

WHITE PAPER:

Metal Detectors

How to select the right metal detector



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Protecting your brand in the marketplace is one of the most important functions a food manufacturer performs. But all the investment to establish a reputation for product quality could be lost in the event of one safety recall. Developing and maintaining an effective, verifiable inspection program is no longer an option for processors. Metal detection is an effective and relatively inexpensive method of protecting your customers and your brand. While price, delivery, and other commercial considerations are important, technical performance must be the primary factor when evaluating a metal detector to trust with your brand reputation.



Table of contents

- Product effect
- Auto-calibration
& auto-learn advantages
- Sensitivity & communication
- Consider the environment
- Communications considerations
- Event tracking
- Choosing a supplier
- Before you buy

Product effect

Product effect is an important factor in the selection of a metal detector. If your products are conductive (usually due to water, salt, or iron content), they will affect the electromagnetic field of the metal detector, causing it to produce a false reject. Dry or neutral products generally do not cause this effect.

If product effect is a factor, the correct frequency must be selected to move the product effect signal away from the signal of the contaminants. A metal detector that uses a single frequency cannot accommodate much signal variation thus making it unsuitable for inspecting a variety of product types or those that may vary in temperature. A three frequency, or better still, a multi-spectrum metal detector would be more suitable for these applications.

The most sophisticated metal detectors on the market today use multi-spectrum technology. Instead of relying on just one frequency, a spectrum of multiple frequencies work simultaneously to filter out product signals in a way that is much more effective than a single frequency. In addition, the number of false alarms is greatly reduced.

Auto-calibration and auto-learn advantages

The metal detector that will become a successful part of a plant quality control program is one that not only provides good sensitivity performance, but is easy to set up, easy to use, and provides a low level of false rejects. Most metal detectors on the market today perform self-checks to verify that the unit is in balance and performing properly.

The auto-learn routine allows the user to acquire the characteristics of the product in the unit so that the product can be inspected. An efficient auto-learn gives the best sensitivity and the least number of false rejects with a minimum of manual adjustment. This gets the unit into production with a new product in a minimum amount of time.

Sensitivity & communication

Metal detection sensitivity needs often vary according to the operation. For example, a metal detector's primary function might be to protect a key piece of equipment, such as a sheeter or slicer. The goal would be to eliminate metal that is large enough to damage the equipment.

In another part of the line, a different level of sensitivity would be required to inspect a bulk flow of product. And because final package inspection should be the most demanding, even higher sensitivity would be needed to protect your product before it reaches the marketplace.

Your plant's quality control group should have specific sensitivity targets for ferrous, non-ferrous, and stainless steel (even difficult to detect type 316) contaminants for each inspection operation. These targets should be communicated to the metal detector manufacturer so that they can select the right equipment for each application. Be sure to set realistic and achievable goals.

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Consider the environment

Start by evaluating your inspection area. Is it wet or dry? What are the variations in temperature? Selecting a metal detector suited for your operating environment is critical. Water intrusion into the electrical components is one of the most common causes of metal detector failure. If there is a washdown regimen in the plant, is it high or low pressure?

An IP65 washdown rating means that the metal detector can withstand low pressure washdown with ambient temperature water. An IP69K rating means sustained high temperature and pressure. But beware: these ratings are typically self-reported. The manufacturer's reputation in the industry for the ability to withstand washdown can be a good indicator.

Does the washdown include caustic agents? If so, careful attention should be given to the specific alloy of the stainless steel used for the metal detector's case. Type 316L is more resistant to these caustic agents.

For dry environments, is the finish of the metal detector painted? Placing a painted surface in the product stream could eventually contaminate your products with chips of paint.

Also consider impact resistance. Plastic covers and membranes are subject to wear or impact penetration. A robust display screen and keyboard avoid downtime and parts replacement costs.

Communications considerations

Will the metal detector be a stand-alone piece of equipment or does it need to be integrated into the plant's network, providing periodic data reporting for a statistical package? Does the unit have ready-made software that can provide these functions? Is it Ethernet ready? Some manufacturers provide software packages that allow for remote programming and diagnostics via laptop, including oscilloscope emulation via Bluetooth, without the need to open the power supply cabinet.

Make the right choice

Consider these factors to choose the best metal detector for your needs:

- Primary detection function: Food or equipment safety
- Characteristics of products to be inspected
- Size of particles to be detected
- Sensitivity target for each metal type
- Wet or dry inspection area
- Temperature variations in the product or inspection area
- Washdown: High or low pressure, caustic agents
- Will the detector be integrated with other equipment or the plant's data network?



Event tracking

As food manufacturing regulations become more demanding, equipment must keep up. What are the internal requirements for event tracking for a metal detector? Is it good enough to operate with the factory default passwords that everyone knows? Or should each user have his or her own password allowing access to only those levels that management considers appropriate for their position? In this case, each machine entry (product change, sensitivity change, reset, etc.) can be traced to a specific operator. A metal detector must be selected that can offer the required access and event tracking in a way that responds to these internal requirements.

Choosing a supplier

As with any equipment purchase, the buyer is not just purchasing a piece of equipment but also entering into a long-term relationship that includes up-front application assistance, training, parts supply, and technical support. Choose a reliable supplier that you feel comfortable with and that offers ongoing assistance.

Before you buy

Consider testing your products on the metal detector before you make a purchase. In addition to evaluating the detector's performance, you can get first-hand experience with set-up and changeover simplicity, calibration and maintenance requirements, integration with other equipment (such as a checkweigher), and general construction quality. Heat and Control provides demonstrations of CEIA metal detectors, and Ishida checkweighers and X-ray inspection systems.



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