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Automating Medical Device Assembly

Automation Is Key to Medical Device Assembly

One hardly needs sophisticated market research to conclude that the global market for medical devices will continue to rise for the foreseeable future. One need only open a newspaper to read the latest data on the COVID-19 pandemic.

But, if you want to put a number on it... According to market research firm The Business Research Co., global sales of diagnostic products, dental equipment, ophthalmic devices, imaging equipment, cardiovascular devices, surgical equipment, orthopedic devices, patient monitoring devices, diabetes care devices, respiratory devices and other products totaled nearly $456.9 billion in 2019, having increased at a compound annual growth rate (CAGR) of 4.4 percent since 2015. Thanks to COVID-19 and other factors, sales are expected to grow at a CAGR of 6.1 percent in subsequent years, topping $603.5 billion in 2023.

As ever, North America remains the single largest market for medical devices, accounting for some 39 percent of global sales.

That rosy forecast is reflected in the data from ASSEMBLY's 25th annual Capital Equipment Spending Survey. Some 44 percent of medical device manufacturers will spend more on assembly technology this year than they did in 2020, while only 22 percent will spend less. In comparison, just 32 percent of all U.S. assembly plants will spend more in 2021, while 24 percent will spend less. Medical device manufacturers will spend, on average, $637,857 on assembly technology this year, a substantial increase from the 2020 average of $397,562.

It's a good bet that the lion's share of that money will be spent on automation. In this exclusive ebook from ASSEMBLY, you'll see how a variety of medical device assemblers have set about automating their assembly lines. Projects run the gamut from a manually fed, five-station robotic system for assembling sheaths for endoscopes, to a near lights-out system in which products go from raw resin to finished, sterile packages with almost no labor involved.

We hope the reports in this eBook provide inspiration for your own automation projects, and we urge you to challenge our sponsors to meet your automation needs.

John Sprovieri, chief editor, *ASSEMBLY*

Automated Assembly of Medical Devices

Surgical instruments, airflow sensors and endoscopic sheaths are among the many medical devices produced on automated assembly systems.

John Sprovieri - Chief Editor

A pair of rotary indexing dials are used to assemble an actuation device for a surgical instrument. *Photo courtesy Demco Automation.*

Disposable devices are essential components of every medical, dental and veterinary practice. Using disposables lowers costs, increases efficiency, and reduces the spread of infection.

According to market research firm Grand View Research, worldwide sales of disposable medical devices reached nearly $248 billion in 2019. What's more, sales are expected to grow at a compound annual rate of 16.7 percent from 2020 to 2027.

Grand View attributes that growth to the increasing number of surgical procedures, the rising incidence of hospital-acquired infections, and, of course, the COVID-19 pandemic. A growing prevalence of chronic diseases, such as diabetes and cardiovascular diseases, is also expected to boost sales of disposables. For instance, according to the International Diabetes Federation, the number of people with diabetes is expected to increase from 366 million worldwide in 2011 to 552 million by 2030.

Catheters, syringes, inhalers, testing supplies and other disposables must be produced by the millions annually. Meeting that kind volume can only be accomplished with automation. As the examples below illustrate, systems integrators have designed and built some innovative machines for medical device assembly.

Surgical Device Produced on Rotary Indexers

Rotary indexing dials have been a mainstay of automation systems for decades. They are simple, inexpensive, fast, precise and reliable. What's more, they can assemble a lot of product in a relatively small footprint and with a minimal number of fixtures.

So, when a medical device company needed to assemble an actuation device for a surgical instrument, a pair of rotary indexing dials were just what the doctor ordered.

The system was designed and built by **Demco Automation** of Quakertown, PA. The project began with the Wedge, the company's standardized assembly platform. The modular platform is available in one- and two-indexer versions. For the actuation device, the two-indexer machine was used.

> When a medical device company needed to assemble a part for a surgical instrument, two rotary indexers were just what the doctor ordered.

"Two rotary indexing dials in one base machine enable processing in different nests and provide additional access for setup and maintenance," says Stephen Maund, Demco's president and CEO. "All the processes fit comfortably in a compact footprint."

For added flexibility and multitasking, the system is equipped with multiple SCARA robots and programmable pick-and-place mechanisms.

The actuation device is approximately 0.5 inch in diameter and 0.8 inch long. It consists of seven components, including injection-molded polycarbonate parts, synthetic rubber O-rings and a stainless steel cannula. A UV-cure adhesive and a silicone lubricant are also needed for the assembly.

The parts are supplied by standard vibratory bowl feeders, miniature step feeders and miniature vibratory bowl feeders. The latter are just 3 inches in diameter and were tooled by Demco.

Fiber-optic through-beam sensors and laser displacement sensors are used throughout the system to verify the size and presence of parts. Due to the small size of the assembly, a precision, dual-channel leak tester checks the integrity of the seals.

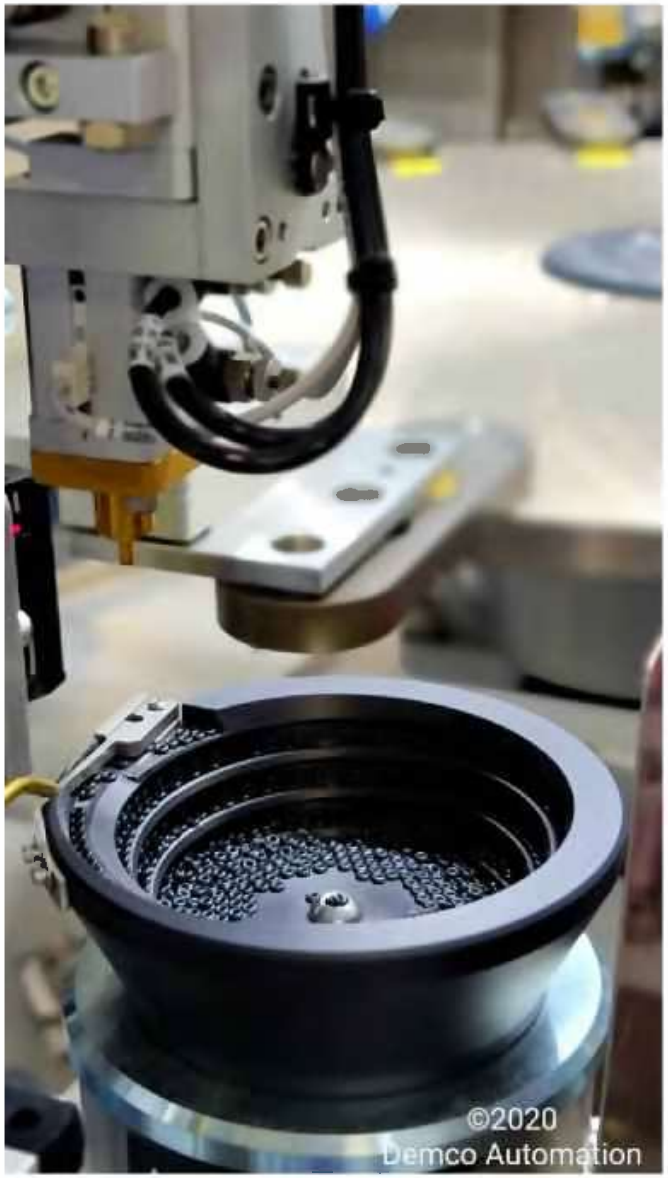
The system can assemble some 208 actuation devices per hour. "The overall production rate is actually much slower than other systems we have built, due to the extra time needed for curing the adhesive and leak testing the finished assemblies," Maund points out.

The actuation device has two variants. To accommodate each variant, one process station includes a SCARA robot fed by two bowl feeders, which are activated according to the product recipe. A vision system verifies that the right component is exiting the bowl in the right orientation. "The user enters work orders by scanning a bar code, and the system does the rest," says Maund.

One of the most challenging aspects of designing and building the assembly system had nothing to do with technology—it was a matter of space. "One challenge was the need to fit a system that has 24 stations through a set of standard double doors," Maund recalls. "Since our assembly platforms are very modular, we were able to configure the assembly process to fit within three sections: dial 1, hand-off and dial 2. By designing the machine framing to easily separate and reconnect accurately, the sections were disconnected, rolled into the clean room entrance, and reconnected."

A team effort, both internally and externally, was critical to the project's success. "Our technical team met with the customer on numerous occasions to discuss how best to design certain components with the primary goal to reduce risk and maximize success of the assembly process while maintaining product performance," says Maund. "For this application, there were features within an injection-molded component that were designed to improve automated feeding, orienting and gripping. We worked together with the customer's manufacturing engineers and product engineers in various locations across the U.S."

For more information, call Demco Automation at 888-419-3343 or visit www.demcoautomation.com.



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