R&D

Message from the Officer in charge

Honing our core technologies based on material technology to improve our technological strength

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The Research and Development Laboratory engages in R&D activities underpinned by the basic policy of "leveraging its material technology and deploying diverse core technologies to take on challenges for the development of next-generation devices and providing solutions" that will support the world five years and ten years from now.

While TAIYO YUDEN's products are based on its core technologies, including material technology, processing technology, evaluation technology, design technology, and mounting technology, the foundation of product development is material technology.

While material technology, in a word, may sound simple, seeking to bring out the full potentials of substances may be a profound pursuit. For example, our multilayer ceramic capacitors (MLCCs), the mainstay product of TAIYO YUDEN, uses barium titanate as its main material. However, as a result of reducing the particles of the material to downsize the MLCCs, we found it difficult to bring out the essential performance of the material. Material technology solves such issues and creates materials that can manifest the intended performance consistently. It is an essential technology in improving product performance.

Meanwhile, the so-called processing technology, such as the multilayer technology, thin film technology, and MEMS technology, may be seen as a technology that was acquired and accumulated from needs for smaller and thinner components. We believe that the role of the Research and Development Laboratory is to continue building upon the foundation of material technology to hone the technology to address new trends, and through such efforts, enhance and support the technological capabilities of TAIYO YUDEN.

The Research and Development Laboratory designs the models of talents required for the development of medium- to long-term technological capabilities towards the future, and focuses on recruiting and training of such human resources. Specifically, we believe that, rather than talents specializing in their expertise, we should focus on seeking those who have accumulated specialized knowledge, experience, and skills in certain fields, but also have knowledge and interest in a wide range of other categories. Bearing this in mind, we opened the Shin-Kawasaki Center SOLairoLab in 2020 as a new base for R&D. We have been successful in acquiring new and different perspectives and talents with expertise, and we are now ready to have more interactivities with various outside institutions, which was the original aim. We are also working on competence development, such as training to acquire a wide range of knowledge for engineers, including those at other bases.

In fiscal 2023, the Basic Technology Center and Material Science Laboratory were separated as new organizations under the development and research department. By further strengthening the conventional functions and deploying the outputs horizontally, we aim to enhance the overall development and technological capabilities.

Today, TAIYO YUDEN is carrying out the medium-term management plan 2025, which was formulated as a milestone towards its goals for 2030. To achieve the goals on a medium- to long-term basis, we believe that the development and research department, being responsible for the development of new materials and processes, plays a major role. We will continue to work towards to become a department that is relied upon by other divisions in the Company, and is also capable of contributing to the creation of economic and social value of TAIYO YUDEN.

Fundamental Stance on Research and Development

The Foundation of Our Research and Development Activities

Hikohachi Sato, the founder of TAIYO YUDEN, was a researcher in ceramic materials, and since its establishment, has believed that product commercialization should start from the development of materials. This has been one of the strengths of TAIYO YUDEN, and has resulted in us creating many products that have been "world firsts." TAIYO YUDEN's research and development activities are aimed at further honing the many elemental technologies it has so far developed to create products that contribute to the ongoing development of electronic devices.

— Research and Development Principles —

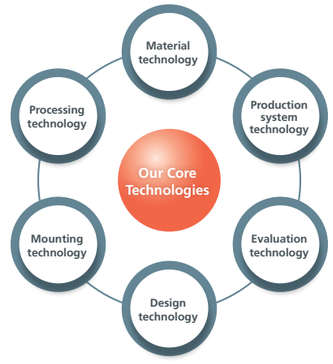
"Innovative advance"

Technology precedence
Promote leading edge technological development as the precursory to innovative product development and become a global leader in technology

Reproducibility
Logically verify the reproducibility of the technology we develop

Technological applicability
Devise technologies which can be applied not only to specific products but also to other areas useful to the markets we serve

Environmental consideration
Develop technologies that are feasible and applicable economically to our manufacturing process and that meet critical environmental standards



Approach to Research and Development

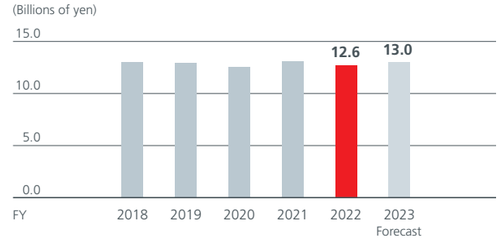
Achievement of Our Vision through Development of Smart Products

TAIYO YUDEN aims to manufacture "smart products" and is actively working to develop and supply steadily such products.

We develop smart products to eliminate the three M's—*muda* (wastefulness), *mura* (inconsistency) and *muri* (overburden)— over their entire life cycle from design through production, sales, and incorporation into the final product right up to final disposal, to add value for customers and local communities we serve as well as our employees. We believe that our research and development activities aimed at creating a higher standard of smart products will enable us to realize our vision of "To be an excellent company that enjoys the trust and highest regard from all stakeholders."

R&D Expenses

We recognize that continuing innovations and advancement in our technologies through R&D is the foundation for TAIYO YUDEN to create the future. As such, in recent years we have continuously invested a fixed amount into R&D activities, rather than making major adjustments based on the financial results.



R&D Themes

At the Research and Development Laboratory, the center of TAIYO YUDEN's R&D activities, we share the roles with the business departments on a medium- to long-term perspective and leverage the core technologies we have so far cultivated to develop new materials and new processes. We are expanding various inspirations through ideas from different fields, co-creation with outside talents, etc., and taking on challenges in manufacturing and providing solutions without fearing failure. We are stepping up our initiatives that address themes which contribute to the creation of new value through items including all solid-state batteries and smell sensors as well as themes related to the SDGs and the environment.

To strengthen the core technologies for the creation of new products, we draw up research themes based on the development strategy roadmap and operate a system that takes a unique twist on the phase-gate process in order to improve the success rates, completion rates, and speed of product development.

R&D

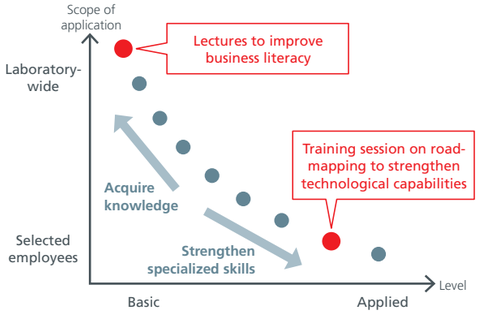
Research Personnel

At the Research and Development Laboratory, in order to develop personnel needed by the Research and Development, we coordinate with the educational training hosted by the Human Resources Department to revitalize the human resources dedicated to innovation. Currently, we are rolling out training activities and learning habituation activities, including improving business literacy and enhancing technological capabilities.

In fiscal 2022, for example, we conducted training to formulate R&D strategies from a long-term perspective by backcasting from major social trends and drawing roadmaps for future R&D activities. We also held six lectures under the theme of innovation by experts and specialists in fields that are recently associated with R&D, such as social science and design, attended by a total of 573 people including employees from outside the Research and Development Laboratory. As a result of these lectures, we are seeing more self-motivated activities among employees, including self-study sessions by participants, and constructive dialogue with the lecturers.

With these efforts, we aim to develop personnel capable of conducting research and development that could lead to innovation and solutions for social issues towards the future.

Image of Human Resources Development Program at the Research and Development Laboratory



Self-study session by employees

TAIYO YUDEN's Research Facility

We are committed to upholding our claim to be "the TAIYO YUDEN of technology and the TAIYO YUDEN of development." Based on this, we opened the R&D Center (Takasaki City, Gunma Prefecture, Japan) in 1998 with the aim of continuing to create the world's best products. Establishing the R&D Center has accelerated our R&D activities, and today it serves as a source of development and technological progress, and a foundation of creativity focusing on the future.

In 2020, we also opened the Shin-Kawasaki Center SOLairoLab as a place to co-create at innovative speed and at innovative level by interacting with outside talents without persisting in in-house development. The Shin-Kawasaki Sozo no Mori ("Forest of Creation") area where the Center is located has a large number of research institutes and start-ups that have congregated. We are taking advantage of this location to strengthen our information gathering and marketing functions as well as our application and solution development capabilities through interactions with people outside the Company. In fiscal 2022, we held more than ten external networking events of various scales, and conducted activities as a place for co-creation.

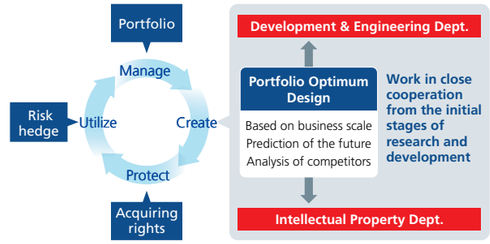
Activities on Intellectual Property Rights

Basic Policy

We, TAIYO YUDEN, endeavor to obtain, maintain and protect intellectual property rights for proper use, and also to respect the intellectual property rights of third parties, in accordance with our CSR Code of Conduct.

Protection of Intellectual Property Rights

At TAIYO YUDEN, the Intellectual Property Department and the Development and Engineering Department work in close cooperation with each other from the early stages of developing new technologies and obtaining intellectual property rights. In addition, we pursue a unique management approach in a way that is optimized for each of our businesses to create, protect, and utilize intellectual property.



Number of Patents Held

TAIYO YUDEN has been acquiring the patent rights needed to conduct its business activities both in Japan and overseas, with the number of patents held increasing year over year (Fig. 1). These are the fruit of our patent creation activities, and include applications that are based on a forecasting mindset starting from recent issues, as well as applications based on a backcasting mindset envisioning the future challenges. We file our patent applications focusing on both. Maintaining these patents is not without cost, but I believe this to be a necessary investment to ensure a degree of freedom in our business. We also review the patents we hold when appropriate and stop maintaining our rights to obsolete technologies in order to reallocate funds to applications that will bolster our new technologies.

On the other hand, there are certain technical fields in which we deliberately do not apply for patents in order to avoid our technologies being disclosed to the public. We register this sort of know-how internally for use within the Group as a form of intellectual property and are working to encourage the creation of such intellectual property by providing incentives to those who invent it in the same way we do for patents.

Blocking Competitor Patent Applications

Patent applications are examined at the Japan Patent Office (JPO). The rate at which TAIYO YUDEN's patents are cited when other companies' applications are examined (the rate at which our patents help prevent peer group competitors from obtaining patent rights) exceeds peer average (Fig. 2). By making appropriate patent applications in terms of both content and timing, we strive to ensure our competitive advantage. With this, we are improving the intellectual property capabilities of our core technologies and supporting the initiatives towards achieving the materiality, to "strengthen core technologies to make our core business grow," thereby contributing to increasing our economic value.

Fig. 1 Number of Patents Held

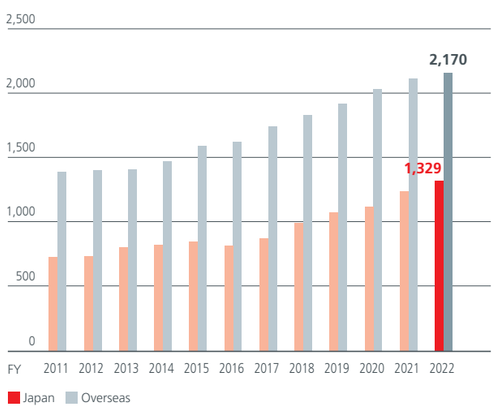
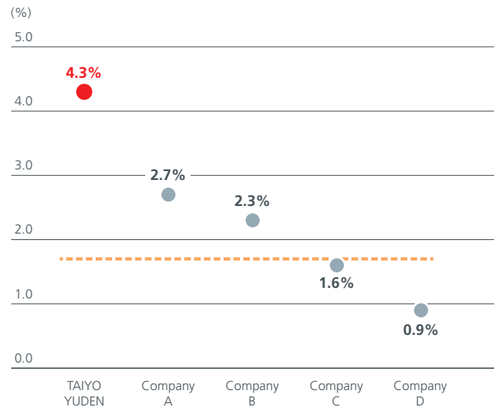


Fig. 2 Rate at which Competitor Patent Applications are Blocked



*Calculated based on 20 years of patent application statistics (FY2003-FY2022)