FUJITSU

Optimizing the Manufacturing Line and Ensuring Flexibility to Double the Factory Productivity

The most important business challenge for manufacturing companies is how to increase the flexibility and speed of production while keeping costs down. One of the key technology is –automation. However, many companies that have incorporated automation share the same problems of improving productivity of multi-step processes and responding flexibly to specification changes. In response, Fujitsu Peripherals (Kato City, Hyogo) has successfully utilized automation technology refined over the years and ensures flexibility in the construction of the manufacturing line to integrate multi-step processes, doubling the conventional productivity. We have decided to broadly share our experience and expertise with manufacturing companies, we are working on building manufacturing lines that utilize automation technology to improving productivity.

The manufacturing industry currently faces various challenges regarding product development and production due to the rapid change and diversification of demands and the escalation of international competition. They look to shorten the product development cycle, reduce development and production costs, improve product quality, and build reliable mass production systems. Manufacturing companies have incorporated automation in hopes to tackle these issues, but the results have been less than stellar.

In many cases, automation can only be implemented per process and does not improve productivity as expected. More than a handful of these companies also have to deal with the inflexibility of automated lines, as any changes to specifications are difficult to implement.

Furthermore, there have been recent cases where production plans must be promptly reviewed due to sudden increase of demand from SNS's word-of-mouth. There are also technical issues. QCD improvements can range from robots and automation to IoT (Internet of Things) and AI (Artificial Intelligence).

Of those that try, not many companies can accurately judge which technologies are best suited for their products, or how to implement them. Over the years, Fujitsu Peripherals stands out as a company that has successfully dealt with these issues facing the manufacturing industry. Fujitsu covers various products from mechatronics to electronics and software, making both modular products such as smartphones, tablets, IoT devices, and computer monitors, and integral products such as manufacturing equipment and system printers.

Shigehiro Fujii

Director
Manufacturing Department-2
Division-1
Fujitsu Peripherals Limited

On top of an automated machine lineup developing products one after the other for integrated production, Fujitsu Peripheral's greatest strength lies in their manufacturing lines, built to flexibly and promptly adapt to customized production.

Shigehiro Fujii, Director of the Manufacturing Department-2, Division-1, says that, "We have a system in place that utilizes IoT technology with a wide range of robots and peripherals with Fujitsu-developed technology, interfaced to link the automated machines (Figure 1).

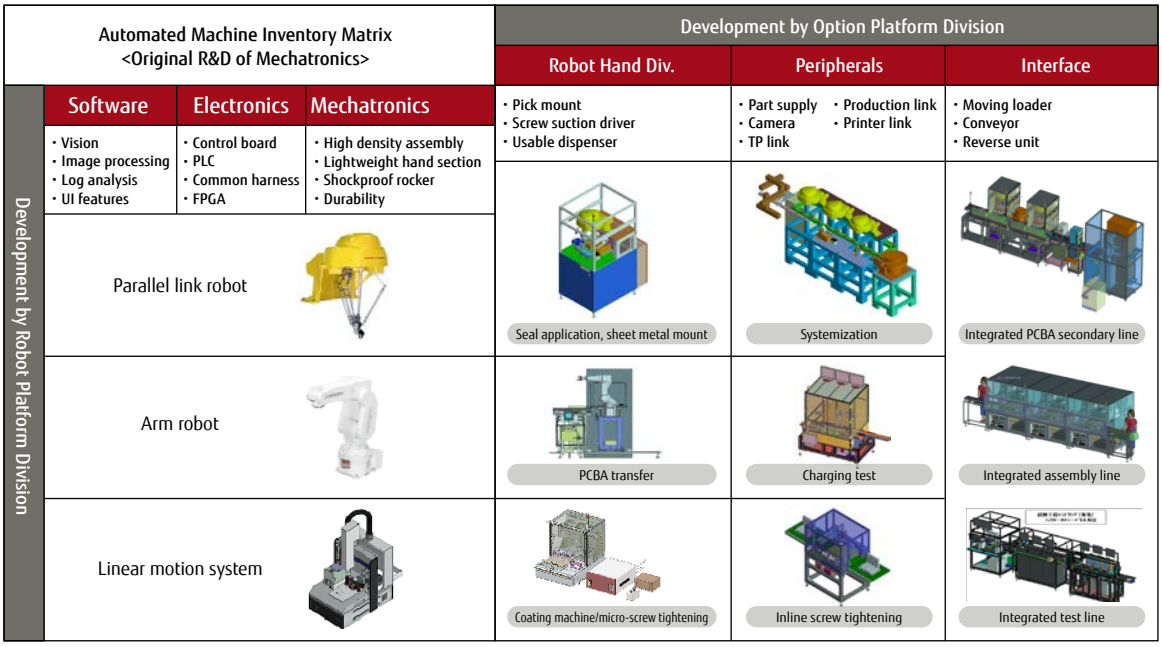

Figure 1: Lineup of automated machines that enables integrated production (example of automation and robotization)

Manufacturing Line's "Complete Automation": People and Robots Working Together

In an effort to lead the Manufacturing Process Revolution, the Fujitsu Group strives to be pioneers in manufacturing. Traditionally, manufacturing at group companies has consisted mainly of line systems, with each product series going through the process of planning, product design, trial production and evaluation, production preparation, trial mass production and evaluation, and finally mass production. Meanwhile, we have shifted to concurrent manufacturing.

In this format, product design, the development of automated machines, and the manufacturing line advance in parallel for agile development and manufacture of diverse products. Based on this policy, Fujitsu Peripherals implemented concurrent engineering and has already made leaps and bounds. "Along with introducing digital mockups and 3D data, we have automated lines using automated machines and manage the entire process with a production management system. With concurrent engineering, we have expanded our scope of automation and doubled overall productivity." (Fujii)

The key was to refine our automation technology by developing our own automated machines for manufacturing in parallel with product development. We particularly focused on automation with robots. Fujii shares, "Starting with the introduction of a screw tightening machine in 2003, we have promoted cell-type automation with the proprietary development of automated machines. We then successfully automated the entire manufacturing line by linking the machines after standardization and optimization. "

One example is our parallel link robot. This machine transmits power in parallel to multiple arms and automates detailed assembly work on printed circuit board assemblies (PCBA) in smartphone manufacturing lines (Figure 2). What once took eight people to achieve now only requires one person.

We have also developed an auto testing system for mobile phones. This system utilizes the communication features of the phone to allow testers to set it and forget it to test the function of multiple features such as the antenna and FeliCa (contactless IC standard), the camera, audio, and the touch panel. We developed in-house programs such as interference control based on two sets of commercially available single-arm robots for the final assembly process to create a dual-arm robot. Another manual task is now automated.

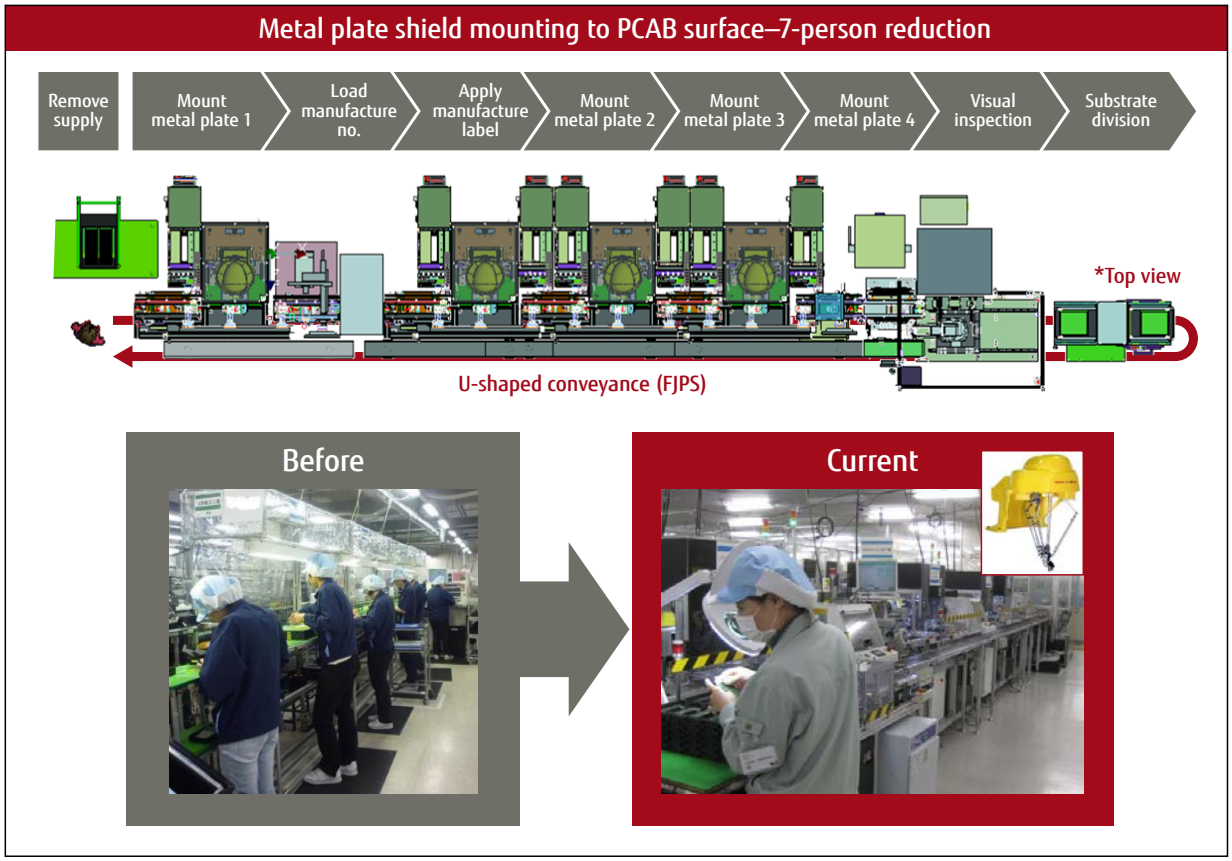

Figure 2: Precision work performed by parallel link robot (smartphone manufacturing line (PCBA assembly))

Fujii mentions that "Quick turnarounds and low costs can be achieved by combining PLC, various sensors, I/O, safety sensors (safety mechanisms) and more while utilizing the advantages of each robot. We aim to improve QCD to the fullest extent by using a line with both people and robots."

Another reason Fujitsu was able to automate the entire manufacturing line is that besides production, it excels in Original Design Manufacturing (ODM), consistently undertaking the design, development, and manufacture of products from other companies. Moreover, these products spanned a wide range, from smartphones to manufacturing equipment. Through ODM, we cultivated our ability to design and develop, and also made use of our expertise in meeting the expectations of clients in terms of both cost and quality.

Creating Manufacturing Value from the Competitive Edges of Flexibility, Speed, and Cost of Manufacturing Line Construction

As we have seen, Fujitsu Peripherals has accumulated the technical skills and expertise surrounding automation based on in-house, practical experience. This led to creating a system that enables the integrated production of various products, and as mentioned earlier, we are able to flexibly and promptly build a manufacturing line that suits the characteristics of each product. Creating a lineup of automated machines is also very effective for reducing the cost of line construction.

Being able to ensure flexible production as well as building a low cost and prompt manufacturing line becomes a slingshot for boosting competitive power to create major value. Through automated machines and ICT solutions powered by the firsthand experience and expertise of Fujitsu Peripherals, we hope to provide said value to other manufacturing companies. We will design an optimal manufacturing line applying automation technology, integrate automated machines, and offer support for stable operation. "We not only provide concepts, but deliver automation expertise with a proven track record." (Fujii)

This framework provided by Fujitsu Peripherals offers a strong edge, especially for companies looking to go global. Through a combination of automated machines, fully verified throughout the actual manufacturing process, companies can create a stable manufacturing line and production infrastructure that is not heavily affected by fluctuations in exchange rates and labor standards in the country of manufacture. Achieving productivity and quality that exceeds certain standards independent of the workers will of course help to boost the competitive power within Japan as well (Figure 3).

In addition to improving QCD through automation technology, we hope to provide solutions in the future that can further improve productivity by analyzing data gathered from automated machines and IoT sensors.

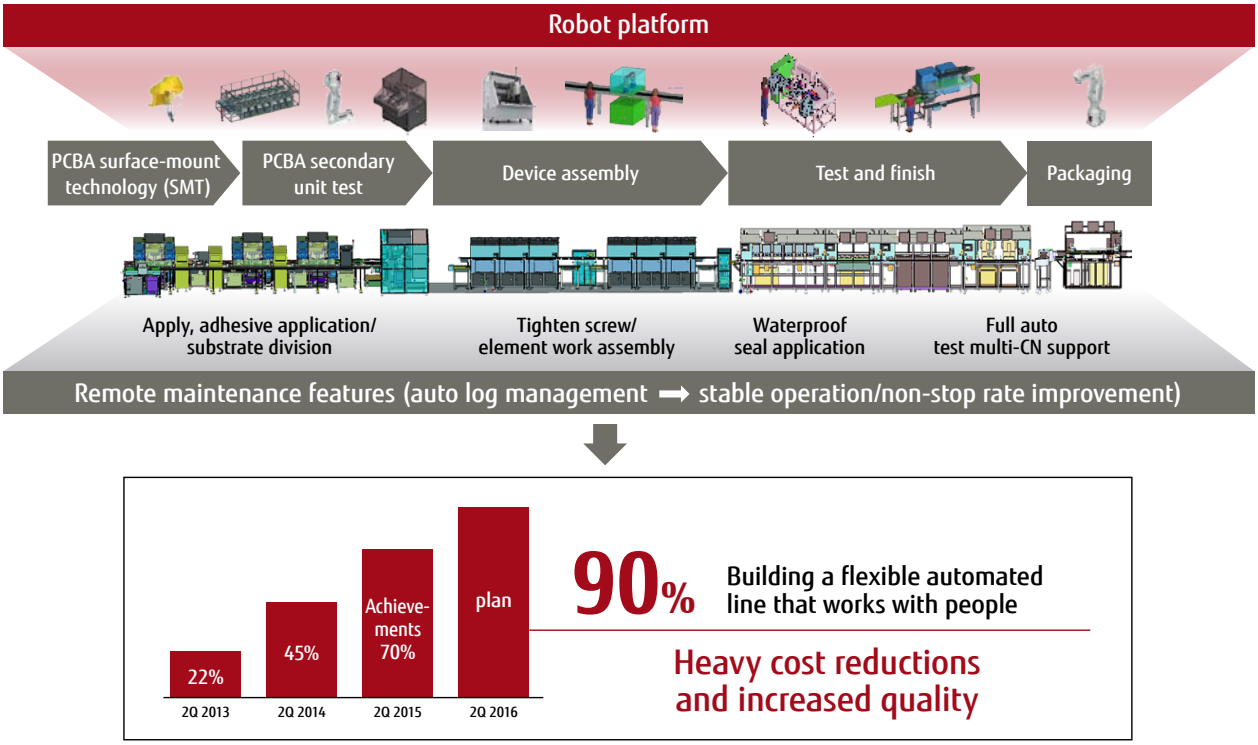

Figure 3: High-order QCD independent of manufacturing country and employees built by integrated production with automated machines (automation status of smartphone manufacturing line)

Automated machines can monitor and provide data about operating status such as breakdowns and defective parts. Data analysis allows for preventative maintenance so parts can be exchanged before they break, leading to major improvements in quality.

Another productivity improvement measure made possible by collecting data is to automatically sort Build-to-Order (BTO) and custom orders that have altered specifications by the client.

Furthermore, we hope to provide solutions for higher quality improvements by analyzing data from automated machines as big data to grasp trends in foreign parts with inconsistent quality and more. In preparation, Fujii says, "We have begun optimizing the testing process by cancelling one hundred percent inspections and changing the sampling rate based on data from automated machines." (Figure 4)

Fujii also mentions that "It's meaningless to collect large volumes of data we cannot use. We wish to improve the value of automated machines by summarizing various data points on one control screen and offering the knowledge on how to utilize them. Fujitsu Peripherals wants to create new value by fusing big data and manufacturing expertise. This company is on the brink of lighting a spark under the strength of 'Made in Japan.'"

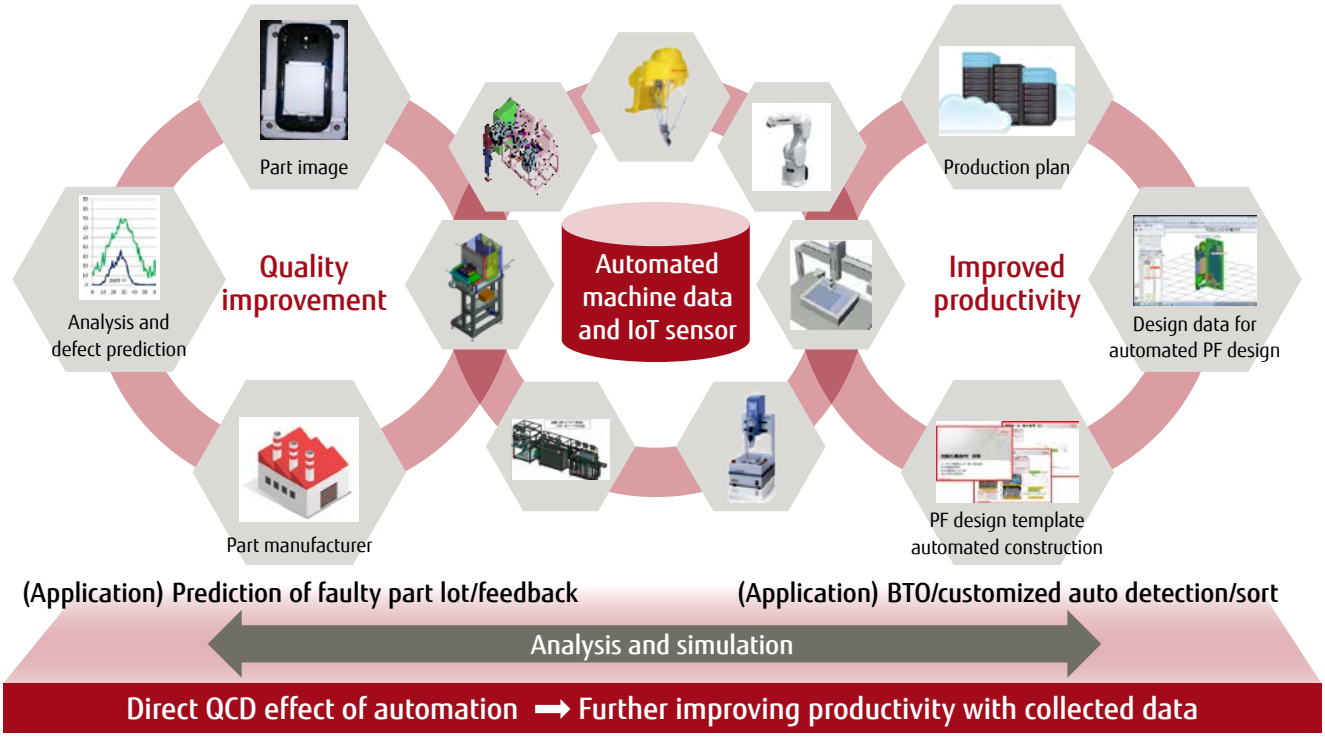

Figure 4: Deepening automation with automated machines and IoT (using big data)
Real time data is collected from Fujitsu-developed production equipment (automated machines, test programs, production system), visualized in a timely manner, and analysis or process feedback is offered

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