

Vision systems advance quality control capabilities

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In the pharmaceutical and nutraceutical industries, every pack of oral solid dosage (OSD) form and its content must be carefully inspected to guarantee that it meets quality standards and complies with regulatory requirements. While traditional control methods have considerable limitations, by adopting advanced vision inspection methods, manufacturers can transform blister pack inspections into an extremely accurate, precise and efficient operation.

Matt Jones, Account Manager at Optimal Industrial Automation, looks at how state-of-the-art vision systems can advance quality control activities on blister packs.

In the world of pharmaceuticals and nutraceuticals, packaging is paramount. Among the variety of packaging solutions available, blister packs have emerged as a popular choice due to their versatility, cost-effectiveness, and tamper-evident features. The individual pockets on the packs protect each OSD form, ensuring precise dosing, tamper evidence and prolonged shelf life. However, their effectiveness depends heavily on the accuracy of the packaging process, therefore, their inspection is a crucial task.

This quality control activity should detect defects in OSD forms, such as chipped or broken tablets as well as any foreign objects on them, and ensure that the right medicaments are being packed. In particular, for lines that process multiple medicines, there should not be any mix-up. It is also vital to spot any empty pocket or OSDs that have been incorrectly positioned within the blister packaging. Following this analysis, any off-spec blister pack needs to be discarded.

Traditional quality control methods, such as manual inspections or basic machinery, often fall short in guaranteeing the required level of precision and reliability. Furthermore, they can contribute to extended, ineffective cycle times. Industrial automation solutions that leverage high-power vision systems can play a key role in effective and responsive inspection of blister packs.

The power of vision system-based inspections

Vision systems typically combine cameras, sensors, lighting and advanced software to capture and analyse images of blister packs as they move through production lines. More precisely, the process begins with high-resolution cameras and lights strategically positioned to generate and capture detailed images. The number and their placement depend on the complexity of the inspection required and the specific setup. For example, various lighting techniques can be used. These include diffuse, direct and backlighting, to eliminate shadows, reflections or other image distortions.

Once the images are captured, they are processed by powerful algorithms. These are designed to detect and analyse specific features, irregularities, defects and other attributes of the blister packs - and the tablets within - that could compromise product quality or safety. The software compares the images against predefined criteria to determine whether each pack meets the required quality standards.

Blister packs that pass the inspection are allowed to move to any downstream operation, while those that have been flagged are automatically diverted and rejected from the line. This ensures that only compliant packs make their way to the next stages.

Vision systems can also provide detailed data and documentation of the inspection process, including images of inspected blister packs, timestamps and records of any defects detected. This information can support comprehensive reporting and quality auditing activities to ensure regulatory compliance. Even more, they support traceability strategies.

The future ahead

With the capabilities of artificial intelligence (AI) evolving considerably, vision systems are deemed to become even more complex, accurate and smarter. For example, they can integrate increasingly advanced spectral functions, sensors, pattern recognition algorithms and data processing functions. Thanks to these, they can detect subtle anomalies that may not otherwise be identifiable.

Even more, thanks to the latest progress in unsupervised machine learning and deep learning, creating accurate vision systems is becoming quicker. This ultimately streamlines key project and helps end users benefit from quick returns on investment (ROI). Additionally, the development of innovative 3D vision technology will allow vision systems to provide even more detailed and accurate quality control, particularly for complex blister pack designs.

Case study: integrating advanced inspection machines in existing facilities

When a tablet manufacturer was surprised by the sudden breakdown of its three blister pack inspection machines, it was necessary to manually scrutinise products as a temporary yet highly expensive solution. To overcome this issue and restart automated operations, the company contacted Optimal Industrial Automation, which could provide responsive, localised support and deliver a robust, future-oriented setup.

The new inspection machines developed by the industrial automation specialist consist of two vision systems monitoring the products as they move on a conveyor. The first component identifies a faulty item and tracks it, while the second, located at the end of the line, rejects any unsuitable pack.

The three identical solutions look for colour, shape and dimensions, as well as absence of OSD forms. They are also highly versatile, as they can be used by the manufacturer to monitor different medicaments.

Finally, the setups were seamlessly integrated with existing assets on the shop floor. In particular, to support the advanced functions of the new machines as well as the needs of the remaining equipment, Optimal replaced the controller with a more powerful PLC. This can handle data-intensive operations while offering a scalable framework that enables future upgrades.

Image captions:

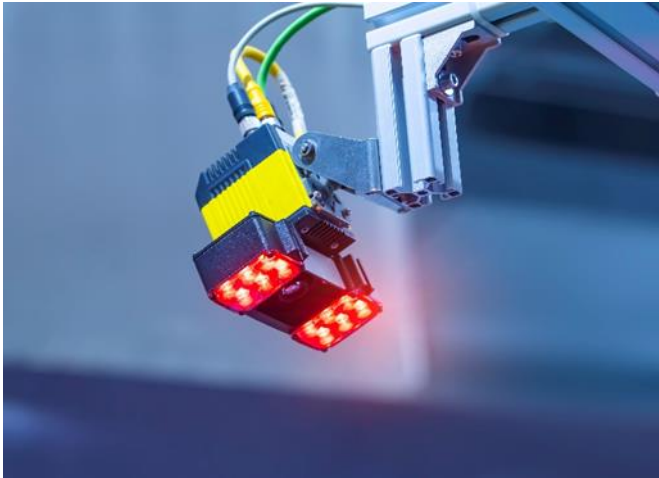


Image 1: State-of-the-art vision systems can advance quality control activities, improving speed, accuracy and end results (Image source: iStock: 1607466465)



Image 2: Optimal Industrial Automation developed new blister pack inspection machines consisting of two vision systems to support a tablet manufacturer that was surprised by a sudden breakdown (Image source: iStock: 1285400923)

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About Optimal Industrial Automation (OIA)

Optimal Industrial Automation has more than 30 years' experience building, integrating and optimising manufacturing automation systems for challenging and highly regulated industries. Projects are typically for the pharmaceutical, life science, chemical, aerospace, green energy, food & beverage and other high-value process sectors. The company's primary aim is to deliver measurable reductions in production costs, while finding substantial improvements in productivity, product quality and business sustainability. Part of its capability in achieving this aim is experience in the implementation of Optimal's print and inspect system product – synTI®, plus sister company Optimal Industrial Technologies' leading PAT based process management software platform synTQ.

The company employs a large technical team qualified in software, electrical, electronic, vision and control hardware disciplines. The team has built and developed individual machines and process skids to meet regulations such as FDA 21 CFR Part 210/211 – Pharmaceutical Industry GMPs, and FDA 21 CFR Part 11 – Electronic Records and Signatures. It is also ISO accredited and has years of experience working within GAMP guidelines.

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