Technical Note

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Cleaning and Maintenance on X-ray Inspection Systems That Can Be Easily Missed.

X-ray inspection systems are now being used in a wide range of industries as a multifunctional inspection machine. Just like other equipment, x-ray systems require regular cleaning and maintenance. Many people are unable to follow the instructions in the operation manual because they are too busy, they do not have enough staff, and other reasons.

However, cleaning prevents the growth of bacteria from food residue and stains and it also eliminates the cause of false rejects, which can extend the service life of an x-ray system. Proper maintenance not just reduces false rejects and provides a longer life of your inspection system but also ensures the long-term performance of equipment. Performing regular cleaning and maintenance on the x-ray system offers many important benefits.

This paper explains about cleaning and maintenance which users tend to overlook.

1. Neglecting regular cleaning can cause false rejects

Regardless of the type of product such as packaged or unpackaged, stains can be stay on a conveyor belt as it directly touches the product for a long period. Particularly with unpackaged products, a conveyor belt needs to be properly cleaned since oil content, blood, bread crumbs of fried food, etc. fall frequently on a conveyor belt. Even with packaged products, a slight amount of powder, oil, and sauce sticking on the surface of a bag can stay on a conveyor belt little by little.

NG evaluation by stains on a conveyor belt

Spots and stains gradually adhere not only to the surface but also the back of the conveyor belt with time and they become the objects that absorb x-rays. For example, a seasoning packet for an individually packed food has a thin thickness and low density so that the x-ray tube voltage is set to a low level during the inspection. In general, an x-ray transmission image will appear clearly with low tube voltage, allowing soft contaminants to be detected easily. For this reason, seasoning powder adhering on a conveyor belt can cause false rejects. Unlike foreign objects in products, spots and stains on a conveyor belt do not cause health risks to the human body; however, the x-ray system evaluates it as a defective product (NG) and may reject a PASS product being conveyed right behind spots and stains on a conveyor belt (Fig.1). Food clinging on a belt forms into a mass with the lapse of time and it will appear as a shadow on a screen of the x-ray system. It is easy to detect a shadow when running a belt without the product as it appears on a screen periodically. Please check both the surface and reverse sides by removing the conveyor belt.

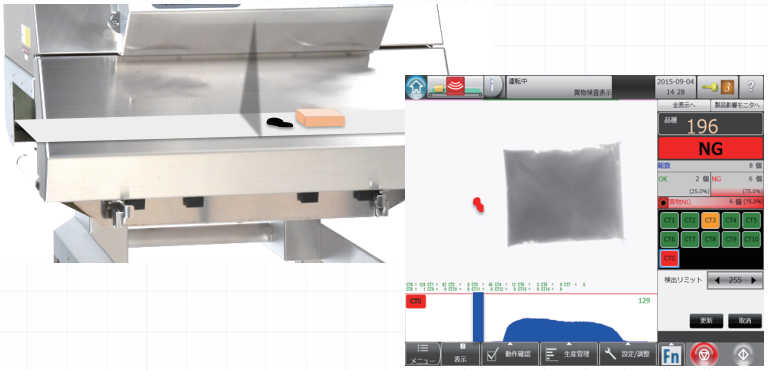

Figure 1: X-ray transmission image

2. Cleaning can extend the life of x-ray inspection system

The x-ray generator produces x-rays by applying a high voltage to a filament in an x-ray tube and by accelerating electrons toward the anode target (Fig. 2). At that time, the majority of the energy is released as heat. Heat can cause deterioration of electrical parts; moreover, it can shorten the life of the x-ray generator. A cooling fan is used to cool down the x-ray generator by taking outside air. When a filter (sponge) of the cooling fan gets dirty, the fan can not properly take outside air so that the temperature inside of the x-ray generator becomes high. It can also cause short circuit failure of a printed circuit board. Proper cleaning is recommended since both the x-ray generator and the printed circuit board are expensive machine parts. The filter can be removed to clean with a vacuum cleaner or wash it with water (Fig. 3, Fig. 4). Since a filter is not very expensive, it can be changed to a new one periodically.

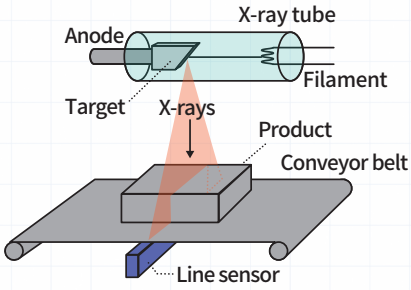

Figure 2: X-ray generator


Figure 3: Air inlet


Figure 4: Filter (remove it to clean)

3. Eliminate contaminants by regular maintenance

Practicing checks before and after the use of an x-ray system in accordance with the procedures can maintain detection performance the same as when the x-ray system was installed. Please refer to your operational manual as maintenance periods may differ according to each machine part.

We sometimes see the media coverage of a recall due to foreign objects derived from production and processing lines. This section describes some points to note about the conveyor belt and the resin cover of the x-ray sensor.

①Belt fraying may become a foreign object

Fraying or peeling on the edge of the conveyor belt occurs due to time-related deterioration or friction between a metal part and a belt from meandering for some reason. Fraying of the belt does not have a direct impact on detection sensitivity; however, it can become a contaminant when falling on the product. Please check for any fraying or peeling on the edges daily and cut off a fraying part or change to the new belt.

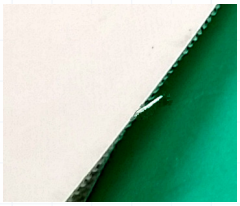
Figure 5: Belt fraying


Figure 6: Resin cover of the line sensor

② Pay attention to the resin cover of the line sensor

A resin cover is placed under the conveyor belt. Please remove the conveyor belt and check for any crack or warp on the cover. When it deteriorates, a chip from the resin cover can fall and can become a contaminant on the production line. Moisture and oil from the product can enter through a clearance gap, causing damage to the high-cost line sensor. By performing both visual and touch inspection, you can avoid repair of the sensor that can cost considerably more.

Conclusion

This paper explained about prevention of false rejects and contaminants under the theme of "Cleaning and Maintenance on X-ray Inspection Systems That Can Be Easily Missed". There are more items for cleaning and maintenance on the x-ray inspection system that are not described in the paper. All of them offer long-term performance and prolonged life of the system.

Please check once more the procedures and standards for cleaning and maintenance in the operation manual and use the x-ray inspection system effectively.

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