



Case Study

THE ROLE OF METAL DETECTORS IN BULK PRODUCTS

In recent years the introduction of the Food Safety Act and the demands imposed by retailers have led to food manufacturers installing factory-wide HACCP systems. As a result, the role of metal detection has changed dramatically. It is no longer purely an end of line check; instead, it increasingly forms an integral part of the production process.

Throughout the production process sweets and snack foods freely flow as a uniform bulk product. They are not packaged until the very end of the process and when they are packaged it is often inside metallic packaging. To ensure that such products reach the consumer metal free the product (and its ingredients) should be checked for metal at every point where metal contamination could conceivably occur. Metal detection ideally forms a seamless part of the free-flowing production process. Most metal detectors used in the snack food sector are gravity-fed or "free-fall" in format, allowing product to flow via a pipe directly through the aperture of the metal detector search head.



How a metal detector works

As product passes through the detector aperture, the metal produces an electromagnetic field similar in operating frequency to that used in radio broadcasting.

Inside the head are three coils that surround the aperture. The central transmitter coil is driven by a powerful oscillator that generates a high frequency field within the aperture. Spaced equally on each side of the transmitter and receiving the signals produced by the transmitter coil are two receiver coils, which are connected so their induced voltages cancel.

If perfectly balanced, this arrangement produces a zero voltage output. But if any metal objects move into the aperture they will interact with the field and send out an unbalanced signal.

Rejecting contaminated product

This unbalanced signal is used to trigger an automatic reject device that removes the contaminated product from the line. In the case of gravity-fed products, contaminated product is rejected by means of a high-speed mechanism, which ensures that metal contaminants are diverted out of the product flow with the absolute minimum of product wastage.

Placing the metal detector in the process

The positioning of the metal detector in the process is all-important. An essential point for detection in a production process is at the raw product stage where bulk ingredients require inspection

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before addition to the process. The bulk product is delivered to a silo and is gravity fed through the metal detector. In HACCP terms, this is a critical control point, as the in-coming bulk ingredient is a potential source of contamination: if the product is not checked here, the quality of the end product could be affected. It also has the benefit of being at the earliest point in the line, so contaminated product is rejected before value is added by processing and before the contaminant disperses through more product or damages delicate machinery.

The final point for the inspection of snack foods is in between the vertical form-fill-seal machine and the multi-head weigher at the end of the line. This provides the final check on the product before it is safely sealed in their final packaging.

Guaranteeing sensitivity

Correct compliance with HACCP demands that all metal detectors are correctly tested at regular intervals in order to ensure that the system is working at its optimum. Loma's Performance Validation system (PVS) ensures that effective and efficient testing practices are carried out by automatically prompting the operator to carry out equipment sensitivity checks at pre-set intervals.



The Canadian company ADM Cocoa of Ontario makes chocolate chips for all of N. America's leading bakers so effective metal detector validation is a key element of the monitoring of the performance of the production line. Firstly, Loma's Performance Validation System, makes sure the metal detector is being tested with the right kind of sample and records the results.

Both the bulk and finished product detection systems are fixed with light indicators. A yellow light goes on at programmed intervals: at ADM Cocoa it is every four hours, to indicate that the machine needs to be tested. If the test is not performed within a half-hour window, a red light comes on and it is recorded that the test was not completed. While it is normal to log an occasional reject every four to eight hours, if suddenly the rate increases to one every half-hour, it is an indication of a recurring problem.

At ADM Cocoa, all of the company's metal detectors are networked to a central PC through LomaNet a data collection network for multiple metal detector lines . The system automatically collect the records of each test from the metal detectors and produces records on a single central printer or PC.

ADM engineering and maintenance manager Robert Gerritsen says the Loma system not only allows ADM Cocoa to perform more accurate and sensitive metal detection on their production lines, but by having the ability to network all of the systems and collect data, they can monitor the entirety of their operations more effectively.

"It's easier to discover trends because of the higher sensitivity and because it's being recorded", he says. "There's the ability to store data, determine how often it is rejecting and what we found in the rejected product."
