

Press release

HEUFT at the BrauBeviale: see what is inside!

Up with the detection accuracy! Down with the false rejection rate! An end to the senseless waste of product and packaging! The HEUFT AI developed in-house makes this possible. At the BrauBeviale exhibition in Nuremberg from 28th to 30th November 2023 the leading supplier will be demonstrating what it can do during quality assurance and in-line inspection in the filling process.

An empty bottle inspection system that you can trust not only for glass-in-glass detection. A full bottle inspection that identifies glass splinters, film, or mould in the beverage even more reliably. A high-precision high-speed empty can inspection. A label inspection with new teach-in. And a truly seamless inspection of tethered caps on disposable PET bottles.

These are by no means all the highlights at the HEUFT stand 8-104. The focus there will be on AI-supported image processing technologies for full detection reliability and a sustainably reduced false rejection rate such as the HEUFT *reflexx*^{A.I.}. X-ray shots are smartly denoised with this so that even smaller splinters become visible during the pulsed glass-in-glass inspection. Glass thickness variations are compensated for by the AI. In optical in-line inspection, it not only filters out harmless objects such as drops on the bottle, but even makes visible what is hidden behind them. During empty can inspection, as well as during all-around inspection of tethered caps on filled plastic containers, it realizes full coverage, and during label inspection it offers a novel teach-in for immediate start-up of new brands and varieties.

Numerous intelligent QA technologies which realize a higher detection accuracy with a lower false rejection rate – such as the HEUFT *reflexx*^{A.I.} drop filter, the smart complete inspection of tethered closures or the innovative *Multi Color Image Processing* – will be clearly demonstrated at particular enlightenment stations at the HEUFT stand 8-104.

Press release

X-ray empty bottle inspection: detection reliability as standard

Still completely new at drinktec 2022, ready for series production at BrauBeviale 2023: the HEUFT *InLine*'' IX goes to the start!

Intelligent color sensor cameras developed in-house for the optical all-surface empty bottle inspection with new precision. In-house developed AI technologies of the latest generation. Perfected pulsed X-rays for the highest operational and detection reliability during the challenging detection of glass in glass and critical defects such as inclusions or shell-shaped fractures at the bottle base. And a revised HEUFT *CleanDesign* for better accessibility and less cleaning and maintenance work: the HEUFT *InLine*'' IX will go into serial production in time for the BrauBeviale exhibition at the end of November 2023 in Nuremberg!

The latest empty bottle inspector from HEUFT which combines smart camera and pulsed X-ray technology could still be seen as a study at drinktec 2022 in Munich. In the meantime the first installations are already in the pipeline – at bottlers of glass containers who are particularly concerned about glass splinter-free primary packaging that can be filled without hesitation. With new, lifetime-optimized X-ray components and AI-supported X-ray image processing, it ensures even greater precision in the detection of glass in glass at the bottom of the bottle.

And it is the only empty bottle inspector of its kind: the concept of integrating X-ray technology to complete packaging and food safety in filling lines was developed by the system engineers about ten years ago – and has been persistently advanced ever since. This also applies to the intelligent optical complete inspection of each individual bottle from the base to the finish. This is now carried out exclusively by HEUFT *reflexx*^{A.I.} cameras developed and manufactured in-house. With adaptive LED illumination, smart image analysis and

corresponding camera technology they open up completely new possibilities not only for the in-line inspection of empty embossing or ACL bottles. The precision of the complete, gapless inspection increases significantly.

Transparent film and other foreign bodies and low-density contaminants are detected just as reliably as inclusions, scratches, cracks, chips, and scuffing. Thanks to doubled resolution and distortion-free detection images, this applies in particular to quadruple sidewall inspection, which covers well over 360° of the container volume.

HEUFT *fluid* modules for the reliable residual liquid detection are now also directly integrated into the easily accessible, tableless new design of the highly automated inspector in the hygiene-optimized HEUFT *CleanDesign*.

But above all in the detection of glass in glass the HEUFT *InLine* ^{II} *IX* achieves a new level of precision during the challenging detection of glass-in-glass with the lowest false rejection rate – thanks to new X-ray components developed in-house and HEUFT *reflexx* ^{A.I.}! The all-surface empty bottle inspector is already ready for production and will be one of the exhibition highlights at BrauBeviale 2023.

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Optical and radiometric full container inspection: an end to blind spots!

It is not only in the detection of glass in glass that the latest release of the HEUFT *eXaminer* "XOS continues to push the state of the art for full bottle inspection.

The fact that a full container inspection at the end of line is more than advisable at least wherever beverages are filled into glass bottles has meanwhile become common knowledge in the industry. This is the only way to detect glass splinters that get into the primary packaging between the empty bottle inspector and the capper and pose a massive threat to the safety of the end product. The HEUFT *eXaminer* "XOS defines the state of the art for effective consumer and brand protection again and again at the pulse of time not only in this respect.

The release of the highly automated full container inspector presented at drinktec 2022 already achieves exceptional operating and detection reliability in glass in glass detection – thanks to consistently further developed components for pulsed X-ray inspection and intelligent HEUFT *reflexx* ^{A.I.} image processing, which now also uses deep learning to compensate for glass thickness fluctuations and smartly remove image noise and artefacts from the X-ray images.

The latest one goes one better: For sharper images during full-coverage radiometric dual inspection, the compact full-field X-ray imager is now closer to the bottom of the bottle. Also perfected: the integrated HEUFT *sinker* technology in order to identify foreign objects of a lower density such as pieces of plastic or seals in addition to glass fragments. Just like the HEUFT *floater* for the more precise optical identification of paper, foil and other foreign objects which float in the beverage.

New types of HEUFT *reflexx* ^{A.I.} color sensor cameras in which an adaptive LED illumination is already integrated as well as an intelligent

image evaluation now each generate eight front surface views of the bottle base for this purpose. There are even 16 for side wall inspection, thus ensuring a complete inspection of these areas without any blind spots. Mold, film, and other weakly absorbing foreign substances in the bottle, which are not always detectable with pulsed X-ray inspection for physical reasons, are identified just as reliably as contamination, label and adhesive residues, chips, and cracks.

As the only end of line system of its kind the further developed HEUFT *eXaminer* "XOS" combines the latest version of pulsed X-ray technology with smart high performance optics. The dual radiometric base inspection for reliable glass-in-glass detection achieves a new level of precision whilst minimizing radiation. The false rejection rate is reduced to less than 0.2 percent.

Press release

Label inspection with teach-in: Smart commissioning of new brands

Simply quicker teach-in of new labels: the HEUFT *FinalView* " LBL shortens downtimes with intelligent image processing for a detailed label inspection and thus increases the availability of complete bottling lines sustainably.

Putting new types into operation takes time. This is particularly true for added bottle labels which only differ in the smallest details from those previously used – for example when a light variant of a lemonade or a non-alcoholic version of an established beer speciality is newly introduced.

For reliable inspection at the end of line, a new label previously had to be evaluated by an expert and manually set as a new variety based on a large number of appropriately equipped bottles. Anyone can imagine what all this means for the availability and productivity of entire bottling lines, especially in the high-speed sector. The innovative teach-in of the HEUFT *FinalView* " LBL puts an end to this!

With the latest expansion stage of our AI-supported HEUFT *reflexx* ^{A.I.} image processing the detection unit for the detailed label inspection significantly accelerates the commissioning of new types – and at the same time simplifies it so that the operator can teach it in himself without any outside help. If the container shape remains unchanged, for example, an appropriately equipped amber glass beer bottle only needs to be inspected once: In less than a minute, the system permanently memorizes the new label with all its characteristic features and design elements.

Even if non-brand labels differ from this template in only one minor detail, affected containers are always detected and rejected from then on. Putting new types into operation and adapting optical label

inspection to them is now quicker and easier than ever before, and downtimes are permanently reduced.

In addition to non-branded, differently coloured and printed labels the HEUFT *FinalView* ^{II} *LBL* also finds, amongst other things, labels which are incorrectly positioned, crooked, wrinkled and torn. Four high-performance cameras on two levels each generate an undistorted 360° panoramic view of each individual primary packaging material in conjunction with adaptive LED lighting and intelligent HEUFT *reflexx* ^{A.I.} image processing. Non-critical features such as slight pressure misalignment can be taught in as good objects so that these also no longer lead to rejection.

The height and alignment of the two camera levels adapt to the changed container size just as automatically as the individually controllable LEDs for optimum illumination in each case in order to implement changes of format in a simple and time-saving manner. The HEUFT *NaVi* user guidance system not only provides the user with audio-visual step-by-step assistance.

Connected to the HEUFT *SPECTRUM* ^{II} *VX* fill management system the HEUFT *FinalView* ^{II} *LBL* takes over the fill level check including filler valve monitoring or the closure integrity check amongst other things in addition to the detailed label inspection with artificial intelligence.

And with the latest HEUFT *reflexx* ^{A.I.} version it adapts smartly to equipment variants which have been added: Putting new label types into operation now only takes a fraction of the time previously required to do this. This means that lengthy, unproductive downtimes are no longer an issue, and the availability of entire filling lines is noticeably increased.

Press release

High-speed empty can inspection: Clever image analysis

Ensuring that the can can be closed, preventing seaming blockages and the resulting loss of productivity, detecting and rejecting faulty and contaminated packaging in good time before filling. The HEUFT *canLine* " carries out a quality check on up to 144,000 empty beverage cans per hour. The clever HEUFT *reflexx* ^{A.I.} image analysis perfects the simultaneous base and flange edge inspection with only one camera.

Identify deformations, indentations and defects at the finish flanged edge of empty cans just as reliably as dirty and dented inner walls or contamination and foreign objects at their base. The compact HEUFT *canLine* " does all this with just one HEUFT *reflexx* ^{A.I.} camera in a top-down arrangement in which image evaluation for targeted object recognition and classification is directly integrated. The intelligent color sensor camera achieves such a depth of field that no critical defect is overlooked.

With HEUFT *reflexx* ^{A.I.} image evaluation it is now also possible to compensate for the brightness of the adaptive LED lighting so that the base and rim of the empty cans are always well enough illuminated on the images to reliably detect critical defects in both areas at the same time. And the tolerance can now be individually regulated with HEUFT *reflexx* ^{A.I.} when detecting oval-shaped cans which may not be able to be securely sealed. How well all this works will be demonstrated at BrauBeviale at a dedicated Enlightenment station.

The compact system can also be extended by an additional detection unit in order to ensure that the empty can inspection also covers the sloping inner shoulder area just below the can opening which is difficult to see without any gaps: Based on the HEUFT *FinalView* " CAP technology for the 360° closure inspection this generates a total of eight high-resolution camera views from exactly the right perspective directly

on the conveyor which show the sensitive area below the rim of each individual can all around. Even the smallest damage, adhesions and impurities such as material defects, paint defects, oil or grease residues and stains are reliably identified there. And this also at minimal distances between the individual containers on the conveyor.

The superordinate HEUFT *SPECTRUM* " platform realizes the highest degree of automation and support for the user: the height and LED lighting of the intelligent camera is adapted to the new container format just as automatically as the passage width of the guide rails in the inspection area during a type change. The HEUFT *NaVi* user guidance system provides the user with an audiovisual step-by-step assistance which makes every changeover self-explanatory.

Press release

Tethered cap inspection: full coverage

The tethered cap obligation can come: The HEUFT *FinalView* "CAP" now inspects even difficult closure types without gaps and with high precision.

Full closure reliability all around! The HEUFT *FinalView* "CAP" is now fit for new challenges in the field of optical tethered cap inspections in order to guarantee the reliability required for the most varied types of tethered closures:

A software upgrade makes it possible to roll out four individual camera shots each of asymmetrical tethered caps to a 360° view. This ensures gapless coverage. New lighting hardware facilitates all-around inspection of the tamper-evidence bands of rPET bottles. And the advanced cap angle detection reliably checks whether all containers are actually sealed correctly and tightly.

Transmitted light is used to detect defects on the tamper-evidence band of all types of closures. Combined with a realistic frontal inspection in incident light, much more is possible, particularly during asymmetrical tethered caps. Protruding hinges and unusual gaps in the tamper-evidence area then no longer lead to false rejections. The rotational asymmetry of some of these new types of closure caps can even be precisely calculated with the intelligent HEUFT *reflexx* ^{A.I.} image processing.

Where it was usual in the past to generate only a black and white view four color cameras with incident and transmitted light can now be integrated into the HEUFT *FinalView* "CAP" at the same time. The size of the faults which can be detected on the tamper evidence tape is reduced by a factor of three in comparison. Dead angles are no longer an issue and the software update mentioned at the beginning additionally increases the precision of the gapless 360 degree inspection by a good 50 percent.

Compared to its predecessors the HEUFT *FinalView* " CAP offers twice as many color cameras and six times the resolution. The maximum diameter of closures to be completely examined is increased by a factor of 1.5 and the possible height difference between the smallest and the largest full bottle which can be safely inspected increases to 30 centimetres.

The high degree of automation and the intuitively comprehensible audio-visual HEUFT *NaVi* user guidance of the HEUFT *SPECTRUM* " platform make the complete inspection of the closures simply easy – and realize gapless coverage even with tethered caps, which will become mandatory throughout the EU in the middle of next year.

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AI-supported image processing: down with the false rejection rate!

HEUFT's image processing has been using artificial intelligence (AI) for a long time in order to clearly distinguish critical objects from harmless ones. The HEUFT *reflexx*^{A.I.} has been consistently developed further and now increases the detection accuracy even more – and reduces the false rejection rate.

Intelligent object detection instead of a simple brightness comparison during image evaluation: HEUFT already took this step about 20 years ago in order to increase the precision of the in-line inspection and to reduce the proportion of good products which are incorrectly rejected. For more than ten years the real-time image processing from its own development and production has been using AI to classify the detected objects, to distinguish genuine faults from harmless structures, to implement a targeted teach-in and to reduce the false rejection rate to less than one percent.

The HEUFT *reflexx*^{A.I.} has been continuously developed further and now also realizes a denoising of X-ray images based on Deep Learning with brand new hardware in order to further increase the detection accuracy during the foreign object detection. And during optical quality inspection, the smart image processing now not only filters out water drops on the bottle, but even makes visible what is behind them.

The smart image processing can be integrated from now on into the HEUFT *reflexx*^{A.I.} camera with adaptive LED illumination which has been developed in particular and which processes and evaluates its own images directly in real-time. These do not first have to be transferred to the control or inspection equipment for this purpose. Simply connected to them, the camera can do much more during the high-speed inspection of empty and full containers.

And this during significantly increased resolution. The hardware and software developed in-house combines classic image processing methods with modern AI methods such as object recognition, classification and learning functions. Nevertheless, you are not completely at the mercy of the AI, as if you were sitting in a self-driving car without a steering wheel and brake pedal. Because unlike during other providers, object evaluation does not come from an unchangeable black box with countless unknowns. Rather, the human can intervene at any time:

If, for example, an unknown object that has never occurred before is detected, the AI generally evaluates it as an error first, just to be on the safe side. However, the user always has the option of modifying the quality judgment based on his own experience and defining the identified structures as good and uncritical for product and packaging safety - or to have them temporarily tolerated during the process, if necessary. Without affecting the AI network or having to retrain it in a time- and energy-intensive manner, production can then continue safely even in such cases.

So if necessary, the assessment can be changed in an easy way: The expertise of experienced people with experience in filling and packing does not become obsolete. Instead, it is incorporated into the smart image analysis as required. In this way, each individual object can be taught into the multidimensional feature space fully automatically and classified individually in order to distinguish genuine defects from harmless structures such as water droplets. The AI now even filters these out and reconstructs what is behind them.

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Empty crate inspection: Intelligent three-level classification

The new HEUFT *SPECTRUM* " LKX achieves a new level of detection and operational reliability in empty crate inspection on a current platform with innovative technologies for the precise localization and evaluation of foreign objects and defects.

Returnable reusable empty crates must be safely reusable and free from foreign objects, defects and risks of injury. The new generation empty crate inspector checks this just behind the unpacker. It achieves a completely new level of performance, automation and operational reliability for the first time on a HEUFT *SPECTRUM* " basis.

The system offers an innovative three-stage classification for the improved detection of foreign objects in the compartments of empty beverage crates: the HEUFT *SPECTRUM* " LKX first identifies them using exactly the right optics in each case by means of incident and transmitted light and smartly distinguishes them from each other on the basis of their size, color and shape before a 3D laser scan additionally measures their height profile.

This optimizes the containment, localization, and evaluation of identified objects and ensures that only those crates enter the production stream that can be safely reused and easily filled with new beverage bottles. Those where this is not the case are reliably rejected by particular systems from the HEUFT *case rejector* range.

The HEUFT *maxi-flip* and the HEUFT *maxi-laner* even realize a weight-dependent control so that heavier cases are each conveyed just as far onto a parallel conveyor as lighter ones. And a completely newly developed system also distributes them to different lanes in a fault-specific manner during the process.

This also applies to unusable crates with defective bases which the

HEUFT *SPECTRUM* " LKX detects by means of a camera. In addition it inspects the edges of the secondary packaging material and finds cracks, damage or even sharp-edged chips among other things which in the worst case can injure the hands when lifting and carrying. The intelligent HEUFT *reflexx* ^{A.I.} image processing ensures full detection reliability and minimal false rejection rates.

The highly automated HEUFT *SPECTRUM* " platform with HEUFT NaVi user guidance creates full operational reliability during the inspection of up to 7,200 empty beverage crates per hour and realizes quick, easy brand changes: all parameters are automatically adjusted, the height and position of the detection units are motor-adjusted and the user receives comprehensive audio-visual step-by-step assistance.

Together with the novel technology for the three-stage detection and classification of foreign objects the HEUFT *SPECTRUM* " LKX reaches the next stage in the development of intelligent empty crate inspection.

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Tightness check: More precise leak detection

The HEUFT *squeezer*'' QA offers the necessary performance and a flexibly extendable inspection path in order to identify even the smallest leaks and to reliably reject PET bottles which are affected.

Detection reliability up, false rejection rate down: The self-explanatory system simply achieves a greater performance for the leakage check of filled PET bottles simply due to the latest version of the highly automated HEUFT *SPECTRUM*'' device platform. The inspection path of the new HEUFT *squeezer*'' QA can be flexibly extended depending on the application for the even more precise detection of stress cracks and micro leaks which are hardly visible to the naked eye: The transport belt which guides the bottles and pressurizes them in a precisely dosable manner can now be integrated in different lengths. At the same time, the sensitivity of the sensor system for internal pressure measurement has been further increased.

With a longer belt, even smaller leaks can be detected in the comparative fill level check in the depressurized and pressurized state. The inner pressure then drops more clearly with leaking bottles, and the fill level rises more sharply. The correlated evaluation of the fill level and internal pressure measurements refines the result so that leaking bottles are detected even more reliably. This ensures the stability and stability of the bottle as well as the integrity and microbial purity of its contents.

The ergonomic construction in the hygiene-optimized HEUFT CleanDesign makes the operation and cleaning of the further developed HEUFT *squeezer*'' QA easy and convenient. More flexibility is created for example by the individually adjustable new gooseneck panel. The user of the system which is based on the highly automated HEUFT *SPECTRUM*'' platform thus always has the tidy touchscreen with the HEUFT *NaVi* user interface in view.

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Labelling: dynamics and flexibility

As the first semi-modular labeller on a highly automated HEUFT *SPECTRUM* " basis the HEUFT *TORNADO* " dynamic simply achieves more performance, precision and dynamics during wet glue, self-adhesive or wrap-around labelling. The same applies for the integrated quality inspection in the same work process. Integrated voice control creates full responsiveness during machine analysis and process control for simply more efficiency and productivity across the board.

The first labelling machine based on the HEUFT *SPECTRUM* " achieves really appealing results simply due to the significant plus in automation, computing power and accuracy which the multi-processing capable device platform of the new generation has to offer during container tracking, label application, quality control and rejecting faulty products.

The use of up to four electrically coupled labelling stations provides additional dynamics and flexibility: three wet-glue stations for chest, back and neck labelling of up to 60,000 containers per hour are just as possible as a combination of wet-glue, self-adhesive or wrap-around labelling in one and the same machine. In the model exhibited at drinktec 2022, the first station is manned by securely housed, automatically height-adjustable high-performance cameras that use, for example, embossings or even the inconspicuous press seam in the glass as orientation points for servo-controlled fine alignment of the bottles to ensure that the labels are applied cleanly and wrinkle-free to the millimetre where they belong. Permanently mounted in the new-generation semi-modular, tableless labeller, all these units can be replaced with little effort during changeover.

Integrated detection modules for checking the presence and position of the freshly applied labels, as well as for checking the BBD, microcode

fill level, and cap, among other things, carry out the quality inspection of the freshly applied full product in the same operation. Faulty bottles are safely rejected.

The HEUFT *NaVi* user interface provides a complete overview which is not only displayed on the terminal of the compact machine but also on four flat screens positioned around its top. No matter where he is particularly located: The user always has the current status of the HEUFT *TORNADO "dynamic"* in view as a result. The audiovisual user guidance with individual step-by-step assistance and above all the further optimized hands-off voice control provide additional added value: In real dialogue with the virtual assistant Amanda, the new-generation labeller can be operated without manual intervention, using only the voice. Amanda listens to the user, answers questions and speaks to him as soon as something needs to be done. He hears in good time, for example, how many labels are still in the magazine or how long the respective program will run. Verbal instructions for actions such as grade changes or test bottle programs are implemented directly. In clear language, the unique hands-off voice control always keeps the user informed about the situation of the labeller and the entire process, and actively protects against performance losses, breakdowns, and downtimes. This sustainably increases the efficiency and productivity of entire filling lines.

Among other things, the easy-to-integrate automatic magazine loading system for increasing the label supply during wet-glue labeling also contributes to this. The solid, practically tableless design of the HEUFT *TORNADO "dynamic"* realizes optimum accessibility for cleaning, maintenance, changeover and conversion.

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Company profile: HEUFT is SYSTEMTECHNIK

Quality, safety, efficiency: this is what counts when filling and packing beverages, food and pharmaceuticals! Modular checking, inspection and labelling systems from HEUFT SYSTEMTECHNIK GMBH realize these key factors effectively and simply. While maintaining maximum productivity they ensure that only faultless products reach the retail market.

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

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

Those who decide on a user-friendly HEUFT system can rely on a high level of operational reliability. Competent support is always guaranteed with spare parts available on a long-term basis and 24/7 service availability.

This concept keeps the globally operating company on a dynamic growth course. In the meantime, 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 points on all continents satisfy the high demand for HEUFT systems which are exclusively manufactured in Germany.

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

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Fact sheet

Company:	HEUFT SYSTEMTECHNIK GMBH
Management:	Alexandra Heuft, Bernhard Heuft, Bastian Heuft, Dr. Thomas Jahnen, Thomas Holzberger
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:	1,400 in the HEUFT Group, about 750 of them at the Burgbrohl production site
Sector:	special machine construction
Product range:	inspection, quality check, labelling, rejection, transport and IT systems for the beverage, food and pharmaceutical industries
Applications:	empty container inspection, bottle sorting, fill management, full container check, full container inspection, foreign object detection, rejecting faulty products, container transport, conveyor control, labelling, label inspection, code verification, production data acquisition, line analysis, brand and recipe management
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