Letter from the CTO

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The Job of the CTO is to Bring the Future Toward Us

I assumed the position of CTO at the birth of the new Resonac. The CTO is a technical specialist in the Company's CXO structure, and the highest position of engineers for a typical manufacturer, but that role is evolving for Resonac today. For example, I come from the hard disk media business of the former Showa Denko, so I don't understand every aspect of technology, especially when compared to frontline employees. This is even more the case for the former Hitachi Chemical. So, what does a CTO do? I see the CTO's role as pointing the direction where Resonac should go from a technical point of view, or bringing the future toward us.

Resonac launches —Creating an exciting future through dialogue and co-creation!

Since the industrial revolution, manufacturers following a self-sufficient policy under capitalism and consumer-based economy have invested capital in technological development to produce goods and earn returns from society. The primary role of CTOs back then was to refine technology as a weapon and unite the engineers. Now that the foundational notion is crumbling, it is also important to point in the direction of technology that is good for the Earth and what employees can be proud of. To do so, there are limits to thinking only by yourself and an overview of technology is essential. That's the ability that "brings the future toward us", which a CTO should demonstrate.

A Ceaseless Sense of Urgency—If We Don't Change, We'll Decline

I've always thought that if we don't change, we'll decline. Perhaps change may be the only way to even maintain the status quo. I see this integration as a very positive opportunity to incorporate new ways of thinking. Of course, change can be extremely stressful, but we must and will change, even to the point of renaming our company. If we can't overcome this, we won't remain a company that people around the world will support for the next 100 years. That's why I believe we must be people who can enjoy change.

The hard disk media business, which I had been a part of for many years, began about 40 years ago and has continued to expand. However, during this time, the number of equipment manufacturers, material manufacturers, and customers has decreased. Surviving this competition is a testament to our success, and there's potential for further growth with new technologies. However, it is true that both the technology and the market are saturated, and the increased scale means less room for error, making it harder to take on the challenges of new technologies or customer needs. Generations that experienced growth and failures see things differently than those who joined after the company scale expanded, and I am contemplating how to share those perspectives and create spaces where failures are allowed, for instance by using strategic personnel rotations as an alternative.

The Dialogue Triggered by the Integration Creates Synergy

This integration, combining two companies each with a 100-year history, is quite challenging. However, in the field of R&D, I feel that the straightforwardness that engineers from both companies show to customers is very similar. Yet, the ways they fight against challenges differ. The former Showa Denko has a strong belief in chemistry as the seed of industry. It has a strong sense of being upstream in the value chain as a technological culture, with a history of seeking electricity and building businesses based on electrochemical engineering. For this reason, it is good at making and improving what it wants to make with the equipment it designed, and the relationship between its manufacturing equipment and processes is unique. Meanwhile, the former Hitachi Chemical is located downstream, relatively close to the end consumers, and is very skilled at understanding needs and mixing various materials to create new functions.

After two years of trial and error since the decision was made to integrate the two companies, we have come to know each other and have begun a dialogue about how we can bring their different strengths together to create products that can be used in a certain way, given their different technologies. For example, when a petrochemical business engineer from the former Showa Denko develops a catalyst that is a key technology, an engineer from the former Hitachi Chemical will consider it and try to apply it in another business. For another example, if a midstream and downstream resin developer who asks, "Is there a resin like this?," gets to understand the upstream production technology, it will be possible to come up with ideas such as, "If we improve the manufacturing equipment in this way, we can make it," or "If we redesign the raw material itself, it can express new functions like this." We have this way of creating synergies, and we would like to create a mechanism to maximize the expression of such synergies.

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Accelerating Open Innovation by Promoting Dialogue Through the Stage for Co-creation

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Regarding open innovation not only internally but also with external parties, in 2017 we conceived the concept of providing a venue where diverse people can gather for the creation of new pipelines, and in 2022 we promoted this concept mainly through the Stage for Co-creation that was established in Yokohama. Not bound by conventional methods, the Stage for Co-creation is positioned as a place to explore new initiatives. Under the direct supervision of the CTO, Resonac is pursuing R&D themes that aim to "change society" as long-term R&D, and it is also working on enriching the technology database and establishing coaching and mentoring systems as platforms to achieve this goal.

The situation for the Stage for Co-creation has changed dramatically in the six years since the concept was created. I believe that we must conduct a grand experiment on this Stage for Co-creation. One of our long-term R&D efforts is the development of next-generation high-speed communications materials with an eye toward 6G (Beyond 5G). In a 6G world, although the frequency band used will exceed 100 giga, materials that can be used in that frequency band do not exist today. We would like to integrate upstream and midstream technologies to provide world-class composite materials in the 6G domain, and provide essential technologies for the coming society. We are also working to develop innovative technologies to achieve carbon neutrality. Aiming for the "carbon resource recycling" of basic chemical products, we are taking on the challenge of developing waste plastic-to-olefin recycling technologies in the plastic chemical recycling process, which involves collecting waste plastics and turning them back into raw materials. Currently, we are pursuing open innovation with partner companies. We are also working with our petrochemical business on CO_2 separation, capturing and use initiatives as a method to develop technologies to replace fossil fuels. Ideas for such efforts stem from a love for our children and grandchildren, serving as motivation for engineers.

This development requires understanding what customers and various other stakeholders are currently contemplating and what they wish to achieve next, and jointly brainstorming newer perspectives, materials, and processes. Pursuing immediate R&D too much often leads one astray from the actual intentions of the customers or the market trend. Under

such circumstances, we must pause, verify the direction of the chosen research with stakeholders such as customers or partner companies, and then determine the best path to the future that we should be working toward. Furthermore, the challenge lies in how we can transform the material and chemical industries, which have traditionally been required in the society where massive consumption of chemicals has been a premise. The Stage for Co-creation going forward must be a venue where we will consider such issues from a broad perspective, while technological trials and errors are continuously undertaken with an eye toward the next 100 years.

Achieving Further Acceleration Through the Use of Materials Informatics

The changes as a result of the integration are not limited to the organizational culture, business portfolio, and human resources. The forms of open innovation, as well as the levels and nature of computational and information sciences, are also evolving.

Materials informatics is a method that statistically processes how materials are combined to create what kind of product, predictively determines combinations of materials and manufacturing conditions that satisfy required functions, thereby significantly streamlines and expedites development. In process manufacturing industries that utilize chemicals and petroleum as raw materials like the Company, the application of this method is expanding, and I believe an era when engineers and customers routinely use computational science and information science is quickly approaching. For this reason, customization tailored to specific needs will be important. While achieving this is highly challenging, members of our Research Center for Computational Science and Informatics are striving to achieve it by understanding the aspirations of their customers (internal users). Members who have been envisioning the future and creating internal networks of partners since about a decade ago, when there were even no budgets, are now leaders, and they're deepening dialogues within our company and the market and generating businesses with young engineers.

Having a diverse range of businesses has a major positive effect on the acceleration of our R&D. In the market, our product portfolio ranges from petrochemicals and basic chemical products to semiconductor material products, as well as materials like resins, metals, and ceramics, and the combinations of these materials are endless. In some cases, answers that might take a century of experimentation can be produced in a few minutes to hours with this method. In addition, the evolution of materials supporting *monozukuri* (manufacturing) not only drastically enhances performance but also enables the creation of new applications.

Becoming Engineers Who Take Pride in Changing Society Through the Power of Chemistry

It is important to realize that the starting point is the engineer. For example, take the concept of carbon neutrality. Up until now, there's been a tendency not to be open about the progress of one's own technology. However, in an environment where no one knows if what we're doing is 100% correct, sharing information and using technology collectively would actually be a better option. This is even more so if everyone has the same goal of helping the Earth. Of course, to continue research sustainably, pursuing profit is necessary, and the balance is not easy to achieve. However, this may be solved by considering intellectual property strategies and new forms of alliances.

For this reason, engineers must think autonomously and go beyond their own boundaries. When in doubt, our purpose and values are where we return to. We are also further increasing opportunities for dialogue within our research centers, discussing how to specifically interpret them from technological development perspectives.

Engineers are people who can't help but enjoy testing hypotheses based on their own ideas and insights. And of course, engineers want to win and succeed after all. However, R&D is a series of uncertainties. In order for such people to realize our purpose to "Change society through the power of chemistry," it would be necessary as the first step to ensure that what they create brings joy to customers and the market, and that if that leads to profit, research and development budget might eventually increase, leading to desired research opportunities. Another necessary aspect is the pride in knowing that the technology engineers contributed to is protecting the Earth and guiding it in a better direction.

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To this end, diverse career paths for researchers and engineers are desired. Although I spent most of my career in development field in business unit , I also experienced being General manager of Marketing Department before becoming General Manager of Production & Technology Control Department. In the future, R&D theme leaders might even come from marketing backgrounds.

Heading Toward an Uncertain But Exciting Future

Lastly, let's consider why Resonac needs a CTO like me today. Firstly, I already have a blueprint of what we are going to do in the future. I know the approach, having always aimed to compete globally and having continued "co-creative" R&D. Having regrettably experienced a significant restructuring during my time in business unit, I also understand how game-changing technologies emerge, how customers utilize them to innovate, and the pace of that change. Secondly, I possess decision-making skills developed amidst rapid changes.

My other qualities are a certain confidence and generosity. Join me aboard the Spaceship Earth proposed by thinker Fuller and admired by Steve Jobs, and move together toward a bright, positive, and uncertain but exciting future!