

Press release

Deepening detection reliability at FACHPACK
With its own AI for X-ray image processing during the foreign object inspection in the filling and packaging process of inhomogeneous food products, HEUFT makes visible what previously remained invisible. This is confirmed by well-known manufacturers such as Kühne and can now be experienced live at another trade fair: FACHPACK 2024!

Still a vision of the future at *interpack 2023*. Ready for series production at *Anuga FoodTec 2024*. And the first installations and start-ups are already underway in time for *FACHPACK* at the end of September 2024 in Nuremberg: HEUFT *reflexx^{A.I.}*, the proprietary AI for smart X-ray image processing, which is constantly being further developed at HEUFT SYSTEMTECHNIK GMBH, now gets to the bottom of dangerous foreign bodies even more deeply. This means that they are now also visible in places where this was previously difficult or impossible. The demand from major food manufacturers for the latest release of HEUFT *eXaminer^{II}* series foreign object detectors equipped with this technology is correspondingly high.

This can also be seen at food producers such as the long-established Carl Kühne KG (GmbH & Co.), which produces tinned pickles such as the best-selling red cabbage in Germany or gherkins and packs them in jars. Particularly with such inhomogeneous products with highly absorbent structures and cavities between their components, the AI from the company's own development and production shows what it is capable of – and find dangerous foreign bodies even under such difficult environmental conditions. Even if they are no longer visible to the naked eye or are extremely difficult to distinguish in shape and size from non-critical product elements and structures.

This was also recently confirmed by extensive in-house tests which Kühne carried out with the latest release of the HEUFT *eXaminer^{II}*

XAC using filled original pickle jars in the Burgbrohl customer centre of the system technicians. The results were so convincing that they did not hesitate for long and ordered two of them! They will be installed and put into operation this autumn at the Straelen site of the family business, which has been successful for over ten generations. They will soon be demonstrating their impressive detection reliability with an even lower false rejection rate in daily production operations. At FACHPACK 2024 in Nuremberg, stand 3C-339, it will be demonstrated in advance how deep detection with HEUFT *reflexx* ^{A.I.} sustainably increases detection accuracy – and therefore also consumer and brand protection!

Press release

HEUFT *reflexx*^{A.I.}: intelligent image processing

HEUFT *reflexx*^{A.I.} is now even smarter! A newly integrated deep learning algorithm goes into greater depth during the X-ray image analysis – and makes dangerous foreign bodies detectable even where they could not previously be recognized.

Artificial intelligence (AI) has been used in HEUFT inspection systems for over ten years to ensure reliable detection, smart multidimensional evaluation and reliable classification of a wide variety of objects in the food filling and packaging process. In the case of disordered structured products such as gherkins or red cabbage in food jars, *machine learning* is not always sufficient to identify dangerous foreign objects such as glass splinters in particular and distinguish them from harmless product components and inhomogeneities.

The latest version of the in-house developed hardware and software for intelligent X-ray image processing, which is now available for foreign object detectors in the current HEUFT *eXaminer II* series, changes this: with a new deep learning algorithm, HEUFT *reflexx*^{A.I.} makes previously invisible objects visible even in places where this was previously not possible: in inhomogeneous product masses with irregular structures and cavities between their individual components with different levels of absorption.

With the help of the new deep learning algorithm, the aluminium fragment between the gherkins can be detected for the first time just as reliably as the stone in the red cabbage or the ring-shaped piece of cable in ring-shaped pasta of the same size. HEUFT *reflexx*^{A.I.} finds and marks the dangerous foreign bodies in real time – and at the same time reliably distinguishes them from harmless product and packaging structures so that the false rejection rate during the pulsed X-ray inspection tends towards zero.

HEUFT has combined tried-and-tested image analysis and AI processes with a multi-layered neural network that goes into greater depth and thus processes even abstract patterns independently in a meaningful way. This makes the deep-learning-capable HEUFT *reflexx*^{A.I.} far superior to conventional analysis methods such as gray scale determination, contrast detection and machine learning for the detection and classification of different objects.

Previously invisible objects become visible even under difficult environmental conditions – and the proportion of false rejections of actually uncontaminated products is reduced; valuable packaging or food is no longer wasted in vain.

Press release

Pulsed X-ray: future-proof detection technology

HEUFT has perfected its pulsed X-ray technology with new tubes, generators, high-voltage components and the right know-how. This increases the detection accuracy and availability when detecting foreign objects and defects.

Full precision with minimal radiation! This can only be achieved by the pulsed X-ray technology exclusively available from HEUFT for the gentle and precise detection of foreign objects, product faults and packaging defects. Innovative components developed and manufactured in-house create even more performance in the radiometric in-line inspection with HEUFT *eXaminer^{II}* systems.

New X-ray tubes, generators and high-voltage components in combination with optimized full-field image converter technology increase the coverage, sensitivity, detection and operational reliability of HEUFT *eXaminer^{II}* systems! Each individual X-ray pulse now penetrates significantly larger packaging volumes and product quantities than before so that the gentle and precise detection of foreign objects, e.g. even in oversized food cans, is successful. Depending on the application, the size of reliably detected foreign objects is halved.

At the same time, the lifetime increases. And before important components can fail completely, the user is informed in good time so that there is still enough time for preventive maintenance. Essential X-ray components are even integrated redundantly – should one fail, the other takes over immediately to avoid unplanned production interruptions. Developed and launched over 25 years ago, the patented pulsed X-ray continues to score points with its extremely short exposure time for much clearer detection images. Instead of a continuous X-ray beam, an X-ray flash lasting a maximum of one millisecond is always emitted – and only when there really is something to inspect. Motion

blurring, which makes detection more difficult with conventional line scanning with uninterrupted radiation, cannot occur in the first place.

And no radiation is emitted for up to 99 percent of the operating time! If it does, the intensity of an X-ray pulse of just 0.000015 Gray is 600 million times lower than the limit value up to which the World Health Organization (WHO) considers the irradiation of food to be harmless. The maximum radiation energy is 90 kilo-electron volts. At 0.01 microsieverts, the respective radiation dose is only a hundredth of what conventional X-ray scanners emit on average. For medical X-rays, it is even 900 times higher.

Whether for the pipeline inspection of still unpacked product mass, the top-down inspection of thermoformed trays, the sideways inspection of tins and stand-up pouches or the glass-in-glass detection: the further developed pulsed X-ray not only increases the detection reliability but also the operational reliability – and sustainably reduces the total cost of ownership (TCO) of foreign object inspectors from the current HEUFT *eXaminer II* series.

Press release

HEUFT *eXaminer*^{II} XAC: clear glass-in-glass detection

The current HEUFT *eXaminer*^{II} XAC with lifetime-optimized X-ray components increases the sensitivity, coverage and operational reliability of the pulsed X-ray inspection for the detection of foreign objects such as glass in glass. The new deep learning for intelligent X-ray image processing with HEUFT *reflexx*^{A.I.} also creates more detection and rejection reliability.

New tubes, generators and full-field image converters increase the bandwidth, speed, reliability and sensitivity of pulsed X-ray inspection with the further developed HEUFT *eXaminer*^{II} XAC with significantly higher resolution and reduced radiation. The size of reliably detectable foreign objects is halved at line outputs of up to 1,200 food jars to be inspected per minute. The deep-learning-capable HEUFT *reflexx*^{A.I.} X-ray image processing now makes them visible in places where, for example, glass splinters or metal particles were difficult or impossible to detect.

Thanks to double bottom and 360° side wall inspection with optimized pulsed X-rays in the latest version, full coverage is ensured when detecting foreign objects in jars and other food containers as well as maximum sensitivity. The new HEUFT *reflexx*^{A.I.} deep learning functionality now makes high-density foreign objects identifiable for the first time in particular in products which appear inhomogeneous in the X-ray image, have different absorbent structures or irregular cavities between their individual components: the glass splinter in the red cabbage jar is just as reliably detected and smartly marked as the aluminium fragment in the cucumber jar. In addition, the discriminatory power for distinguishing between critical and harmless objects increases, further reducing the false rejection rate.

This protects against unnecessary packaging and food waste and the

resulting consequential costs. As the new X-ray components are now even more durable, the total cost of ownership (TCO) of the HEUFT *eXaminer II* XAC is also reduced. They also require less space so that the compact full container inspector offers more space and flexibility at the end of line with unchanged dimensions – for example for inspecting oversized containers.

Its HEUFT *CleanDesign* predestines it for use in hygienically sensitive areas. Inclined surfaces make cleaning easier and prevent the accumulation of stubborn dirt. Special channels and openings allow the liquid required for cleaning to drain away completely. Dangerous germs and bacteria therefore have no surface to attack.

Press release

HEUFT *eXaminer*^{II} XT: More precise product inspection

With new mechanics, optimized X-ray components and HEUFT *reflexx*^{A.I.} X-ray image processing with deep learning capability the compact HEUFT *eXaminer*^{II} XT increases the reliability of the pipeline inspection for detecting foreign objects in still unpacked liquid, pasty or spreadable product masses.

HEUFT has completely redesigned the mechanical construction of the highly automated full product inspector for space-saving integration at the end of food packaging systems. This also applies to the integrated X-ray and image converter technology for full coverage and greater sensitivity in the gentle detection of foreign objects before packaging.

And the new *deep-learning-capable* HEUFT *reflexx*^{A.I.} X-ray image processing makes dangerous foreign objects visible in places where they were previously impossible or difficult to detect: The current release of the HEUFT *eXaminer*^{II} XT for pipeline inspection now ensures the operator even more flexibility, performance and detection accuracy!

X-ray generators and receivers, the product-conducting tube, the housing as well as the control terminal of the compact inspector can be positioned almost anywhere so that a wide variety of installation positions are possible. Even space-saving wall or ceiling mounting is possible.

Thanks to new X-ray components and full-field image converters, millisecond X-ray flashes can now penetrate unpackaged products such as jam, yoghurt, syrup or muesli in even larger pipe dimensions of up to 150 DN. High-density foreign bodies such as glass splinters or metal particles are detected even before the actual packaging process. Even if the product is conveyed through the pipe at high or fluctuating speeds, the pulsed X-ray which is exclusively available from HEUFT ensures

clear images which are free from motion blurring: The product flow is literally frozen.

With deep-learning-capable HEUFT *reflexx* ^{A.I.} the X-ray image analysis is now even deeper so that foreign objects can also be seen in places where this was previously impossible: The small stone, wire or glass splinter in an inhomogeneous mass of structured individual products of similar shape, size and density such as loose almonds or muesli mixtures is reliably detected and marked immediately. Intelligent filtering, classification and teach-in processes also help to reliably distinguish real risks from harmless deviations. This ensures that only goods that are really no longer marketable are removed from circulation. A rejection valve is activated for this purpose.

The change of type and program is fully automatic and does not require time-consuming recalibration. The detection performance of the further developed HEUFT *eXaminer* ^{II} XT can be checked and fully documented under real production conditions using a test wheel prepared with typical foreign objects.

The new generation pipeline inspector works correspondingly reliably. It achieves exactly what is becoming increasingly important in the supply chain in the tightest of spaces: the delivery and processing of pre-inspected, foreign object-free bulk goods as effective protection against pointless packaging and food waste.

Press release

HEUFT *eXaminer II* XS: Smart sidewall inspection

When detecting foreign objects in simple food packaging with the space-saving HEUFT *eXaminer II* XS multi-layered neural networks for X-ray image processing and optimized pulsed X-rays open up new perspectives. The result: full coverage and detection and rejection reliability that goes even deeper.

The lean turnkey solution for pulsed X-ray inspection of food cans, doypacks, squeeze bottles, stand-up pouches or carton packaging achieves full detection accuracy in the tightest of spaces: dangerous high-density foreign bodies such as metal particles or hard plastic fragments in the product are identified gently and precisely. The modular system can be flexibly equipped with one or two sidewall X-ray flash units. This ensures that the inspection always covers the entire filling volume and, together with the new deep detection during X-ray image processing with HEUFT *reflexx A.I.*, increases the precision of the foreign object detection.

The deep learning algorithm based on multi-layered neural networks now even makes visible what was difficult or impossible to detect even with HEUFT *eXaminer II* systems until recently: the ring-shaped wire in the ring-shaped pasta and similar inconspicuous foreign objects in foodstuffs with special structures which absorb the X-ray impulses to varying degrees.

If, as with liquid products in cardboard packaging, only a bottom inspection is required, the HEUFT *reflexx A.I.* image processing system realizes an "unfolded" bottom view. Small foreign objects lying flat at the bottom of the packaging are thus even more clearly visible.

A new option for particularly tall full products, the complete volume of which has to be inspected, is a special oblique alignment during X-ray with only one detection unit. This makes it possible to identify foreign

objects not only at the bottom, but also anywhere else in the packaging. A full-surface image converter provides increased sensitivity and ensures that each individual X-ray pulse covers a significantly larger container area than before.

The superordinate HEUFT *SPECTRUM II* control unit of the HEUFT *eXaminer II XS*, to which many other detection modules can be connected – among other things for the precise verification of product markings – is highly automated. For example, the height and alignment of the upper X-ray flash module automatically adapts to the changed container format when the type and program are changed. The HEUFT *NaVi* user guidance offers the operator comprehensive audio-visual step-by-step assistance.

All of this makes the compact HEUFT *eXaminer II XS* a real turnkey solution for the full-coverage detection of foreign objects at the end of line. Thanks to the new deep-learning-capable HEUFT *reflexx A.I.* image processing even the previously invisible now becomes visible.

Press release

Company profile: HEUFT is SYSTEMTECHNIK

Quality, safety, efficiency: this is what matters when filling and packaging food, beverages and pharmaceuticals! Modular quality control, inspection and labelling systems from HEUFT SYSTEMTECHNIK GMBH implement these key factors effectively and simply. With maximum productivity, they ensure that only flawless products reach the market.

Unique camera, X-ray and image processing technologies for precise empty and full container inspection, trend-setting labelling technology and smart tools for container flow optimization, production data acquisition and performance analysis ensure sustainable product quality and line efficiency!

A consistent modular principle with a cross-system control unit for a wide range of technologies, processes and modules generates the right automation solution for every application with a high degree of component uniformity.

Anyone who opts for a user-friendly HEUFT system can rely on a high level of operational reliability. With long-term availability of spare parts and 24/7 service availability, competent support is always guaranteed.

This concept keeps the globally operating company on a dynamic growth course. The number of employees has long since exceeded the 1,000 mark. The company's own locations in 18 different countries and a close-knit network of service centres on all five continents satisfy the high demand for HEUFT systems manufactured exclusively in Germany.

The result: greater safety, quality and efficiency in the filling and packaging of food, beverages and pharmaceuticals. HEUFT ... knows how!

Press release

Fact sheet

Company:	HEUFT SYSTEMTECHNIK GMBH
Management:	Alexandra Heuft, Bastian Heuft, Bernhard Heuft, Dr. Thomas Jahnen, Thomas Holzberger
Company headquarter:	Burgbrohl, Rhineland-Palatinate, Germany
Other locations:	Argentina, Australia, Brazil, China, Denmark, France, Great Britain, Hong Kong, India, Italy, Mexico, Netherlands, Austria, Russia, Spain, Thailand, USA
Foundation:	01.04.1979
Employees:	over 1,200 in the HEUFT Group
Industry:	Special machine construction
Product range:	Inspection, quality control, labelling, rejection, transport and IT systems for the food, beverage and pharmaceutical industries
Applications:	Container sorting, empty container inspection, fill management, full container inspection, foreign object detection, rejection systems, track & trace, container transport, conveyor control, labelling, full container

inspection, code reading, label inspection,
closure inspection, production data acquisition,
line analysis

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