

Retrofit IoT

The method of managing manufacturing equipment that has long been used by means of IT.

Technology maturity level: High

Expectation for 2030: 7.3

A system that uses computers to enable control of old machine tools used on the floor, allow the operating states of them to be recorded, and/or enable other things. An act of modifying an old machine or equipment to add a new function to it is referred to as a retrofit or retrofitting, and retrofit IoT means a system for digitalized retrofitting. IoT is an abbreviation for the Internet of Things, but the system is not always connected to the Internet.

Moves to reform operations by incorporating digital technology are afoot also among those engaged in manufacturing. They faced the reality that many long-used manufacturing machines working properly in terms of manufacturing were difficult to control and manage with computers.

OKI Circuit Technology, a printed circuit board (PCB) provider based in Tsuruoka City, Yamagata Prefecture developed a system to obtain quality records by connecting their analog devices that have worked for more than 20 years to a network and setting production conditions with digital data as part of factory automation they began to work on in the 2020 fiscal year.

For the production of PCBs of ten layers or more with a high degree of difficulty, OKI Circuit Technology will also start automating the changeover work. They started their digitalization with digitalizing the etching process line and hot-pressing equipment in the lamination process. When introducing workpieces (PCB substrates) into the etching process line, an operator can enter the set values into three pieces of equipment including a sprayer and conveyor by scanning the barcode of an attached card from a touch screen. In the past, an operator had to walk across three control panels to make settings manually.

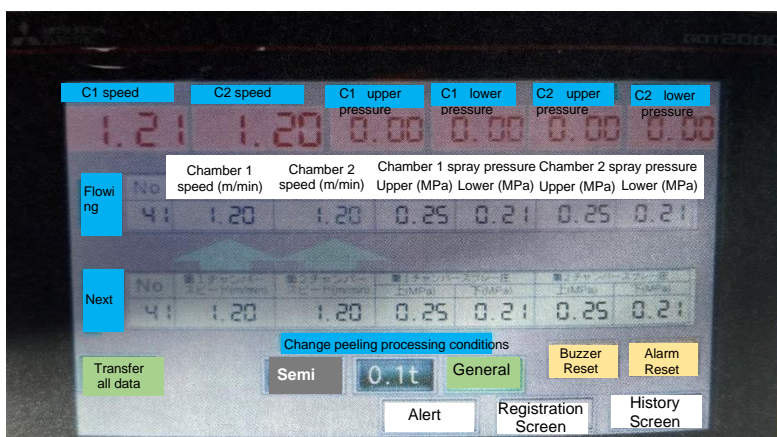


Figure: The settings screen that was digitalized by adopting a touch screen

(Source: Nikkei Monozukuri (Image keystone corrected))

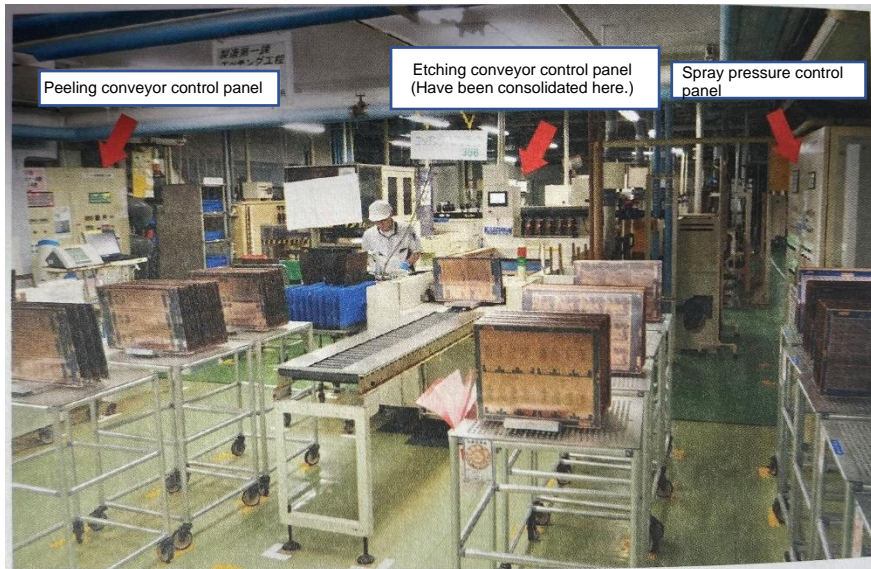


Figure: In the past, the etching process line had control panels in three different locations.

(Source: Nikkei Monozukuri)

With regard to the lamination process, a data logger has been attached to the controller of the hot-pressing equipment so that quality records during the processing are kept on a computer. A mechanism will be introduced to compare the data of the quality records with the reference value, and give an alert when there is a large difference between them.

A pen recorder attached to the controller used to write such data directly on chart forms based on analog signals received from the controller, and the forms were kept. Now the analog signals are converted into digital signals, which are transmitted to the data logger.

Retrofit IoT also offers a market for new services. In February, 2021, Murata Manufacturing launched a service "JIGlet" as a joint business with ACCESS, a firm engaged in software development and other services, to allow small and mid-sized manufacturers to easily grasp the situations of their plants and equipment through data.

The service uses three types of sensor devices, the dice, illumination and button, in combination with facilities and equipment. As each of the devices is equipped with the LTE communication function, turning on the power automatically connects them to the cloud service. The devices can be used simply by scanning the QR code labels on them with a tablet to be used as a management terminal.

The dice device communicates the situation on the floor. Stickers indicating such equipment states as "Operating", "Awaiting parts", and "Downtime" are affixed to the dice faces to allow the operator on the floor to communicate any changes in the situation by putting the dice with a specific face up.

The illumination device detects the turn-on and -off of lights, and communicates them. Mounting this device on the green light of the Andon three-color double-sided lightbox sign (to indicate the normal operation) of the production equipment allows the operating states of the production equipment to be grasped and tabulated.

Inspection operators on the production floor can report any issues such as defective items by pressing the button device. It is also possible to graphically display the operating states on the management screen of the tablet placed on the floor.

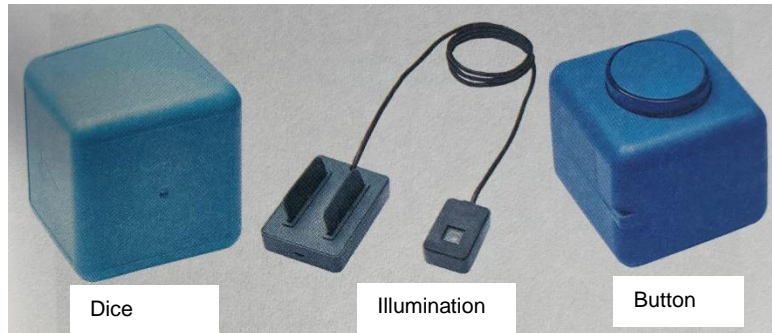


Figure: Sensor devices, "dice", "illumination", and "button"

(Courtesy of Murata Manufacturing)

The service costs 150,000 yen for creation of a new account, and requires an initial cost of 30,000 yen per device. The monthly fee per device is 3,500 yen.

(By Kentaro Kizaki, Nikkei Monozukuri / Nikkei XTech and Yumi Kobayashi, facet)