Advantech Automated Optical Inspection System Powered by AMD Ryzen™ Embedded Processors

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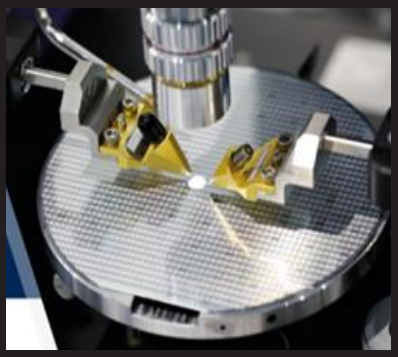
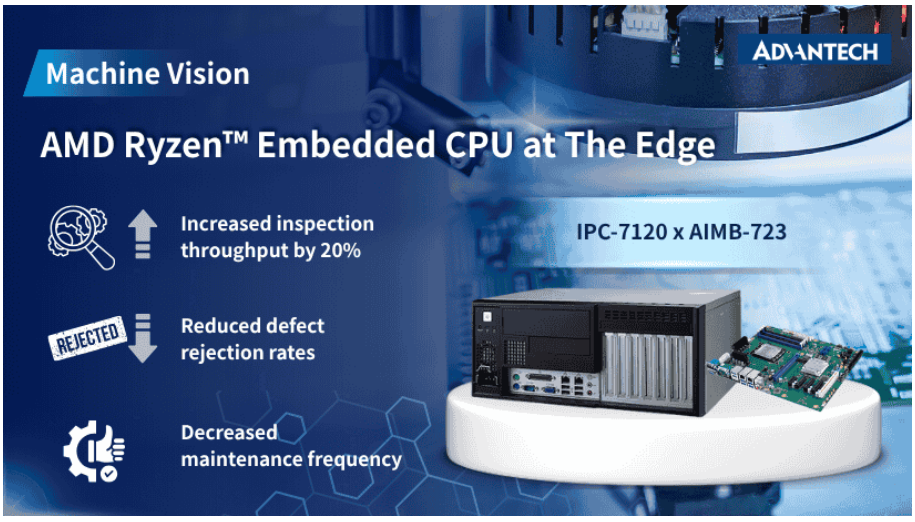


INTRODUCTION

As industrial applications become more sophisticated and complex, they require stronger processors for manufacturing. An example of these applications is a high-precision Automated Optical Inspection (AOI) system.

The customer must simultaneously capture multiple video streams from industrial cameras and acquire factory sensor/control signals, all while maintaining separate network segments with redundancy. Additionally, the system must perform real-time defect detection, optical character recognition (OCR), and log all operator actions for traceability.

To satisfy these complex requirements, the Advantech IPC-7120, configured with the AIMB-723 motherboard powered by the AMD Ryzen™ Embedded CPU, was selected. This setup supports five PCIe expansion cards and two pin-header breakout I/O modules, providing the flexibility and performance needed for industrial AI workloads.



CHALLENGE

In traditional manufacturing, manual inspection is inefficient and prone to errors. With the rise of production-line automation, integrating machine vision technology has become essential to improving inspection accuracy and speed.

INDUSTRY
Industrial; Machine Vision

CHALLENGES
Enable real-time AI vision defect detection with lightweight machine vision; Route all data over four redundant subnets to prevent loss; Maintain uninterrupted high-frequency capture and CPU inference without throttling; Securely log operator actions for traceability.

SOLUTION
Advantech ultimately chose AMD because of its sustainable high-frequency performance. Additionally, AMD provided strong support for industrial applications, ensuring long-term availability and reliability—both critical for its customers.

RESULTS
AI plays a crucial role in Advantech's solution. The system integrates AI-driven machine-vision algorithms to identify defects in components. The AMD platform provides the high-speed computing power necessary for AI inference at the edge, reducing the need for cloud processing and improving response times.

AMD TECHNOLOGY AT A GLANCE
AMD Ryzen™ Embedded 7000 Series processors

TECHNOLOGY PARTNER
Advantech

To meet these demands, the inspection system must handle multiple technical requirements simultaneously—from reliable image acquisition to real-time analysis. The key capabilities include:

- **Multi-channel Image Acquisition and Processing:** Support both USB and GigE industrial cameras, expand sufficient USB ports for additional cameras, sensors, and controller signals, and enable real-time AI-driven defect detection, OCR, and CPU-based lightweight vision tasks.

- **Network Segmentation and Redundancy:** Distribute image transfer, Serial-to-Ethernet, and PROFINET-to-Ethernet traffic across four independent subnets, each with failover redundancy to prevent data loss during inspections.

- **Continuous High-performance Operation:** Sustain high-frequency computing for long-duration image capture, AI inference (defect detection, OCR, and lightweight machine vision), and operator event logging, avoiding thermal throttling that could delay inspection.

- **Traceability and Compliance:** Record every operator action—such as parameter adjustments or manual overrides—in a secure log for audit and process optimization.

Advantech's AOI solution consists of the IPC-7120 industrial computer and the AIMB-723 industrial motherboard powered by an AMD Ryzen™ Embedded 7000 processor. This combination is specifically designed for high-precision inspection applications.

The AMD solution has helped Advantech enhance product reliability, reduce downtime, and improve overall production efficiency. In turn, its customers can now run high-speed, high-accuracy inspections with minimal risk of performance drops.

The system runs a combination of edge-based AI software and lightweight machine vision pipelines on the AMD Ryzen Embedded 7000 processor, enabling CPU-only execution of simpler vision workloads while offloading heavier inference tasks to the GPU. An integrated logging service records all operator interactions—login events, parameter changes, manual overrides—storing logs locally and streaming them securely to the factory MES for traceability

SOLUTION

Advantech evaluated several alternatives, including those using high-performance processor architectures. While these solutions deliver solid performance, they found that under sustained high loads, certain models exhibited CPU frequency throttling issues that could affect real-time inspection speed and reduce production line efficiency.

The company ultimately chose an AMD Ryzen Embedded processor because of its sustainable high-frequency performance. Additionally, AMD provided strong support for industrial applications, ensuring long-term availability and reliability—both critical for its customers.

RESULT

Advantech has realized the following improvements since integrating AMD technology into its design: a) improvement in inspection speed due to stable high-frequency performance, b) lower rejection rates due to more accurate defect detection, c) reduced maintenance since the system operates without overheating or instability.

AI plays a crucial role in Advantech's solution. The system integrates AI-driven machine vision algorithms to identify defects in components. The AMD platform provides the high-speed computing power necessary for AI inference at the edge, reducing the need for cloud processing and improving response times.

The AMD Ryzen™ Embedded 7000 series processors include the "Zen 4" 5nm core architecture and AMD RDNA™ 2 graphics. With thermal design power (TDP) profiles spanning from 65W to 105W, the AMD Ryzen™ Embedded 7000 series processors combine powerful CPU processing with integrated AMD Radeon™ graphics and rich I/O connectivity in a socketed solution for performant, and efficient industrial systems.

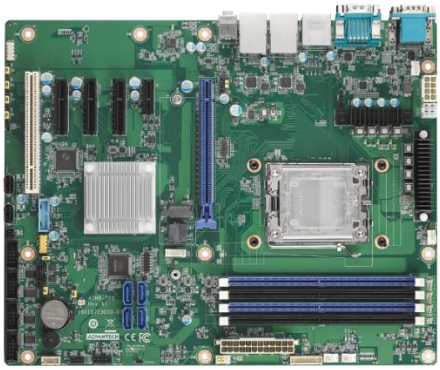
AMD Ryzen Embedded 7000 series processors can provide a powerful performance boost for IPCs, workstations, edge servers, robotics and machine vision applications, with power profiles and heat dissipation optimized for heavy workloads. This family of processors provides ample I/O flexibility, in a socketed format for simplified integration and upgradeability.

In addition, AMD Ryzen Embedded 7000 series processors feature integrated AMD Radeon™ graphics with the newest generation AMD RDNA™ 2 architecture technology to optimize performance, visuals, and power efficiency. Integrated graphics eliminate the need for a discrete GPU or graphics card for designers seeking to streamline system density and cooling while preserving PCIe® lanes to maximize I/O flexibility.

"Advantech's design experience with AMD has been highly collaborative," said Harry Weng, product manager at Advantech. "AMD provided technical support and optimization guidance, ensuring our system fully leveraged high-performance mode for maximum efficiency. The documentation and developer resources provided by AMD made the integration process smooth." he added,

"Advantech has received positive feedback from several customers who have experienced significant improvements with their technology powered by AMD. One of our customers in AI AOI and machine vision applications highlighted how the AMD-powered system accelerated their AI processing, delivering up to 20% faster performance. This boost has directly enhanced inspection accuracy and operational efficiency, enabling them to achieve better results in less time."

"The Advantech AIMB-723 offers the industry's most highly integrated and capable AOI solution. Because of the performance enhancements offered by the AMD Ryzen™ Embedded 7000 series processor, our customers are satisfied choosing this new motherboard for production deployments."
Harry Weng, product manager



AIMB-723

ABOUT Advantech

Advantech's corporate vision is to enable an intelligent planet. The company is a global leader in the fields of IoT intelligent systems and embedded platforms. To embrace the trends of IoT, big data, and artificial intelligence, Advantech promotes IoT hardware and software solutions with the Edge Intelligence WISE-PaaS core to assist business partners and clients in connecting their industrial chains. Advantech is also working with business partners to co-create business ecosystems that accelerate the goal of industrial intelligence. More information is available at https:// https://www.advantech.com/en-us

ABOUT AMD

For more than 50 years AMD has driven innovation in high-performance computing, graphics, and visualization technologies. Billions of people, leading Fortune 500 businesses, and cutting-edge scientific research institutions around the world rely on AMD technology daily to improve how they live, work and play. AMD employees are focused on building leadership high-performance and adaptive products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit the AMD (NASDAQ: AMD) website, blog, LinkedIn, and X pages.

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