

Message from the Director in Charge of Research and Development



We pursue long-term sustainable growth coupled with higher capital efficiency by further upgrading R&D efficiency and strengthening human resource development.

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Risks and opportunities

● **Achieve both consecutive growth and nonconsecutive growth to be inherited toward a 100-year company in 2040**

TOK has developed as a long-running R&D-driven company that continues to target niche top markets. To achieve net sales 200.0 billion yen, EBITDA 45.0 billion yen, and ROE $\geq 10\%$ as the overarching aspiration (quantitative aspects) under TOK Vision 2030, we will steadily grasp business opportunities in the e-material field as the key battle ground for the next ten years, by continuously upgrading our world-leading high-purity processing technology and microprocessor technology as our core competences, under the management principle "Continue efforts to enhance our technology." In the cutting-edge areas with incessant fierce competition, we will win the competition and achieve consecutive growth by updating customer-oriented strategies.

In the e-material field, there are risks of technological obsolescence and commoditization in many product areas. We will expand future blue oceans by continuously acquiring and introducing new technological seeds through open innovation and cooperation with external stakeholders, thereby launching new R&D themes one after another.

Through these initiatives, the TOK Group will continue to create new added value and achieve both consecutive growth and nonconsecutive growth to be inherited toward becoming a 100-year company.

The diverse risks over the past ten years, such as the Great East Japan Earthquake, U.S.-China trade friction, and the COVID-19 infection, will definitely occur in the next ten years as well. We will overcome these risks by individual human resources thinking and acting autonomously toward the purpose of contributing to a sustainable future through chemistry and by leveraging the accomplishments of Company-wide Strategy 3: Strengthen human resources who can perform research, make decisions, and take the initiative under TOK Medium-Term Plan 2021.

Develop a keen awareness of R&D efficiency to improve capital efficiency and corporate value

● **Always set an R&D efficiency target higher than the present level**

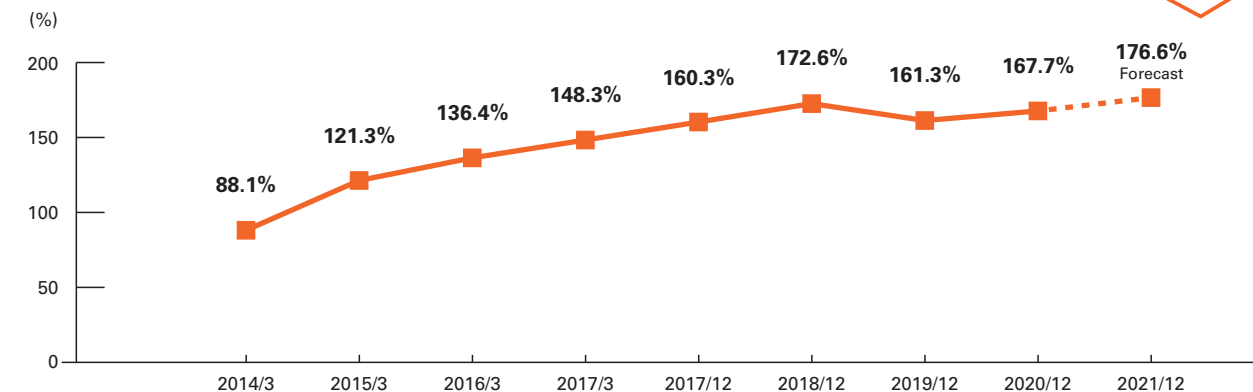
TOK is a top global niche company specializing in high-added value fields, and research and development are critical factors. We have continuously invested approximately 8% of net sales in R&D since 2010, including in the business structural reform period that followed the financial crisis in 2008. In this way, we have continuously reinforced our value creation basis in cutting-edge fields on a long-term perspective. In the product portfolio, the respective net sales of ArF and KrF photoresists increased more than twice over the past ten years. We also achieved high growth in the high-density integration materials segment, which was introduced as a blue ocean, making up for the decline in panel materials. We will continue to increase R&D investment in strategic segments in line with the increase in net sales, and we will further improve R&D efficiency so that the achievements of development will directly lead to improvement in capital efficiency and corporate value.

As specific measures, marketing will be emphasized by the R&D Department, just as in the Marketing Department, so that products with higher added value can be developed. We will also set, and aim at, a R&D efficiency target higher than the present level in each R&D project. Bearing this in mind, we will particularly focus on the following initiatives in FY 2021/12 as the final year of TOK Medium-Term Plan 2021 and toward TOK Vision 2030.



Aim to further improve R&D efficiency

Changes in R&D efficiency (five-year moving average)*



* R&D efficiency = Operating income over the past five years / R&D costs over the preceding five years

Initiatives toward TOK Vision 2030 in the R&D department

● **Further reinforce the R&D approach by exploring the essence**

To improve R&D efficiency, we will reinforce the R&D approach to a higher level. Rather than depending on existing patterns and formulas that have been acquired through trial and error in the material design and synthesis processes or in product development, we will continuously return to the materials to examine their chemical structures and reaction mechanisms, exploring the essence of the mechanisms through questions as to why a certain phenomenon occurs and how a certain property can be improved. By doing so, we will infiltrate autonomous thinking to explore why certain factors are favorable, while others are unfavorable. In this way, we will promote the development of next-generation products in the same product areas, while strengthening capabilities for new R&D themes.

● **Strategic use of computational chemistry, data science, and AI/ML**

We will strategically use computational chemistry and data science to enhance knowledge productivity (efficiency of outputs gained through information inputs) through expedited PDCA cycle in the R&D approach. In the hypothesizing process to attain the requested product performance (functional definition), the analysis of historical data can be streamlined with data science, AI, and materials informatics (MI). The hypothetical forecasting efficiency will be increased with computational chemistry by using specified parameters and surrogate indexes. Efficiency will be improved in the processes from material design and synthesis and sample formulation to discussions and transition to the next process by leveraging data science and AI/ML. Computational chemistry will be effectively

used for the testing of hypothesis in the processes above by improving the precision of computational chemistry through feedback from the analyses of parameter/surrogate indexes and the evaluation of sample performance.

● **Develop R&D human resources and hand down individualistic knowledge and know-how**

TOK will continue to use AI/ML in the pursuit of higher R&D efficiency. The quality of outputs from AI/ML substantially depends on the initial data setting based on the individualistic knowledge and expertise of R&D human resources. Our business model is based on the customer-oriented strategies inherited since our founding and is rooted in interpersonal communications. We will continue to develop human resources with a strong faith and passion who are capable of persistently exploring the essence of things, taking proactive action and accepting challenges, establishing partnerships through communication with others, and continuously learning, changing, and growing under the policy of the Research and Development Department to develop human resources who can perform research, make decisions, and take the initiative. At present, the two executive fellows appointed in 2020 are leading the respective development teams focused on human resource development and sharing individualistic expertise. To steadily grasp business opportunities in the semiconductor industry that will expand to horizons substantially differing from the past ten years, we will also increase non-Japanese employees and mid-career recruits toward the overarching aspiration under TOK Vision 2030.