

Utilization of Engineering Simulation and DX Talent Development

Status of Kuraray's DX Initiatives

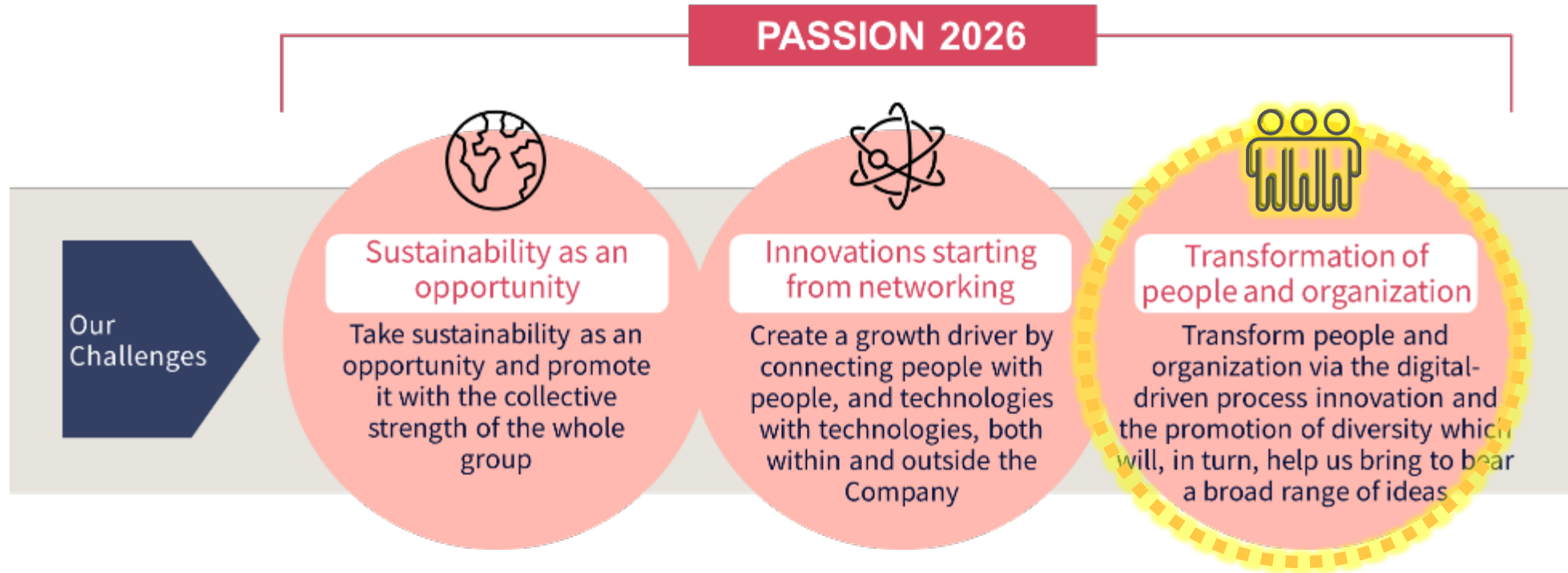
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Executive Officer, General Manager of DX-IT Division

September 9, 2024

kuraray





PASSION 2026



Innovations starting from networking

Create a growth driver by connecting people with people, and technologies with technologies, both within and outside the Company



Transformation of people and organization

Transform people and organization via the digital-driven process innovation and the promotion of diversity which will, in turn, help us bring to bear a broad range of ideas

DX Vision

Improve competitiveness, continuously evolve and contribute to the world as a digitally savvy company

Priority Fields

1 Customer experience (CX) reforms

- Understanding customers
- Customer contact points

2 Operational process reforms

- Process digitalization
- Higher capabilities and efficiency
- Performance management

3 Business model reforms

- Digitized of businesses
- Novel businesses powered by digital technology
- Digitally driven globalizations

4 R&D and Production Technology simulations

- Simulation of chemical reaction
- Simulation of plant operations

DX-IT Division

Data-driven organization

"Think in data, decide by data."

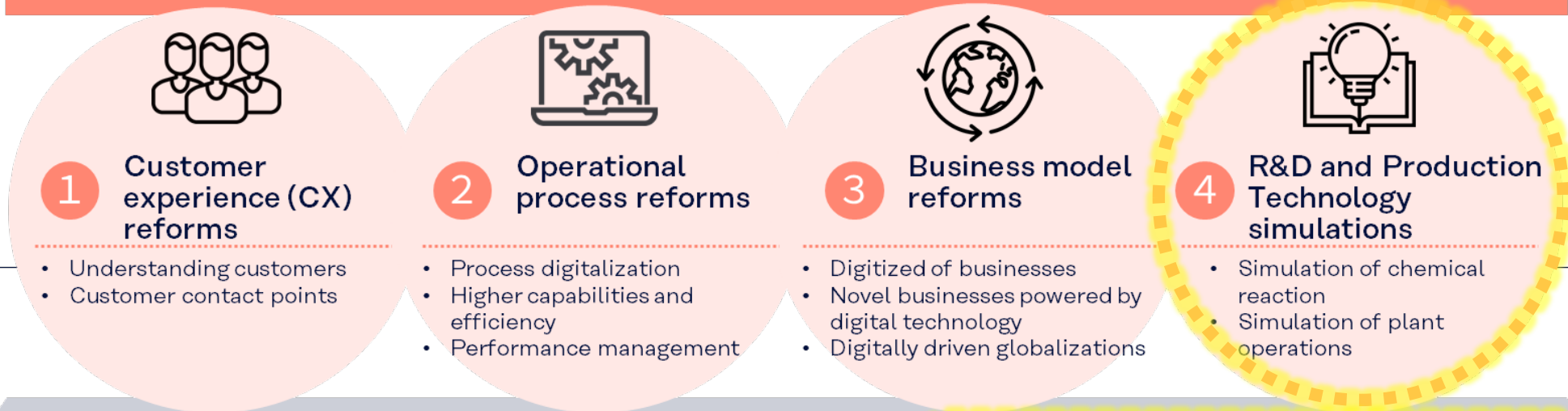
Higher digital literacy

Improve ratio of data analytics talents.

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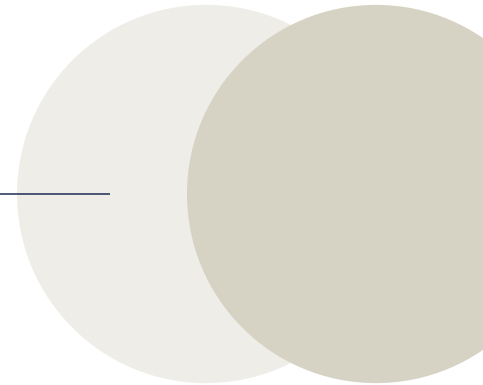
DX-IT Division

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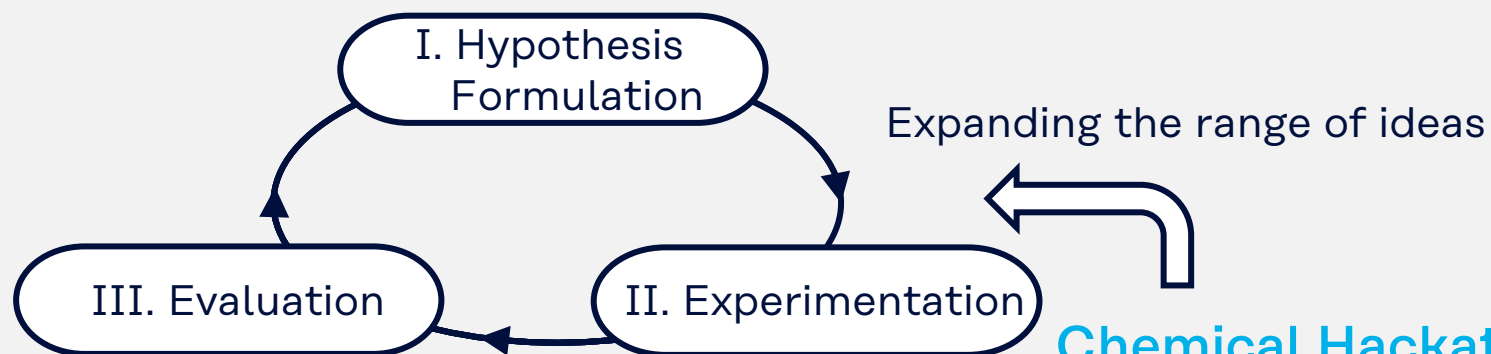
Priority Field : **DX in R&D**



Accelerating R&D to quickly produce new products

KMP: Knowledge Management Platform

Utilizing past knowledge to generate many ideas



Materials Informatics (MI)

Hypothesis verifying cycle in a short time

Ongoing efforts in in corporate R&D

Chemical Hackathon

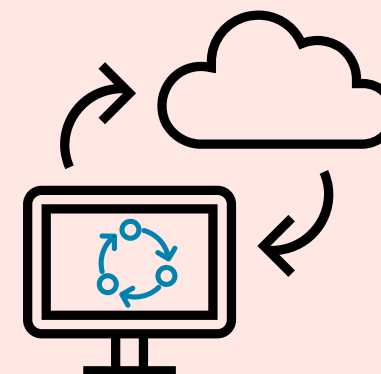
Incorporating a wide range of technologies and knowledge from external sources

Collecting insights from events held in North America

Delivering to Customers Quickly and Widely

Digital Presence

Customers worldwide can test Kuraray products in a virtual space



Collaborating with ANSYS, Inc., a leading company in the field of simulation software

Engineering Simulation Software



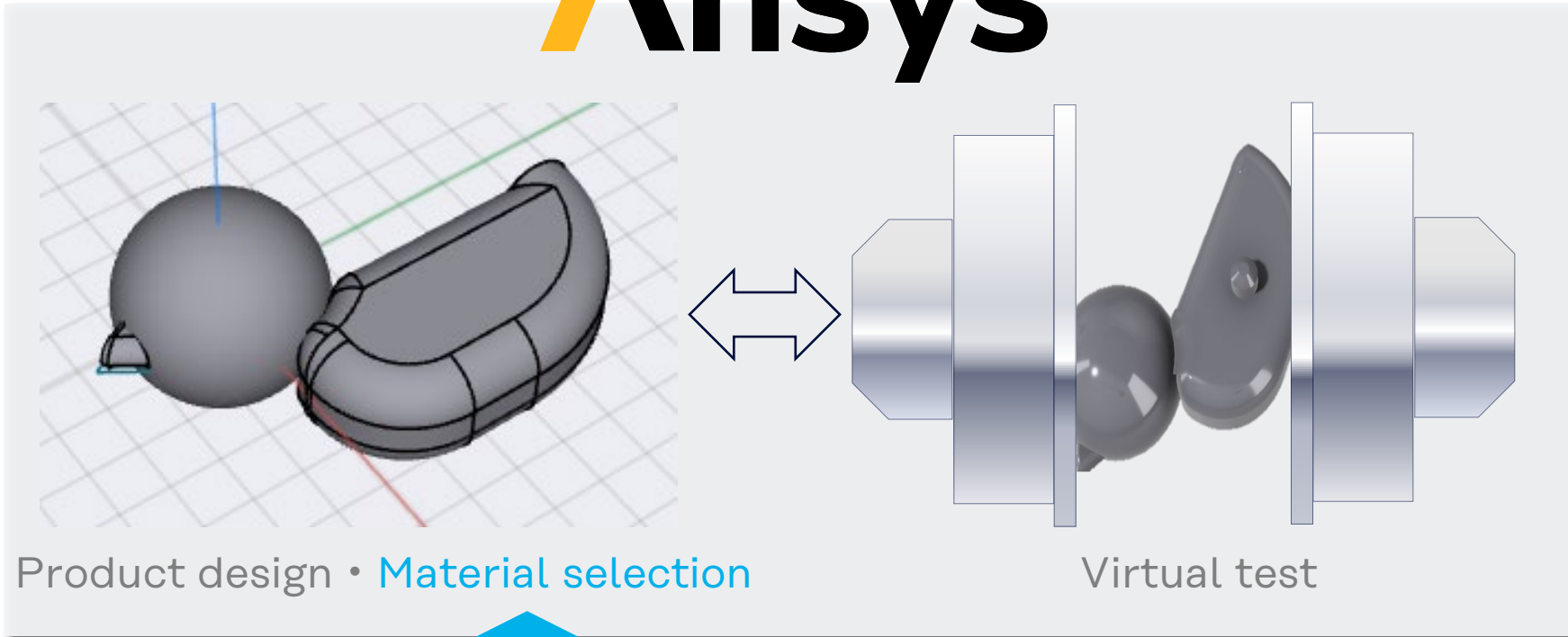
Test how it works in the real world in a virtual space

Register property data of Kuraray's materials

Quickly deliver high-quality products to market by shortening the development period and reducing costs

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Ansys

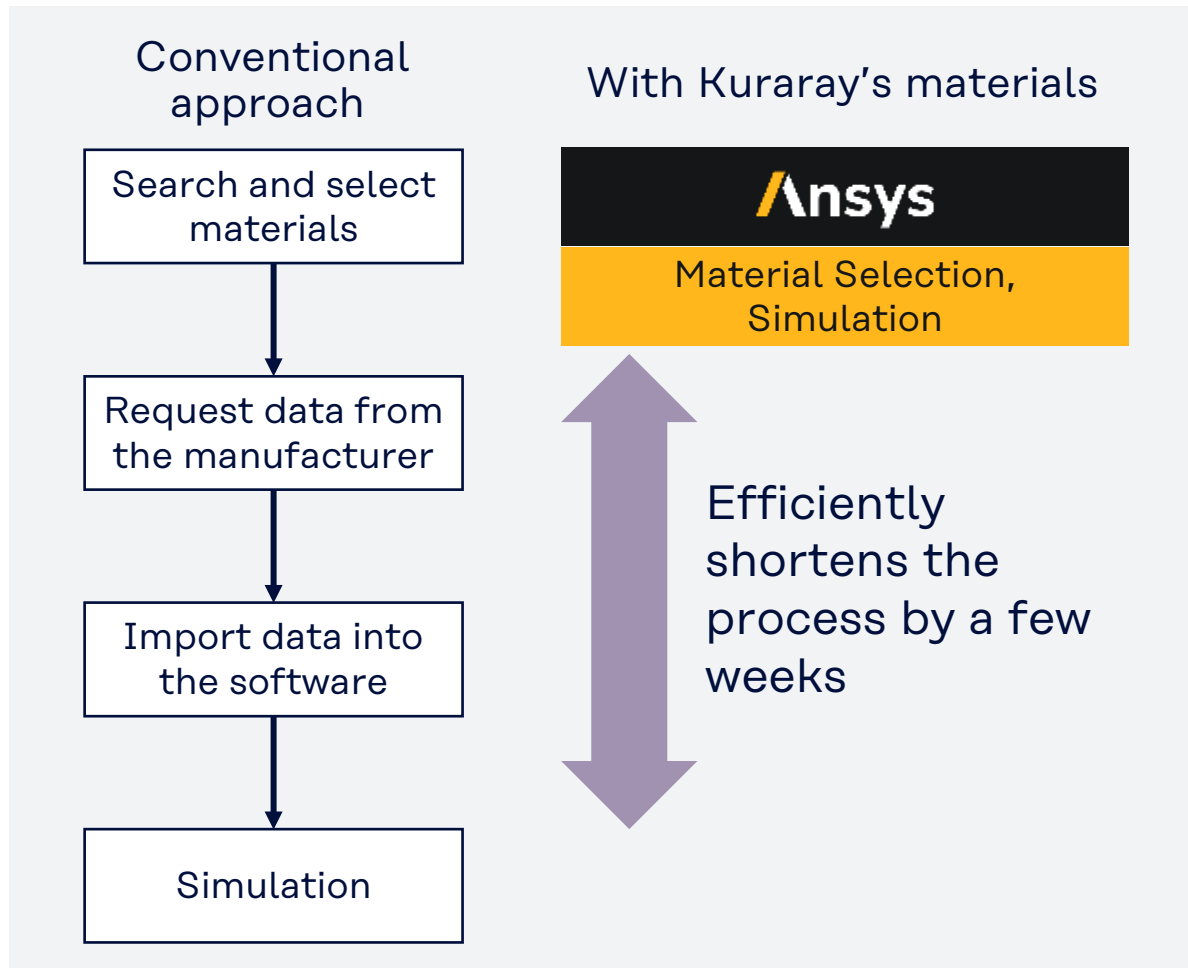


Simulation users belong to companies and universities around the world, and are engaged in R&D or product design.



- Prepare an environment where customers can study Kuraray's materials during design, simulation, and material changes.
- Highlight the strengths of Kuraray's materials through physical property data in a virtual space (heat resistance, formability, transparency...)

Provide an environment where customers can easily test Kuraray's unique materials in a virtual space.



Kuraray has a wealth of knowledge about physical property data and simulation on our materials

We can provide them to simulation users ahead of our competitors.

- Experience in R&D and technical support
- Extensive knowledge of simulation with Kuraray materials
- Knowledge of mechanical, thermal, and optical simulations
- Expertise in physical properties measurement

Making Electric Vehicles Go Further with New Materials

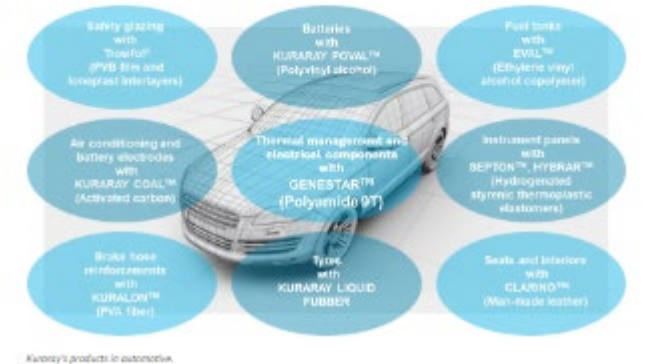
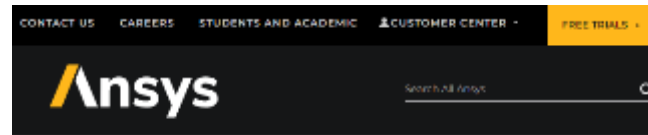


Kuraray and Ansys teamed up to provide detailed materials information on GENESTAR™ PA9T series materials to use directly in Ansys solvers.

The idea is to add value to that data by preparing it for simulation, hence the term “simulation ready.”



<https://www.ansys.com/blog/making-electric-vehicles-go-further-with-new-materials>



Bringing Automotive Polymer Properties into Design

GENESTAR™ is a brand name of heat resistant polyamide developed by Kuraray. These PA9T series materials are well-balanced long-chain poly(amide)s (PPAs) that combine low water absorption and high mechanical properties over a broad temperature range, resulting in dimensional stability and better resistance during surface mounting processes. The materials enable lightweight designs and parts miniaturization for EV batteries for better efficiency while ensuring safety in high-voltage applications. Their low-permeation properties significantly extend the life and durability of EV battery coolant tubes and battery parts subjected to a wide range of temperature and humidity changes.



GENESTAR™ PART in automotive. There's a lot to consider when it comes to material selection for an engineer to be considering in their next simulation of a vehicle component they may be designing. It's not just about the material's mechanical properties, but also its electrical and thermal properties. Ansys has a solution for you: GENESTAR™ PART in automotive. This material is simulation ready, meaning it's been prepared for use directly in Ansys solvers. The data includes non-linear mechanical properties such as stress-strain and creep curves, along with thermal and electrical properties over a range of temperatures. Ansys applied its expertise of material models to ensure all data is "simulation ready" and available in the Global Polymer material library for Ansys Grants III and Ansys Grants Selector users. From there, it can be exported into a wide range of Ansys simulation tools, including Ansys Mechanical and Ansys Workbench. In this way, Ansys is building partnerships with companies like Kuraray, where Ansys acquires data on their material products and prepares it in the Ansys ecosystem. The idea is to add value to that data by preparing it for simulation, hence the term "simulation ready." Basically, Ansys gives customers the data on materials that they can directly use in their simulations via Ansys tools, such as Ansys Mechanical and Ansys Workbench. Kuraray and other material producers get a added exposure in the marketplace, as a result of gaining access to some of the top engineering companies while reinforcing high product quality.

Choosing the Right Automotive Materials for the Job

To customers interested in a specific material, Ansys material databases provide all the data they need. But it's still up to each customer to decide whether they have found the right material choice for their EV application. Ansys offers a huge database of different polymers from numerous companies; however, within Grants III, searching simulation-ready materials cuts the list down to 2000 polymers based on significant properties. It's an exclusive subset of materials data available to Ansys simulation users, including OEMs looking for materials solutions to their lightweighting challenges. Temperature-dependent data is one important element of this subset directly related to EV design. OEMs use very high-performance polymers to address elevated temperatures near the battery pack and HV wiring, or on the vehicle interior or exterior where exposure to direct sunlight can easily drive temperatures upwards of 60-degree Celsius (120-degree Fahrenheit). Having data with the right thermal properties enables accurate simulation of a range of temperatures that leads to better thermal management. Polymers exhibit highly nonlinear behavior and to accurately simulate that behavior you need to use nonlinear material models. These nonlinear models generally require stress-strain data, so if you don't have that data you cannot use these models, and the accuracy of your simulation will suffer. Tapping into temperature-dependent and nonlinear material data provided by Grants III, OEMs can run multiple simulations using the full extent of Ansys technology and expect good results.

"Without tools like Grants III, a lot of time is wasted searching for data needed for simulation," says M. S. "Customers will Google it, they will go through old papers to find it or recreate it to support their simulations, ultimately leaving them open to errors. We're giving that data to them, ready to import directly into their simulations, validated by Ansys, which amounts to a huge time savings. And because we're giving them temperature-dependent, nonlinear data, users can expect accurate simulation results."

Interested in learning more about the materials that are needed for the electrification of the powertrain — and how you can search, compare, analyze and manage them? Check out our white paper, [Data for the Electrification of the Powertrain](#).

References

1. Internal Combustion Engines vs. Electric Vehicles (EV), [Engine Builder Magazine](#), October 14, 2021.

- GENESTAR™ heat-resistant polyamide resin
- PARAPET™ methacrylic resin
- EVAL™ EVOH resin
- KURARITY™ acrylic thermoplastic elastomer
- VECSTAR™ liquid crystal polymer film
- VECTRAN™ liquid crystal polymer fiber
- SEPTON™ thermoplastic elastomer, Q-series



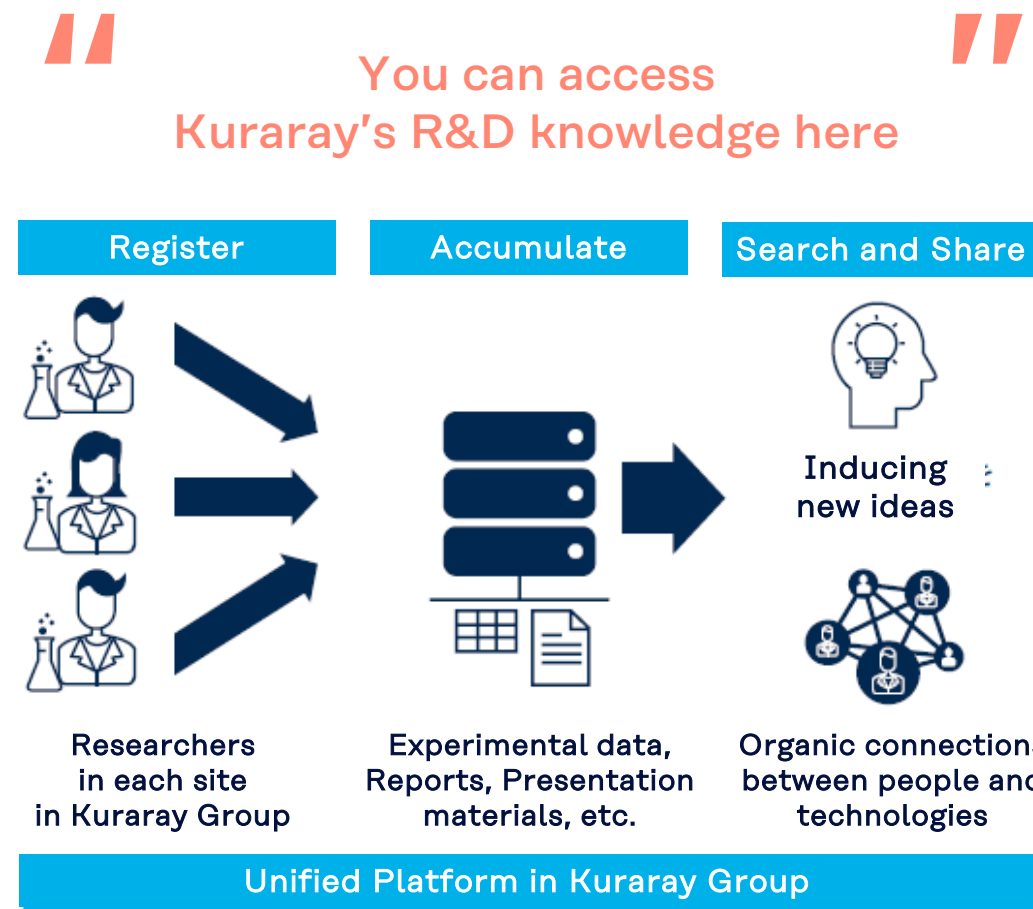
Available for **mechanical, thermal, optical,** and **electromagnetic simulations**

Aiming to develop Kuraray's existing businesses and create new products and businesses by effectively utilizing knowledge

- Enhancing the reliability of knowledge by linking it with data and other evidence in reports and presentation materials
- Accumulating reliable knowledge and using it as a source for effective AI utilization

Building a unified platform where "you can access Kuraray's R&D knowledge here"

- Enabling global unified management of knowledge
- Improving searchability by diversifying search axes such as materials, applications, and properties, thereby eliminating the dependency on individual researchers
- Planning to start operation across the Kuraray Group in the first half of 2025





Fundamental: **Developing DX talent**

We launched a global DX talent development training program in 2023 to enhance the digital literacy of all employees and develop DX planning and promoting talents.

- All employees in Japan have completed the Bronze class program (5,114 employees in FY2023).
- Each department has at least one DX leader (Gold class) and DX promoters within each division (Silver class).
- Gold class members propose DX projects to solve their division’s challenges after completing the training.

DX Talent Development Project under “PASSION 2026”:
Number of Staff Trained and Future Plan (Japan, as of March 2024)

Class/Target	FY2023 (Training completed)	FY2024 (Planned)	FY2025 (Planned)	FY2026 (Planned)	Cumulative
Gold Selected employees	44	45	45	45	Approx. 180
Silver Executive candidates (general staff)	163	300	350	350	Approx. 1,200
Bronze All employees	5,114	200	200	200	Approx. 5,700



We launched the DX talent development training program for our group companies approximately six months following its introduction in Japan.

- We conduct e-Learning for the Bronze class (2,190 employees as of August 2024).
- We adopted courses from a German university for the Gold and Silver class programs tailored for our subsidiaries in Europe and America, aligning with those in Japan.
 - These courses will be held from September 2024 to January 2025 (25 employees in the Gold class and 30 in the Silver class for FY2024).
 - Participants join the training with issues from their own departments and create prototype solutions during the training period.



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