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Food Industries

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Why a Metal Detector?
The task of metal detectors is to detect metallic foreign bodies in non-metallic products, and they are thus used in many industrial production processes, particularly in the food production sector, where great demands are made on product quality and hygiene.

Pure Raw Materials  Incoming Inspection
Producers who can precisely verify raw materials are able to reduce non-conformance costs by making early diagnoses and also by assessing the quality of their suppliers.

Pure Finished Products  Final Inspection
The customer shall receive only pure products having the highest degree of purity which can be realized on a technical basis.

Protection of Production Facilities and Process Control
Metal pieces having managed to enter the production chain can severely disturb or even destroy production facilities. Downtimes of machines and plants can negatively affect the constancy of product quality and quantity.

HACCP  Critical Check Point for Metallic Foreign Bodies
A critical control point refers to a point within the production chain where lacking supervision can mean a non-acceptable risk to human health.

Function
The metal detector operates on the basis of an inductive measuring principle. A high-frequency electromagnetic alternating field is generated by a transmitter coil. If a metal piece passes through the metal detector, the field experiences a change corresponding to the magnetic and electrical properties of the metal piece.

The change in the field is measured by a balanced pair of receiver coils, subsequently reprocessed and digitally analyzed by the control unit.

This measuring principle reacts to electrical conductivity and magnetism and is therefore able to recognize all types of metals, i.e. non-ferrous metals and stainless steel. However, magnetic metals can be slightly better recognized than non-magnetic metals. The measuring field penetrates the food products and recognizes metal pieces even in the interior of the product or in packages.

Metal Detectors reacts to
Electrical Conductivity
Magnetism

All metals are detected, even non-ferrous and mild steel.

Magnetic Metals are better detectable than non-magnetic metals.

The measuring field penetrates the food products and recognizes metals objects even inside packages.

Technical limits = Product Effects
The maximum sensitivity is limited by the physical laws upon which the measuring principle is based. Food often has a more or less strong electrical conductivity due to small contents of salt, sugar, minerals and water which cause the metal detectors to react. This reaction is referred to as product effect.

In most cases, the sensitivity attainable in practise primarily depends on how well the metal detector is able to compensate the product effect.

Product Effects
Product effect must be considered before the installation of a metal detector. What metal sensitivity is possible along with the product?

Product samples can be tested through Cassel free of charge. This is the best way to determine the real metal sensitivity.
Testing Procedures and Intervals

With the help of a metallic test ball of a defined size, the function of the metal detector can be tested in operation. A test ball is added to the product and is subsequently passed through the metal detector. If the detector recognises the ball, the test is considered passed.

Metallic test ball encapsulated in plastic

The test intervals shall be short enough: All products having passed the metal detector since the last test procedure must be able to be re-tested once again. In addition, tests should be carried out at the beginning of working shift and when changing products.

Documentation

In all production lines working in accordance with HACCP and ISO 9000, the metal detection process has to be documented in written form thus making it comprehensible, verifiable and safer.

By means of a logging printer which is connected to the metal detector via a data interface, it is possible to effect complete, automatic documentation of metal detection, tests and all set parameters. On request, a suitable printer can be supplied together with the metal detector.

Logging printer, integrated into a METAL SHARK Metal detecting system

Conveyors / METAL SHARK BD

Conveyors: The metal detector is integrated into a conveyor belt either with the belt passing through the frame search coil or being installed just below the belt as flat search coil. There are several devices available to reject the detected metal pieces (e.g. Pusher).

Gravity Feed / METAL SHARK GF

Gravity Feed Applications: Bulk material falls into a pipe through the metal detector. Metal pieces are rejected by means of a separation flap.

Inline / METAL SHARK IN

Pipeline Metal Detectors: This in-line system serves to detect metal pieces in paste-like or liquid products and is integrated into the conveyor pipes (e.g. with milk pipe fittings). The metal pieces can be transferred out of the system by means of three-way-special-valves.
What is HACCP?
HACCP (Hazard Analysis and Critical Control Points) is a programme for the prevention of non-conformances in the Food Processing Industry.

HACCP and Metal Detectors
With respect to metal detection, the HACCP programme requires the following:

Critical Control Point
The metal detector is a critical physical control point of the danger of metal pollution. If no control is carried out it is likely to result in a health risk.

GMP - Good Manufacturing Practice
Here, detectability defines the critical limiting value for the calibration to the smallest recognisable metal ball. A product has to be kept free from metal pollution as made possible by "Good Manufacturing Practice" (GMP) and according to the latest state-of-the-art. With reference to metal detectors, this means that all metal pieces which a modern metal detector reliably detects on optimum installation have to be removed from the product.

Critical limiting value
Setting of the critical limiting value, however, must in any case enable the metal detector to operate in a stable and reliable manner without triggering random or false alarms.

Systematically and continuously
Ensurance is needed that all products are systematically and continuously tested by the metal detector.

Documentation
Complete documentation must be made on the operation and results of the metal detection.

Correction Procedure
If a metal piece is detected in the production process, it is absolutely necessary to search for its source. The source of metal contamination has to be rigorously eliminated in order to exclude further pollution from the same source.

Maintenance
Modern metal detectors are equipped with an automatic self-control system and are, therefore, maintenance-free.

Preventive maintenance by the manufacturer of metal detectors include consulting the customer and verifying the system on site if it is still correctly installed after a longer operation period. It is checked if no external interference affects the system's performance and if the detecting sensitivity for the current product and site is still optimally set. This includes, in addition, the training and introduction of new staff and the integration into quality management.

DIN ISO 9000 and Metal Detectors
It is recommended to write detailed job instructions for the metal detector where e.g. the measures to be taken after metal alarm and testing procedures are laid down.

On request, a sample for job instructions can be obtained from CASSEL Messtechnik. Furthermore, reference is made to all the items specified under HACCP.

Sample: Job instruction according ISO 9000

Job instruction: General Function
Target people: Quality management staff, HACCP-Manager

At job start:
Switch the metal detector on and wait until you read STATUS OK in the LC display.

Move to the appropriate product number (refer to job instruction "Recall product number").

Check Metal Detector Function:
Move some metal free product samples through the metal detector. A metal alarm should NOT occur!

Move another product sample along with a metal test object through the sensor head.

A metal alarm must occur now!

The test intervals must be short enough. All products having passed the metal detector since the last test procedure must be able to re-tested again. In addition, tests should be carried out at the beginning of working shift and when changing products.

Production:
Ensurance is needed that all products are systematically and continuously tested by the metal detector.

Metal alarm:
If a metal piece is detected in the production process, it is absolutely necessary to search for its source. The source of metal contamination has to be rigorously eliminated in order to exclude further pollution from the same source.
Example: Daily Metal Detector Record

It is recommended to regularly test the metal detector with standardized test objects and to keep records of these tests in a daily metal detector record. Metal testing spheres are generally supplied along with the detector.

A suitable metal testing object and a testing schedule should be established for the examination: The testing object should be a sphere of the smallest diameter which detection is required. The sphere is passed through the detector along with the product in order to observe whether a metal detection signal is issued.

The testing schedule should establish when the detector is to be tested and by whom. Example: The quality manager on duty has to test the detector using the testing object one hour after the start of each shift. The test results are recorded in the record with the date, time and signature. Example: Test object recognized, 24 August 2001, 08.30, signed, Smith.

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**CALIBRATION CHECK**

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**REJECT RECORD**

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Reviewed by:  
Date: