



Strengthening Research

Equipping ourselves with advanced technologies that enable us to swiftly address social issues is critically important for ULVAC's sustainable value creation. We will further promote initiatives aimed at achieving innovation and co-creation with various companies and research institutions.

A Field of Potentiality for the Future – Integration of Plasma Diagnostics Technology and AI Technology

Many of the vacuum equipment ULVAC develops, manufactures, and sells use plasma-based technology. At the ULVAC Advanced Technology Collaborative Research Cluster, opened at Tokyo Institute of Technology (hereinafter the "Tokyo Tech"), we are conducting research with the aim of integrating Tokyo Tech's plasma diagnostics technology and AI technology. For plasma diagnostics technology, we are working on the verification of plasma conditions, and for AI technology, we are promoting integration with numerical analysis. Going forward, to improve the accuracy of prediction of plasma conditions, we will use numerical analysis to calculate the plasma distribution in a vacuum chamber etc. We expect there to be synergy with AI technology.

In addition, as an aspect of human resources development, we provide engineering students at Tokyo Tech's ULVAC Advanced Technology Collaborative Research Cluster with opportunities to deepen their understanding of vacuum and plasma processing technologies from an engineering perspective, through experiments and lectures. By "connecting" different fields of research, namely, direct plasma diagnostics and AI technology, via ULVAC's vacuum equipment, we expect to expand the possibilities of vacuum equipment.

Fostering and Education of Technical Human Resources

For technical human resources, we aim to develop human resources possessing broader knowledge that goes beyond that gained through engineering skills education as it is conventionally conducted.

Our particular focus is on developing human resources with an awareness of "management" based on "technology." We have invited Professor Shuzo Fujimura, Professor Emeritus of Tokyo Institute of Technology, as an advisor to guide us on "Management of Technology (MOT)." Lectures start by encouraging trainees to rethink the meaning of the terms that we use every day, such as by clarifying the difference between "research" and "development" and between "science" and "technology," and are designed so that trainees learn what they need to know in order to increase the probability of innovation. For us to be able to develop the products required by customers, development of human resources as well as improvement of organizational quality are indispensable. Through these initiatives, ULVAC will further contribute to the development of industry and science as a comprehensive vacuum product manufacturer.

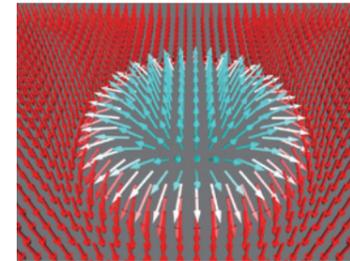
Diversity in Technical Human Resources

In FY2021, Sakae Inayoshi, an employee of ULVAC's Institute of Advanced Technology, was awarded the title of "Shinkuu no Takumi" by the Japan Society of Vacuum and Surface Science (Award to the full membership of the Society for devoting many years to vacuum-related technology related to the Society or for pioneering the development of original vacuum-related technology). The award is in recognition of her contributions over many years to vacuum technology and her research on "development of surface treatments for various vacuum materials and evaluation of outgassing characteristics." Inayoshi is the first woman to receive this award since the title of "Shinkuu no Takumi" (Award to the full membership of the Society for devoting many years to vacuum-related technology related to the Society or for pioneering the development of original vacuum-related technology) was established in 2008 on the 50th anniversary of the founding of the Vacuum Society of Japan, the predecessor of the Vacuum Society of Japan and Surface Science. Ever since its foundation, ULVAC has sought to inculcate a corporate culture according prime importance to the technological development that underpins equipment manufacturing. Inayoshi succeeded to the research started by Sonoko Tsukahara, who served as the director of the former Tsukuba Institute for Super Materials from 1989 to 1994, and she has conducted research on gas emission measurement and development of surface treatment technology for 30 years. This award attests to her commitment to R&D. As greater participation of women in science and technology has emerged as an issue in recent years, ULVAC will continue to promote the advancement of women.

Initiatives for the SDGs – Regenerative Medicine, Energy Sector, etc.

The ULVAC-Osaka University Joint Research Laboratory for Future Technology is conducting research initiatives that address the SDGs. "Freeze-dry preservation of platelet-rich plasma using spray-freeze-drying (Micro Powder Dry(TM)) (joint research with the Graduate School of Medicine, Osaka University)" is expected to be applicable to regenerative

and Development Capabilities



Conceptual diagram of a magnetic skyrmion
Note: The arrows represent magnetic spins and the center represents skyrmions (magnetic quasiparticles that appear inside a magnetic material).

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medicine. For "Development of emerging computing method utilizing magnetic skyrmion (joint research with the Graduate School of Engineering Science, Osaka University)," magnetic films formed by vacuum deposition technology are being applied to process information with zero energy.

In addition, in collaboration with the Graduate School of Engineering, Osaka University, we are conducting basic research on circularly polarized light sources for direct cancer detection using endoscopes, SiC-MOS for power devices, and GeSn light-emitting semiconductors for silicon photonics applications. Moreover, as a unique theme using the Co-Creation Program, we are also conducting R&D of InP-based quantum dots applicable to high color rendering light sources.

With regard to education and human resources development, within the framework of industry-academia collaboration as part of the Course of Industry-University-Government Co-Creation of Osaka University, we offer Japan's first corporate co-creation program and accept students on master's and doctoral courses who seek to develop not only research skills integral to the academic foundation conventionally fostered by universities but also the

ability to adopt a panoramic perspective encompassing business development, including market exits and roadmaps, as well as collaborative skills essential for management of joint research. Through these industry-academia joint research activities (internship on campus), we are contributing to society.

Industry-Academia-Government Collaboration – Toward Technological Innovation for Quantum Computers

In the "Development of Integration Technologies for Superconducting Quantum Circuits," which is one of the projects of the Moonshot Research and Development Program promoted by the Japan Science and Technology Agency (JST) under Goal 6 "realization of a fault-tolerant universal quantum computer that will revolutionize economy, industry, and security by 2050," ULVAC, Inc. and ULVAC CRYOGENICS INCORPORATED are in charge of developing the refrigeration system specialized for quantum computing.

Whereas conventional computers are thought to be approaching their limits, quantum computers are attracting attention because of their potential ability to meet the exploding demand for various types of information processing. However, a refrigeration system that cools superconducting elements to near absolute zero (minus 273 degrees Celsius) is indispensable for the proper operation of quantum computers. Through this initiative, we aim to make further contributions to technological innovation and offer solutions to social issues that harness the power of vacuum technology.

Intellectual Property Assets

As a pioneer of vacuum technology in Japan, the ULVAC Group has accumulated intellectual property rights and know-how in many vacuum-related fields over the past 70 years.

The vacuum-related intellectual assets accumulated within ULVAC, ranging from equipment, such as vacuum freeze-drying equipment for pharmaceutical applications and semiconductor manufacturing equipment, to materials are expected to be applied to new technologies in the future.

With vacuum technology at its core, the ULVAC Group will continue to create and utilize intellectual property assets for the advancement of industry and science.

Basic Policy

The basic policy on intellectual property assets is "to develop and enhance the business environment, strengthen the competitiveness of the entire ULVAC Group, and enhance corporate value through intellectual assets." To accomplish this basic policy, we are implementing four measures.

1. Respect intellectual property rights of other companies
2. Utilize intellectual property information (IP landscape) for business strategy
3. Link business, development, and intellectual property strategies (trinity strategy)
4. Implement centralized management of intellectual property of the entire Group

[For details](#) ▶ [Website](#) > [Research and Development](#) > [Intellectual Assets](#)

Initiatives and Structure for Intellectual Assets

- Intellectual Property Strategy Committee

The Intellectual Property Strategy Committee has been established as an organization to discuss Group-wide IP strategies. The committee is chaired by the director in charge of innovation and is working closely with the Board of Directors. Members include responsible personnel of departments and Group companies, and in formulating intellectual property strategies, the committee adopts a bird's-eye view of the entire Group.