

Brand protection looks to Tailored solutions from inspection systems

TAILORED SOLUTIONS IN METAL DETECTION, X-RAY AND VISION SYSTEMS ARE INCREASINGLY RESPONDING TO CONCERNS ABOUT BRAND – AS WELL AS CONSUMER – PROTECTION.

The online contaminant detection market continues to grow, both in metal detection and the more costly X-ray. And at the same time, X-ray and the more cosmetic checks offered by vision systems are also establishing an important role in broader quality control.

X-ray systems have attracted a lot of the limelight – just as much, it seems, for the capacity to inspect closed packs for missing or broken items as the ability to uncover fragments of glass, stone and bone that elude metal detectors. But with a price tag generally in the £25,000 to £30,000 range, the costs of X-ray still leave it well above the £6500 to £7500 that might be paid for a combination of metal detector, conveyor and reject mechanism.

For many, this gap means that X-ray and metal detection remain quite different types of market. As Mike Randall, executive chairman of Lock Inspection Systems points out, entry into this market involves a considerable investment by the supplier. “We see it as quite a different market because of its capital cost. And most of the time, X-ray is not a competitor to metal detection,” he explains.

So, unlike many other companies in the inspection equipment sector, Lock has resisted the temptation to enter the X-ray market. This, the company believes, allows it to present itself as a specialist able to channel valuable development resources into its core technology.

Nevertheless, there is of course one particular area where metal detection and X-ray tend to compete directly: detecting metal in foil packaging. Whether it is ready meals, cheese or petfood, the foil-packaged market is a strong one in the UK.

Metal in foil clearly presents problems for metal detection. “Stainless steel has always been the target, and the most difficult to find, which is why we developed our triple-frequency



Breakthrough claimed: Sartorius Observer is aimed particularly at inspecting aluminium foil packs

detector,” explains Mike Randall. But he recognises that X-ray has the edge when it comes to identifying other metals, such as bronze, brass, copper, or aluminium itself, which have similar or identical characteristics to the foil pack itself.

New sensor technology

For certain kinds of foil-wrapped pack, weighing and metal detection company Sartorius claims to have made a “breakthrough in sensor technology”. The flatbed Observer has an aperture height of 45-50mm and is said to be able to detect stainless steel in low-profile aluminium foil packs.

“The principle is that the foil itself is ‘transparent’ from a magnetic point of view. Most stainless steel parts have been worked at some stage, and do have some magnetic qualities,” says brand manager Andrew Hallitt. “On our system, any contaminants are pre-magnetised

very strongly, before being sent over the flatbed detector.”

Sartorius also says that the metal detector – with sensor technology and evaluation electronics jointly developed by STL in Germany – has been designed to cut out interference and ‘noise’ from the surrounding environment.

One area where metal detection specialists have worked to improve performance in more difficult inspection tasks has been in multiple-frequency systems. Indeed, Sartorius is among several suppliers with a multi-frequency system on offer. Andrew Hallitt points out that manufacturers packing products with varying degrees of conductivity are now able to ensure that machine sensitivity can be optimised across their range.

Lock’s triple frequency Met 30+ 3f triple frequency detector operates at three crystal controlled frequencies – high medium and low –



Triple frequency: The Met 30 + 3F metal detector from Lock Inspection

selecting the most appropriate frequency for the product and packaging. So when inspecting product wrapped in film the detector will automatically select high frequency, while for product wrapped in metallised film it will operate at low frequency.

Cintex, which was recently acquired by Loma Systems' parent company, has taken this strategy one step further, and produced what it says is the "first ever metal detector with true variable-frequency capabilities." The company argues that by operating at any frequency between 40kHz and 900kHz the Sentry VF offers the maximum sensitivity for a whole range of different products, both wet and dry.

But whatever the type of machine – completely variable-frequency or multi-frequency – the control and management philosophy is vital.

For example, John Craig, global product manager for contaminant detection at Thermo Electron Corporation, sees the future of metal detection in networks where units will not only be calibrated for possibly dozens of different products, but will also switch automatically to the correct setting.

Integration into Profibus, Ethernet and other networks with SCADA control will increasingly be required by larger customers, Mr Craig argues. Data recording, reports, trend analysis and traceability then all become possible within a factory-wide system.



Variable frequency: Cintex Sentry VF operates at any frequency between 40 and 900kHz for maximum sensitivity

Indeed, the ability to spot a contamination trend and harness this for diagnostic purposes is of crucial importance, he explains. Thermo Electron's own AuditCheck system, which provides an automatic, programmable cross-check on metal detector performance, is designed to dovetail with just this type of network.

"What the customer wants is an instrument with an on/off switch," says John Craig. "The ultimate inspection system will simply sit on the line and inspect."

In general terms, he believes that there is still plenty of scope for continuing to improve metal detection performance, even though it is 55 years since the technology was born.

Systems support development

He points, for example, to the considerable amount of development work that has gone into the systems supporting the metal detection function, such as faster microprocessors, but also to more fundamental ways in which metal detection can be improved.

"What the customer wants is an instrument with just an on/off switch. The ultimate inspection system will simply sit on the line and inspect."

"For example, we have just launched a product for pharmaceuticals which takes quite a new approach to the fundamental coil system design," he explains. "There are still opportunities for increasing performance in metal detection."

Also in the pharmaceutical sector, Lock Inspection Systems has recently launched a system that meets the FDA's requirements for 21 CFR Part 11 compliance, whereby all changes to settings and production reports

have to be secure from unauthorised change, with operator sign-in checked and logged.

Mike Randall at Lock believes the importance of developments in metal detection should not be underestimated. "It is true that these developments involve refining the sensitivity of

Blister test can be

Although the Blue Dye test has long been a popular method for identifying leaks and weak seals in blister packs, its test results rely on the operator's subjective judgement and, consequently, cannot be validated.

Sepha's solution is the BlisterScan leak tester on which a pass or fail indication for each pocket is shown on the screen, making the system fully validatable, since the operator has no influence over the results. The process is clean, dry and takes 2 minutes to detect leaks and weak seals as small as 5 microns across the full blister web.



Fast change: Fortress Phantom E pipeline unit

our systems by small and progressive amounts – but nonetheless, progress is being made,” he says, noting in particular that Lock’s triple-frequency range has been well-received by the target industries.

He adds: “There have also been developments in making the technology more compact, easier to clean, and improving data communications.”

Recent product launches in metal detection include Fortress Technology’s new Phantom E-Type pipeline system for handling meat. The complete assembly can swing out of the way for fast changeover, while operator controls can be mounted on the detector or located remotely.

Safeline underlines the high frequency at which its range of Signature metal detectors operate. At 850kHz, this is between three and eight times the frequency used by most systems in use today, says Safeline. According to the company, this high degree of sensitivity allows



Inspecting entire cases: Loma SnaX3 X-ray system is aimed specifically at the snacks market

the system to detect even fine fragments and shavings of metal, including stainless steel.

The supplier says that its metal detectors are also able to inspect clusters of products with similar signatures. This allows inspection of a wide range of products with the minimum number of machine settings, making operation easier and quicker with no compromise in machine sensitivity.

Mettler Toledo has integrated Safeline metal detection into its Garvens CombiChecker combined checkweigher and metal detector. The use of zero metal free zone technology allows the mechanical integration of the metal detector with the checkweigher’s infeed conveyor, says the company.

X-ray inspection

The impulse to combine contaminant and weight analysis is nothing new, and this crossover is one of the potential strengths of

X-ray. As John Craig at Thermo Electron explains, while a checkweigher will ascertain the overall weight – and ensure conformity to legal requirements – X-ray can take this process a step further. “You can not only look to see that all the components are there, but you can also effectively do a weight analysis to 1-2 per cent accuracy, checking whether items are there in the right ratios,” he says.

It is not difficult to find examples of areas where X-ray can act as a valuable back-up to checkweighing. “A checkweigher may pass a two-layer box or chocolates, even where one is missing from the bottom layer,” says Mr Craig. “This would not be illegal, but the consumer is likely to feel wronged. The same is true with broken biscuits. The legal weight may be fine, but they will be seen as substandard product.”

Despite a drop in the price of an X-ray system from, in broad terms, £50,000 five or six years ago to around £25,000 now, say suppliers, this downward trend is not open-ended, and the technology remains expensive in comparison with metal detection.

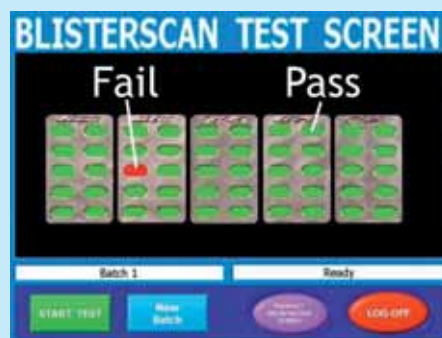
“I’m sure the gap will close to some extent, but not altogether,” argues John Craig. “Are we going to see the decline of the metal detector? The answer is, emphatically not. There is no way that X-ray will come down to match the cost of metal detection.”

But unlike vision systems, he maintains, X-ray offers substantial cost-saving benefits: in process control as well as quality control. Here again, as with metal detection, these benefits can most clearly be realised within some sort of SCADA network where data can be recorded and communicated. “There has been a definite increase in the need to provide this type of

easily validated

Another key feature of BlisterScan is that it identifies exactly which pocket is leaking, thereby pinpointing the location of any quality inconsistencies in the packaging material or the sealing process. This, says Sepha, makes BlisterScan an essential at-line diagnostic tool, as it quickly alerts operators to problems, allowing them to stop the line and investigate immediately.

Apart from being a generally messy process, the Blue Dye test destroys blisters so that test samples and their contents cannot be re-used, whether they leak or not. In contrast, Blister-



Scan is non-destructive and allows blisters that ‘pass’ the test to be re-introduced to the blister line. Product from failed blisters can be deblistered intact and repacked.

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capability, and so help to squeeze even an additional 0.1 per cent efficiency out of the line," he reports.

Clearly, a key area of success for X-ray remains the detection of non-metallic contaminants. To underline the safety issues here, John Craig instances the niche sea urchin meat industry in Chile, where the use of X-ray technology has been required. "The meat is shipped to Japan, where it is a delicacy," he explains. "But the spines are extremely poisonous, so the product has to be scanned to be absolutely sure there are none present."

Specific developments in the X-ray contaminant detection area include Loma Systems' X3 pipeline inspection unit, designed for meats, pastes, dairy products, soups and sauces. Advanced filtering techniques mean that even low-density items such as calcified bone can be detected, says Loma.

The X3's AutoTrack image-processor is said to set the scanning module automatically to the density of the food being inspected, reducing set-up times and the number of false rejects. Here again, says Loma, a self-test system is in place, avoiding the need to introduce trial samples into the pipe.

Loma has also announced a new end-of-line X-ray unit for the snack industry, able to check entire cases of bagged product such as crisps.

Eliminates individual units

SnaX3 is said to eliminate the need for individual inspection units on each line, detecting a wide variety of contaminants including metal, glass, stone and high-density plastics, in cases containing products from different production lines. It is also able to highlight flavour and sugar clumps in low density snack and cereal products.

To do this, the SnaX3 system incorporates multi-layer image processing that adapts the scanning equipment to the characteristics of different food products, while the AutoTrack detection software calibrates the machine with no need for downtime.

"The SnaX3 does the job that has been traditionally carried out by a number of freefall metal detectors and in most cases at less cost and disruption," says Alan Johnson, X-ray product manager at Loma.

John Craig at Thermo Electron feels that in the future, greater resources will be put into designing much more tailored X-ray systems and, for example, models that particularly target the metal-in-foil market.



Vision system: New Delford VS200 provides 100 per cent verification of label data and positioning

"The challenge is to develop X-ray systems which are suited to a specific application," he says. "I would think that over the next five years or so, you're going to see application solutions based on X-ray, rather than generic X-ray systems looking for applications." Otherwise, he points out, end users finish up with a range of features that are often irrelevant to their specific purpose, and which add to the overall cost.

The idea of combining a thorough detection system for all types of contaminants with bolt-on quality control tasks is obviously an attractive one. But some metal detection suppliers warn that setting an X-ray machine to perform both types of function is likely to be extremely difficult. At the very least, it is unlikely that performance in both areas will be optimised.

Indeed metal detector and X-ray system suppliers report more X-ray systems being installed in end-of-line locations rather than at pre-packaging stages of the line, often checking that all the components of a composite pack are in place. "For many end users, brand protection has almost become more important than consumer protection," says one supplier, adding that the supermarkets are increasingly pushing suppliers to include this type of quality check.

In part, at least, this shift in the way that X-ray is seen – and used – is a response to the growing importance of packaged food ranges with a premium presentation inside and out.

Vision inspection systems

When it comes to vision, the availability of systems on the market appears not to have taken off like X-ray in recent years. And clearly as a

method of contaminant detection, it cannot compete with either of the two major technologies. But as other aspects of quality control become more important, and the aesthetics of a product become an ever-greater priority, suppliers and end-users alike are taking the technology more seriously.

In particular there is more and more pressure from retailers to check that information is where it should be, especially in barcode form.

For example, Delford has introduced the VS200 single camera inspection system that provides 100 per cent verification of label information and positioning.

A triggered camera captures images from the pack passing on a conveyor and can identify up to 12 pre-programmed fields for verification. Typically these fields would be price, weight, barcode, traceability, sell by date, batch codes, unit prices and packing codes. It is also possible to verify the readability of the barcode for point of sale assurance.

Faults identified on screen

Label positioning and orientation can be checked against limits set independently for each product while secondary labelling, such as promotional and flash labels, can also be included in the verification process. Captured images are displayed on a pack-by-pack sequence on a full colour screen with any faults identified visually, along with a change to the screen background colour. If required, rejected packs are removed from the line by an air-operated reject device.

The VS200 can also be interfaced to any

INSPECTION

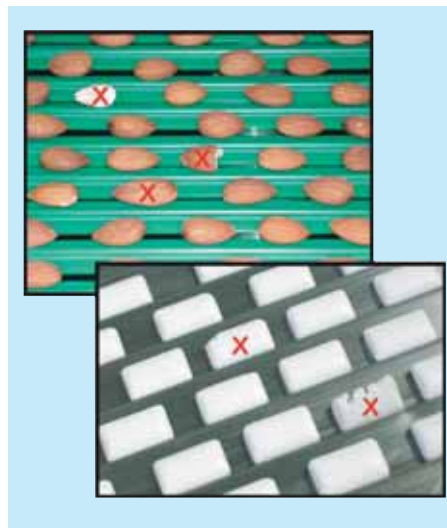
Delford weigh-price labeller to check that all variable information for each pack is correct.

Vision systems are also now capable of indicating a physical fault with the pack. For example, image-processing specialist Cognex UK has worked with German quality control company CLK and Sealed Air Corporation division Cryovac to develop a vision-based seal-testing system for food.

Cryovac wanted a contact-free 100 per cent in-line leak test for vacuum-packed sandwiches. Passing in front of the camera at a rate of around 60 a minute, the sandwiches are checked against defined standard reference values. If any image diverges from these standards, the pack is isolated and separately inspected on a seal-integrity checking unit.

According to Cognex, the system adapts well to changes in the production process or the introduction of new sandwich products. The company believes the same approach could be applied to seals on other types of oxygen-sensitive products.

Radix Systems is launching two new vision-based inspection systems at the Total exhibition: the Autosort AS-P316 grader, which sorts confectionery products such as chewing gum pel-



Sorting by shape and size: Radix Autosort AS-P316 grader handles confectionery products

lets or nuts primarily by size, and the MC-A322 colour sorter for small items such as herbs and seeds.

The AS-P316 size grader is able to handle some 50,000 objects a minute and offers accuracy to better than 0.5mm. Product accepted onto the machine's multi-lane conveyor is also checked for shape, integrity and colour and any defective or out of specification pieces removed by air blast ejectors.

The machine can be equipped to grade into ranges – such as large, medium and small –

while the Radix 3DF option allows accurate checks on length, width and height.

Small colour defects in goods such as herbs and seeds are identified and removed by the new Autosort MC-A322, which is able to work to a resolution better than 1mm. The use of four different wavelengths, from ultra-violet through the visible light spectrum to infra-red, also helps find foreign bodies and contamination. ■

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