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Some Paths to Help Streamline Overseas Factories

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China, often referred to as the “world’s factory,” may have reached a turning point. Maintaining effective and efficient production is critical for continued successful business, and many manufacturers may rely on overseas production for survival. China, with its half-billion-strong labor force, is also facing rising labor costs and may have to count more on automation to provide practical manufacturing solutions. As an example, soldering technology is indispensable for a wide range of applications, including in automobiles, home appliances, and digital equipment. But successful future businesses will depend on finding ways to streamline and optimize soldering in overseas factories

As labor costs have risen over the past decade, the task of maintaining a low-cost labor force is no longer trivial. Owners of manufacturing facilities in China have seen an increase in the mobility of individuals within the labor market, making it increasingly difficult to acquire and maintain high-quality personnel for electronics manufacturing.

In general, businesses are responding to these labor challenges in one of three ways. The first solution is to real-

ize a high-quality, high-productivity production line while remaining in China. The strong labor market in



The UNIX-413S system includes solder position correction and can automate picking, component insertion, and soldering.

China is still attractive for establishing low-cost manufacturing lines, and low-cost production in that market will still make a great deal of sense. But rising labor costs do pose a problem, and the “low-quality, low-cost” situation in

China is changing. To maintain their low-cost structures in China, many businesses are producing varieties of equipment with greater added value and shifting toward high margin sales models while reining in labor costs by partially automating existing processes.

Relocating to Reduce Costs

The second solution is to relocate to a region with lower-cost labor. Recent years have seen an increase in expansion to locations such as Southeast Asia, Bangladesh, and Myanmar. For a time, the low-cost labor force can bring about a reduction in production costs. However, the education levels and stabilization of quality that has accrued in China over the past 10 years will need to be built over again in these countries, starting from scratch.

When reinvestment in education and infrastructure are taken into account, reduction of production costs becomes less likely. For this reason, there is a trend toward automation of the production line from the very beginning in the most recent developing nations.

Workers are less likely to affect product quality, with operations affecting

quality partially automated, ensuring stable production volume and quality.

Bringing it Home

The third solution is to return manufacturing from overseas and perform production in the home country. For production at home, high-quality materials and components are easy to acquire, and the infrastructure is already in place. Moreover, the levels of education are far beyond those for overseas production areas. However, higher labor and material costs are obstacles to this third solution.



The versatile UNIX-41S series desktop robot enables quick startup and partial automation at this overseas factory.

In this third case, full automation is assumed from the start of business, and the requirement for fewer personnel makes it possible to construct a manufacturing system for 24-hour operation.

This trend has been seen recently in North America, Japan, Korea, and other developed nations.

No matter which path is taken, "streamlining" of production is unavoidable from a variety of respects. In particular, as products become more highly functional and soldering becomes more complex, know-how regarding "automation" entailing more than robots alone has come into the spotlight.

Even in the Chinese electronics market, which has grown through cost competition, the trend continues towards improved-quality products. As consumer confidence increases, the Chinese consumer is demanding better products, with products providing high added value. To make the most of existing production lines, with stable production of high-value-added products, proper division of roles between personnel and robots is essential.

At one Chinese electronics manufacturing services (EMS) facility, soldering

had been performed by hand on such a scale that hundreds of workers were required. However, significant changes, including rapid market growth and increase in printed-circuit-board (PCB) density, outpaced the ability to train and educate new personnel. To keep pace, several dozen desktop type robots were introduced, and a cell-manufacturing-based soldering system was implemented. Surplus personnel were transferred to processes unlikely to impact product performance, such as assembly. As personnel are no longer responsible for soldering operations, advanced skills are not required, and the product quality has become more uniform.

Along with miniaturization of connections, increasing circuit-board density has made weight management essential. For this reason, high-precision feeding equipment was installed at this Chinese EMS facility. Being able to feed 0.6mm of 0.15mm diameter solder wire enabled weight management with a precision of less than the amount of solder for a single point, a mere 0.1mg. The resulting use of robotic equipment allowed a reduction in the number of workers by roughly 50 percent; the reduction of required skills also cut the costs associated with that requirement by more than 50 percent. At the same time, a quality level over 99 percent was achieved in production quality.

The UNIX 41S series of automated EMS equipment is designed with a desktop form factor, for rapid introduction and startup. The series of systems is designed for ease of use, delivering high-quality soldering without requiring advanced knowledge of operation. These systems have been widely adopted for a broad range of manufacturing purposes, including automobiles, household appliances, smartphones, and renewable energy devices. They can support almost any soldering application when equipped with the proper options. These systems also help establish and maintain a high quality rate when production is brought to a new region.

As an example, a factory in Southeast Asia adopted a UNIX-413S system. It came equipped with a position correction mechanism, and the capability to correct the solder position of the iron tip with a precision of 0.05mm. The system can also make incisions into solder wire to prevent flux dispersal and solder

balls. As a result, initially configured conditions are maintained, making it possible to maintain a high-quality production rate. When implementing partial automation in a facility, management must be sensitive to how equipment can represent environmental changes for personnel, and how EMS production can be maintained most effectively with the combination of equipment and personnel.

The UNIVERSE S (Universe Series) soldering robot positions a PCB between a scalar robot above and articulated robot below, and automates electronic component picking, board insertion, and soldering all in a single sequence. In a traditional process model, four processes (component insertion, board setting, inversion, and soldering) are performed by a number of workers. In contrast, the UNIVERSE S takes advantage of these two types of robots to integrate component insertion, setting, and soldering into a single process.

As a result, the UNIVERSE S system reduced a 150-second mounting process to roughly a 55-second process at a Japanese factory. The installation area was also reduced to about one-third of what it had been. In addition, the uniformity provided by this use of automation, along with the system's image-recognition-based error detection feature, reportedly led to an increase in the quality rate of the soldering process to almost 100 percent.

The UNIVERSE S is an excellent product for Japanese factories in which unmanned 24-hour full automation is not uncommon. The system achieves full automation that simultaneously delivers significant quality improvements while reducing required operating space.

With the evolution of PCBs and their components, soldering is becoming more difficult and complex. An understanding of the basic technology is essential to effectively automate modern soldering. To meet such needs, the Soldering Lab, a specialized soldering R&D center within Japan UNIX Co., Ltd., has been expanded to four locations within Japan. In these locations, state-of-the-art, advanced analysis equipment and the latest models of automated machinery are used to perform microlevel quality control and applied research into cutting-edge soldering technology.

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