



Quality assurance of rice & co.

X-ray inspection of natural products

DANRICE A/S Ørbæk, Denmark (Ebro Foods Group)

Danrice is a leading international B2B supplier of pre-cooked IQF rice, grains and pasta for the food industry with a particular focus on the ready-meals market. In 2004, Danrice became part of the Ebro Foods Group and created a joint venture with Keck Spezialitäten in 2013 to form Europe's largest independent supplier of IQF rice, pasta and grains under EBRÖFROST GmbH holding.

It is never possible to reliably exclude impurities in the raw goods when dealing with natural products. This applies not only to rice but also to lentils, bulgur, couscous and quinoa. Danish company DANRICE A/S processes all these products in Ørbæk and for all of them relies on X-ray scanners to identify and separate out foreign bodies in good time during the incoming goods inspection. The systems used for this, supplied by WIPOTEC-OCS from Kaiserslautern, have such high detection sensitivity and good detection rates that they can detect even the smallest contaminants.

40 tons a day

An X-ray scanner's workload at DANRICE is enormous. Up to three tons of raw goods, that's more than 4.5 cubic metres of product, pass through the scanner on the motorised conveyor belt every hour. After the X-ray inspection, rice passes through the washing, boiling and flash freezing processes before being packed ready for transport and stored. After heating for just a few seconds in boiling water, the instant product processed in this way is ready to eat. Customers are mainly ready meal producers and also large-scale catering kitchens.



X-ray scanner at DANRICE. The product arrives on the conveyor belt via a pipe system (right) and is conveyed through the scanner

DANRICE A/S supplies approx. 80 % of all upstream products for ready meal producers in the EU. Regardless of the downstream quality assurance of its customers, the company also checks finished products

before delivery using X-ray scanners from WIPOTEC-OCS, in addition to using metal detectors as required by the regulations. And there are good reasons for this.

"We buy our products from all over the world, to a large extent from Asia. It's not possible to rule out impurities and the same applies to rice from Europe. We therefore have to monitor all products and check them for foreign bodies irrespective of where they come from," says Kim Kirkeby, CEO of DANRICE. "And for us it's an additional level of security that we build in by examining all products for impurities with WIPOTEC-OCS X-ray scanners to ensure that the goods we deliver are free from foreign bodies."

After all, these are foods to which the highest quality assurance standards in the world apply. Anyone who attracts attention here is bound to make the headlines.

It all begins with tests

X-ray scanners must undergo extensive functional tests. In these tests, it is demonstrated that the X-ray scanners comply with the specifications, the customer's requirements and the detection rates therefore required. How do you ensure, however, that X-ray scanners are properly adjusted and furthermore, how do you guarantee that they also work correctly? Both are achieved with test specimens, in this case with stainless steel balls and glass beads with diameters of 1.0 and 2.5 millimetres respectively.

The former can barely be seen in the product due to their size and the same applies to the only slightly larger glass test specimens. Non-metallic foreign bodies, such as stone and glass, pass unhindered through every metal detector, even the magnetic detectors upstream of the X-ray scanners at DANRICE. Even mechanical precleaning using vibrating screens does not present any serious obstacle to them. A scanner that is working properly detects all test specimens and reliably separates them out.

The sensitivity of the WIPOTEC-OCS X-ray scanner is so high that it can detect even the smallest foreign bodies in the product. The systems are trained to detect foreign bodies, such as stone, glass, plastic or metal particles, which can pass through mechanical and other precleaning processes and must not get into the production process under any circumstances.



Product flow with system open. Due to the various planes inside the X-ray scanner, radiation cannot escape via the transport openings and the unit is safe during operation

How sorting out is performed

Differences in density of the foreign bodies in rice, lentils, bulgur, couscous and quinoa show up on the X-ray as different greyscale values. High-performance image processing software scans the X-ray images to reliably detect impurities such as stone, glass, plastic and metal particles. The scanning speed of the high-speed X-ray scanner from WIPOTEC-OCS is so high that the actual maximum speed as the product passes through is limited not by the scanner but by the downstream production processes which require a certain time.

What is much more interesting is the question as to what quantity of good products the detection process sorts out involuntarily, so to speak, along with the foreign bodies and is thus lost completely to the production process.

To work as effectively as possible and conserve resources, the system divides the product flow on the conveyor belt into several



Rice with foreign bodies sorted out

virtual, parallel paths that are examined for foreign bodies simultaneously. If a foreign body is detected, the product flow is interrupted only briefly on the appropriate path by the opening of a flap and the foreign body together with its surrounding product is diverted downwards. As the remainder of the product flow on all the other paths can pass unhindered, this design saves over 80% of the good product which would otherwise be sorted out with the foreign bodies.

Perfection is never good enough

This saving could even be improved: A modification of the ejection system agreed with the manufacturer further increased the savings potential. An X-ray scanner equipped with just such a system has already been supplied to DANRICE.

In future, a further system will be used at Ebrofrost in the USA. The USA is one of the biggest rice exporters in the world.

Henrik Rosenlund, factory manager at DANRICE, organised the two-day training of the technical operation team from the United States in Ørbæk, "Our American colleagues were particularly impressed by the reliability of foreign body detection and the sophisticated discharge system. With the current technology, they can limit their loss of good product to a very low value in the parts per thousand range – and that goes for rice from every region."



Henrik Rosenlund (left), factory manager and Kim Kirkeby, CEO of DANRICE A/S