

MESSAGE

Observation, Measurement, and Analysis: Launch Pad for Digital Transformation of Society, Industry, and Living

Measurement Technologies that Underpin Vigor and Growth
of Leading-edge Industries

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Joined Hitachi, Ltd. at Naka Works in 1985. Appointed General Manager, Metrology Systems Design Department, Naka Division, Nanotechnology Products Business Group, Hitachi High-Technologies Corporation in 2004; General Manager, Planning and Facilitating Department, Research and Development Division in 2011; General Manager, Life Informatics Center, Corporate Strategy Division in 2013; General Manager, Strategic Planning Division, Science & Medical Systems Business Group in 2014; President of Hitachi High-Tech Solutions Corporation in 2016; Executive Officer of Hitachi High-Technologies Corporation (since renamed Hitachi High-Tech Corporation) in 2017; Vice President and Executive Officer in 2019; and Senior Vice President and Executive Officer 2020; Representative Director and President 2021. He took up his current position in 2022. He also serves as Vice President and Executive Officer, General Manager of Healthcare Business Division, and Deputy General Manager of Connective Industries Division at Hitachi, Ltd.

Strengthening Business Resilience in Anticipation of Risks

—Numerous companies have had their operations heavily impacted by the global spread of COVID-19. With the current business environment having been characterized as one of volatility, uncertainty, complexity, and ambiguity (VUCA), what is your macro view on how things will play out as we enter the post-COVID world?

Iizumi: The pandemic has had a big impact on us, not least due to the difficulty of sourcing vital components such as semiconductors and connectors, which is a result of factors such as business interruptions at companies in the Association of Southeast Asian Nations (ASEAN) region. Parts procurement is vital to maintaining business continuity and this is a painful reminder of the need to learn from the pandemic and better prepare for uncertain times ahead.

Rather than being pessimistic about this situation, however, we need to turn it into something we can learn from.

These supply blockages have led to a lot of time and effort being spent on parts procurement and production coordination. Reflecting on this, we need to work with our partners to devise ways of ensuring the resilience of the supply chain, paying attention not just to those primary partners with whom we deal directly, but also to the tens of thousands of other suppliers in the second tier and beyond. We also need to adopt a variety of different measures, such as having multiple supply chains in place and carrying strategic stocks of those parts at risk of causing problems, looking ahead to the extent that we can while also taking steps to be ready for the unexpected. This is very much an area where digital technology can prove effective, and as we work to establish ecosystems that also encompass small and medium-sized partner companies, we are looking at ways of establishing resilient practices in our procurement activities.

As well as being a vital task for Hitachi High-Tech, the securing of supplies is an issue with which many companies around the world are likewise grappling. As such, I believe that if we can take the lead in putting systems in place, it will help to strengthen the resilience of the manufacturing industry as a whole.

Of particular importance to achieving this is that we speed up our management. This means being quick to identify changes happening in the wider world and acting resolutely to reform those areas where change is needed while also taking maximum advantage of our past experience and core competencies. In this regard, you could say that the pandemic has been an opportunity for transformation, a result of the need it has imposed upon us to act quickly in response to changing circumstances.

We relocated our company headquarters in February 2020 and this was accompanied by a 70% reduction in paper documents, use of satellite offices, and the installation of a new network system, all of which were undertaken with working style reform in mind. Though predating the pandemic, these initiatives have proved to be very helpful. With greater use of remote work, our engagement with overseas companies and operations has also been sped up by having the people involved in particular projects come

together in online meetings that involve not only sales staff, but also people from design departments. Even after the pandemic has ended, we will never return to the old ways of working, and we are serious about working in ways that suit the conditions during and after COVID-19.

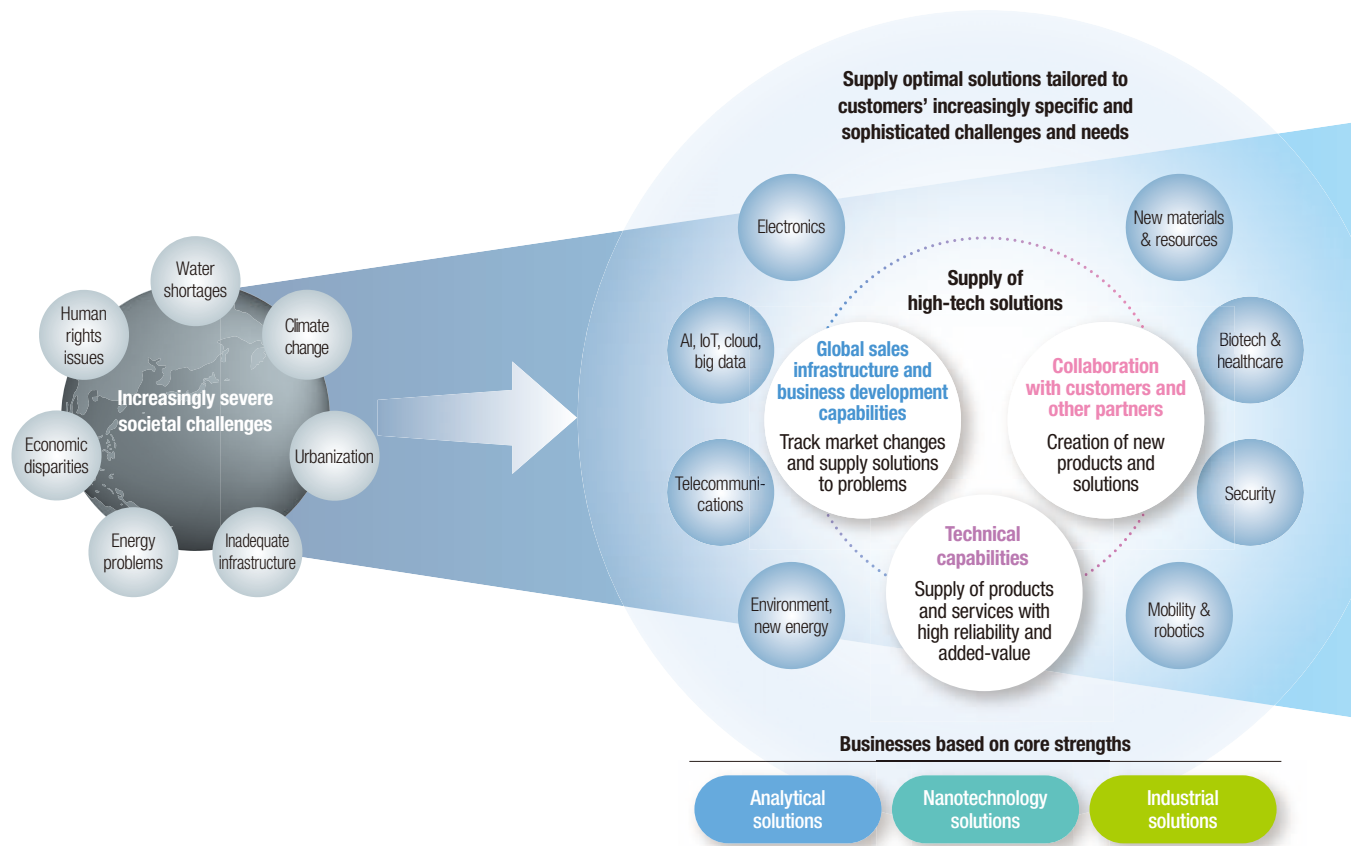
Measurement Technologies that Help Achieve Carbon Neutrality

—Along with the steady growth of your own operations, businesses today are also being called upon to help resolve the various societal challenges that confront the world, not least those articulated by the Sustainable Development Goals (SDGs). Tell me about how, as part of the Hitachi Group, Hitachi High-Tech Corporation can deliver value in this area.

lizumi: At this time, beset by unexpected events, there are clearly a mountain of issues that need to be addressed. I also see a need to reassess whether we are taking the right approach to these challenges. With our diverse products and considerable experience and knowledge, I believe that Hitachi High-Tech and the Hitachi Group are grappling seriously both with issues that have already arisen and those that are likely to do so in the future, and that we are able to draw on our comprehensive capabilities to find solutions and offer them to society, work that encompasses a great many different fields.

For example, while there has been a rapid uptake of electric vehicles (EVs) in response to global warming, the recycling and reuse of the lithium-ion batteries used in these vehicles is a major issue. That is why we are working on new solutions for battery life cycle management. Specifically, we have launched a life cycle management service for batteries that uses a rapid-assessment technique for determining the performance degradation and remaining life of both used and in-use lithium-ion batteries. One example of how this could work would be the recovery of batteries that no longer have sufficient performance for an EV but that can be repurposed for household use.

Figure 1 | Management Policies for Ongoing Growth of Hitachi High-Tech



If impurities get into lithium-ion batteries during the manufacturing process, not only does it degrade their performance, but it also poses a dangerous fire risk. Detection of these impurities is done using our X-ray particle contaminant analyzers, which operate automatically and are able both to identify the presence of contaminants and determine their elemental composition. In other words, Hitachi High-Tech products are playing a part throughout the battery life cycle, from the production of safe batteries to their recycling. For the future, we plan to focus our efforts not just in Japan, but also in Europe where regulations are particularly strict.

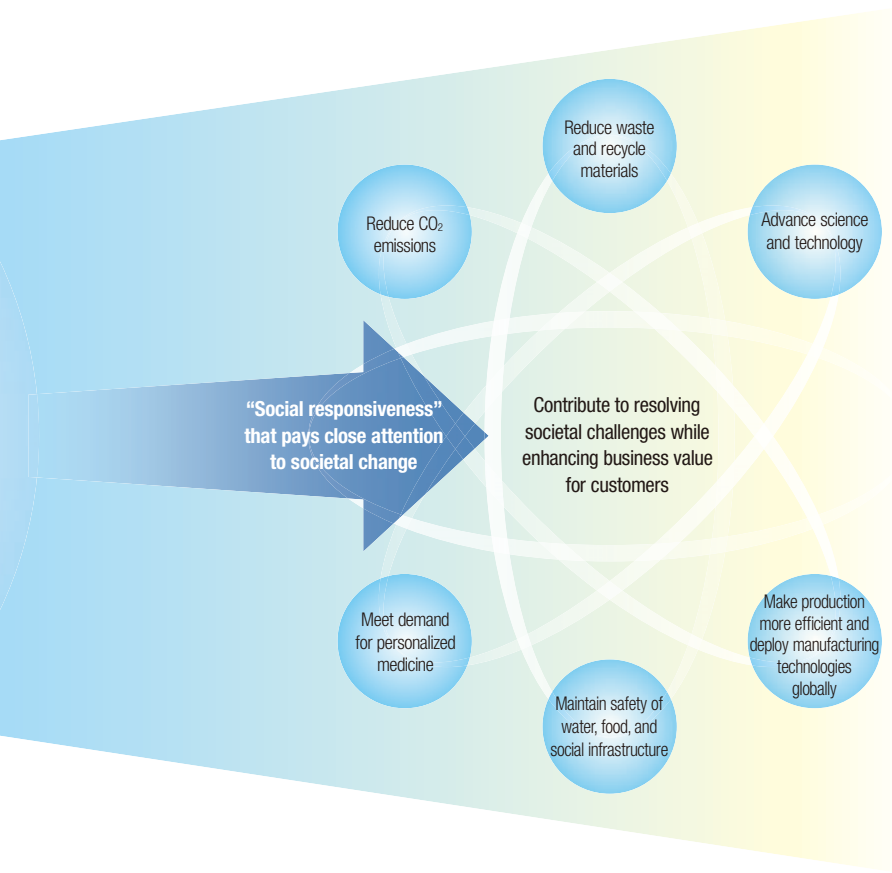
Another initiative aimed at carbon neutrality is our contribution to the development of catalysts that can absorb CO₂ and transform it into other substances. This involves the use of transmission electron microscopes (TEMs) developed in partnership with Hitachi’s research laboratories that are capable of in-situ observation, meaning they

are able to observe the reaction between the catalyst and CO₂ in real time.

In the healthcare sector, we are accelerating initiatives in fields such as regenerative medicine, biopharmaceuticals, and drug development that address the many problems brought about by aging demographics and a low birth rate and that will enhance people’s quality of life (QoL). In this way, Hitachi High-Tech’s core competencies in the technologies of “observation, measurement, and analysis” are helping to address global-scale challenges such as the SDGs.

Strengths Rooted in Technical and Product Development Capabilities

—Hitachi High-Tech is a key company within the Hitachi Group playing a leading role in the Smart Life sector, supplying specialist products with a high share of



their respective global markets while still holding firm to distinctive Hitachi attributes that include a strong focus on manufacturing and technology. Please tell me about the company’s products and where their strengths lie.

lizumi: The products and technologies of Hitachi High-Tech tend to be background players that are not widely recognized despite their contribution to sustainable societies and ways of life. I believe we will need to make an effort in the future to publicize our activities more widely.

One class of products in which we have a leading share of the global market is the clinical analyzer used by the healthcare industry for blood testing and other such tasks. Based on spectroscopy, this analyzer is a flagship product with half a century of history behind it since it was developed. We have marketed it around the world in partnership with Roche Diagnostics K.K., a subsidiary of Roche Group, which handles the development of the reagents it

uses. Vital to clinical practice, the pandemic has made this analyzer more important than ever.

Also in the flagship category are our field emission beam (FEB) instruments designed for measuring the dimensions of microcircuitry patterns on semiconductor substrates. A type of scanning electron microscope capable of measuring dimensions in the order of a few nanometers, these instruments are indispensable to semiconductor fabrication plants. The performance of our instruments has evolved to keep pace with semiconductor advances in miniaturization, stacking, and three-dimensional fabrication. We also intend to step up our preparations for next-generation semiconductors designed for even lower power consumption.

One of the reasons these specialist products tailored to specific applications have maintained a leading share for so long in these international markets is the high level of technical capabilities that we call upon to develop leading-edge technologies. This is also underpinned by our depth

of understanding of specific applications and the strong product development and production capabilities that we have built up through the manufacturing of products that are required to operate continuously, delivering high levels of dependability and reliability under industrial conditions, 24 hours a day and 365 days a year. That we have been able to incorporate the electron beam technologies developed by Hitachi's Central Research Laboratory into our microscopes and deploy them as inspection systems for use in semiconductor production is a result, I believe, of the experience and know-how we have acquired in these particular areas. In other words, our domain knowledge.

Hitachi High-Tech has been entering young engineers involved in product manufacturing into the National Skills Competition since 1968 and, as we set out to become a world-leading manufacturer, I believe that it is the high level of these technical and product development skills that serves as the source of our strength.



However, key products combined with a high level of skills will not be enough for the corporations of the future. It is important for us to also enhance the value we offer as a company. Having worked in a variety of different areas in the past, through my dealings with numerous customers and other partners, market developments, and things like talking to staff, I have often asked myself what corporate value actually is. Obviously, companies can only survive if they make a profit, and generating strong profits helps to fulfil the expectations of investors. However, when I look at the current situation, where many people around the world are living in poverty or do not have access to adequate healthcare services, and with societal challenges and the load on the environment that results from economic activity increasing on a global scale, I feel that we need to revisit the question of what role companies should play.

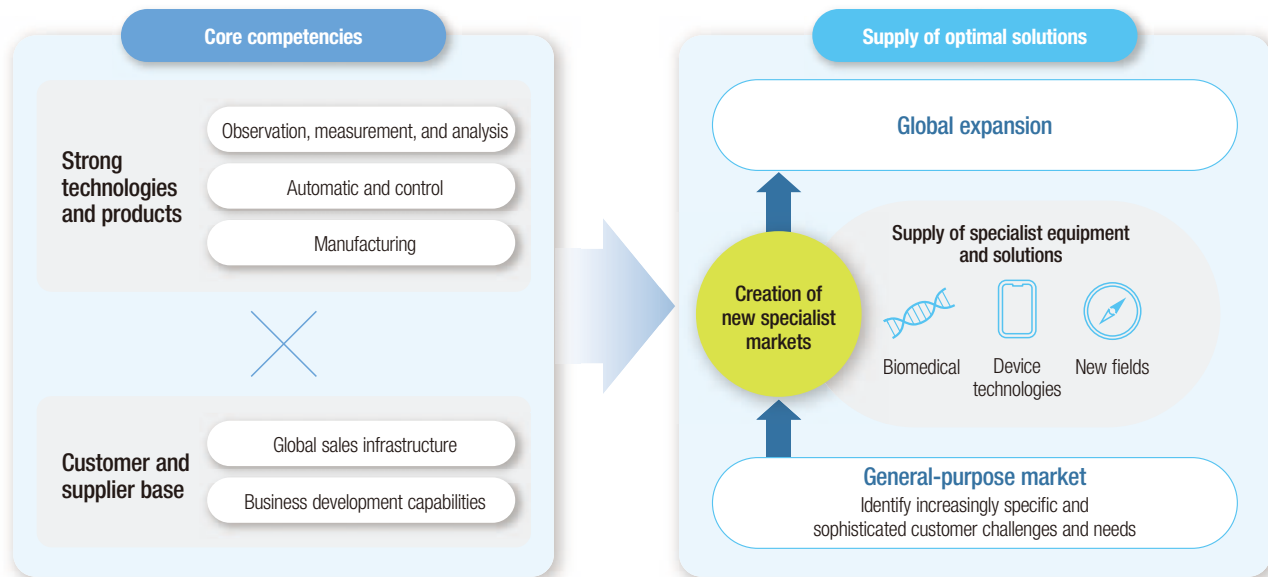
In the discussions around our upcoming Mid-Term Management Plan, this thinking has prompted us to consider how best to increase not only economic value calculated from financial indicators, but also societal and environmental value derived from non-financial indicators. To this end, we need to undergo a transformation whereby, rather than seeing the resolution of societal challenges as simply a way to earn more revenue, we seek instead to increase both revenue and corporate value as a result of resolving these challenges.

Enhancing corporate value and adopting a corporate stance of addressing societal challenges should raise awareness among our staff and boost their motivation to work. If we are conscious of the value achieved when our work contributes to society and understand how this leads to profitability, then I believe that the attitude we adopt toward our work will transform into something quite different.

Combining Work on Sensing with Data Utilization

—The cyber-physical systems (CPSs) advocated by programs such as Industrie 4.0 and Society 5.0 have become a more realistic proposition over recent years. The key to this

Figure 2 | Core Underpinnings of Hitachi High-Tech's Operations



is digital transformation (DX), whereby advanced technologies such as artificial intelligence (AI) are used to turn data into value. Among the underlying technologies essential to fulfilling this promise, what advances do you see as being needed in the areas of measurement and sensing?

lizumi: If you want to turn data into value and go about DX more efficiently, you need to be talking about which data you should be collecting. While some think that it is enough to subject large amounts of collected data to cleansing so that it can be used in analysis, there is no way you can make up for what was lacking from the data in the first place. Working to develop more diverse and sophisticated forms of sensing to enable the collection of a wider variety of data is an essential step toward creating more advanced and efficient control systems.

That is, existing sensors and instruments are in themselves not enough to deliver DX in a way that generates high added value. This means that ongoing development of the technology will be vital. One example of sensing techniques still at the development stage are those for assessing the extent of degradation in bridges, water pipes, and other infrastructure so that this information can be used to prioritize repair work. Likewise with personalized medicine, sensors capable of the comprehensive and routine acquisition of data on people's state of health have yet to

be developed. I expect there are many such areas where the development of suitable sensing techniques would lead to new breakthroughs.

To overcome these challenges, we are working on numerous different sensors that deliver immediate results with high reliability. Along with our clinical analyzers, these also include instrumentation for the control of combustion temperature in waste incinerators and measurement devices for integrated railway inspection vehicles that can inspect both track and overhead power lines for the Shinkansen. It is through familiarity with domain knowledge from these different areas that we are able to develop the sensors they need that are tailored to their particular requirements. In the future, we intend to put a lot of effort into a wider and more advanced range of sensing techniques by working in tandem on both turning data into value and on collecting the right data.

The data that can be acquired using Hitachi High-Tech products includes much that is highly confidential, including blood test and genetic information, and we always pay close attention to how such data is handled. Essentially, this data belongs to the customer or the individual and I believe it is impossible to create value from this data unless it is done through collaborative creation with these stakeholders.

Meanwhile, there are growing calls from customers for the use of data to improve yield and productivity, most

especially in semiconductor manufacturing. This summer, we plan to open a new semiconductor engineering facility called the Hitachi Center of Excellence in Portland, which will be located in Hillsboro, Oregon. The aim is to improve productivity in semiconductor manufacturing by utilizing customer data together with the latest measurement techniques.

Something else we are working on is our ExTOPE IoT service portal. Along with using the cloud to collect the measurement and equipment operation data output by the instruments we supply so that it can be managed centrally, the service also features a portal for putting the data to use. Through these measures, we have opened up greater opportunities for helping customers to create value from their data by giving them access to it for analysis wherever and whenever they want.

Key Role for Collaboration with Academia and Digital Transformation of Business Processes

—You are saying that the use of customer measurement data will lead to the next round of innovation. I believe this distinctive standpoint of Hitachi High-Tech has arisen out of your achievement of ongoing growth.

lizumi: Reviewing Hitachi High-Tech's core competencies as we put together our upcoming Mid-Term Management Plan reminded us that, along with the core technologies of observation, measurement, and analysis, we also benefit from end-to-end (E2E) strengths that encompass our outward-facing capabilities for dealing with customers as well as our manufacturing skills. Along with using our core technology and core business as a basis for earning strong profits from manufacturing specialist equipment for specific areas, we also want to be establishing the framework for future businesses that will address the emerging societal challenges of the future. If we are to aggressively develop advanced technology that takes time to achieve profitability, then it is essential that we further strengthen our collaboration with academia, including universities and academic societies.

In healthcare, for example, we have embarked upon joint research with Fujita Academy in Aichi Prefecture aimed at improving the quality and efficiency of clinical testing. Along with enhancing the performance and functionality of the instruments used for this purpose, this also involves initiatives that actively incorporate digital technologies such as robots, AI, and the IoT in an effort to re-imagine the testing laboratory to make the work of laboratory technicians more efficient.

Through these challenging objectives undertaken with a view to the long term, it is vital that we establish strong relationships of trust with university academics. In this, it is unlikely that these specialists will want to team up with us unless we are familiar with the technology. In our dealings with academics, we need to be continually seeking to raise our own level, meaning that this sort of human capital development is crucial.

Meanwhile, to strengthen the foundations of our business, we are also working on an in-house DX project to “transform ourselves” that involves conducting a zero-base review of all the business processes we have built up in the past. Along with simplifying business processes throughout our operations from sales to service (E2E), this also includes the global standardization of all activities with a view toward undertaking a range of different collaborative creation initiatives.

Improving the productivity of design work is likewise vital. In addition to dealing with increasingly advanced products and technologies, it is also important that we address changing circumstances brought about by working style reform and the low birthrate. To this end, we are also undertaking DX of the design process by revising our design business processes and adopting cyber-physical systems that incorporate advanced digital tools.

At Hitachi High-Tech, we intend to mobilize our strong technology and business fundamentals as well as core competencies that include global customer-facing capabilities to work toward the solution of societal challenges from the perspective of measurement and analysis.

Challenge of Anticipating the Future while Developing Advanced Technology

—Given that innovation is the source of competitive advantage in the leading-edge businesses in which Hitachi High-Tech operates, how do you work with research and development (R&D)? Also, what sort of people do you need for this work? Please tell me about your outlook for the future.

lizumi: Taking a customer-inspired and issues-inspired approach to deciding what is needed gives us clarity about where we do and do not need to focus our efforts. This means responding to the needs of the market, augmenting what we already have and working with Hitachi's research laboratories to develop what we lack, or else acquiring it externally. We also actively recruit mid-career staff with expertise in specialist fields. In this regard, the trading business of the former Nissei Sangyo Co., Ltd., one of the companies from which we were formed, has proved to be very useful for bringing in products and systems from around the world. Meanwhile, it is also vital that we show no hesitation in giving up those things that will no longer be needed in the future and invest our R&D resources on an ongoing basis and with optimal timing.

The more difficult a technical challenge, the more of a difference it makes once you have successfully overcome it. The development of such advanced technologies obviously has its difficulties. Overcoming them requires people with an enterprising attitude, a strong will to persevere, and an innovative mindset that does not fear failure. People with interest in innovation and a strong desire to contribute to society will transform society in the future. I am confident that, at Hitachi High-Tech, we have many such independent-minded staff who share this mindset.

While imagining how the world might change over the coming decades is difficult, whatever changes occur, the demand for observation, measurement, and analysis will certainly not be going away. In fact, the greater the

uncertainties in the world, the more important measurement will be. What matters most for us, then, will be to look ahead to anticipate what sort of measurements will be required and what technologies we will need to accomplish them.

Keeping pace with such changing times will require more than just paying attention to the market, it will also require that we anticipate the future and get to work on technologies ahead of time on the basis of a medium- to long-term technology plan. We also need a sense of urgency and to adapt flexibly to changes in the wider world, especially in the realm of applications.

In the future, we intend to establish a solid base of technologies that match the times we are living in and to continue supplying the products that the world needs. I am confident that this will help bring about a sustainable future.