High-performance AX8000 multi-axis servo system maximizes machine throughput

Scanning times in sterile vial transport reduced to microseconds

SVM Automatik A/S, based in Silkeborg, Denmark, utilizes the high-performance AX8000 multi-axis servo system in the design of NESTOR, a transport machine for the pharmaceutical industry. The machine requires only microseconds to handle sterile glass containers for quality control. In addition, it can be converted extremely flexibly and quickly and is much easier to program than previous models.

The expert team in front of the new NESTOR feeding and transport system for glass vials and syringes

The small glass bottles pass by on the conveyor belt so rapidly that the eye of the observer can barely recognize the individual bottle. Every minute the NESTOR machine places 660 small, thin medical glass syringes into the inspection machine and removes them again: the sterile glass containers are placed on a tray on the conveyor belt. With incredible speed, robots grasp 10 syringes at a time and lift them safely into the inspection systemin order to check the integrity of the glass containers. Once the scan is complete, the containers that pass inspection are transported to the next processing step.

The extremely short throughput times are the key benefit of NESTOR, a machine that SVM Automatik developed with its parent company, the Stevanato Group. The pick-and-place robots perform 11 pick-and-place cycles per second in order to manipulate the delicate glass containers. In addition, the scanning time for each individual part has been reduced to a twentieth of the previously required time span.

Such high processing performance is made possible with the help of advanced servo drive technology from Beckhoff – the modular AX8000 multi-axis servo system and AM8000 servomotors – as well as the high-performance C6920 control cabinet Industrial PC (IPC). This IPC runs kinematics software based on TwinCAT 3, which offered an important upgrade from the previous machine's software.

Standardized machine platform simplifies tailor-made solutions

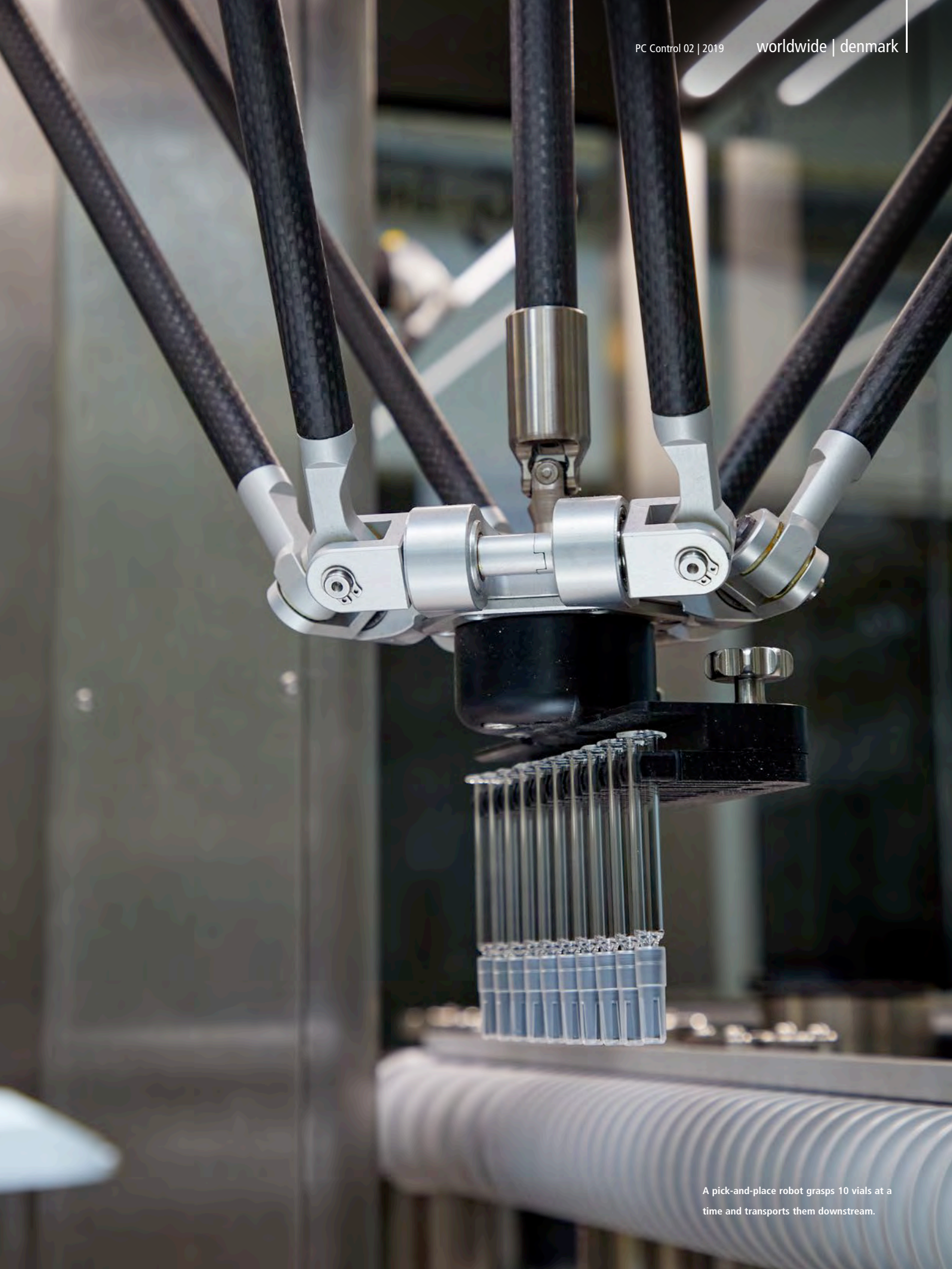
With currently about 120 employees and a turnover of around 215 million DKK in 2018, SVM Automatik is regarded as one of Denmark's largest machine manufacturers. The company, which specializes in the development of fully automatic production machines, was founded in 1974.

When the Stevanato Group took a 65% controlling interest in the company in 2016, the corporate strategy was realigned. Whereas SVM Automatik had previously focused on the development of many different custom machines for a few large Danish manufacturers, the company now supplies custom machines based on standardized modules for a broad range of manufacturers.

"Becoming part of the Stevanato Group has opened our door to the world of pharmaceutical companies. With more identical devices applied in the pharmaceutical industry, SVM has been able to develop a standard machine platform that can be used for a variety of assembly applications. The customers benefit because they get a uniform user interface for their solutions," says Jens Schou Christensen, Head of Product Management at SVM Automatik, emphasizing: "That considerably simplifies machine controller operability."

Extremely high performance is essential for success

NESTOR is a transport system that infeeds and outfeeds empty or filled glass containers to the inspection machine. The functionality of NESTOR is useful elsewhere in the process, however. The transport grippers can place workpieces into compact, sterile-operating machines for optical inspection and subsequently forward them to downstream processing stations, such as filling, random sampling, quality control, packaging and labeling.



A pick-and-place robot grasps 10 vials at a time and transports them downstream.

The transparent manufacturing of pharmaceutical products can be conveniently controlled via a Beckhoff Control Panel and a uniform user interface.

Jens Schou Christensen, Head of Product Management at SVM Automatik: "It was most important for us to be able to reduce scanning times from the previous 4 to 5 ms down to 20 µs."

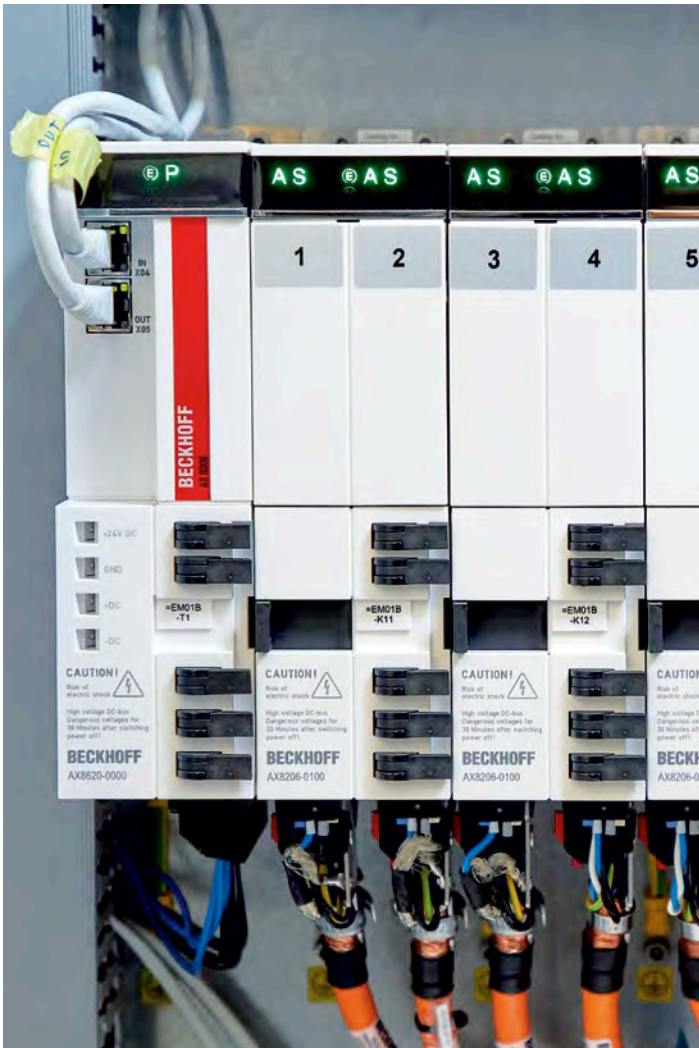
The decisive factor for the plant's success is the extremely high speed of parts transport combined with sufficient time for a constant test duration.

Compact and easy-to-handle servo controller

NESTOR has a footprint of just 2 x 1 m. The two integrated delta robots, with highly dynamic AM8000 servomotors controlled by two compact AX8000 multi-axis servo systems, move with exceptional speed and safety inside a glazed enclosure. The smooth interaction of the individual components – the C6920 IPC, fast servo drive technology and TwinCAT software – ultimately convinced the machine manufacturer to select the Beckhoff solution.

Anders Silkær Mikkelsen, Software Designer at SVM Automatik, further explains: "The new PC-based servo controller enables very fast machine cycle times. It automatically calculates the direction in which the robot grippers have to act. With the high-performance AX8000 multi-axis servo system, the robot arms move faster and with greater precision than before. Moreover, you simply put the drive's axis modules together with plug-and-play assembly like function blocks. That's new, and it optimizes both space requirements and costs. The machine is now so flexible that we can quickly convert from 1 ml to 10 ml glass containers."

The solution uses One Cable Technology (OCT), which means SVM Automatik only needs one cable to connect from the control cabinet to the motor. "We can install the drive hardware inside the actual machine. That makes it even simpler to adapt the machine design," he concludes.



The highly dynamic AM8000 servomotors (on top) form the dynamic basis for the ultra-fast transport and handling by the pick-and-place robots.

Jens Schou Christensen adds: "It was most important for us to be able to reduce the scanning times from the previous 4 to 5 ms down to 20 µs. As a result, the machine is one of the fastest on the global market. We presented NESTOR at the Interphex trade show in New York City and Achema in Frankfurt and received extremely positive feedback. We see great potential in this machine type and expect to sell 10 machines per year."

Close collaboration shortens time to market

SVM Automatik relies on TwinCAT 3 as the engineering and control software. The integration in Microsoft Visual Studio® allows simpler programming of automation objects. The Danes developed the kinematic software together with Beckhoff. This software controls the four AM8000 servomotors in a delta robot. The close collaboration with the development and support team from Beckhoff proved to be valuable for everyone involved.

"We had close communication with Beckhoff in Germany and in Denmark, and this shortened the path from idea to implementation. The dialog was good the whole time and we got all the support we needed," says Silkær Mikkelsen. "There's no doubt that Beckhoff is right at the top of the range when it comes to automation innovations and support."

The precise and highly dynamic movements of each delta pick-and-place robot are controlled by a high-performance AX8000 multi-axis servo system.

At a glance

Solutions for the pharmaceutical industry

– feeding and transport system inspecting glass vials and syringes in plants

Customer benefit

– processing of 660 glass vials per minute
– scanning time reduced from 4 – 5 ms to 20 µs
– simple machine operation and conversion

Applied PC Control

– extremely short response times with the AX8000 multi-axis servo system and the dynamic AM8000 servomotors
– compact design and space-saving installation in control cabinets
– fast commissioning through simple connection of the desired axis modules
– One Cable Technology (OCT) reduces cabling and connector requirements

Further information:

https://engineering.stevanatogroup.com/svm

www.beckhoff.dk