



Future factory

Doubling productivity using
autonomous technology

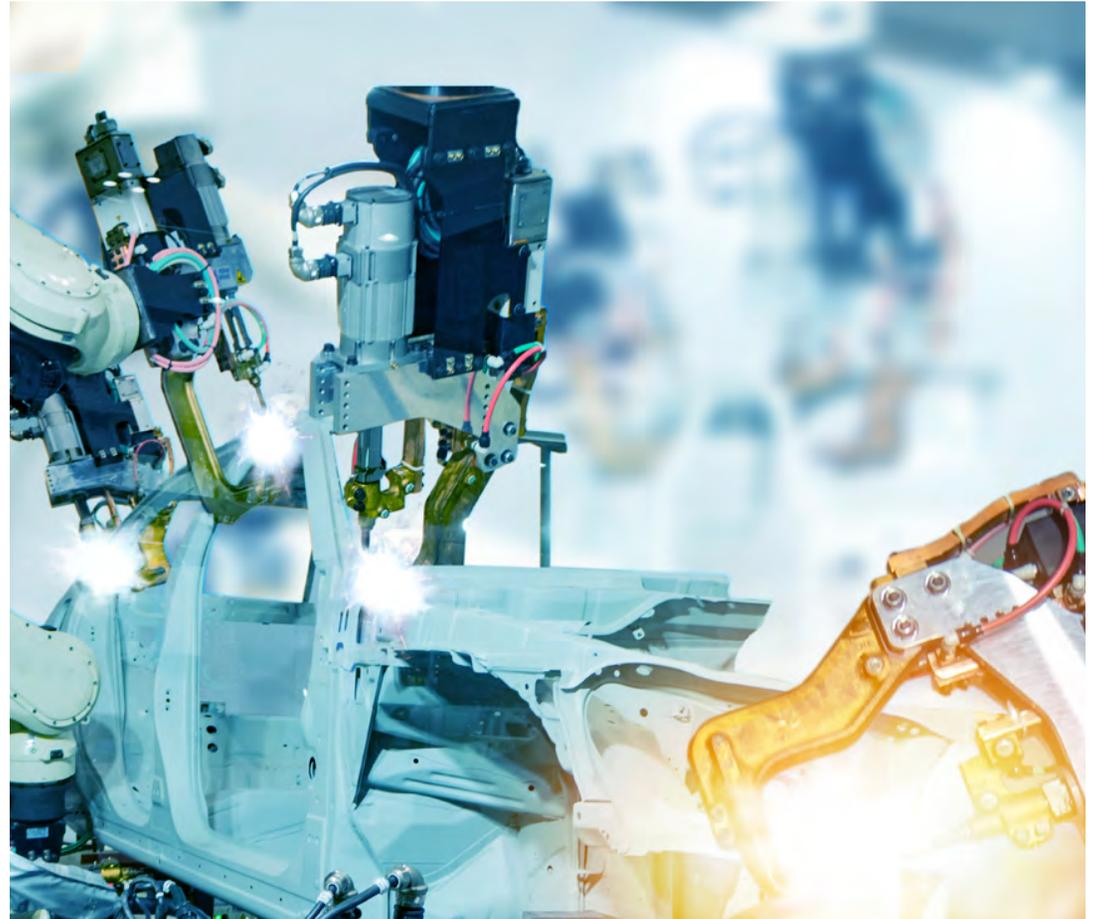
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6-minute read

Kyocera Corporation has progressed beyond its inherited fine ceramics business, diversifying into new areas such as communications, automotive, environmental energy and healthcare.

As the market environment changed drastically with the spread and expansion of new technologies, including 5G and automated driving, Kyocera set a goal to expand sales from JPY 1.6 trillion to JPY 2 trillion in the near future. The “Productivity Doubling Project” has been positioned as a key measure to support this plan.

Takeshi Maeda, Kyocera’s General Manager of the Dx Promotion Center, Corporate Digital Business Promotion Group, explains the company’s aim:



“We will double the manufacturing productivity to reduce costs and establish a competitive advantage through cost leadership, thereby increasing sales in existing businesses.”

In order to achieve this aim, Kyocera launched a series of production lines, including the Kokubu plant in Kagoshima in May 2018, the Gamo plant in Shiga in October 2018 and the

Sendai plant in Kagoshima in March 2019, to demonstrate its improved manufacturing efficiency through unmanned production lines using AI and robots. Since April 2019, Kyocera has been promoting the deployment of unmanned lines at all of its plants.

The crucial keyword is “autonomous,” which goes beyond automation.

“Automation, or simply replacing human work with robots, may result in the line continuing to produce defective products of its own accord,” Mr. Maeda explains.

“Instead, the AI analyzes various data collected in real time, and when it determines that a defective product is likely to be produced, the robot itself will automatically change the processing conditions and deal with it. When the AI determines that the line is likely to stop, it will alert the operators or the

By decreasing the defect rate, Kyocera experienced a

6%

increase in fine ceramics yield

Through automation, Kyocera aims to gain

2x

productivity increase

person in charge before the machine breaks. This is the form of autonomous production that we are pursuing.”

Of course, this is not an easy task.

Kyocera’s products are basically designed to a “one specification for one item” policy, and when the productivity doubles as a result of autonomous production lines, related work such as

replying to quotations from customers also increases. For example, when producing fine ceramic components, the business must also predict the shrinkage rate due to firing and design the drawings of the finished product to reflect that rate.

“Even though the related work doubles, we cannot double the number of engineers and designers in charge of operations,” says Mr. Maeda. “The same number of them as before must handle all the works.

“That is the essence of doubling productivity,” he emphasizes.

Kyocera considered the use of IT, specifically a digital platform to analyze plant data in real time, to be a necessary prerequisite to solving this issue.

“IBM told us, ‘We will work closely with you to create the most suitable system to achieve your aim of the Productivity Doubling Project.’ So we chose IBM not just to introduce the solution, but also as a partner to promote the project.”

Takeshi Maeda, General Manager, Dx Promotion Center, Corporate Digital Business Promotion Group, Kyocera Corporation

Building the smart factory

In order to realize nonstop autonomous production lines, it was essential to establish a production management system that would comprehensively monitor and manage production facilities and automated guided vehicles (AGVs) that transport materials and products-in-progress between the processes and operators.

Ideally, the control function to prevent defects, as well as the system that automates related activities such as quotations, shrink-rate calculation and prediction, and drawing, would be implemented on the same framework as the production management system. Thus, Kyocera set out to build the digital platform.



“We didn’t have the entire image in mind from the beginning. As we increasingly kept incorporating and considering necessary functions, we reached the digital

platform as a result,” Mr. Maeda explains.

Kyocera integrated the [IBM® Global Integrated View \(GIView\) Planner](#)

solution with the production planning process to determine the most suitable number of monthly models and procurement, and with the scheduler to devise the most suitable daily resources plan. It also integrated the [IBM MES Express](#) + GIView PS with the system that devises the production plan, checks the status of the production process, sends instructions to the operators and controls the facilities.

The business also uses the CFC analysis platform as the basis for an edge computing mechanism that collects Internet of Things (IoT) data from production sites and analyzes it in real time. Additionally, IBM introduced [IBM Cloud Pak® for Data](#) as a data platform that collects, stores, processes and analyzes data, and manages data models throughout the company's offices and plants.

To establish an autonomous production line, the correlation of the data with the

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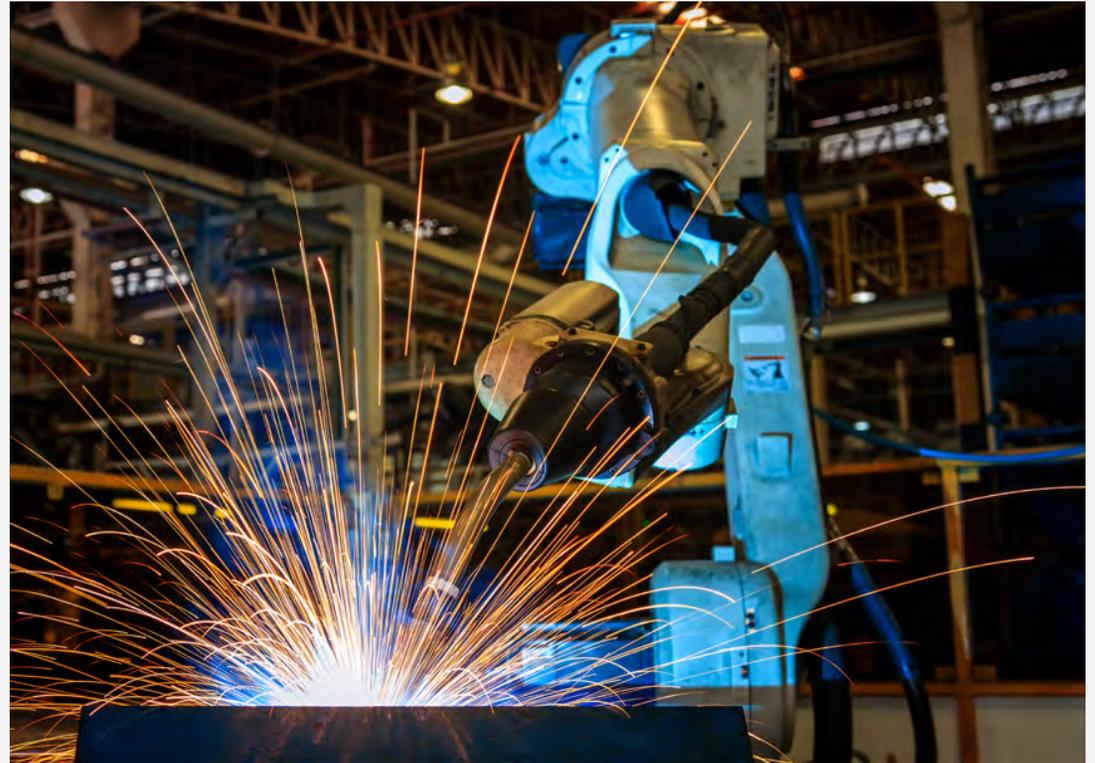
Takeshi Maeda, General Manager, Dx Promotion Center, Corporate Digital Business Promotion Group, Kyocera Corporation

flow and status of products is extremely important. All information including the processes before and after production must also be integrated with the data utilization.

“Only then we will be able to predict beyond human wisdom and control the production process to prevent defective products,” says Mr. Maeda, explaining the aim of introducing a series of IBM solutions.

These IBM solutions for constructing such a smart factory and utilizing data were the main reason why Kyocera tapped IBM to promote the Productivity Doubling Project.

“Selecting highly functional solutions based on individual technical profiles such as production planning, the scheduler or the production system and ‘adding up’ these solutions does not always provide the maximum effect,”



explains Mr. Maeda. “We also had a time limit. We had to launch the digital platform at the earliest possible time and apply it in practice to produce results by the fiscal year ending March 2021.

“So we evaluated the solutions from the perspective of overall optimization.

At the same time, IBM told us, ‘We will work closely with you to create the most suitable system to achieve your aim of the Productivity Doubling Project.’ So we chose IBM not just to introduce the solution, but also as a partner to promote the project.”

Work smarter, not harder

The digital platform, having begun its operation with the start of the model line in May 2018, has provided quality improvement results at the production lines in many of Kyocera's plants. For example, in the production process of fine ceramics, a nearly 6% increase in yield was achieved as the result of defect improvements.

“Kyocera has a nearly 40-year history of producing fine ceramics and has accumulated a high level of technical know-how, but even with that, defective products were inevitable. Using the AI model developed with the IBM SPSS Modeler incorporated in the CFC analysis platform, we found the cause of defects that even experienced workers missed. The 6% improvement



in yield rate is really amazing. In just a few months, we improved the defect rate, which we had been unable to reduce for decades,” states Mr. Maeda.

Effects

- Improves price competitiveness and share expansion through cost reduction
- Enables nonstop and defect-free production lines
- Improves capacity utilization rates through autonomous production lines using robots and AI
- Builds a digital platform that integrates production planning, scheduler and a production operating system

- Improves the yield rate of the fine ceramics component production process by about 6%
- Delivers insights into the workflow of the operators, freeing them to focus on higher-value work
- Increases existing business sales by reducing costs through doubling productivity

With these steady achievements, Kyocera is advancing the Productivity Doubling Project further.

It is planning to improve the achievement level by positioning the

three years from 2020 through 2023 as the growth phase and the period after that as the penetration phase. Meanwhile, Kyocera is also exploring the evolution of the digital platforms.

“The digital platform integrating the various data in the production process has shown some shape, but it is not enough to realize the autonomous production we are aiming for. The real aim of the digital platform is that the insights gained from the system change the workflows of the operators and free them to focus on higher-value work,” says Mr. Maeda.



About Kyocera Corporation

Founded in 1959, [Kyocera](#) (external link) is a specialized manufacturer of fine ceramics. The company has diversified its business to include industrial and automotive components, semiconductor packaging, electronic devices, smart energy systems, printers, and telecommunications equipment, and has developed its business globally from materials and components to devices and equipment, as well as system services.

Solution components

- IBM Cloud Pak® for Data
- IBM® Decision Optimization/CPLEX
- IBM GView Planner (Global Integrated View Planner)
- IBM Maximo® APM
- IBM MES Express + IBM GView Planner

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