

# Arubis detectable balls – 25/06/2019

Food quality control is of the utmost importance and has become a growing global trend. It is expected from the food producers to be aware of all safety risks. Therefore finding contaminants in your packaged food products is critical to protecting your brand. Just one incident of food safety contamination puts your company's reputation on the line.

This comprehensive food safety and quality can be achieved by implementing one or more inspection systems to your production line. The most common ways for manufacturers to detect foreign materials in-house are : inline magnets, inline strainers, metal detectors and X-ray machines. These inspection systems can not only detect metals, but also many other contaminants, such as glass, ceramics, stones, PVC and important to mention **our brand new Arubis detectable rubber balls**.

We developed a metal/x-ray detectable natural rubber compound. Rubber sheets and balls from this compound were tested against magnets, metal detector and X-ray machine.

The results of our test can be found below. Please note that all tests were performed for comparison purposes. The results should be treated as such and data supplied should not form the basis for certified datasheets.

## **Metal detection**

Metal detection results are difficult to translate between systems as results will vary with factors such as size, shape of „contaminant” and machine setting. Our test was conducted on a metal detector with 300mm x 150mm aperture and an approximate running speed of 42m/min. The machine was balanced using the phase control and sensitivity to allow detection of the typical detectable content in our rubber balls as well as standard ferrous balls. Results have been converted to an approximate ferrous ball equivalent.

|                                      |   |
|--------------------------------------|---|
| Rubber sample: 5mm x 5mm x 3mm thick | Approximate ferrous ball equivalent : 2.0mm |
|--------------------------------------|---|

## **Magnetic pull**

Many food companies use magnetic separators to find and remove contamination. Magnetic separators are available in a wide range of designs and have different uses. The most common magnetic separators used in the food industry are: bar magnets, plate magnets, grate magnets, liquid line trap magnets and suspended magnets.



Our standard rubber sample (5mm x 5mm x 3mm thick) was tested for magnetic pull on the test rig shown beside by moving the magnet down towards the samples until they were attracted up to it. The recorded value, were the distance from the magnet to the top surface of the sample when the sample moved to the magnet, was 11.8mm. The magnet utilized had a diameter of 20mm and a pull of 3.6kg.

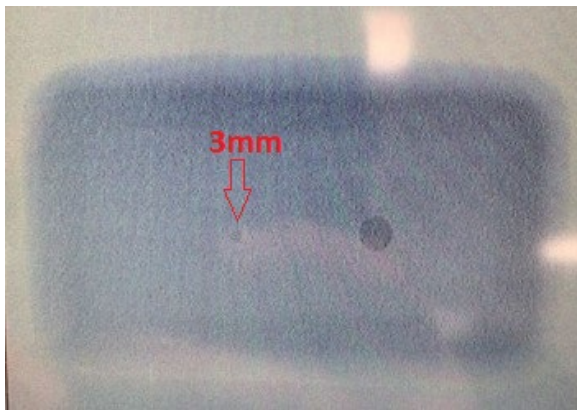
## **X-Ray testing**

X-rays are a form of invisible electromagnetic energy with short wavelengths and high energies. X-rays can also penetrate food products and allow the imaging of internal features of the food to detect physical defects or contaminants without damaging the food product.

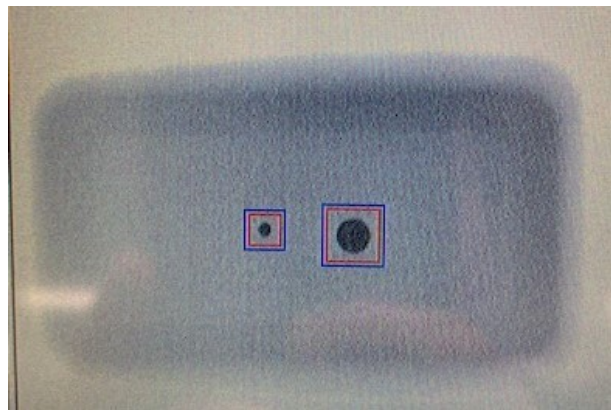
If the X-ray encounters a dense area in the food, such as a metal contaminant this will reduce the X-ray energy further. As the X-ray leaves the food a sensor in the inspection equipment converts the X-ray into a greyscale image of the food's interior. The denser a contaminant, the darker it will appear on the image, which helps its identification.

X-ray detectability testing was performed on X-ray inspection system by Dylight. This type of machine is typically used by food processing plants in order to detect foreign inclusions in food products.

The food product utilized for the testing procedure was a 50mm thick layer of sugar, held within a plastic container. In this case our tested materials were round samples of 3mm (left) and 10mm (right) with a thickness of 2mm.



Standard natural rubber

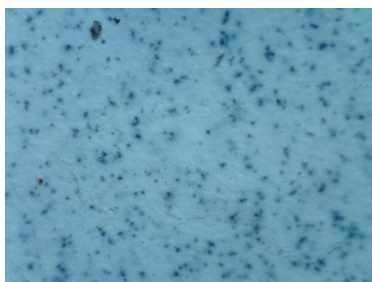


Arubis detectable natural rubber

The particles are strongly detectable and the image proves that detectability by X-ray is still strong against the food product even down to 3mm diameter by 2mm thickness.

## **Microscopy**

The metal/X-ray detectable blend that we use as additive in our compound is a well-kept secret. Most of our competitors use a form of metal oxide, but these have a negative impact on the mechanical properties. Another disadvantage is that they are difficult to disperse in the compound. With a microscope we compared the appearance of the additives in our balls to some of our competitor products. All images were taken at identical magnification.



Arubis



Competitor 1



Competitor 2

## Food regulations

Food product manufacturers are very particular about standards put in place by the FDA and other regulatory agencies. These standards define the purity and reliability of a product or process, and prioritize public safety.

Rubber parts of any food processing equipment, in order to be used, should meet the **CFR 21 FDA 177.2600** standard - 'rubber articles intended for repeated use'- requirements. To assess whether the rubber sample fulfils the global migration criteria as specified in CFR 21 FDA 177.2600 a Soxhlet extraction is used on the rubber part in n-hexane and in de-ionized water.

## Test report

no. 19205

date: 21-06-2019

page: 3 of 3

**Results:** The results of the global migration according to FDA CFR 177.2600 are shown in Table 1.

**Table 1:** Results of FDA CFR 177.2600 extraction of "NR/BR 50 ShA Metal/X-Ray detectable"

|                          | Global migration [mg/inch <sup>2</sup> ] |          |          | Mean | Limit FDA* | Conclusion |
|--------------------------|--|----------|----------|------|------------|------------|
|                          | Sample 1                                 | Sample 2 | Sample 3 |      |            |            |
| N-hexane, 7 hours        | 16.0                                     | 16.0     | 13.3     | 15.1 | 175        | Pass       |
| N-hexane, 2 hours        | 2.1                                      | 2.3      | 2.1      | 2.1  | 4          | Pass       |
| Distilled water, 7 hours | ≤0.5                                     | 1.1      | 1.6      | 1.1  | 20         | Pass       |
| Distilled water, 2 hours | ≤0.5                                     | ≤0.5     | ≤0.5     | ≤0.5 | 1          | Pass       |

\*Maximum acceptable global migration according to FDA CFR 177.2600.

The sample meets the FDA requirements according to CFR177.2600 paragraph (e & f) for repeated use in contact with aqueous and fatty foods.

## Rubber properties

| Specifications                         | Method       | Value   |
|--|--------------|---------|
| Polymer Type                           |              | NR/BR   |
| Color                                  |              | Black   |
| Hardness [°Shore A]                    | ISO7619-1    | 50 +- 5 |
| Tensile strength [MPa]                 | ISO37,type-2 | 7       |
| Elongation @break [%]                  |              | 550 %   |
| Tear strength [N/mm]                   | ISO34-1      | 18      |
| Density [g/cm <sup>3</sup> ]           | ISO 2781     | 1.34    |
| Abrasion resistance [mm <sup>3</sup> ] | ISO 4649     | 140     |
| Rebound resilience                     | ISO 4662     | 60 %    |
| Food                                   | FDA 177.2600 | yes     |
| High temperature resistance            |              | +80°C   |
| w temperature resistance               |              | -40°C   |

