

Faster palletising with the delta robot EXPT

As precise as a Swiss watch

The Swiss watch industry protects the legendary reputation of its watches with the quality label “Swiss Made”. This level of quality can only be achieved with fast and accurate automation equipment. This led Amax Automation AG to create a multifunctional palletiser – with robotic and handling systems such as the ready-to-install delta robot EXPT from Festo.

According to surveys, consumers from all over the world are willing to pay up to 50% more for a watch if it carries the quality label “Swiss Made”. This label also means, according to legislation by the Swiss parliament, that in terms of production costs more than 60% of these fine watches must have been manufactured in Switzerland.

This is one of the reasons why the Swiss watch industry is carrying out more and more of the production steps for watches and watch parts in Switzerland. Another reason is that rising wage costs are making the suppliers in low-wage countries less and less attractive. Coupled with this is the fact that these countries often cannot attain the reproducibility required for sophisticated, hand-made parts. There were also quality losses due to the precision stamped parts being handled as bulk material. This led to more wastage and higher cleaning costs.

By producing in its home market, the Swiss watch industry benefits from faster and shorter transport routes and simpler production control. The palletisers supplied by the Swiss special machine builder Amax ensure accurately sorted and precisely stamped parts for further processing such as electroplating, painting, pad printing and assembly. The high-precision parts are different for each watch model and each brand and are extremely thin, with a thickness in the range of tenths of a millimetre.

Maximum accuracy

The multifunctional palletiser is very flexible and fast. With a throughput of 120 parts per minute, it can set down up to eleven different small parts in six different lattice trays or two different JEDEC trays. The machine can be easily set up for other parts via teach-in using the control panel and the software. The subsequent steps in the process require the parts to be set down in the trays to a high degree of accuracy. The parts must always be right side

up in the trays. Two integrated vision systems and a specially developed turning system ensure that only correctly oriented parts are set down.

Hard to distinguish

The actual process of palletising then begins. The intelligent vision system SBO..-Q detects the position of the watch parts on the conveyor belt and signals this to two delta robots EXPT. The delta robot uses a specially developed vacuum gripper to →



Maximum precision is required when inserting the watch parts.

pick up the parts from the conveyor belt and to set these down, depending on the application, in either a lattice tray or JEDEC tray. This process is not quite as simple as it sounds. As the small parts are so light, a draught of air can easily change their position on the belt. What is more, they are so thin that the vacuum gripper can only just distinguish between a part and the belt. Reliable production therefore requires a handling system which provides highly precise and consistent motion sequences that don't affect the position of the parts on the belt but enable them to be gripped reliably. "This is why using

the right robot technology is crucial," explains Rolf Wirz, Managing Director of Amax.

Robot with delta kinematics

"It was clear that only a robot with delta kinematics could achieve the necessary flexibility and speed required to pick up the small parts in the working area," Wirz continues. "We have had our eyes on the Festo delta robot EXPT for a long time but didn't have a suitable project until now. The deciding factor was the optimum cost-benefit ratio and the fact that we have already been working together successfully with Festo Switzerland for many years," explains automation expert Wirz.



The delta robot uses a specially developed vacuum gripper to pick up the parts from the conveyor belt and set these down in either a lattice tray or JEDEC tray.

"Festo was asked to develop the vacuum gripper system on the basis of its experience in pneumatic automation," says Wirz. This required a great deal of know-how, since it is not easy to generate the right amount of vacuum at the right time for the gripping and ejector pulses. "It was advantageous that Festo could provide both pneumatic and electric automation technology, and that we were able to use the gripper system and the robot to create a discrete development package. This also resulted in a reduction in the number of interfaces and the associated cost," says Wirz, describing the benefits of working with Festo.

Fine-tuning in the Festo Application Centre

However, before the tripod could be put to work in the palletiser, a large number of validation tests were required. "We therefore asked our colleagues in the Application Centre at headquarters in Germany for support," says Daniel Minger, Sales Engineer, Industry Cluster Small Parts Handling and Electronics with Festo Switzerland. In order to achieve 120 cycles per minute, two delta robots would be necessary: the first one would pick up as many parts from the conveyor belt as possible, while the second one would pick up the rest. A Festo vision system with an integrated PLC would control both tripods. At least this was the theory.



The electric axis EGC-HD, known for its rigidity and precision, moves a mechanical gripper horizontally. This lifts several parts at a time, swivels 90° and sets them down in a lattice tray.

But in practice the situation was different: with complex applications, screen simulations are often not enough. In these cases, tests in the Festo Application Centre are needed. Under real conditions, and using parts supplied by the customer, the cycle times and repetition accuracy of handling systems are tested, with movements recorded using a high-speed camera from Festo. Software and hardware can thus be precisely matched.



Rolf Wirz, Managing Director of Amax (right) in discussion with Daniel Minger, Sales Engineer, Industry Cluster Small Parts Handling and Electronics with Festo Switzerland.

Two delta robots EXPT fill the JEDEC trays with a throughput of 120 parts per minute.

In the case of the Amax palletiser, the set-down accuracy in the trays was particularly critical. The laboratory conditions in the Application Centre were therefore ideal as a way of analysing the set-down accuracy and the subsequent settling times of the delta robots, developing appropriate software algorithms and optimising these in order to obtain the required cycle times.

Engineering know-how saves a lot of time

The two delta robots EXPT were supplied by Festo as a complete ready-to-install system with the robotic controller CMXR and the motor controller CMMP-AS in a suitable control cabinet. These were complemented by the intelligent compact vision system SBOI...-Q which optically detects parts on the conveyor belt and signals position data to the robotic controller. Other ready-to-install handling systems were supplied for tray changes. Electric axes ELGR push the trays forward, and pneumatic cylinders then lift and clamp them. The electric axis EGC-HD, famous for its rigidity and precision, moves a mechanical gripper horizontally. This gripper lifts several parts at a time, swivels 90° and sets them down in a lattice tray. Vertical movement is provided by an electric axis EGC.

Festo delivered the ready-to-install system solution, fully assembled and tested and with a functional guarantee, directly to the machine. "We took advantage of the engineering know-how of the Festo automation specialists, which saved a great deal of time throughout the process, especially during testing and commissioning," says Rolf Wirz, underlining the comprehensive range of services which Festo provides.

New ground for delta technology

"With our custom automation solutions, we are often working at the limits of technical knowledge and feasibility. We expect our partners to be enthusiastic about innovation and to be willing to work with us to meet new challenges and open up new applications. We found such a partner in Festo," says Wirz. "The delta robot EXPT is only one example of many which show how Festo is able to provide us with innovative products with which we can succeed in the market," says Amax's managing director. Wirz believes that the Festo tripod with its attractive price/performance ratio makes delta technology viable in areas that were previously the preserve of SCARA robots. It benefits greatly from advantages

such as low moving mass and better accessibility, while also offering high system rigidity and thus good repetition accuracy. ■

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