Research and development strategy

Our Strategic Growth Plan shows the direction of our efforts to develop solutions that contribute to improving safety and productivity at customers' sites, along with our response to diverse power sources to become carbon neutral. In this section, we will introduce technological developments such as development reforms using AI, more advanced automation and remote operation, and models based on the SDV* concept.

* Abbreviation for Software Defined Vehicle. It refers to a vehicle that is defined and managed by software. SDV is characterized by the ability to flexibly update and change vehicle functions and performance by updating the software

■ Medium- to long-term R&D (research and development) policy

Komatsu is taking on the challenge of co-creating value through innovation with our customers as a collaborative partner committed to optimizing safe, productive, and clean workplaces, while passing on our founding DNA of a commitment to Quality and Reliability and manufacturing and technology innovation. The activities that form the core of this challenge are innovative manufacturing of products and solutions for carbon neutrality and on-site installation optimization for customers, and we are working on technological development to respond to diverse power sources and achieve more advanced automation and remote operation. These new technologies must be tailored to customer jobsites with their diverse power sources and communication infrastructures, and we are therefore conducting research and development in various regions of the world in partnership with our customers.

■ Global R&D structure

In order to efficiently research and develop construction and mining equipment and solutions that can be used at various sites around the world, we have established global research and development departments and are encouraging activities while expanding personnel exchanges and joint development. To create technologies that will be the starting point for innovation, Komatsu is also proactively cooperating and collaborating with universities all over the world, research institutes, and companies that have cutting-edge technologies in promising fields and striving to accelerate technological innovation achieved by merging core Komatsu technologies with external insight (Open innovation). To protect the technologies we have created in this way and to turn them into competitive products, services, and solutions, we apply for and obtain patents on a global basis.

The speed of technological development in the wake of DX and AI advancements is remarkable, and the competitive environment surrounding Komatsu is becoming increasingly severe. As differentiation from technology becomes increasingly important, research and development departments bear tremendous responsibility, and in order to accelerate technological innovation, we must also evolve the way we conduct our own research and development. For example, we believe that the evolution of AI can revolutionize not only the products themselves, but also the way all work is done. Since the advent of ChatGPT, generative AI has evolved rapidly and is said to have exceeded the average person's IQ by the end of 2024, and is expected to eventually become part of social infrastructure, similar to electricity, water, and the Internet. In Komatsu's research and development, AI will be used to stimulate rapid development, support for automation, remote operation, and electrification, and encouraging utilization of digital technologies.

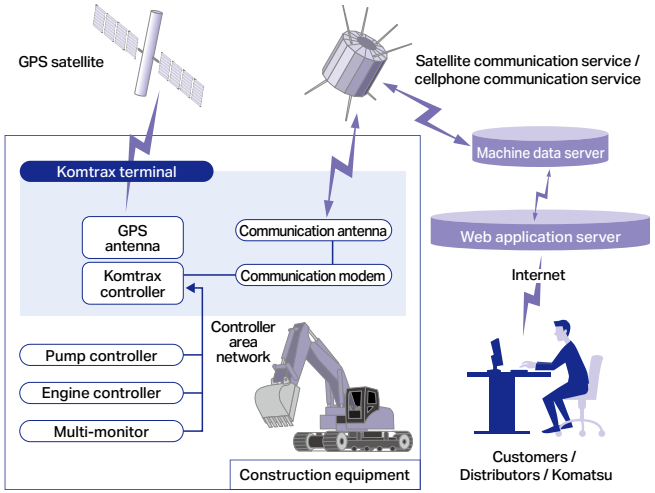
■ Development reforms using AI

In order to use generative AI to create products, services, and solutions, we are first promoting its use to improve the efficiency of business processes. We have established a global usage policy for the appropriate internal use of generative AI, and are building an IT infrastructure to stimulate information sharing and collaboration on use cases at each overseas subsidiary, including compliance with laws and regulations in each country and region. This activity is conducted under the purview of the Office of CTO and led by the CTO. A global working team has been formed in cooperation with overseas subsidiaries to train human resources, build a development infrastructure, strengthen development capabilities, and promote the use of generative AI on a global scale.

Another example of its use in the value chain is through Komtrax units equipped on new generations of hydraulic excavators and wheel loaders introduced to the market in 2024, allowing for more detailed data on the components and how they are used. The data obtained from Komtrax is not only used to improve the quality of our products, but is also used in the service operations of our distributors to ensure that our customers' machines are in optimal condition. The Development Division and the Solution Division, which supports the business reform of dealers, are collaborating to develop applications such as component service life prediction, abnormality and failure detection, and optimal overhaul timing detection. AI is being applied to this kind of predictive maintenance.

The generative AI global working team in action

How Komtrax works



■ Automation and remote operation in mining equipment

At mine sites, which require continuous operation for long hours in harsh environments such as high altitude and low temperature, improving safety, maximizing production, and reducing greenhouse gas (GHG) emissions are common issues for our customers. Aiming to contribute to sustainable mining operations, Komatsu is working to develop technologies for product automation, remote operation, and decarbonization, as well as developing solutions for optimal fleet management at mine sites.

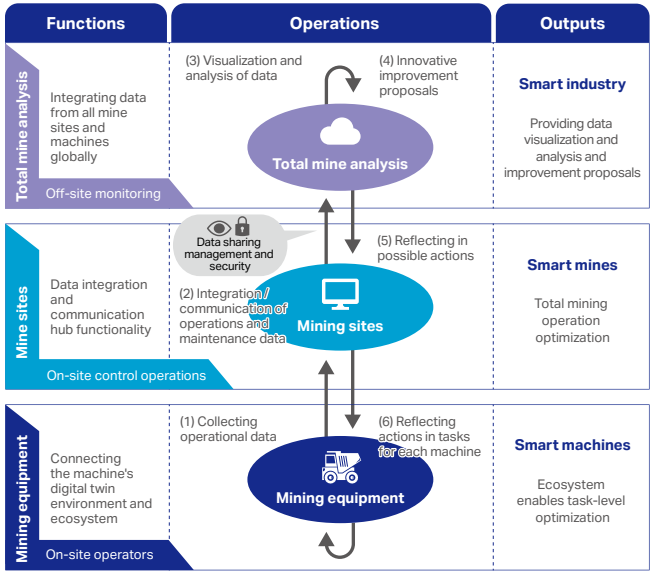
In product development, Komatsu aims to improve productivity and efficiency of mining equipment, including through automation, remote operation, and unattended operation; we are also developing various power sources, such as electrification, fuel cells, and hydrogen utilization, as well as compatibility with ethanol-blended fuel by utilizing existing internal combustion engines, or developing machines with energy regeneration technology from internal combustion engines to reduce GHG emissions. In solution development, we are progressively working to optimize overall mining operations through system integration of equipment and infrastructure in the mine. This enables businesses to visualize operations, assist operators, optimize and automate each process, reduce waiting time between processes, and so on.

In the area of automation technology, Komatsu pioneered the commercial introduction of Autonomous Haulage System (AHS) for mining in 2008. Currently, 896 such units have been introduced at 25 mines in five countries (as of June 30, 2025). When compared to manually operated dump trucks, AHS provides significantly higher safety, improved productivity, and reduced rapid acceleration through efficient in-pit operation with optimal driving control, contributing to GHG reductions. In the area of remote operation technology, we have also partnered with Anglo American to introduce large ICT bulldozers with remote operation specifications at the Minas-Rio iron mine in southeastern Brazil starting in 2023. This has enabled remote operation on dangerous mine stockpile slopes in a safe and comfortable environment. Furthermore, the machine is equipped with Komatsu's proprietary automatic blade control technology integrated with the ProVision machine guidance system, enabling operation from a remote location and easy operation even for inexperienced operators.

Based on DISPATCH, its industry-leading fleet management system (FMS), Komatsu announced a Modular Ecosystem in 2024 that enables data analysis for vehicle management, mine site operations management, and even the entire mining operations of its customers. This is a comprehensive framework for providing mining solutions, consisting of three layers of data analysis across equipment, mine sites and mining operations (see figure). This ecosystem uses an open architecture design, enabling connection to all mine site operations, including data not only from Komatsu products but also from third-party vendors and other manufacturers' equipment to leverage big data on equipment status and operating conditions to support more efficient decision making. This allows us to offer unparalleled value to the mining industry.

In addition, in September 2024, Komatsu acquired Octodots Analytics, a company that provides technology to optimize and streamline mining processes. Octodots leverages AI to analyze and optimize complex decisions made by skilled FMS operators on the system in real time. Through integration with Komatsu's DISPATCH, it will maximize the capabilities of existing solutions.

Modular Ecosystem



■ Automation and remote operation in construction equipment

In construction equipment, we are also promoting research and development of automation and remote operation. In the area of automation, in December 2024, we launched the PC200i-12 hydraulic excavator in Japan, equipped with standard 3D machine control. This machine is equipped with a 3D machine guidance function as standard, which enables accurate understanding of machine and work equipment positions relative to the drawing by importing 3D design data into the construction equipment and using global navigation satellite systems (GNSS). Switching to 3D machine control is also possible, which supports automatic stopping of the work equipment and automatic operation according to the drawing. This allows construction according to the drawings regardless of the operator's skill level. In addition, some of the Smart Construction construction management applications are included as standard, making it even easier for customers to support ICT construction. This features the industry's first auto-swing function and a 3D boundary control function, which detects potential collision zones and automatically stops the machine.

P.24 Special feature 1 Project story (New-generation hydraulic excavators)

P.56 Enhancement of product safety

In the area of remote operation, we have finished the development of remote operation, models of a hydraulic excavator equipped with semi-automatic control functions for work equipment and a bulldozer with automatic blade control functions, and research and development toward unattended construction is underway. In 2024, Komatsu launched sales of Smart Construction Teleoperation, a remote operation, system for construction equipment jointly developed with EARTHBRAIN Ltd. The system can switch between multiple construction machines from a single cockpit, helping to resolve issues faced by customers who are faced with improving safety and productivity in addition to labor shortage. A mobility office that incorporates this system's functions, has also been launched. It has enhanced maneuverability and offers promising use cases in disaster recovery and other areas.

HIROSE CO., LTD.'s system-compatible hydraulic excavator (left) and the Smart Construction Teleoperation cockpit provided to the company (right)

Research and development strategy

Intellectual property activities and promotion structure

Komatsu's Intellectual Property Department is responsible for filing patent and design applications to protect the technologies created by research and development departments and to keep products, services and solutions competitive, as well as filing trademarks to build and protect brands. Intellectual Property Division staff are assigned to business locations with R&D departments to ensure that technologies and ideas of the R&D departments are properly secured as intellectual property rights. Through this system, we are working to keep an eye on the budding seeds of innovation through collaboration from the planning stage of R&D and by broadly and closely monitoring the progress of domestic and international industry-government-academia collaborations.

Meanwhile, we are also actively communicating with related departments regarding intellectual property, such as trademarks, that are created in close proximity to business units, such as branding, to ensure that we can cultivate our global business advantageously.

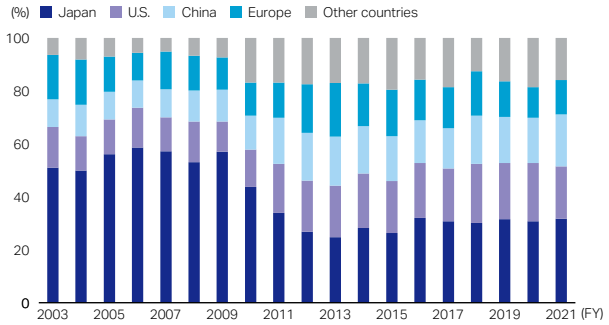
Acquiring global patent rights

Through intellectual property activities tailored to R&D departments, we can identify key technologies being worked on from a medium- to long-term perspective and file patent applications for inventions quickly and robustly. As a result of these activities, Komatsu has a high implementation rate of over 60% of our acquired patent rights*.

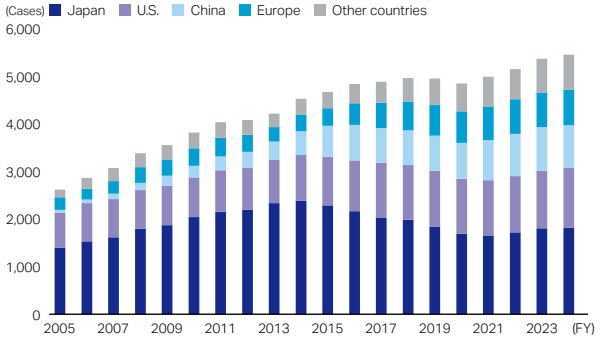
In addition, in order to support global production and sales, we have been working to optimize the portfolio of countries in which we hold patent rights. In particular, since fiscal 2010, we have been promoting activities aimed at generally obtaining rights in Japan, the U.S., China, and Europe (mainly Germany) for technologies related to construction equipment. Although we have traditionally focused on applications filed in Japan, we have endeavored to achieve an equal application ratio in the aforementioned countries and regions. We also review our holdings of registered rights as necessary, and as of the end of fiscal 2024, we have built a globally balanced portfolio of patent rights in those countries and regions.

* According to Japan Patent Office research, the utilization ratio of patent rights in Japan is around 50%.

Share of applications by country



Patents held by country

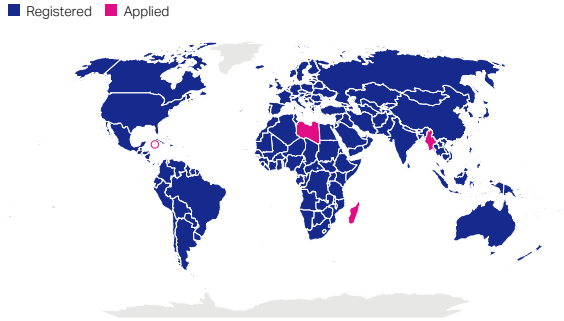


Branding and anti-counterfeiting

We work to obtain trademark rights at the corporate level for branding. Regarding trademark rights for product and technology names, Komatsu acquires rights to names deemed to enhance the attractiveness of Komatsu. The Komatsu logo has already been granted rights in countries with stable trademark laws in the classification of crawler-type construction machinery. For the new visual identity established in 2024, we have already obtained trademark registrations in several countries, although in some countries the trademark rights cannot be obtained due to legal requirements.

In addition, counterfeit Komatsu parts have been seen on some e-commerce sites, but we are working with Marketing Division to handle these appropriately so as not to damage the Company's brand image.

Komatsu logo application/registration status



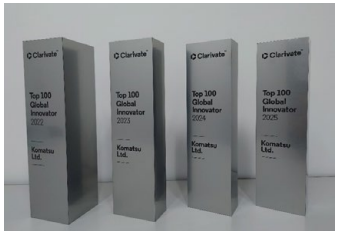
Our new visual identity

Web About the new visual identity

External recognition

Komatsu has been named a Top 100 Global Innovator 2025 by Clarivate, one of the world's leading information services providers (for the 11th consecutive year, 2015-2025). Since 2012, Clarivate has selected the world's top 100 innovation leaders from among more than one million companies evaluated worldwide, taking into account factors such as patent impact (degree of influence on the ideas of others) and the level of geographic investment in the invention.

Clarivate™



Previous Top 100 Global Innovator plaques from Clarivate