

Technical Strategy and Strategic Table of Technological Capabilities



Dialogue How to Utilize the Strategic Table of Technological Capabilities

Connecting people with technology to solve problems with EBARA's R&D and manufacturing capabilities

Norihisa Miyoshi
Executive Officer,
Division Executive, Technologies,
R&D & Intellectual Property Division & CTO

The EBARA Group has created and is continuously updating its Strategic Table of Technological Capabilities, which makes visual EBARA's core competencies of its technologies, and its technical talent map, which transforms such technology and technical personnel into data. The EBARA Group has a diverse variety of businesses, but they are all based on the Group's shared foundation of technology and manufacturing. Norihisa Miyoshi, who was appointed as CTO in March 2023, and Toshiharu Nakazawa, who is in charge of manufacturing, discussed the utilization and R&D of the Strategic Table of Technological Capabilities, and strategies and practices of manufacturing.

Toshiharu Nakazawa
Head of Production Process Innovation and
Quality Assurance Department



Facilitator
Kazunori Suda
Division Executive, Marketing Division

New System to Accelerate Technical Development

Suda: E-Plan 2025, the new medium-term management plan, started this year. Please tell me your strategies and initiatives to utilize technology and human resources in line with the Strategic Table of Technological Capabilities.

Miyoshi: The CTO Office was newly established to create new value by managing the EBARA Group's technologies. The office has dozens of members from the technology and marketing departments of each in-house company. With this departmental variety, the members' background knowledge and experience becomes complex, but by using the symbols of the Strategic Table of Technological Capabilities, each member can understand each other's technical background, and communication is smoother. I believe that this will lead to higher-quality discussions, advance technology sharing, and generate synergies.

Technology by itself can't stand on its own, but a product is composed of many technologies. Until last year, I worked on the business side of things. To be honest, I thought it would be difficult to consider technology as a single element. However, after the Strategic Table of Technological Capabilities was completed, I found it very easy to understand, even from an outside perspective, and I can see why it's been praised so highly.

Nakazawa: From a manufacturing perspective, from among the production technologies connected on the Strategic Table of Technological Capabilities, we must properly maintain the six technologies of casting, machining, welding and joining, surface modification, pressing, and 3D. At Ebara Manufacturing Technology Advanced Center (EMTAC), one

of EBARA's prototype facilities, we can use this technology for experiments such as casting with various materials. I believe that one of EBARA's strengths is its ability to take advantage of such advanced prototyping technological capabilities even in the development stage. We share technology with both domestic and overseas bases with factory equipment, and work together to solve problems. Going forward, I would like to collaborate further with our overseas Group companies.

Suda: Mr. Miyoshi was the president of Ebara Environmental Plant until last year, after which he started work as CTO, but what kind of strategies do you want to execute for technology policy?

Miyoshi: R&D staff are good at understanding technology on a deep level, but I feel that business is somewhat outside of their typical field and there aren't opportunities to consider it. I would like to help create a system that allows people to interact with the information around them and learn organically how business is conducted. If you don't have any business experience, you won't have an awareness of it, so you might miss a good opportunity. I would also like to increase opportunities for R&D staff to interact with customers, get a sense for time and even nerves, and really understand the value of their work.

Connecting Technology with People to Swiftly Solve Problems

Suda: Starting this year, the Group has switched to a new corporate structure that focuses on target markets. One of the important points in a customer-oriented perspective is to act swiftly. Can you give any examples of such action?

Nakazawa: At EMTAC, the technology manufacturing hub, we aim to deliver a prototype within three days, and we treat our business departments like customers, listen to their feedback, and work to quickly deliver products that better meet their needs. Going forward, we will expand this system across the Company and increase development speed.

Miyoshi: When I was working on the business side, I had a chat with Mr. Nakazawa, which helped me see a connection between the technology and the issue at hand, and we solved it very quickly. At Ebara Environmental Plant, we wanted to use a surface treatment with a corrosion-resistant material to extend the life of the grates used in stoker furnaces, but the challenge was the shape of the grate would deform when heat was applied. Mr. Nakazawa happened to ask me at the same time about a laser spray technology, but I wasn't actually aware if EBARA had such technology. When I asked about the details, I thought that it would be the perfect surface treatment for the grates. I then conferred with the people involved. We went and tested it, and now we are using the technology for the grates.

Nakazawa: Mr. Miyoshi happened to be near EMTAC and immediately went to go see the laser spray technology. From that conversation, we connected the dots and quickly solved the issue without a hitch. That was very interesting.

Suda: As you both mentioned, it is very important to increase points of contact between the R&D side and the business side.

Miyoshi: In the CTO Office, we are working to increase points of contact through organic discussions to share issues between customers and the Company. Just by looking at the Strategic Table of Technological Capabilities, you can't immediately tell if a technology will solve a problem, but if someone who understands the technology hears about your problem, they will instantly see the relationship between the two. I think it will be crucial to create opportunities for people to connect technology with problems.

Think Deeply and Expand Outlooks

Suda: How will the EBARA Group advance its technological strategies in the future?

Miyoshi: R&D for 2030 and beyond will require a structure that allows us to think about what EBARA should do for the future, not limited to just our existing businesses, and to continue to make proposals. Starting this year, we have examined various scenarios based on mega-trends and

started considering our future technology strategies.

We will consider introducing technology and external cooperation for the technologies EBARA doesn't handle, and incorporate these directions into an action plan. We will review this every year and polish it when necessary. Our semiconductor-related business, which has grown to become a pillar of our business today, originated from a project we started in 1985. We will build a system that will allow us to lay the groundwork for the next twenty or even thirty years.

Nakazawa: I believe that we must look ahead the same way for our manufacturing. For example, in casting, the basic manufacturing technology will stay the same, but we are in discussions about how to proceed with it. Previously, we made sand molds from wooden molds, but now we can make sand molds with 3D technology. We are creating a technology development roadmap and deliberating issues like if we can use environmentally friendly resins without CO₂ emissions, or if we can reimagine our processes to eliminate CO₂ emissions.

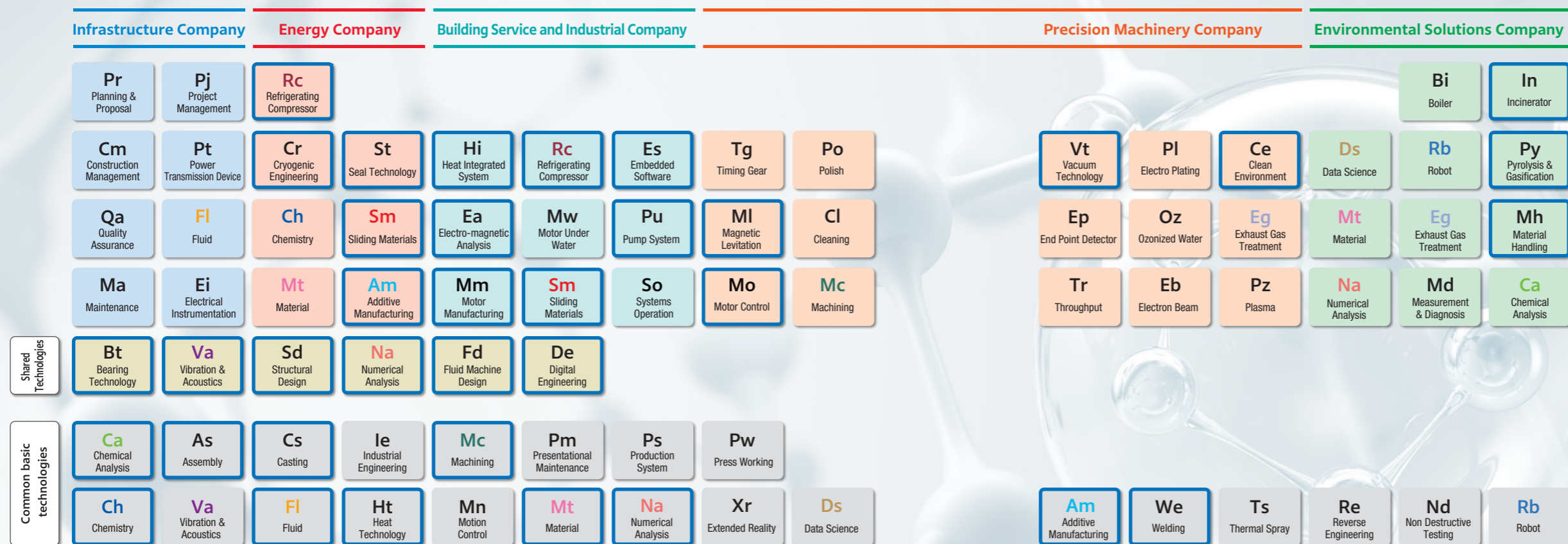
Miyoshi: We are thinking about where we are headed with medium- to long-term mega-trends, so we need to have a broader and more overarching perspective. People involved in our technology must share this perspective. If you look at the Strategic Table of Technological Capabilities, the elements are different colors. Going forward with this understanding, I would like to determine exactly what we should strengthen, how we should strengthen important areas, and how we should develop our human resources.

Nakazawa: EBARA's manufacturing business is diverse, and we have bases all over the world, so we will look at the big picture and explore our basic technology even further. I would like the managers on the ground to work with this kind of awareness, grow together, and establish this mindset as our corporate culture.

Suda: Our top two R&D and manufacturing executives will take the lead in strengthening EBARA's manufacturing, and we will strive to quickly release products that meet the demands of customers and the market, thereby putting EBARA's slogan, "Netsu to Makoto" (Passion and Dedication), into practice. Thank you for your time today.

Technical Strategy and Strategic Table of Technological Capabilities

The EBARA Group's Strategic Table of Technological Capabilities



Meaning and Technology Indicated by Symbols

Example: Mt (Material)

- Mt (Material)** (Green box): Environmental Company: Technologies related to the selection of optimal materials, evaluation and diagnosis, and the development of new materials in the high-temperature corrosive environment unique to waste incinerators and biomass boilers.
- Mt (Material)** (Grey box): Common basic technology: Basic and applied technologies related to corrosion protection, sliding and wear, and structural strength of metallic materials.
- Mt (Material)** (Blue box): **frame:** Hydrogen-related technology. **Colored text:** Multiple of the same symbol.

The EBARA Group acquires and forms its unique material technologies by conducting research and development on materials that adapt to special environments (high temperature, corrosion, sliding, fluid, etc.) in which EBARA products are used in combination with its fluid technologies and vibration technologies.

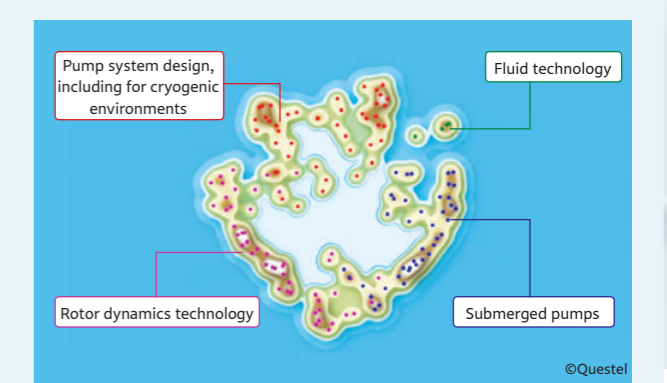
The New EBARA Group Strategic Table of Technological Capabilities

The EBARA Group has created five in-house companies to handle each of its target markets. Accordingly, we revised the EBARA Group Strategic Table of Technological Capabilities. The new EBARA Group Strategic Table of Technological Capabilities has been reorganized into core technology categories that show the features of the five in-house companies, technologies shared between multiple in-house companies, and technologies shared across the entire Company. Last year's table had 47 technologies, and has increased to 64 with this year's revisions, including new technologies related to heat, motors, and infrastructure equipment. We will work with "Netsu

to Makoto" (Passion and Dedication) in mind to contribute to society by making use of these technologies. The corporate research and production technology departments develop Company-wide technologies which support the core shared technologies of the five in-house companies. EBARA will utilize these technologies and their expert personnel to create new value and develop complex solutions in collaboration with the CTO Office team members. In addition to using the Strategic Table of Technological Capabilities for efficient human resource development, we will also apply it to revitalizing internal and external collaboration and joint development.

Hydrogen-Related Technology Development Utilizing Core Technologies

The CP Hydrogen Business Project was launched in August 2021 with the purpose of creating optimal technology across fields by combining new technologies based on the core technologies cultivated through R&D, as well as taking on the challenge of the production technologies of the five EBARA in-house companies and corporate headquarters. Going forward, we will increase the number of new core specialized technologies for hydrogen-related businesses, create new symbols in the Strategic Table of Technological Capabilities for such businesses, and work toward the practical application in society of clean hydrogen-related technologies across all fields of production, transportation, and implementation.



Creating Human Resources to Support Hydrogen-Related Technologies

Production

Turquoise Hydrogen

To realize a hydrogen society, we are developing a turquoise hydrogen production process with no CO₂ emissions by using methane raw materials such as natural gas and bio-gas. Based on the EBARA Group's core thermal, chemical, and analytical technologies, we are advancing technological development of catalysts, process condition construction at optimal temperature and pressure for reactions, and reactor development and design. We are working on process construction and collaborating with partners with the end goal of practical implementation of turquoise hydrogen in society.

Kenta Toyoshiba
First Section, Marketing Promotion Department, Marketing Division

Transportation

Hydrogen

Through cross-business co-creation and generation of synergies, we aim to create a unique EBARA hydrogen business in the fields of production, transportation, and implementation. EBARA's cryogenic engineering, fluid technology, vibration and acoustic technology, numerical analysis technology, material technology, pump system technology, and digital engineering are developed and integrated to create unique new products and contribute to the creation of a hydrogen society.

Kei Watatsugu
Technology Development Unit, CP Hydrogen Business Project, Corporate Project Hydrogen Technology (Rotating Machinery) Group

Implementation

Space

We will help realize low-cost, easy-to-use space transportation, and environmentally friendly new options such as hydrogen aircraft by applying the rotor technology that we have refined over the more than 110 years since EBARA's founding. By taking on the challenge of development, EBARA will further enhance its strengths in fluid technology, vibration, materials and production technology, and apply these strengths to land-based general industries, thereby contributing to the realization of a sustainable society.

Hideki Fujieda
Technology Development Unit, CP Hydrogen Business Project, Corporate Project Aerospace Technology Group

Hydrogen-Related Business Patent Map

The above map shows just some of the patents the Company holds in Japan for its pump technologies that make up the foundation of the hydrogen-related business. By applying EBARA's cultivated technologies, such as for pump system design, rotor dynamics, submerged pumps, fluid technology, cryogenic technology, and more, we were able to quickly develop relevant technologies for hydrogen-related business such as liquid hydrogen booster pumps. At EBARA, we use IP landscapes, including this patent map, to assist various activities such as analyzing the patent value by business and making technical personnel more visible.