The SASI-30 inspection machine feeds syringes or vials through up to seven camera stations to assure that products adhere to stringent medical hygiene standards.

Faster processes, lower costs: PC Control optimizes visual inspection system

Inspection system meets highest quality standards for pharmaceutical product packaging

The production and packaging of medical products are subject to some of the strictest hygiene regulations in any industry. To ensure patient and consumer safety, any possibility of product contamination must be ruled out through stringent quality checks. Particle Inspection Technologies and Wierciszewski Controls specialize in the medical inspection and quality assurance market segments. Developed as a joint venture by the two American companies, the SASI-30 machine, a high-performance, automatic visual inspection solution for syringes and vials, can inspect 120 products per minute.

Particle Inspection Technologies (PI-Tech), developer of customized packaging systems, and Wierciszewski Controls, a company that specializes in custom machine design and advanced vision inspection solutions, pooled their expertise to build these high-tech machines. "Sharing the results of more than 30 years of combined engineering experience, PI-Tech creates robust, innovative and easy-to-use inspection machines that cater to the individual needs of each customer," states Jerry Wierciszewski, President of Wierciszewski Controls.

Eliminating human error and increasing throughput

The SASI-30 (Semi-Automatic Syringe Inspection) from PI-Tech provides comprehensive 360-degree inspection of syringes and vials, certifying that products are free from cracks, scratches, contamination or other manufacturing defects. "You could say that Particle Inspection Technologies is rewriting the book on particle inspection, which today is still mainly carried out manually," says Jerry Wierciszewski. "By combining the latest in PC-based control technology with

our companies' collected experience, we developed an innovative solution to automate visual inspection processes and largely eliminate human error."

The inspection principle that forms the foundation of the SASI-30 system is called "image subtraction", where a product test image is compared with a template image to discover defects, e.g. in the form of loose particles or defects. "There are benefits and challenges when utilizing this technology," Jerry Wierciszewski explains. The most significant benefit is that any static inclusions or bubbles on the wall of the vial or syringe are reliably ignored, since they do not represent a quality defect. Only the problem particles that are in motion are considered as potential rejects. "Reliable inspection performance requires the perfect coordination of machine control and vision system control," says Jerry Wierciszewski.

Highly sophisticated error detection via seven cameras
To achieve this highly-reliable error detection, the SASI-30 employs seven separate cameras, each performing a specialized part of the inspection process. At the start of the inspection run, Camera 1 provides detection of scratches and Camera 2 looks for contaminant particles against a light background. Moving on, Camera 3 checks for cracks in vials and syringes and passes the products on to Camera 4 for contaminant particle detection against a dark background. Depending on the particular application, Cameras 5, 6 and 7 join the process at this point. Camera 5 provides inspection of the printed labels. Cap and/or label position inspection falls to Camera 6, while Camera 7 completes the process with a thorough inspection of the syringe plunger, where applicable.

EtherCAT and TwinCAT ensure exact timing in image processing
The centerpiece of the machine is TwinCAT automation software. It controls the machinery in concert with multiple USB-3 cameras present in the system. "The SASI-30 system acquires 50 images every 20 ms, buffers them in memory, and displays the processed images to the user at 50 ms intervals. What makes the system unique is that it allows the user to process the images in manual mode at up to 30 images per second, so that they can be captured by the human eye. In automatic mode, up to 600 images per second can be processed," says Jerry Wierciszewski. When achieving 360-degree inspection of a traveling syringe while it rotates, exact positioning and precise timing are prerequisites for such fast image analysis. "This can be realized based on the speed and positioning accuracy of TwinCAT NC PTP software and EtherCAT communication," points out Jerry Wierciszewski.

Compact and easy to program: drive technology from Beckhoff
AM8000 series servomotors combine with AX5106 EtherCAT Servo Drives and compact EL7201 servo terminals to provide motion control for the inspection system. "The EL7201 terminals, measuring just 12 mm wide, are exceptionally compact and therefore ideal for space-constrained applications," as Jerry Wierciszewski explains. "We chose the Beckhoff servomotors and drives because they offer an excellent price-to-performance ratio and ease of integration. Automatic device configuration through TwinCAT saves us weeks of programming time."

The servomotors of the AM30xx and AM81xx series provide robust, highly-accurate motion control.

High performance gains and cost reductions at the same time
Jerry Wierciszewski regards the system control based on EtherCAT and TwinCAT as a milestone in the company development of PI-Tech: "With the PC- and EtherCAT-based automation solution, we are able to achieve much higher benchmarks than we previously thought possible." In addition to extended functionality and higher performance, Jerry Wierciszewski also welcomes the reduction in component costs by approximately 30 percent. "With the combined benefits of powerful operation and a lower price point, we are able to provide exceptional value to our customers," he continues. "With even more plans to integrate Beckhoff solutions moving forward, including an upgrade to the more advanced TwinCAT 3 automation software platform, the innovations have by no means ended," concludes Wierciszewski.

Further information:
www.particleinspectiontechnologies.com
www.beckhoffautomation.com