MITSUBISHI ELECTRIC ROBOTS HELP DRIVE QUALITY CONTROL IN HIGH-SPEED INHALER TESTING LINE

A leading pharmaceutical manufacturer specialising in asthma inhalers has transformed its in-line testing operations thanks to an automated quality control solution developed by Mitsubishi Electric and leading system integrator Optimal Industrial Automation. The innovative system uses two Selective Compliance Articulated Robot Arms (SCARA) and system-matched components, such as a MELSEC-iQ platform PLC and MAPS SCADA software.

The fully automated quality control solution increased leak detection rates for in-line pharmaceutical gas analysis during inhaler production by 30 times, significantly reducing manufacturing cost and waste generation.

Delivering quality medicaments is a must for pharmaceutical manufacturers, as it ensures that the treatment is safe and therapeutically effective. When producing metered dose inhaler (MDI) canisters, typically used for respiratory drug delivery for people suffering from Asthma, it is essential that all products released into the market can generate a suitable aerosol of a drug formulation. To do so, it is necessary to fill the canisters with an optimum level of liquefied gas under pressure, then test for gas leaks and dispose of any faulty canisters.

While detecting gas propellant leaks in MDI canisters is of utmost importance, conventional, non-automated methods suffer from a number of limitations. Automation can address these issues and help pharmaceutical manufacturers to improve their profitability. In particular automated testing helps move away from manual, off-line leak inspections – which slow down production and reduce overall volumes. Embracing in-line or at-line testing means operators do not need to physically collect samples and can achieve a rapid uplift in productivity.

In addition, by installing automated systems it is also possible to increase accuracy, by testing each individual canister. Conventional leak detection is conducted as an end-of-line test on one or a few samples from each batch. This means that if a single canister is defective, the entire batch may be scrapped, resulting in high wastage, cost and poor efficiency. On the other hand, if the sample examined passes the quality control test, this doesn't exclude the possibility of off spec items remaining in the batch, which may enter the market.
Automation brings a breath of fresh air in inhaler manufacturing

These benefits were particularly appealing to a forward-looking manufacturer of pressurised MDI (pMDI) canisters, that wanted to drive performance in its quality control strategies. To implement a reliable, advanced system, the pharmaceutical company contacted Optimal, an expert in process control and system integration.

Nigel Penny, Project Manager at Optimal Industrial Automation, comments: "We knew that the application would require a high level of accuracy and repeatability in position control to effectively move and monitor the pMDI canisters. Mitsubishi Electric offers very reliable and accomplished small robots which are easy to synchronise and control, using powerful controllers and intuitive software. We also appreciate the technical support and assistance offered, which helps to deliver the type of advanced tailor-made solutions we specialise in."

The innovative, automated leak detection system developed by Mitsubishi Electric and Optimal consists of a carousel conveyor running at constant speed and composed by 86 cavity holders, known as 'pucks'. These hold the individual canisters and transport them through a tunnel, designed to help concentrate any gas leakage by sealing the top and bottom of the pucks. A sensitive laser gas analyser is used to test the air surrounding the canisters. If an item is found to be defective and leaking even a tiny amount of propellant gas it is discarded. Operators can monitor the process in real-time via Mitsubishi Electric's MAPS SCADA platform, which shares information with the gas analysers.

The importance of fully synchronised robots

The system uses two Mitsubishi Electric FR-Series four-axis SCARA robots, which position the canisters correctly into the moving puck as well as place all items that pass through the leak testing onto an outfeed conveyor. The 'pick-and-place' robots are controlled by a powerful iQ Platform PLC to ensure exact synchronisation. This allows the robot to handle moving canisters without the need to stop the conveyor, avoiding any interruption on the line.

Martin Gadsby, Director at Optimal Industrial Automation, explains: "Synchronisation on this line is critical because the canisters are unstable and may topple unless the motion of the robots and conveyors matches perfectly." Steve Kirby, Key Account Manager at Mitsubishi Electric, adds: "The iQ series PLC is ideal to meet the levels of speed and
accuracy required by the system. The controller executes command processes in a matter of nanoseconds. It also offers a high-speed data logger module, where the sampling function is synchronized with the sequence scan.

This latter aspect further helped to create a comprehensive and intelligent set up. In effect, Mitsubishi Electric and Optimal allowed the PLC to interact with the gas analyser, process and log the results of each individual pMDI test as well as offering exportable reports of canister analytical data for each batch.

Bringing quality control to the next level

The resulting leak detection system, now fully operational, can process 180 pMDI canisters per minute and reject individual defective items, rather than entire batches. As a result, pharmaceutical manufacturers could benefit from substantial reductions in waste generation, whilst optimising its use of resources and the overall production plant.

Nigel Penny comments: "It has been a real pleasure working with Mitsubishi Electric and we are extremely satisfied with the project’s outcome. The company's extensive capabilities in factory automation were crucial to deliver the high level of performance and accuracy required by the production and testing line. In addition, the expert engineers established a close collaboration with Optimal and the end customer in order to deliver a highly effective system and a smooth handover."

Steve Kirby concludes: "We are delighted to have been involved in this project and help set up a highly effective system. The application proves how advanced robots and automation equipment can improve quality control in highly regulated sectors such as the pharmaceutical and life science industry."

Image captions:

Image 1: A leading pharmaceutical manufacturer specialising in asthma inhalers has transformed its in-line testing operations thanks to an automated quality control solution developed by Mitsubishi Electric and Optimal Industrial Automation.

[Source: Optimal Industrial Automation Ltd]

Image 2: The system uses two Mitsubishi Electric FR-Series four-axis SCARA robots, which position the canisters correctly into the moving puck as well as place all items that pass through the leak testing onto an outfeed conveyor.

[Source: Mitsubishi Electric Europe B.V.]

Image 3: The SCARA robots are controlled by a powerful iQ Platform PLC allowing them to handle moving canisters without the need to stop the conveyor.
Image 4: Mitsubishi Electric offers very reliable and accomplished small robots which are easy to synchronise and control, using powerful controllers and intuitive software.

Image 5: Each robotic arm is connected to a Mitsubishi Electric robot controller, which communicates with iQ series PLC to deliver accurate and synchronised movements.

Image 6: Operators can benefit from greater process insight, as they can monitor the automated line and interact with it to look at data logs and make on-the-fly adjustments.

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About Optimal Industrial Automation Ltd

Optimal Industrial Automation has more than 30 years' experience building, integrating and optimising manufacturing automation systems for challenging and highly regulated industries. Typically food & beverage, chemical, pharmaceutical, life-science and other high-value process and manufacturing industries.

The demands being placed on manufacturers in relation to production costs, product quality and business sustainability are ever increasing; hence, the company’s primary aim is to deliver measurable improvements in all these target areas.

Optimal employs a large technical team qualified in software, electrical, electronic, vision and control hardware disciplines. As part of the implementation of these services, Optimal has also developed a world-leading integrated Print and Inspect system product – synTI ®.

About Mitsubishi Electric

With nearly 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite
communications, consumer electronics, industrial technology, energy, transportation and building equipment. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of approximately 40.7 billion dollars* in the fiscal year that ended on March 31, 2019.

Mitsubishi Electric Europe, Industrial Automation – UK Branch is located in Hatfield, United Kingdom. It is a part of the European Factory Automation Business Group based in Ratingen, Germany which in turn is part of Mitsubishi Electric Europe B.V., a wholly owned subsidiary of Mitsubishi Electric Corporation, Japan.

The role of Industrial Automation – UK Branch is to manage sales, service and support across its network of local branches and distributors throughout the United Kingdom.

*At an exchange rate of 111 Yen = 1 US Dollars, last updated 31.03.2019 (Source: Tokyo Foreign Exchange Market)

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