R&D and Intellectual Property Strategies

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Mission of Creating Value

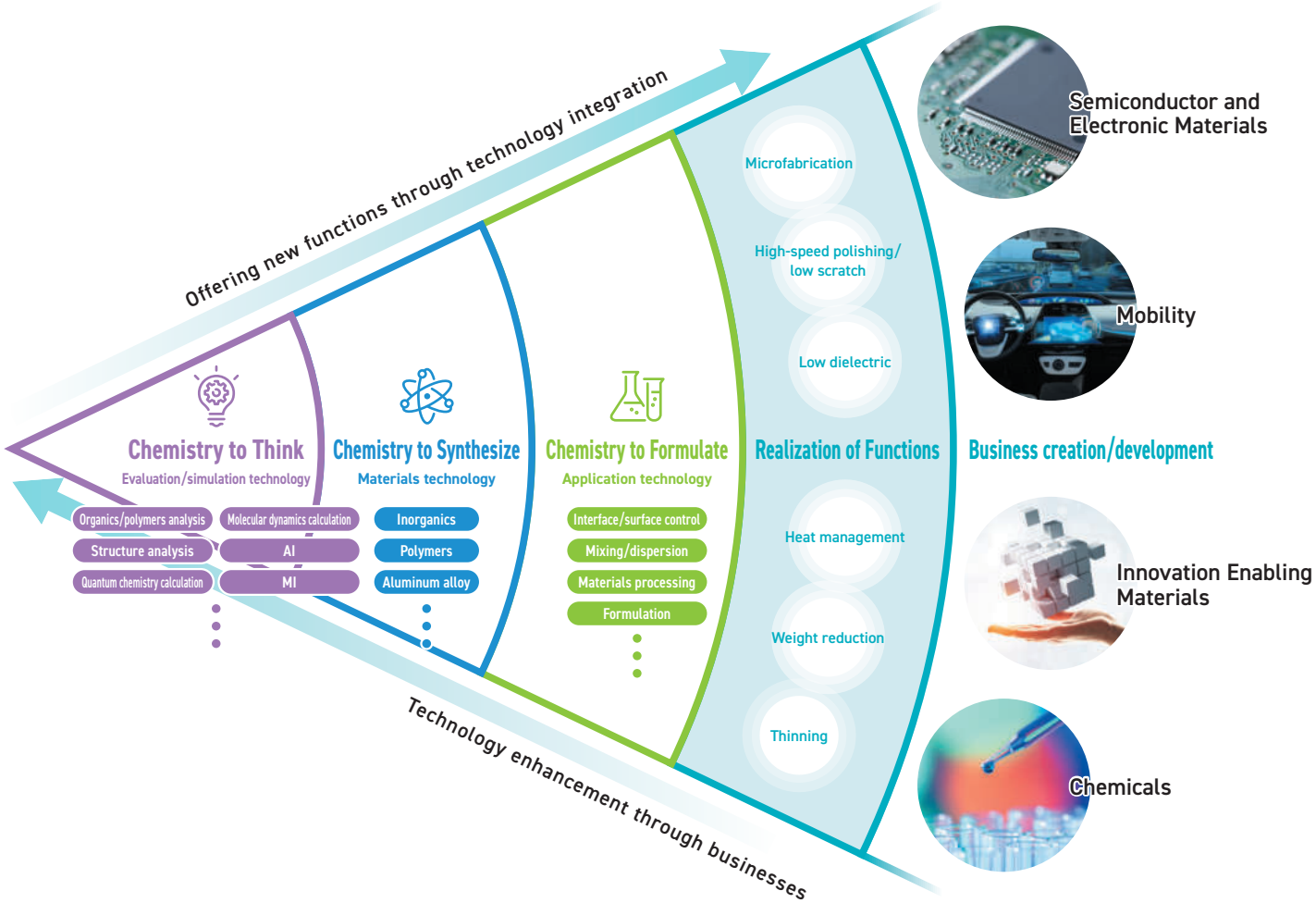
Inspired by its vision of generating synergies between "Chemistry to Synthesize," "Chemistry to Formulate," and "Chemistry to Think," to contribute to the production of world-leading products and technologies, Resonac is advancing R&D activities aimed at accomplishing three missions: broadening of technology portfolios to create innovation, promotion of cross-business technology development, and changing society through long-term R&D projects.

Policies

We will pursue the following three missions to realize our purpose and contribute to resolving social issues by creating the world's No. 1 technologies and products through co-creative technological development.

1. Deepen materials technology and promote horizontal deployment of technologies
2. Strengthen fundamental technologies such as computational science and informatics, analysis and evaluation analysis
3. Facilitate networking and open innovation through the exchange of human resources within the company and with people outside the company, transcending the boundaries of business and technology fields, and expand added value through synergies

In order to drive creation of synergies by technological resonance of "Chemistry to Synthesize," "Chemistry to Formulate," and "Chemistry to Think," the CTO organization is executing corporate R&D activities, management of R&D activities, and oversee Companywide intellectual property (IP) activities.



R&D and Intellectual Property Strategies

Mission of R&D organizations

Institute for Advanced Integrated Technology
- Create new businesses, and research and develop materials including metal, inorganic and composite materials
- Enhance values of existing businesses and products, and cultivate their surrounding areas, which may grow further in the future
- As a hub for evaluation technologies related to power modules, promote the entire process from development of materials and composites to design and evaluation of devices

Institute for Polymer Technology
- Research and develop materials including organic and polymeric materials
- Enhance values of existing businesses and products, and cultivate their surrounding areas, which may grow further in the future
- As an analysis center for composition, general structure, surface structure and microstructure of organic and inorganic materials, accelerate the product development cycle of material development, analysis and evaluation

Research Center for Computational Science and Informatics
- Promote Companywide R&D with computational science and informatics
- Solve problems of products through atomic- and molecular-level simulation/structural and fluid simulation/AI analysis technologies; accumulate, analyze and utilize internal and external technical data
- Establish the base of data-driven R&D and develop the talent

Stage for Co-creation
- Promote long-term R&D projects that contribute to resolving social issues in collaboration with a diverse range of people inside and outside Resonac

P15 / Stage for Co-creation

Intellectual Property Department
- Oversee the intellectual property activities of the entire company and contribute to R&D, business, and management strategies

R&D Planning Department
- Ensure smooth operation of Companywide R&D activities based on Resonac's diverse technologies and business domains
- Formulate technology strategies, promote open innovation, and establish and operate various infrastructure and systems to support the execution of R&D activities

Roadmap for realizing the long-term vision

Results in 2022	Plan for 2023	Vision for the future (2030)
● Completed substantial integration of functions with a view to complete integration. Pursued synergy of the two companies' technologies centering on development of semiconductor materials ● With regard to deep-level digital transformation, deployed electronic lab notebooks and statistical analysis software throughout the Company ● Organized the internal structure to vigorously promote open innovation inside and outside the Company ● Clarified the ideal post-integration state of R&D human resources	● As projects to generate synergies, accelerate and enrich development of advanced materials in the semiconductor field and promote vertical collaboration ● With regard to deep-level digital transformation, accelerate R&D utilizing computational science and data-driven R&D ● Facilitate co-creation through vigorous open innovation inside and outside the Company ● Accelerate R&D activities throughout the company to achieve carbon neutrality ● Formulate a plan to develop leaders who will drive R&D activities and professional-minded human resources to develop core technology	● Be a provider of technology and solutions attuned to the needs of society, the market, and customers ● Be a driving force of unceasing innovation by addressing and resolving technological issues inside and outside the Company ● Be the source of a stream of technologies contributing to a truly sustainable society by enhancing R&D activities from a long-term perspective ● Be the source of a stream of leaders and professional-minded human resources for the above R&D activities

Targets and results of KPIs on material issues

P58 / Material Issues and Non-financial KPIs

KPIs and 2025 targets	Results in 2022
Co-creation with external parties: ● Promotion of open innovation and increase of the ratio of external themes ● Number of papers and external presentations ● Increase in the number of cross-organizational themes	● Start of consideration of actions to facilitate open innovation
Strengthening of R&D and intellectual property strategies ● Increase of the ratio of introduction of life cycle assessment (LCA) ● Enhancement of intellectual property indicators, such as Market Coverage (MC), which indicates market value, and Technology Relevance (TR), which indicates technological value	● Started LCA calculation of research themes ● Set targets of IP indicators
Human resource development ● Assignment of leaders and professional-minded personnel at an appropriate ratio ● Completion of a venue for co-creation	● Started discussion on personnel assignment ● Opened the Stage for Co-creation

Priority Measures for 2023

Based on the measures prescribed for realizing our long-term vision, in 2023 we are promoting activities focused on four priority measures.

1 **Promotion of projects to generate synergies and broaden our technology portfolio:** Business units and R&D organizations will work together to generate synergies and accelerate and enrich development of advanced materials in the semiconductor field and promote vertical collaboration. The Power Module Integration Center is constructing a system to accelerate co-creation with customers for each material. P16

2 **Implementation of deep-level digital transformation:** We will accelerate R&D utilizing computational science and data-driven R&D and construct a material informatics (MI) platform to foster a culture conducive to utilizing data and promote the evolution of digital technologies using MI and process informatics. P67

3 **Promotion of co-creation:** This measure will be advanced through the pursuit of internal synergies as well as through open innovation with external partners. P15 P67

4 **Achievement of carbon neutrality:** The path toward carbon neutrality will be paved by our efforts utilizing the new Stage for Co-creation and activities based on long-term R&D themes, such as a carbon cycle through plastic recycling, CO_2 separation and recovery, and conversion to chemicals. P16

Through such ongoing efforts, we aim to drive unceasing innovation leading to resolution of technological issues inside and outside the Company by 2030. We also aim to be the source of a stream of technologies contributing to a sustainable society by enhancing R&D activities from a long-term perspective.

R&D and Intellectual Property Strategies

Co-creation Initiatives to Resolve Social Issues

Digital Transformation of R&D using computational science and AI—Co-creation with external parties and adoption of cutting-edge technology

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The Research Center for Computational Science and Informatics is one of the few organizations in the world that integrates computational science (molecular simulation, structural and fluid simulation) and informatics (AI[*1], MI[*2], image analysis, natural language processing, and development of the infrastructure for data utilization) technologies at a single location. The Center's technologies are applied to R&D issues in all of Resonac's business segments. The Center's mission is to position Resonac as a world-class functional chemical manufacturer by maximizing R&D capabilities and business competitiveness.

In 2022, the Center had 35 opportunities to present its outcomes externally, including lectures by invitation, publishing of papers, and conference presentations in Japan and abroad. The Center's activities were also covered by numerous news releases and newspaper articles. The Center's initiatives for digital transformation of R&D based on "developing infrastructure for data utilization that supports accumulation, analysis, and utilization of data" and "fostering processes, culture, and organizations that utilize data" have attracted great interest in society, and we have invited many government agencies and companies that have requested our services to the Stage for Co-creation to exchange opinions. Web

Moreover, through co-creation with a U.S. startup we are adopting and utilizing cutting-edge technologies. We collaborated with QSimulate, a company with cutting-edge simulation technologies, on the development of a new capability for its quantum simulation platform for materials development, which reduces an experienced researcher's workload by more than half. Web We are also working with Enthought, a startup that supports digital transformation of its partners, to transfer Enthought's cutting-edge AI and MI skills to our young data scientists who are promoting deployment and utilization of AI and MI applications throughout our material development departments. Web

Cases of Co-creation with Internal and External Partners in 2022 and Outcomes

Cases of Co-creation with Internal Partners We hold Technology Forums as opportunities for employees involved in R&D throughout the company to interact and discuss beyond the boundaries of their place of work and R&D fields. In 2022, the forum had 730 participants. Presentations of 67 themes and feedback on them strengthened technology sharing and relationships among engineers throughout the Group.

In addition, in-house working group activities are conducted with the aim of solving problems in product development by combining the Group's materials technologies and evaluation and analysis technologies. The application of technologies to new products is already yielding good results.

Cases of Co-creation with External Partners We are conducting Open Innovation (OI)[*3] activities to search for partners and promote collaboration worldwide. In 2022, our dedicated OI team, which promotes OI with external partners, obtained information on more than 2,000 innovative startup technologies from affiliated venture capital firms. Having meticulously examined the potential synergy effects between these technologies and our own technologies, we started collaboration with five startups with a view to introducing their technologies.

On the Stage for Co-creation, we promote long-term R&D themes that will lead to the creation of future businesses.

As part of the initiatives, we have started collaboration with Microwave Chemical to establish advanced recycling technology that realizes plastic-to-plastic circulation. Using microwave irradiation, ethylene and propylene, which are feedstocks for plastics, can be efficiently produced from used plastics. In addition to accelerating R&D with a view to practical application of this technology, we aim to resolve social issues by expanding the circle of co-creation to a wide range of stakeholders, including local governments and consumers.

P16 / Long-term R&D Themes Contributing to the Next Generation

Open innovation through co-creation with a range of stakeholders

*1 Artificial intelligence
*2 Materials informatics
3 OI is a methodology that incorporates the knowledge and technology possessed by external organizations in product development and technological innovation to break away from the self-sufficiency. It was proposed by Henry Chesbrough in 2003.
Henry Chesbrough, "Open innovation: The new imperative for creating and profiting from technology," Harvard Business School Press, 2003.

R&D and Intellectual Property Strategies

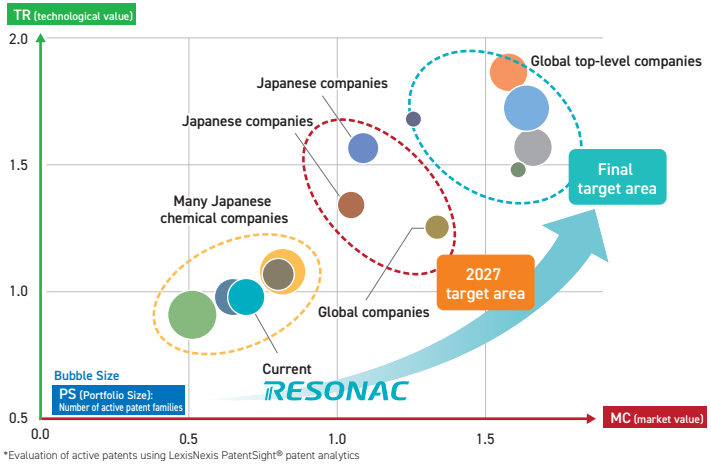
Contribution to Business by Vigorous Utilization of Intellectual Property

The objective is to increase the number of patents that attract the attention of other companies and obtain rights in countries with large markets in cooperation with business units. By further increasing the market value (measured by MC[*1]) and technological value (measured by TR[*2]) of our patent network, we aim to raise MC and TR to the area indicated by the dotted line in the center of the figure below by 2027 as the first step, and eventually to be on par with global top-level companies. In addition, our MC and TR are trending upward compared with the previous year, reflecting our commencement of a post-merger portfolio review, and we are beginning to see positive results of integrated intellectual property activities.

We will enhance our business advantage through the timely and appropriate exercise of our intellectual property rights. To this end, we will further strengthen our patent network to achieve differentiation of our proprietary technologies from those of competitors.

*1 Market Coverage (MC) is a score calculated based on information on countries where patent applications are filed.
*2 TR (Technology Relevance) is a score calculated based on the number of citations.

Target area of market value and technological value of the patent network



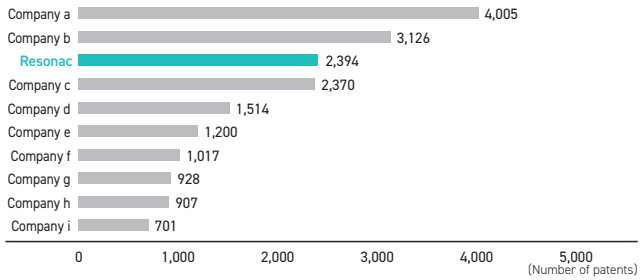
*Evaluation of active patents using LexisNexis PatentSight® patent analytics

Utilization of IP Landscape to Develop Patent Application Strategies in line with the Situation of Each Business Segment and Business

For each business, the Intellectual Property Department, business units, and R&D organizations collaborate and utilize the IP landscape to visualize the patents held by Resonac and clarify Resonac's position in each technological field. Based on the results of IP landscaping and the issues of each business, such as the EBITDA margin, we develop application strategies appropriate for each business to expand and strengthen our patent network.

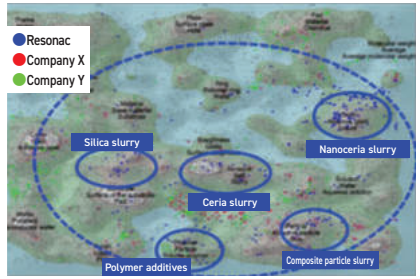
We have a wide range of technologies related to the semiconductor field, from front-end to back-end processes. Our patents in this field are on a par with those of global companies. Taking CMP slurry, one of the semiconductor materials, as an example, a bird's-eye view of related patents shows that we hold patents related to our key technologies such as nanoceria slurry, ceria slurry, silica slurry, and polymer additives, which are the source of our strength. The IP landscape also indicates the technologies that are the source of our strength.

Number of Patents Held in the Semiconductor Field



*Evaluation of active patents using LexisNexis PatentSight® patent analytics

Competitive Advantage in the CMP Slurry Field



*Evaluation using the ThemeScape function of Clarivate's Derwent Innovation patent analysis tool

Vigorous Dissemination of IP-related Information to External Parties Web

With the aim of enhancing corporate value, we vigorously communicate our IP-related initiatives to external parties.

In addition to timely news releases on the gaining of patents related to our key technologies and the construction of our patent network, we promote IP landscape and technology trend research by utilizing our advanced IP information analysis technology, and disseminate the results of such research to external parties. Moreover, we have posted IP information on our website as fact data on our ESG initiatives. Web We will continue to strive to communicate our intellectual property policies to investors in an easy-to-understand manner and enhance information disclosure.