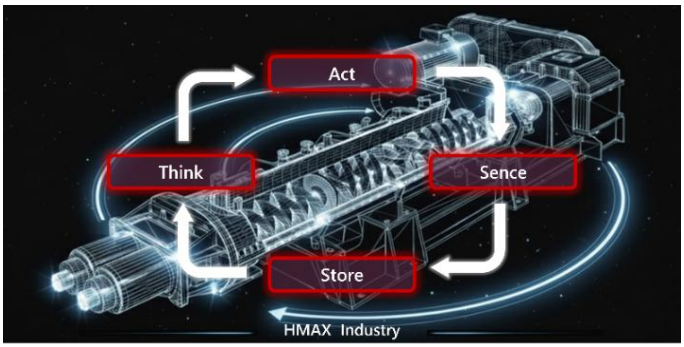
Kurimoto and Hitachi High-Tech launch collaboration to optimize mixing process conditions using mixing data and physical AI

Aiming to enhance and streamline high-quality slurry manufacturing processes by using the KRC Kneader, and contribute to improved battery performance and yield with HMAX Industry, a next-generation AI solutions for industrial fields



Tokyo, May 11, 2026 – Kurimoto, Ltd. ("Kurimoto") and Hitachi High-Tech Corporation ("Hitachi High-Tech") have launched a collaboration to optimize mixing[*1] process conditions of the battery manufacturing ("this collaboration").

This collaboration addresses the challenge to optimize conditions in the mixing process which is an area that relies heavily on advanced expertise and experience in the slurry[*2] preparation stage that affect battery performance. By combining the mixing technologies, domain knowledge, and extensive operational data cultivated over many years by Kurimoto, a pioneer in the mixing field, with Hitachi High-Tech's measurement and analysis technologies, and physical AI[*3] which integrates AI with informatics technologies, we will work to optimize the mixing process and evaluate ways to shorten processing time, aiming to ensure a stable supply of high-quality, high-solid-content[*4] slurries. We also aimed to improve the sophistication and efficiency of the high-quality slurry manufacturing process, while also contributing to enhanced battery performance and improved yield[*5] at production launch.

■ Expected results of evaluation through this collaboration
- Fewer man-hours spent on prototyping and verification
- More efficient and sophisticated evaluation of mixing conditions
- Stable production of high-quality slurry
- Stabilized quality and improved productivity in the mass production phase

*1 Mixing: The process of mixing multiple substances evenly to create substances with new properties.
*2 Slurry: A mixture of multiple materials used in batteries, such as powders and liquids, mixed with solvents. It is coated onto current collectors such as aluminum or copper, and dried to form an electrode layer.
*3 Physical AI: Developed and provided in collaboration with Hitachi, Ltd.
*4 High solid content: Slurry with a high proportion of non-volatile components remaining after volatile components such as solvents are removed from the mixture. As such, it achieves high performance even when applied in thin coatings.
*5 Yield: The percentage of good products produced from the manufacturing process (yield = number of good products / number of products produced)

Background

In recent years, the demand for lithium-ion batteries and other secondary batteries has remained high across consumer electronics, smart devices, and industrial equipment, driving the need for greater efficiency and consistent quality in manufacturing processes. In particular, the mixing process, which evenly combines multiple materials to produce slurry, plays a key role in improving the accuracy of electrode thickness and density, both of which directly affect battery performance. As such, it is regarded as a critical step in the electrode manufacturing process. However, continuously producing a uniform slurry under optimal mixing conditions is a challenging process that requires a high level of technical skill and expertise.

Kurimoto possesses advanced mixing technology and contributes to accelerating the development of manufacturing processes in the chemical industry and next-generation battery materials. Its twin-screw continuous kneader, the KRC Kneader, allows the degree of mixing to be adjusted to suit specific applications by combining multiple paddle shapes installed within the kneader. By leveraging this feature, even raw materials prone to agglomeration can be dispersed and homogenized, reducing lot-to-lot quality variation during continuous production and improving both product quality and productivity. On the other hand, determining the optimal paddle configuration for the kneader involves countless possible combinations and trade-offs. Moreover, identifying more optimal mixing conditions in combination with operating conditions requires a high level of technical expertise and has traditionally relied heavily on experience.

Hitachi High-Tech has provided measurement and analysis equipment to a wide range of fields, including batteries, semiconductors, and chemicals, and possesses quality control, evaluation and measurement technologies tailored to customer needs, alongside industry knowledge. We have also leveraged digital technologies to provide solutions[*6] for materials development and manufacturing processes using materials informatics (MI)[*7], and have supported the advancement of DX for manufacturing customers through One Hitachi.

This collaboration will combine the technologies, expertise, knowledge and digital capabilities of both companies to address quality and production efficiency challenges in uniform slurry manufacturing, by optimizing mixing conditions that have traditionally relied on advanced expertise and experience.

*6 News Release January 2025
*7 Materials Informatics: A technology that integrates and analyzes data on material composition, structure, physical properties and experimental conditions, and utilizes AI and data science to predict material properties and optimize material design.

Specific Initiatives

(1) Optimizing mixing process conditions through Hitachi's proprietary generative AI technology
Hitachi's proprietary generative AI technology will propose kneader settings and mixing process control conditions for the production of optimal slurry by incorporating publicly available knowledge obtained from patents and academic papers, together with proprietary knowledge extracted from manuals and paddle configuration data of Kurimoto's kneaders. This will enable us to provide concrete, knowledge-based guidance even when data from past prototypes is lacking. By leveraging this technology, we aim to shorten evaluation periods and reduce the number of prototypes and experiments required.

(2) Optimizing mixing conditions through process informatics (PI)*8

After manufacturing the prototype of slurries with Kurimoto kneaders, we apply PI technology to the prototype data evaluated by Hitachi High-Tech's technologies (such as image analysis and battery evaluation, etc.). As a result, we will be able to predict battery performance and optimize mixing conditions. This will reduce the number of experiments and prototypes involved in the mixing process, contributing to shorter evaluation periods at production launch and faster improvements in yield.

*8 Process Informatics: A technology that integrates and analyzes data on conditions and measurements from manufacturing and experimental processes, and uses data-driven approaches to predict performance and identify optimal manufacturing process conditions.

Future Outlook

Under this collaboration, once optimization of the mixing process has been demonstrated, we will aim to develop a new mixing solution "Kneaders x AI x Maintenance". This solution will ensure stable operation of kneaders and automate quality control during the mass-production phase of slurry manufacturing. We will use AI to analyze inline data from kneaders (such as torque and temperature), real-time video analysis data captured during the mixing process, and continuously monitored mixing conditions, including variation coefficient and viscosity. In addition, by applying AI-driven predictive maintenance to kneaders using Hitachi's digital twin technology, we will help preventing issues before they occur, and contribute to the continuous production and stable supply of homogeneous slurry.

Furthermore, by integrating Kurimoto's domain knowledge in mixing with the Hitachi Group's measurement and analysis technologies, and advanced AI, this collaboration will expand initiatives levaraging the mixing process technology to powder processing technologies which is Kurimoto's strength. While applying to related processes, such as drying, calcination and pulverization, aiming to the position which support high value-added manufacturing in the fields of chemicals, electronic materials, foods and pharmaceuticals. We will also expand this collaborative initiative, which is part of the Hitachi Group's HMAX Industry, into growth industries such as advanced materials, contributing to the advancement of DX across industrial sectors and to innovation among frontline workers.

Related links

- Hitachi High-Tech's MI Solutions
- Examples of application to lithium-ion secondary batteries (Kurimoto,Ltd.)

Trademark Notice

About Kurimoto

Kurimoto was founded in 1909 and began manufacturing cast iron pipes for water and gas, and currently consists of six businesses in three areas: Lifeline, Machinery System, and Industrial Materials. Since its founding, we have supported the stability of social infrastructure and industrial development through the development of social infrastructure that supports people's lives, such as water supply and sewerage, electricity, roads, communications, and transportation, as well as the expansion of industrial equipment essential for manufacturers' production activities. We aim to be "a corporate group that contributes to society into the future", and through these business activities, we are promoting initiatives to realize a sustainable society. In the field of Plant Engineering & Machinery, we boast the top market share in Japan for Twin Screw Continuous Kneader, and have accumulated elemental technology, design know-how, and operational data for kneading through many years of experience. Utilizing the accumulated

technology and knowledge, we will provide more specific and highly reproducible solutions to customer issues in the battery development and mass production phases, including next-generation batteries, and contribute to solving social issues by improving productivity and saving labor and energy.
For further information, visit https://www.kurimoto.co.jp/worldwide/en/ or https://www02.global-kurimoto.com/us/

About Hitachi High-Tech
Hitachi High-Tech provides cutting-edge technologies, products and services to society and customers with its corporate vision of "Changing the World and Future with the Power of Knowledge" to contribute to a sustainable global environment, healthy, safe and secure lives, and the sustained development of science and industry. We manufacture and sell clinical analyzers, biotechnology products and radiation therapy systems in the healthcare field, semiconductor manufacturing and inspection equipment in the semiconductor field, as well as analytical systems and electron microscopes used in environmental fields and materials research. We are also engaged in a wide range of business areas globally, providing high added-value solutions in battery, communication infrastructure, railway inspection, digital and other industrial and social infrastructure fields. We provide solutions through a deeper understanding of the issues facing society and our customers to contribute to realizing a sustainable society. The company's consolidated revenues for FY2025 were approx. JPY 821.7 billion.
For further information, visit https://www.hitachi-hightech.com/global/en/

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