The invisible cost of high-conductivity meat products

by Phil Brown, Sales Director, Fortress Technology, Oxfordshire, UK.

Faced by the challenge of identifying hard-to-find metals in food products with high conductivity, metal detection companies are increasingly leveraging multi-frequency scanning.

Fortress Technology has gone one step further with a revolutionary high performing solution for wet products that is proven to be 100% more sensitive and accurately picks up metal fragments half the dimension previously possible. This article examines the science behind inspecting 'wet' products using metal detectors and counts the costs of false rejects.

Quality control in general, contaminant detection in particular, remain essential functions within food manufacturing. If anything, the safeguards and best practice required by retailers and industry certification bodies such as the British Retail Consortium (BRC) are becoming more demanding year by year.

Putting this into context, the new issue 7 of BRC Global Standard for Food Safety dedicates an entire section to metal detection and X-ray.

Those aspiring to BRC certification must present very good, documented reasons for not having metal detection on their lines in the first place. For the majority who do, there follow specific points about reject mechanisms, system tests, sensitivity and corrective action.

But if brand-owners and retailers want to eliminate the cost and reputational damage of undetected foreign bodies, and the recalls that may result from them, food manufacturers are under equal pressure to reduce – or eliminate – false positive rejects.

With margins on product tighter than ever, there is the cost of the rejected item itself. More importantly, where a fault recurs, stopping the line may incur further cost.

In fact, the real cost burden extends beyond this most immediate level. False rejects do cost the customer money which primarily occur when a metal detector cannot discriminate between 'product effect' and a metal contaminant. Equally, the 'man hours' spent checking the performance of equipment and investigating false rejects are bound to impact line productivity and overall equipment effectiveness.

Precise figures for rejected products will depend on the product and, clearly, the volume of false positives. Industry estimates regularly put the potential costs at up to £14,000 per year per production line.

The false positive challenge

The majority of dry products, even factoring in the possible presence of stainless steel, do not tend to trigger false rejects. This is despite the fact that the grades of stainless steel typically used in processing and packaging line equipment, which exhibit low magnetic permeability and low conductivity, make them among the most difficult metals to detect.

Rather, false rejects are most likely to occur in 'wet' products. For those handling and inspecting meat, product effect has posed a challenge for many years. Essentially it comes down to basic physics. Water, like metal, is a conductive and all products react in different ways in a magnetic field.

By definition, the industry term 'wet' extends to any higher-conductivity product, be it wet, moist, with a high salt content or containing other conductive compounds. In these products the 'product effect' can be pronounced, and can make the identification of signals from genuine metal contaminants – especially stainless steel – all the more problematic.

There are two distinct components to metal detection: magnetic permeability and conductive effect. Most products exhibit some sort of combination of the two, but the overriding factor is likely to be conductivity. Metals also display both, but with stainless steel, the signal can be swamped by the product effect. This is less likely with ferrous metals, which typically display stronger magnetic permeability, and non-ferrous, which are likely to have high conductivity.

Despite its prevalence in modern line equipment, stainless steel is not the most likely metal to feature as a contaminant. Statistically, the metals you are most likely to be looking for are those, such as aluminium, which are more breakable.

However, detecting stainless steel remains the 'gold standard' and the challenge is to safeguard consumer well being and uphold product quality while avoiding those over-sensitive settings, which may trigger multiple false rejects resulting in high waste.

Background signals

In recent years most development in metal detection have focused on the coils that transmit and receive multi-frequency signals. However, even the most advanced pre-set

Continued on page 8

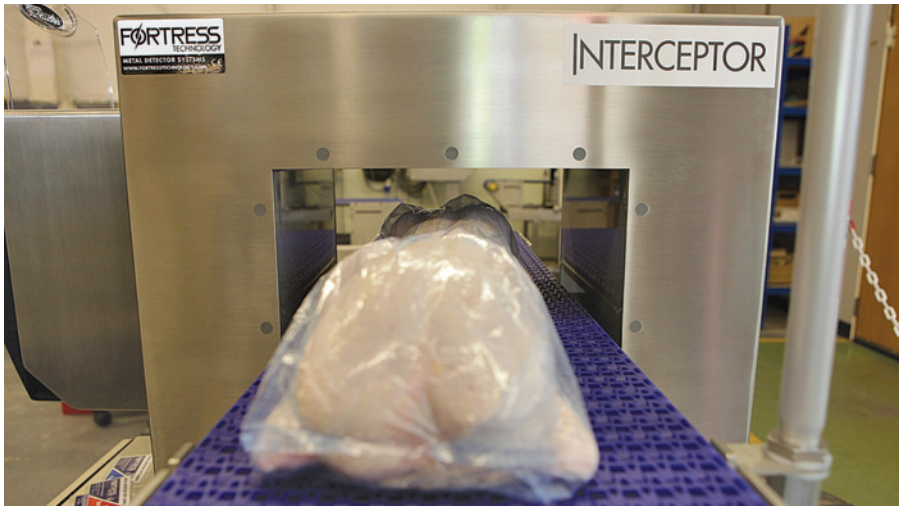
Continued from page 7
product compensation and phasing techniques deployed by equipment manufacturers today have limitations.

Refining the Continuous Multi-Frequency technology first integrated into Fortress metal detectors in 2009, the company's new Interceptor metal detector takes a revolutionary approach by splitting the product and metal detection signals and then linking the readings back together.

Technological advances

Deploying the same type of microprocessor power driven by developments in today's smartphone, Fortress has applied these technological advancements into its newest metal detector. This enables the company to continue offering its market-leading 'Never Obsolete' guarantee, giving customers the option for future line expansion and the assurance of equipment compatibility, no matter how extensive or regularly food safety standards change.

This latest advancement puts a stop to a potential stainless steel signal being 'swamped' by product effect. Instead, the focus is on two frequency ranges; one high, one low. The low-frequency range can be used to eliminate the product effect, leaving any stainless steel signal in the higher-frequency range more readily identifiable.



This takes account of the background 'noise' from the product, and the fact that you are looking for an additional 'blip' beyond that. This approach factors in the background signal and eliminates it.

With this latest way of applying metal detection technology, Fortress calculates that it can identify metal contaminants in wet products down to half the size of those detectable with the previous generation of equipment, with the same degree of reliability.

The Interceptor metal detector can be configured for every product handling application, including production and packing line conveyor belts, gravity and free fall powders and pipeline configurations for pumped product.

The ability to clearly discriminate between the signal generated by the product and the metal contaminant is an industry game-changer. Single pass product learning, 100% increased metal detection sensitivity, reduced false product rejects and straightforward upgrades go a long way to solving the longstanding challenge of 'product effect' whilst also boosting overall equipment effectiveness. ■