Advanced Business Management by Utilizing Digital Technologies

The Group-wide Effort to Promote Digital Transformation

A key initiative in “AP-G 2022” is promoting advancements in management through digital transformation (DX), which will strengthen competitiveness and transform business through the effective use of data and digital technologies. In order to facilitate reviews and discussions regarding group-wide efforts to promote DX, Toray established the Toray Digital Transformation (TDX) Promotion Committee, chaired by the President, and under that the Technology Center DX Promotion Committee and the Business Division DX Promotion Committee. The Company is advancing the group-wide TDX Promotion Project in addition to conventional departmental initiatives.

The Technology Center DX Promotion Committee is promoting DX through its policy of “on-site human resources with expertise in production, research and technological development (R&D) utilizing digital technology to solve on-site issues.” In R&D, we have succeeded in making materials development more sophisticated and efficient by clarifying the nature of materials through simulation and predictive design using materials informatics (MI). In the production field, we have achieved significant results with AI-driven quality improvements and the predictive management of equipment failures.

The Business Division DX Promotion Committee is engaged in operations with themes that can be applied horizontally, serving as leading examples across the Group, such as improving the sophistication and efficiency of global supply chain management (SCM), introduction of a customer relationship management (CRM) system to visualize the information communicated with customers, and marketing automation (MA)-driven digital marketing.

In addition, the Information Systems Division is working to build out IT infrastructure and strengthen information security in support of global business expansion.

Based on its policy of “improving the digital skills of personnel with a good grasp of Genba (workplace) operations,” the Company’s DX program will immediately train dozens of experts with digital expertise and at least 100 key personnel who can utilize digital technology to proactively promote business, as well as research and technological development.

These key people, being personnel engaged in R&D, as well as being active in on-site production activities, will be educated in digital operations, by means including on-the-job training. We are currently also putting in place a DX human resource certification system for the purpose of expanding our pool of engineers and for specialist development.
Examples of DX Initiatives

Advancement and Streamlining by Leveraging Digital Technology

Example of Informatics
In resin material development, Toray has utilized high-quality data collected and amassed over many years, and MI technology based on physical property prediction AI technology, to develop a physical property prediction system for resin products. By entering the required properties, the external resin database for customers and other external users that incorporates this system enables them to understand the properties and availability of currently offered, developed, and projected products. In addition to providing the necessary information for customers to select resin materials, this digital service enables us to provide resin materials that meet customer needs in a short period of time and contributes to accelerated customer product development. By applying the material property data accumulated in this system to computer-aided engineering (CAE) analysis, there is also a concierge function provided to assist in selecting the optimum resins for components.

Example of Simulation
By means of global joint research with the University of Chicago in the United States, Toray has developed a multi-scale simulation technology that combines molecular simulation and coarse-grained simulation, and succeeded in reproducing the rheological properties of polymers. By utilizing this technology, it is possible to predict the physical properties of polymers with arbitrary chemical structures without using any experimental parameters, so simulations are expected to lead the way in the molecular design of completely new polymer materials. By creating a database of physical property data obtained from simulations and using it for AI learning, it will also be possible to improve the accuracy of physical property prediction by informatics and expand the scope of application. Having been published in the American Chemical Society’s journal Macromolecules*, this achievement has received high academic acclaim.

Example of AI Utilization

Improving Production Sites by Utilizing Digital Technology

Example of AI Utilization
In the quality control of resin products, samples were conventionally taken every few hours to measure the resin’s melt viscosity, and the manufactured product was disposed of when the viscosity no longer matched the specification. This method, however, also had the problem of increasing product loss, because it takes time to detect quality abnormalities.

To solve this problem, the Company has developed a software sensor that continuously analyzes the process data of a manufacturing process by means of AI and estimates the viscosity in real time. This technology reduces inspectors’ workloads and, at the same time, enables the immediate detection of viscosity abnormalities and feedback to manufacturing conditions, resulting in a significant reduction in product loss.

Widely utilized at production sites, AI contributes greatly to the increased sophistication of manufacturing technologies, for example by improving product quality and production efficiency.