CASE STUDY

X-ray Food Inspection

How one manufacturer utilized IEI industrial computer hardware for their AI-powered X-ray food inspection machine

ECA-200

» RoHS compliant design
» Supports microATX motherboard
» One 3.5" HDD or one 2.5" HDD/SSD bay
» Four expansion slots

Introduction

Cleanliness. Safety. Trust. Food producers know these are the key components to building and maintaining their food brand. Quality control and quality assurance throughout the food production cycle are paramount to achieving consistently high quality, and X-ray food inspection has become a critical tool for automated inspection and visualizing operations at multiple points in the production process.

X-ray food inspection is an effective way to perform quality assurance on raw materials and packaged food products. It uses X-ray cameras and image-based automatic inspection, powered by deep learning technologies, to check food at every point in the process, from raw ingredients all the way to packaged products, so that only those that make the grade leave the facility. X-ray food inspection systems can check for metal contaminants (stainless steel), presence of necessary elements, completeness and fill level, package defects, foreign bodies and air bubbles.

Our client in China was looking for reliable computer hardware for their X-ray food inspection equipment. In recent years, they've faced challenges keeping up with the complexity and speed of digitized product lines, straining their current equipment and maxing out the rate of throughput. Essentially, their existing technologies needed an upgrade to better integrate with modern digitized production lines in a way that their existing systems could not. They sought our help to provide the AI-powered computer hardware that could help them do that.

Challenge

When developing X-ray food inspection machines, it is crucial to consider the cleanliness demands in food facilities, environmental factors like temperature and moisture, and the performance needs of the automatic inspection system.

Cleanliness and disinfection

Food facilities must be super clean. Contaminants must be kept out. And all equipment must be cleaned regularly to inhibit contaminant buildup and maintain a consistently high standard of cleanliness. All systems must be designed to collect as little dirt as possible and be easy to clean. This means that the system must be able to withstand water and common cleaning products and allow cleaning without undue extra effort, such as shutting the system down or being super-careful with specific parts.

IMB-H810

» LGA1150 4th generation Intel® Core™ i7/i5/i3, Pentium® or Celeron® processor supported
» Dual-channel DDR3 1333/1600 MHz support up to 16 GB
» Intel® HD Graphics technology integrates high-performance graphics and media processing

Water and wide temperatures

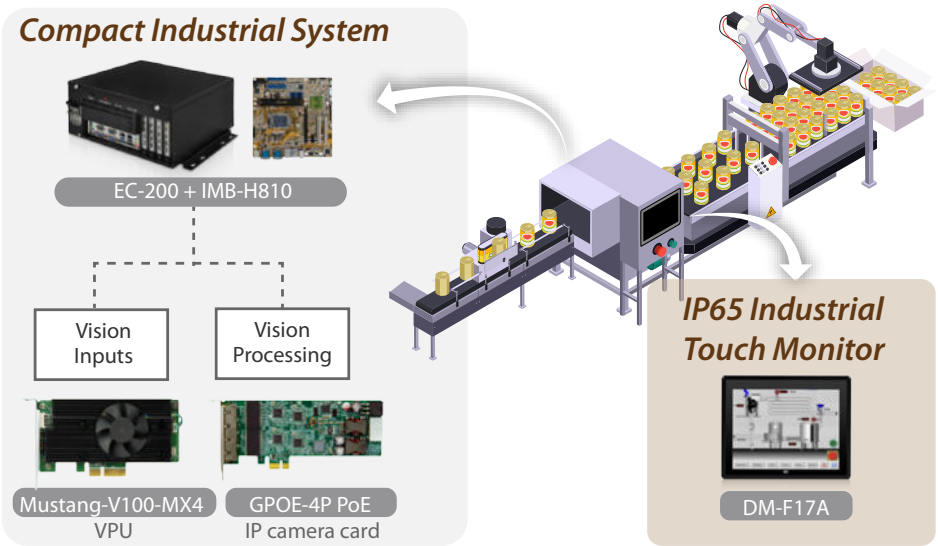
Food production often necessitates cold temperatures to meet guidelines and reduce food safety risks to a safe level. To operate in these environments, the system must be able to operate correctly in ambient temperatures as low as 13°C or even 7°C for raw meat processing. To withstand these temperatures, the electronic systems must be built tough enough to protect against moisture that can form when warm computer parts meet the cold outside air. Wide temperature operation and waterproof design for user-facing monitors are required.

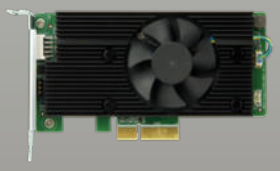
Graphics processing performance

The X-ray Image processing system has two parts: capturing the images and then processing them. High-speed X-ray cameras send hundreds of high-resolution X-ray images for analysis every minute through the inputs on the computer. Each image is analyzed, requiring enough computer processing power to perform image analysis and identify defects in real time. The processing speed must be quick enough to trigger the system to divert any defective products to the defect bin before leaving the inspection machine.

IEI Solution

IEI provided a compact industrial system powered by a Mustang-V100-MX4 VPU card, offering outstanding end-to-end performance, efficiency, and responsiveness to empower next-gen AI inference capabilities. The rest of the system combines a selection of industrial parts that provide the robustness and reliability needed to ensure consistent and predictable operation.





Mustang-V100-MX4

» PCIe Gen 2 x 2 form factor
» 4 x Intel® Movidius™ Myriad™ X VPU MA2485
» Power efficiency, Approximate 15W
» Operating Temperature -20°C~60°C

ECA-200 desktop/wall-mount industrial chassis

Employing the robust design of a larger chassis, but with a smaller footprint that's suited to use inside the X-ray inspection machine, the ECA-200 is ideal for an X-ray machine that requires expansion cards and connectors for the other parts of the machine, such as the X-ray cameras, conveyor belts, and defect bins. Compact dimensions and easy installation in space-limited cabinets.

IMB-H810 microATX motherboard

The microATX form factor is 20% smaller than the ubiquitous ATX, and provides just as much power, but without wasting space with too many full-size expansion slots. The IMBH810 provides enough full-size expansion ports for the X-ray food inspection machines while providing plenty of power and COM and PCI support while leaving room for other essential components of the system.

Mustang-V100-MX4 Intel Movidius VPU AI accelerator

The quality of AI-powered computer systems hinges on the efficiency and power of accelerator cards. The Mustang-V100-MX4 is a vision processing unit (VPU) that is optimized for vision processing applications such as X-ray food inspection. AI-processing power can be flexibly upgraded or downgraded by using more or fewer cards with more or less processing cores to suit specific applications. This card uses four Intel® Movidius™ Myriad™ X VPU MA2485 and supports the Intel OpenVINO™ toolkit.

GPOE-4P PoE IP camera card

A VPU must process high bandwidth visual data. The GPOE-4P has four high speed GbE PoE ports for vision inputs from high-speed cameras. This PoE card provides the flexibility to specify a suitable number of cameras while fitting in with existing Ethernet systems. The major upside of PoE is doing away with extra power cables and enabling the control system to have complete control over the cameras.

GPOE-4P

» PCI Express® x1 compliant
» Support for total 90 watts under full load
» Support link aggregation/ jumbo frames (9 Kbyte)
» Supports 12V~24V DC input power

DM-F17A 17" IP65 industrial touch monitor

The 17" DM-F17A wide temperature industrial monitor with IP65 front panel is made for tough environments. It features an ultra-thin front bezel for seamless panel mounting, making it easy to clean, and supports an optional multi-touch PCAP for better visualization of data and operational management. The monitor accepts VGA, HDMI, or DisplayPort video inputs and 9–36 VDC power input. Temperature support is -20–60°C. Easy installation, panel mount for cabinet installation, and connection to available video outputs and power supplies are important for the manufacturer. But for the end user, whose primary usage is the HMI, smooth operation, touch sensitivity, and easy cleaning are the main concerns. The DM-F17A delivers them all.

Result

With the right combination of quality computer hardware, the X-ray food inspection machine is ready for service. The compact size of the system enabled our client to comfortably integrate the system into their design, saving space for the other essential components, and keeping the design sleek. The narrow bezel display enabled a comfortable front panel design that they could easily install while ensuring protection against dust and water through the IP65 rating.

The end product is a breeze for their customer. It's relatively compact, so it can easily be introduced as part of the final QA stage. The whole system minimizes places for dust and contaminants to build up and can be wiped down with traditional cleaning approaches without worrying about damaging the screen. Finally, the power and performance ensure that the inspection system can keep pace with a high product throughput.

Our client is happy to get their product to market quickly, and they now have happy customers who can ensure they deliver consistently high-quality products to consumers.

IEI Integration Corp.

IEI Integration Corp. builds up the business as a leading industrial computer provider, and turns to artificial intelligence and networking edge computing. IEI's products are applied in computer-based applications such as factory automation, computer telephony integration, networking appliances, security, systems, and in fields like AI, IoT (Internet of Things), national defense, police administration, transportation, communication base stations and medical instruments. IEI continues to promote its brand products as well as serving ODM vertical markets to offer complete and professional services.

Product Selection Guide

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DM-F17A

» Robust IP65 aluminum front bezel
» Aesthetic ultra-thin bezel for seamless panel mount installation
» Wide range 9V~36V DC input
» HDMI / DisplayPort / VGA flexible video input solution

To find out more, please fill out the sales inquiry form and you will be contacted shortly by an IEI sales representative. Thank you.

Sales Inquiry