small and medium-sized corporations. We are also enacting frameworks in which EBARA's Marketing Division works in conjunction with the EOL to promote joint development projects with external partners as well as other development projects.

Our future plans entail engaging in joint projects with start-ups and other companies and universities during the period of E-Plan 2022. In the first half of this period, we will work on creating research successes and applying for patents with regard to these successes. In the second half of the plan, we will look to transform these successes into actual businesses and grow their sales.

* A corporate research organization that enables exchanges among researchers and open sharing of research themes in-house

New Business Creation Process



New Business Initiative 1

Targeted Global Issues

Limited Food Access and Oceanic Pollution

It is estimated that approximately 800 million people worldwide (one in every nine people) suffer from a chronic lack of food. Aquaculture has been proving to be a popular approach to secure stable supplies of food, seen in the continuous increase in production volumes globally. Aquaculture now accounts for half of the total production of all aqua products.

However, fish excretions and feed residue from aquaculture operations can accrue on the seafloor, polluting the site of operations and adversely impacting the surrounding ocean areas. This situation is becoming a serious problem. The world is thus pressed with the need to address the crises facing its sources of aqua products and to develop sustainable fishing and aquaculture approaches.

Preventing Oceanic Pollution and Resolving Food Issues through Development of Inland Aquaculture Technologies

Project Commencement and Business and Capital Alliance with University-Launched Start-Up

The EBARA Group has commenced a project to develop an inland recirculating aquaculture system to address oceanic pollution issues arising from conventional offshore aquaculture. This is especially important as these issues are compounded by the global rise in aqua product demand and the expansion of aquaculture businesses.

On this front, we commenced a capital and business alliance with Regional Fish Institute, Ltd. (RF), after receiving a third-party allocation of shares. RF is a food tech start-up established as the core proponent of the efforts of Kyoto University and Kinki University to develop selective breeding techniques for marine life. Through open innovation activities with RF, EBARA seeks to develop a next-generation aquaculture system that combines selective breeding techniques (to speed up aquaculture processes) with smart aquafarming (automated farming). We thereby aim to help alleviate worldwide protein deficiencies (SDG Goal 2: Zero Hunger), contribute to the reconstruction of Japan's fishing industry and to regional development (SDG Goal 8: Decent Work and Economic Growth), and prevent oceanic pollution (SDG Goal 14: Life Below Water).

EBARA's decision to form a business and capital alliance with RF was inspired by our support for its approach toward addressing environmental issues.

Future Business Initiatives

We aim to create a sustainable inland recirculating aquaculture system that can produce aqua products in sufficient quantity with reliable quality, which is friendly to the environment and safe from infection by pathogens. We will utilize technologies EBARA has fostered since its founding, such as fluid and heat control and others, to help realize this. With this system at its core, we will move forward with the development of new businesses and contribute to the advancement of inland aquaculture technologies and the protection of the ocean from pollution.

Inland Recirculating Aquaculture System (RAS)

RAS entails the cultivation of aqua products in inland areas by artificially creating necessary environments. This approach is garnering attention for its potential to contribute to improved quality and productivity in aquaculture, as people will be able to more effectively manage cultivation environments, while helping reduce environmental impacts. Conversely, there are disadvantages to inland aquaculture such as high initial equipment costs and significant running costs due to factors such as large electricity consumption volumes. There is thus demand for sustainable aquaculture systems that eliminate these disadvantages.

Ocean free from pollution

New Business Initiative 2

Targeted Global Issue

Oil Dependence

The vast majority of the plastics and fibers that are indispensable to our daily lives are made from petroleum. The fossil fuels used to make these items are a finite, non-renewable resource. If we continue to consume fossil fuels at the current pace, it is estimated that we will deplete our global supply within the next 40 years. Moreover, fossil fuels are viewed as problematic as substantial amounts of GHGs are emitted throughout all stages from the excavation to the use of these resources.

Society must eliminate its dependence on oil if it is to achieve sustainability and prevent global warming.

Ending Dependence on Oil with Fossil-Fuel Free Biotechnologies

Business Alliance with Non-Petroleum Material Pioneer

In January 2020, EBARA invested ¥1.0 billion in Spiber Inc. and embarked on the joint development of biotechnologies to support the elimination of oil dependency. Spiber develops and manufactures Brewed Protein™, which are sustainable protein materials produced from plant-derived biomass gaining attention as next-generation key materials.

Together with Spiber, we are currently working to address obstacles toward the mass production of materials created by Brewed Protein™ and the reduction of the costs associated with the manufacturing processes. EBARA technologies are being employed to increase the efficiency of manufacturing processes in order to remove these obstacles. In addition, we are working to improve the functionality of EBARA products by utilizing Brewed Protein™ materials as replacement materials and additives for these products.

Future Business Initiatives

Ending society's dependence on oil requires the global popularization of biotechnologies that can create various materials from brewed proteins. However, the high costs of production processes are presenting a major obstacle to the practical application of these materials. Eliminating this obstacle is our first priority. We will also continue working closely with Spiber to gather insight into the brewing process and to develop new businesses in the biotechnology field, an as yet unexplored area for the EBARA Group. Leveraging existing know-how and future discoveries of the Group, we aim to innovate related manufacturing processes and propose solutions in new fields.

Brewed Protein™

Brewed Protein™ refers to protein materials produced from plant-derived biomass using Spiber's proprietary fermentation process. This production process does not rely on oil or other fossil fuels for its main raw materials. The characteristics of Brewed Protein™ can be modified according to end-product needs through an ongoing process of molecular-level refinements that is not dissimilar to the process of evolution. These materials have substantial potential to help industries eliminate their dependence on microplastic and animal-derived substances while also addressing the needs of the transportation field to reduce the weight of transported articles.

Brewed Protein™ materials

Brewed Protein™ manufacturing facility

Three Businesses Supporting Social and Industrial Infrastructure

Fiscal year ended December 31, 2019

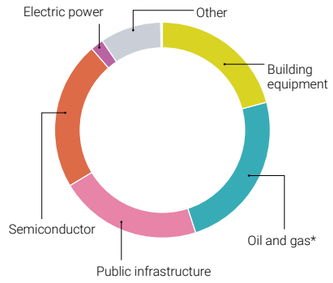
Consolidated Net Sales

¥522.4 billion

Consolidated Operating Income

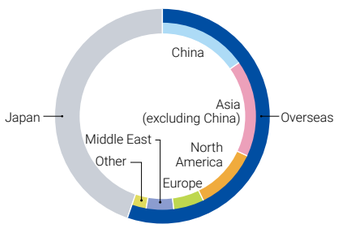
¥35.2 billion

Net Sales Ratio by Industry

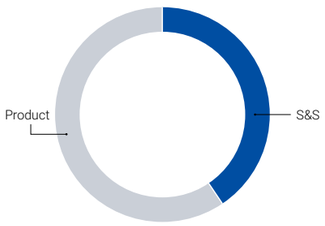


* Mostly downstream businesses

Net Sales Ratio by Region



S&S Sales Ratio

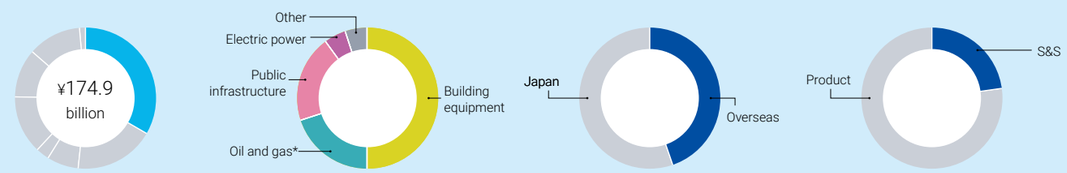


Fluid Machinery & Systems Business ➡ P.35–38

Net Sales Ratio | Net Sales Ratio by Industry | Net Sales Ratio by Region | S&S Sales Ratio

Pumps Business

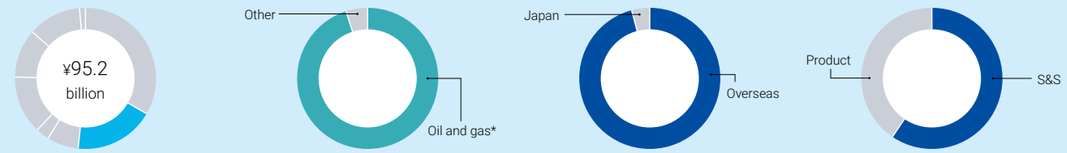
Offers large-scale, high-pressure custom pumps for use in sewage facilities, rainwater drainage systems, petrochemical plants, and other facilities as well as standard pumps for use in high-rise buildings, condominiums, industrial facilities, and others



* Mostly downstream businesses

Compressors and Turbines Business

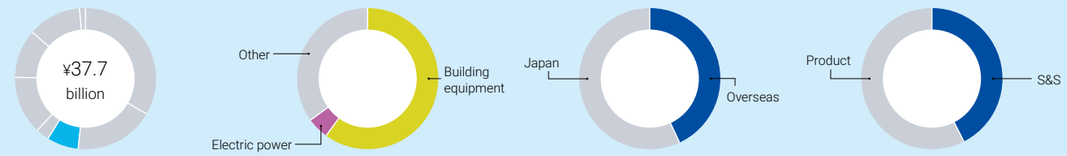
Provides compressors and turbines for oil refineries and petrochemical plants



* Mostly downstream businesses

Chillers Business

Handles chillers, cooling towers, and related systems for use in the air-conditioning equipment of buildings and large-scale commercial facilities



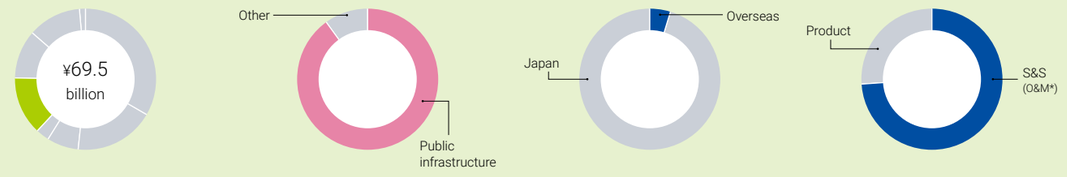
Other Businesses

Provides fans for use in applications such as tunnel ventilation as well as electricity, telecommunications, and energy control equipment

Environmental Plants Business ➡ P.39–41

Net Sales Ratio | Net Sales Ratio by Industry | Net Sales Ratio by Region | S&S Sales Ratio

Uses EBARA's incinerator and gasification plant technologies to perform processes encompassing the design, construction, operation, and maintenance of municipal solid waste incineration plants and other waste treatment facilities



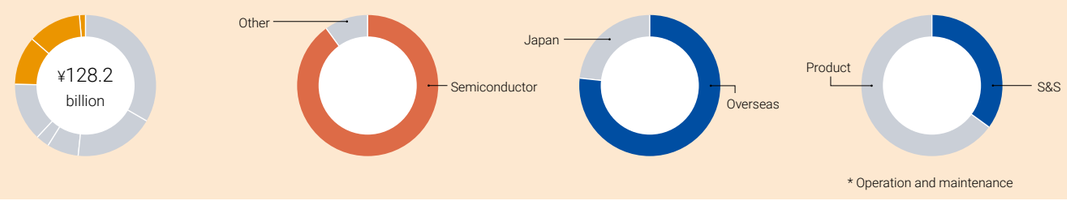
Precision Machinery Business ➡ P.42–44

Net Sales Ratio | Net Sales Ratio by Industry | Net Sales Ratio by Region | S&S Sales Ratio

Net Sales

Components	¥58.9 billion
CMP Systems	¥62.6 billion
Others	¥6.6 billion

Provides products that contribute to the manufacturing processes of semiconductors, flat panel displays, and other devices indispensable to a super-smart society including the dry vacuum pumps that create the required vacuum environments and the CMP systems that can polish semiconductor wafers with nano-level precision



* Operation and maintenance

Fluid Machinery & Systems Business

We will reform the business structures of the Fluid Machinery & Systems Business to improve our presence in overseas markets and generate appropriate profits.

Nobuharu Noji
Executive Officer
President, Fluid Machinery & Systems Company

Strategic Points

- In the standard pumps business, focus on markets and regions with the potential for growth while bolstering sales networks and product lineups and reinforcing supply chains.
- In the custom pumps and the compressors and turbines businesses, improvements in profitability will be pursued, as opposed to growth in the sales of base products, through S&S enhancements and business structure reforms.
- In all businesses, create products matched to the needs of customers in unexplored and other markets with an emphasis on market-oriented product development and the establishment of a leading position in niche areas.

In the fiscal year ended December 31, 2019, net sales in the Fluid Machinery & Systems (FMS) Business increased over the same period last year as a result of brisk investment in the oil and gas markets of China. Operating income also improved thanks to the benefits of ongoing process reforms in domestic standard pumps operations as well as the favorable performance of S&S operations for compressors and turbines.

Under E-Plan 2019, the previous medium-term management plan, we enacted the basic policies of working to improve our profitability and market share in Japan and to expand the scale of our operations overseas. In Japan, we commenced the operation of automated standard pump assembly lines with the aim of creating an efficient production system. Overseas, meanwhile, we established new standard pumps sales bases and reorganized cryogenic pumps operations.

In terms of the KPIs for our ESG initiatives, we were unable to achieve our targets regarding lower electricity consumption and reduced weight for our products as they are tied to the amount of those products sold. However, we were close to achieving our target for increasing the number of S&S bases.

E-Plan 2022, the new medium-term management plan, calls on us to further improve our overseas presence in the standard pumps business while developing operations in which profits are not affected by market fluctuations in the custom pumps and compressors and turbines businesses. At the same time, we will explore new fields and markets as we strive to create high-value-added products that capitalize on the Group's fundamental technologies.

Review of the Fiscal Years Ended December 31, 2017–2019

Material ESG Issue Action Policies and Major KPIs (E-Plan 2019 Final Year Results)

Action Policy 1 **Provide products and services that minimize the use of energy and resources**

KPI: Reduce electricity consumption of certain products in comparison to prior offerings	Progress toward Target
KPI: Reduce the weight of certain products in comparison to prior offerings	Progress toward Target

Action Policy 2 **Expand the service and support (S&S) business, maximize product life, and minimize any product downtime**

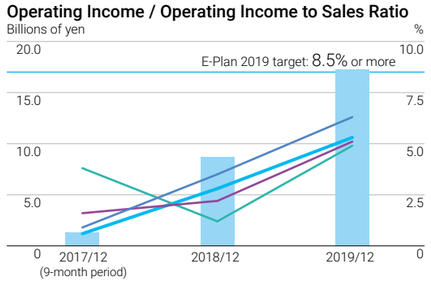
KPI: Increase S&S sales	Progress toward Target
KPI: Increase number of S&S bases	Progress toward Target

Numerical Targets of E-Plan 2019 (Consolidated)

Operating income to sales ratio of 8.5% or more

Pumps Business	8.0% or more
Compressors and Turbines Business	11.0% or more
Chillers Business	7.0% or more

Operating Income / Operating Income to Sales Ratio



SWOT Analysis of Fluid Machinary & Systems Business

Strengths
- Fluid, numerical analysis, material, analytical, and other fundamental technologies cultivated over the years (entire FMS Business)
- Propensity for developing highly efficient, high-quality, and highly reliable products (entire FMS Business)
- Diverse, global employee base and network (entire FMS Business)
- Presence in Asia (entire FMS Business)

Weaknesses
- Lacking presence in Europe and the United States (pumps, chillers)
- Insufficient lineup of products matched to overseas specifications (pumps)
- Dependence on highly volatile markets (compressors and turbines)

Opportunities
- Increases in infrastructure investment in conjunction with rising water demand attributable to population growth and urbanization in emerging countries (pumps)
- New opportunities arising from industrial structure changes occurring in conjunction with progress in 5G, IoT, and other technologies (pumps, chillers)
- Growing demand for EBARA products in tandem with growth in demand for LNG, hydrogen, and other forms of clean energy (pumps, compressors and turbines)

Threats
- Intensification of price competition stemming from domestic market contraction (pumps, chillers)
- Increased competition due to maturity of technologies and improvement of technological capabilities of manufacturers in emerging countries (entire FMS Business)

E-Vision 2030 and E-Plan 2022 Business Strategies

Business Vision (E-Vision 2030)

Become a top-class industrial machinery manufacturer that continues to advance into new fields supported by the fundamental technological prowess forged over years of operation

E-Plan 2022

Business Strategies

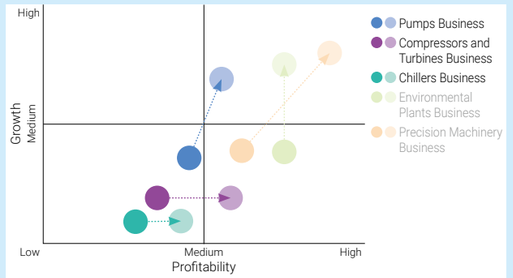
- **Establish business structure that ensures reliable profits**
- **Improve presence in the overseas market**
- **Create products matched to customer needs in unexplored and other markets**

Operating Income to Sales Ratio Targets

FMS Business 7.0% or more

Pumps Business	6.5% or more
Compressors and Turbines Business	8.0% or more
Chillers Business	5.0% or more

Target Business Portfolio



Measures by Market

Market	Overall Trend	Principal Businesses	Major Measures
Building equipment	Domestic: ↘ Overseas: ↗	Pumps Chillers	• Improve operational efficiency and reduce labor requirements with AI and robotic process automation (RPA) (Japan) • Expand sales network (overseas) • Expansion of product model lineup (overseas) • Reinforce supply chains (Japan, overseas) • Launch high-value-added products (Japan, overseas)
Water infrastructure	Domestic: ➡ Overseas: ↗	Pumps	• Develop technologies for extending lifespans of aged equipment (Japan) • Launch products matched to regional needs (Japan, overseas)
Oil and gas	Domestic: ➡ Overseas: ➡	Pumps Compressors and turbines	• Expand regional base network coverage to accommodate S&S increases through collaboration between custom pumps and compressors and turbines businesses (overseas) • Bolster production capacity through installation of new cryogenic pump test stand (overseas)

Social Contributions through Business

Water Supply Unit Contributing to Effective Space Use and Easy Installation

Stable Water Supply from Optimal Water Supply Equipment

Relevant SDGs

In December 2019, we commenced sales of 10 different models of the new FRESHER 3100 NEO (BN-MG-Type) feed water pump in Japan. Such water supply units are crucial to realizing stable water supplies in buildings, condominiums, and other structures and in factory equipment. The FRESHER 3100 NEO (BN-MG-Type) is equipped with an inverter-integrated permanent magnet motor that combines an EBARA inverter with a permanent magnet motor boasting Ultra Premium Efficiency (IE5), the highest class for motor efficiency, making this offering one of the smallest in the industry, weighing roughly 44 kg less than prior models and requiring approximately 32% less space. Furthermore, the direction of water outputs and the location of control panels can be chosen on-site, making it possible to freely arrange the layout for easier maintenance. These features help realize optimal water supply facilities that contribute to effective space utilization and shorter installation and maintenance times for buildings, condominiums, and other structures.

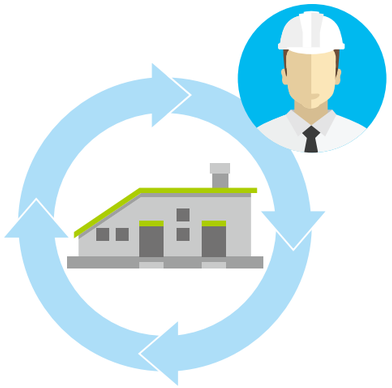
FRESHER 3100 NEO (BN-MG-Type)
Standard pumps have a wide range of uses ranging from water supply in buildings, condominiums, and other structures to conveying fluids in industrial plants. The FRESHER 3100 NEO (BN-MG-Type) is an energy-efficient, resource-saving product that can be used for realizing efficient manufacturing processes to deliver optimal levels of convenience.

* BN-MG-Type is an EBARA model number.

Provision of S&S Matched to Customers

Contributions to Reliable Operation of Customer Infrastructure

Relevant SDGs



The EBARA Group has a robust global track record of custom pump deliveries to oil, gas, and water infrastructure and to power markets in the Middle East, Southeast Asia, and other parts of the world. This track record is particularly strong in Saudi Arabia, where we have delivered more than 5,000 custom pumps to date. To ensure that these products can continue to be operated reliably after delivery, we are developing customer-rooted service systems at overseas service bases.

To this end, we have sales representatives and engineers perform proposal-based sales activities while on-site field service engineers supply parts and overhaul services. Going forward, we will continue to respond to customer needs by delivering components as well as repair and maintenance services as we seek to offer S&S that spans the entirety of product life cycles.

Saudi Arabian Service Shop
Through the provision of S&S tailored to customers, we support the stable operation of infrastructure by extending the lifespans of delivered products and thereby contributing to the reduction of waste. Moreover, maintenance proposals that realize energy-efficient operations contribute to the reduction of environmental impact.

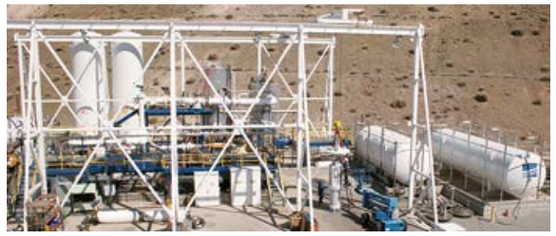
Cryogenic Pumps Underpinning Safe and Secure Transportation of Natural Gas

Support for Supply of Chemical Products and Energy

Relevant SDGs

Primarily used in the LNG industry, cryogenic pumps are indispensable to the transportation and storage of LNG. Harvested in forms such as shale gas, natural gas takes a gaseous form under normal temperatures and pressures. Efficient transportation of natural gas is achieved by cooling it to −162°C to shrink it to approximately 1/600th of its normal volume, and cryogenic pumps are used in this process. These pumps have high technological requirements to ensure that their structure can prevent leaks of vaporized flammable gas from LNG and that they are able to operate under temperatures ranging from normal to ultralow. Looking ahead, it can be expected that natural gas demand will increase in conjunction with the economic growth to be seen largely in China, India, and other parts of Asia. In light of this demand, Elliott Group Holdings, Inc., will contribute to the stable supply of energy through the safe and secure transportation of natural gas using cryogenic pumps.

Supplier of the Cryogenic Pumps Supporting the LNG Industry
Elliott Group Holdings designs and manufactures the compressors and turbines that form the hearts of petroleum refineries and petrochemical plants while also supplying related after-sales services. Over a history spanning more than a century, this company has pursued engineering innovations, produced highly reliable products, and thereby won customer satisfaction. The compressors and turbines business of EBARA CORPORATION, the parent company of Elliott Group Holdings, was transferred to this company in 2000 followed by its cryogenic pumps business in 2019.



Cryogenic pump test stand

New Turbo Chiller Installed in the Japan National Stadium

Helping to Combat Global Warming

Relevant SDGs

Turbo Chiller Delivered to the Japan National Stadium
An ERS turbo chiller using AGC's refrigerant was delivered for use in the cold source equipment for the air-conditioning system in the Japan National Stadium in 2019.
(Photograph provided by Taisei Corporation)

EBARA REFRIGERATION EQUIPMENT & SYSTEMS Co., LTD. (ERS), has developed an eco-friendly high-efficiency Model RTBA centrifugal chiller designed for non-fluorinated gases that uses the eco-friendly AMOLEA™ 1224yd refrigerant produced by AGC Inc. This chiller has been delivered to a variety of facilities, including commercial and lodging facilities as well as chemical plants. Recognized for its excellent performance and undeniable track record, this chiller received a special judges committee award in the 21st Ozone Protection and Global Warming Prevention Awards, and has been adopted for use in the Japan National Stadium. In addition, we provide partial upgrade services to renovate prior chiller models to be compatible with the AMOLEA™ 1224yd refrigerant. These services enable customers to introduce eco-friendly products that help combat global warming without making substantial upfront investments.

Initially established as the chillers business division of the Company, ERS is a pioneer in the manufacture and sale of large-scale cold source equipment, having delivered the first domestically produced turbo chiller 90 years ago in 1930. This division was spun off as its own company in 2002, and has been developing the Group's chillers business in Japan and overseas since. ERS delivers comprehensive solutions in the heat energy field through its chillers, cooling towers, and accompanying S&S operations. Going forward, ERS will continue to supply its products to various facilities and further its efforts to contribute to the prevention of global warming.

* Model RTBA is an ERS model number.
* AMOLEA™ is a registered trademark of AGC Inc.

Environmental Plants Business

The Environmental Plants Business aims to grow into a resource circulation solutions provider that contributes to the development of sustainable communities.

Atsuo Ohi
Executive Officer
President, Environmental Engineering Company

Strategic Points

- Continue contributing to the development of sustainable communities through close cooperation with local communities.
- Pursue reductions of CO_2 emissions through facility energy efficiency improvements and effective utilization of CO_2.
- Utilize proprietary technologies to effectively reuse plastic waste and address issues regarding marine microplastic issues.
- Make ongoing improvements to product and service lineups to support the continuous implementation of the aforementioned initiatives.

The EBARA Group kicked off E-Plan 2022, its new medium-term management plan, with the fiscal year ending December 31, 2020.

Under E-Plan 2019, the previous medium-term management plan, we sought to elevate the level of our area management practices in the waste treatment field. We thereby succeeded in streamlining operating procedures by ramping up the sharing of information between existing facilities.

In creating E-Plan 2022, we reviewed the period of E-Plan 2019 in addition to defining a long-term vision for the Group in 2030. Through this process, we were able to clearly define our commitment to contributing to the development of a sustainable society through management based on ESG factors and measures for helping accomplish the objectives of the SDGs in the waste treatment field. E-Plan 2022 has been positioned as our first step toward realizing the vision indicated in E-Vision 2030. Under this plan, the Environmental Plants Business aims to grow into a resource circulation solutions provider. In this capacity, we will develop business centered on the construction and operation of waste treatment plants that primarily serve local governments. We will also seek to help resolve environmental and social issues and deliver a wide range of services that contribute to the development of a sustainable society.

Review of the Fiscal Years Ended December 31, 2017–2019

Material ESG Issue Action Policies and Major KPIs (E-Plan 2019 Final Year Results)

Action Policy 1 **Provide products and services that minimize the use of energy and resources**

KPI: Waste-to-energy generation volume	Progress toward Target
KPI: Power generated by biomass-related power generation facilities	

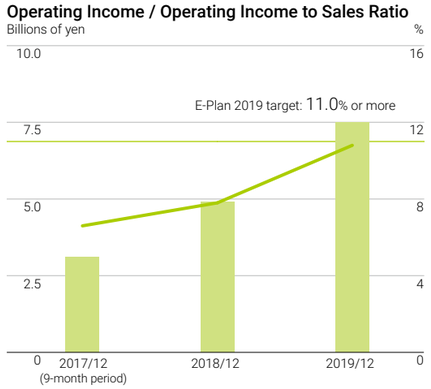
Action Policy 2 **Expand the service and support (S&S) business, maximize product life, and minimize any product downtime**

KPI: Increase number of Operation and Maintenance (O&M) contracting facilities	Progress toward Target

Numerical Targets of E-Plan 2019 (Consolidated)

Operating income to sales ratio of 11.0% or more

Operating Income / Operating Income to Sales Ratio



Bar graph: Operating income (left scale)
Line graph: Operating income to sales ratio (right scale)

SWOT Analysis of Environmental Plants Business

Strengths

- Integrated system for providing services ranging from engineering and construction to operation and maintenance
- Track record of constructing more than 400 plants worldwide utilizing a wide range of incinerator technologies
- O&M expertise founded on industry-leading operation contracting track record
- Cutting-edge plant operation initiatives employing AI and ICT
- Gasification technologies related to chemical recycling

Weaknesses

- Dependence on public infrastructure industry in Japan
- Geographic overconcentration of customers
- Labor-intensive facility operation businesses

Opportunities

- Reconstruction and upgrade demand stemming from aging of waste treatment plants
- Increased outsourcing of plant operation to the private sector
- Increased demand for renewable energy
- Growing need for waste plastic processing

Threats

- Consolidation of plants in response to domestic population decline
- Workforce contraction
- Intensification of cost competition

E-Vision 2030 and E-Plan 2022 Business Strategies

Business Vision (E-Vision 2030)

Expand business to become a resource circulation solutions provider with operations centered on waste treatment plant construction and operation that provides integrated engineering, procurement, and construction (EPC) services primarily to local governments

E-Plan 2022

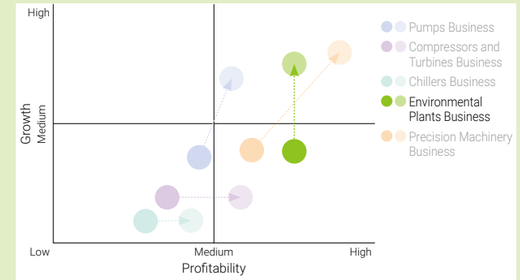
Business Strategies

- **Reinforce core operations**
- **Develop new businesses**
- **Step up waste treatment equipment liquidation and sales activities in China and promote offshore trading**
- **Improve non-price evaluation of design, build, and operate (DBO) projects**

Operating Income to Sales Ratio Target

Environmental Plants Business 9.5% or more

Target Business Portfolio



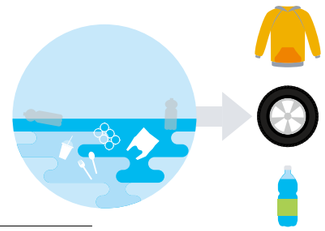
Measures by Market

Market	Overall Trend	Major Measures
Waste incinerator planning, engineering, and construction	Domestic: ➡ Overseas: ↗	• Improve new EPC and DBO order acquisition success rates through enhancement of non-price proposal capabilities (Japan) • Bolster production capacity of Chinese manufacturing sites and promote offshore trading of equipment (Overseas)
O&M services	Domestic: ➡	• Reduce maintenance and management costs and improve plant performance using AI and ICT (Japan)
Other	Domestic: ↗ Overseas: ↗	• Construct chemical recycling business model (Japan)

Social Contributions through Business

Plastic Waste Gasification Chemical Recycling

Quest to Address Marine Microplastic Issues through New Collaborative Business Model

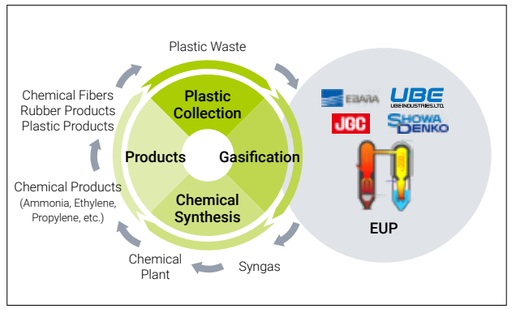


Relevant SDGs

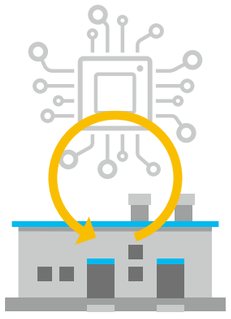
In July 2019, Ebara Environmental Plant Co., Ltd., concluded a confidentiality agreement with JGC Corporation (currently JGC CORPORATION), Ube Industries, Ltd., and Showa Denko K.K., with regard to the promotion of plastic waste chemical recycling using the Ebara Ube Process (EUP). We also began examining possibilities for collaboration at this time, and are currently looking at introducing the EUP to the market.

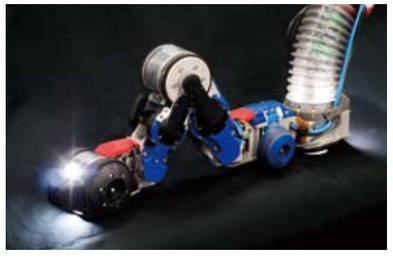
The goal of this project is to promote plastic waste chemical recycling as a solution for helping address climate change and oceanic pollution issues stemming from plastic waste, which have recently been garnering attention on a global scale.

EUP is a two-phase gasification system developed jointly by Ube Industries and EBARA Environmental Plant. This system can be used to convert plastic waste into a syngas (H_2+CO) through thermal decomposition and ultimately enable this gas to be reused as a material for producing ammonia or other chemical products.



Plastic Waste Recycling Process
Gasification chemical recycling of plastic waste is capable of decomposing a mixture of various kinds of plastics and impurities, which presents difficulties for other recycling methods, at the molecular level, to be recycled as various chemical materials. This process is anticipated to contribute to substantial improvements in recycling ratios.





Small Traveling Robots for Automatic and Continuous Boiler Pipe Thickness Measurement
We have successfully developed small traveling robots that can move through narrow pipes and other small spaces. However, Ebara Environmental Plant is committed to always striving for better and will be undertaking new development projects for technologies and other breakthroughs to make ongoing contributions to the creation of sustainable recycling-oriented cities.

Automatic and Continuous Boiler Pipe Thickness Measurement Using Small Traveling Robots

Further Evolution of Safe and Secure Plant Operation through Technological Capabilities

Relevant SDGs

At Ebara Environmental Plant, we regularly measure the pipes of fuel gas heat recovery boilers in waste treatment plants to assess the amount of corrosive and other wear in order to promote longer lifespans of our plants.

Conventional methods for measuring the thickness of pipes from inside entailed inserting small sensors into the narrow pipes. However, this method required a portion of the pipes to be severed, in addition to other cumbersome preparations.

To address this issue, we began joint development of small traveling robots that can move through small spaces, such as narrow pipes, with HiBot Corporation, a company that boasts cutting-edge development technologies. Working together, we were able to complete a successful field test of the automatic and continuous measure of boiler pipe thickness using these robots.

Precision Machinery Business

Accelerate growth in all of our businesses by bolstering product cost-competitiveness and reconstructing business structures centered on the automation of dry vacuum pump assembly lines

Tetsuji Togawa
Executive Officer
President, Precision Machinery Company

Strategic Points

- Transition from a supplier of standalone equipment to a solutions provider.
- In the components business, transform into a comprehensive exhaust-related equipment provider for vacuum processes.
- In the CMP systems business, evolve into a CMP process solutions provider centered on equipment.
- Create new businesses with new technologies at their core.
- Pursue highly efficient management and develop operations on a global scale.

During E-Plan 2019, the Precision Machinery (PM) Business began construction on automated dry vacuum pump assembly lines and a development and verification test facility, built overhaul bases in the Kyushu and Chubu regions, and started full-fledged operation of a new building in its CMP system mass production factory. We also promoted further procurement and component production capabilities of overseas bases. As a result, during the period of E-Plan 2019, we achieved a three-year average operating income to sales ratio of 11.5%, This is unfortunately lower than the target of 12%. Major issues to be tackled in our business include the optimization of production systems, through further increasing the number of automated assembly lines; the expansion of our share in the growth-promising Chinese market; and the swift achievement of profitability in new business ventures. Meanwhile, we will continue to develop energy- and resource-efficient products in line with KPIs pertaining to action policies for addressing material ESG issues. We will thus contribute to reducing the environmental impacts of customers' business activities.

It is projected that semiconductor demand will be buoyed by the ICAC5 technologies sparking swift increases in the performance of semiconductor chips thereby allowing state-of-the-art semiconductor devices to enter into the 14Å (angstrom, one ten-billionth of a meter) era by around 2030. In light of this, the PM Business's vision for E-Vision 2030 is to contribute to the development of society through partnership and distinctive technologies while helping create a more enriched world through endeavors in new fields.

Review of the Fiscal Years Ended December 31, 2017–2019

Material ESG Issue Action Policies and Major KPIs (E-Plan 2019 Final Year Results)

Action Policy 1 **Provide products and services that minimize the use of energy and resources**

KPI: Reduce electricity consumption of certain products compared to 2017 models	Progress toward Target
KPI: Reduce the weight of certain products compared to 2017 models	Progress toward Target

Action Policy 2 **Expand the service and support (S&S) business, maximize product life, and minimize any product downtime**

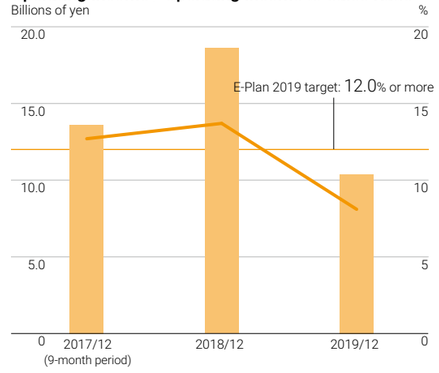
KPI: Increase S&S sales	Progress toward Target
KPI: Shorten overhaul* delivery periods	Progress toward Target

* Overhaul: Inspections and repairs involving disassembly

Numerical Targets of E-Plan 2019 (Consolidated)

Operating income to sales ratio of 12.0% or more

Operating Income / Operating Income to Sales Ratio



Bar graph: Operating income (left scale)
Line graph: Operating income to sales ratio (right scale)

SWOT Analysis of Precision Machinery Business

Strengths
- Rotating machinery, fluid equipment, machine control systems, gas decomposition and abatement, and energy conservation technologies
- Sophisticated technological capabilities and manufacturing technologies that contribute to resource conservation
- Bases positioned near customers worldwide
- Flexible, high-quality customer support capabilities
- Long-term employee retention contributing to technology accumulation and transfer
- Diverse base of technically skilled employees around the world
- Robust supply chain

Weaknesses
- Lack of optimization of production systems (i.e., fully automated plants, etc.)
- Faltering share expansion in growth-promising Chinese market
- Slow launches to new business initiatives

Opportunities
- Spread of IoT, AI, and automated driving technologies
- Diversification of work styles through teleworking and other methods utilizing cloud and communications technologies
- Growth in semiconductor demand in conjunction with the technological development of a super-smart society
- Aggressive semiconductor investment in China
- Consistent capital investment demand in Taiwan, South Korea, and Japan

Threats
- Fluctuations in semiconductor demand and inconsistent pace of semiconductor capital investment following slowed pace of semiconductor complexity increases
- Diminishment of market share due to supply chain issues and other factors leading to insufficient production capacity
- Impacts of trade dispute between the United States and China
- Effects of economic stagnancy following prolongation of the COVID-19 pandemic

E-Vision 2030 and E-Plan 2022 Business Strategies

Business Vision (E-Vision 2030)

Contribute to the development of society through partnership and distinctive technologies centered on the semiconductor field while helping create a more enriched world through endeavors in new fields

E-Plan 2022

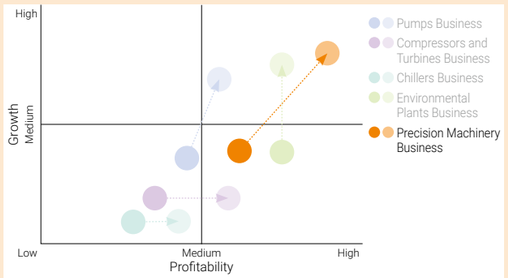
Business Strategies

- **Transition from a supplier of standalone equipment to a solutions provider**
- **Create new businesses with new technologies at their core**
- **Pursue highly efficient management and develop operations on a global scale**

Operating Income to Sales Ratio Target

Precision Machinery Business **13.0% or more**

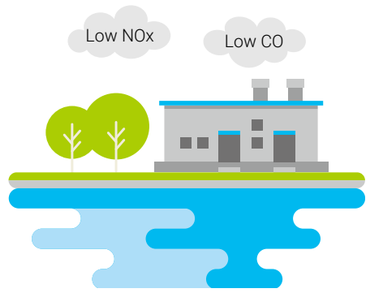
Target Business Portfolio



Measures by Market

Market	Overall Trend	Major Measures
Components	Domestic: ↗ Overseas: ↗	• Launch new dry pump models • Improve production efficiency by reducing model numbers, constructing fully automated plants, etc. • Optimize domestic and overseas S&S systems • Bolster Chinese market-specific sales capabilities
CMP systems	Domestic: → Overseas: ↗	• Develop process solutions proposals and upfront development systems • Deploy models matched to wide-ranging customer needs • Ramp up in-base S&S activities through increased coordination and component information sharing with consumable manufacturers, expand after-sales support service lineup, and make proactive proposals to customers • Bolster Chinese market-specific sales capabilities
New businesses	Domestic: ↗ Overseas: ↗	• Launch new models for next-generation applications • Establish dedicated organization specializing in development

Social Contributions through Business



New Gas Abatement Systems Matched to Customer Needs

Contributions to Reduction of Environmental Impacts of Semiconductor Manufacturing Processes

Relevant SDGs

In November 2019, EBARA launched new gas abatement systems for use in semiconductor manufacturing processes, namely Model TND-Single (burn + wet) and Model TND-Single Plus (wet + burn + wet).

These models are equipped with new burners to reduce heat energy loss for more efficient incineration and to lower NOx and CO emissions. In addition, these models feature improved performance that contributes to extended maintenance intervals (three to more than six times longer than prior EBARA products*). We anticipate that these new models will have an important role to play in the realization of E-Vision 2030.

As communication and robot technologies advance rapidly in conjunction with the progress of the IoT and AI technologies, demands such as for higher efficiency in gas abatement and extended maintenance intervals through deposit measures in semiconductor manufacturing processes are increasing. Having developed the new Model TND Series of gas abatement systems matched to customer needs, we will proceed to deploy highly reliable EBARA brand products to locations centered on Japan, North America, and Taiwan.

* Comparisons were made using prior EBARA products under the same conditions. Results may vary based on conditions.

Model TND-Single Gas Abatement System
Gas abatement systems treat and release exhaust gas from incineration and other processes in a manner that prevents impacts on the surrounding environment. EBARA's gas abatement systems are primarily used to treat the toxic gases emitted during semiconductor manufacturing processes. Going forward, we will continue to support global advancements in digital technologies with EBARA's sophisticated technologies amid the ongoing rise in semiconductor demand.

Awards from Customers

Contributions to Sustainable Business Activities for Customers as a Reliable and Sustainable Supplier

Relevant SDGs

EBARA is constantly refining its technological capabilities to ensure that it can live up to customer expectations by providing finely tuned support. This diligence has made reliability one of our greatest strengths, and has won us several awards in the fiscal year ended December 31, 2019.

For example, Taiwan-based Taiwan Semiconductor Manufacturing Co., Ltd. (TSMC), has presented EBARA CORPORATION with the Excellent Performance Award for eight consecutive years. Each year, TSMC awards select suppliers that have exhibited outstanding performance through the provision of service and support with this honor. Three achievements were cited as reasons for EBARA winning the most recent award: Exceptional supply of products to match the expansion of production volumes at TSMC factories, extensive support for R&D activities, and the proactive localization of major CMP components. In addition, subsidiary Ebara Precision Machinery Taiwan Incorporated. received a letter of appreciation in the spare parts standalone awards category sponsored by TSMC's production equipment buying division. This letter cited thanks for Ebara Precision Machinery Taiwan's contributions to improved efficiency through the localization of production in Taiwan and to the increased supply of products by TSMC via heightened supply capabilities.

Also in the fiscal year ended December 31, 2019, EBARA CORPORATION was presented with the Supplier Achievement Award by Intel Corporation. This honor is presented to suppliers that have achieved especially excellent performance in areas emphasized by Intel and thus indicates that these companies are playing an important role in leading the industry. EBARA was presented with this award in reflection of a high evaluation from the perspective of sustainability. Major points considered included our business continuity plan (BCP) and other systems as well as the stability of our operations.

The Precision Machinery Company, which develops EBARA's core semiconductor manufacturing equipment and component business, will continue to support customer business activities with products and services that help improve productivity, cut overall costs, and reduce environmental impacts.

TSMC Excellent Performance Award ceremony

Intel 2019 Supplier Achievement Award