



ADVANTECH iAutomation
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Industrial Vision AI Inspection Solutions

for Semiconductor & Electronics Manufacturing

Advantech Application Cases



ADVANTECH

Enabling an Intelligent Planet

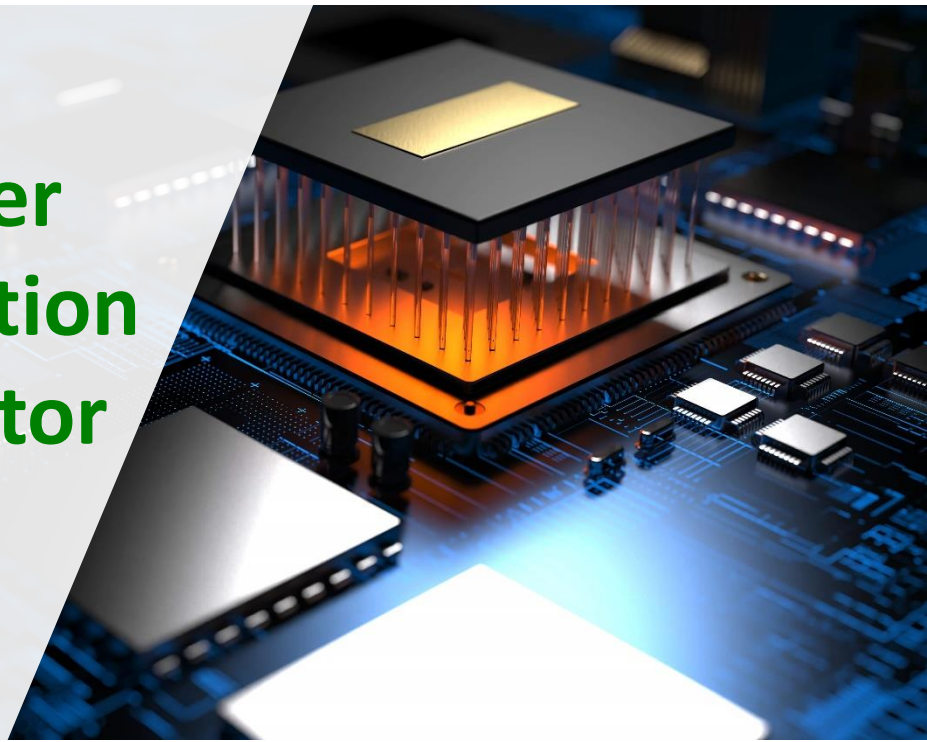
Vertrieb durch



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Advantech Wafer Inspection Solution for Semiconductor Factory



Introduction

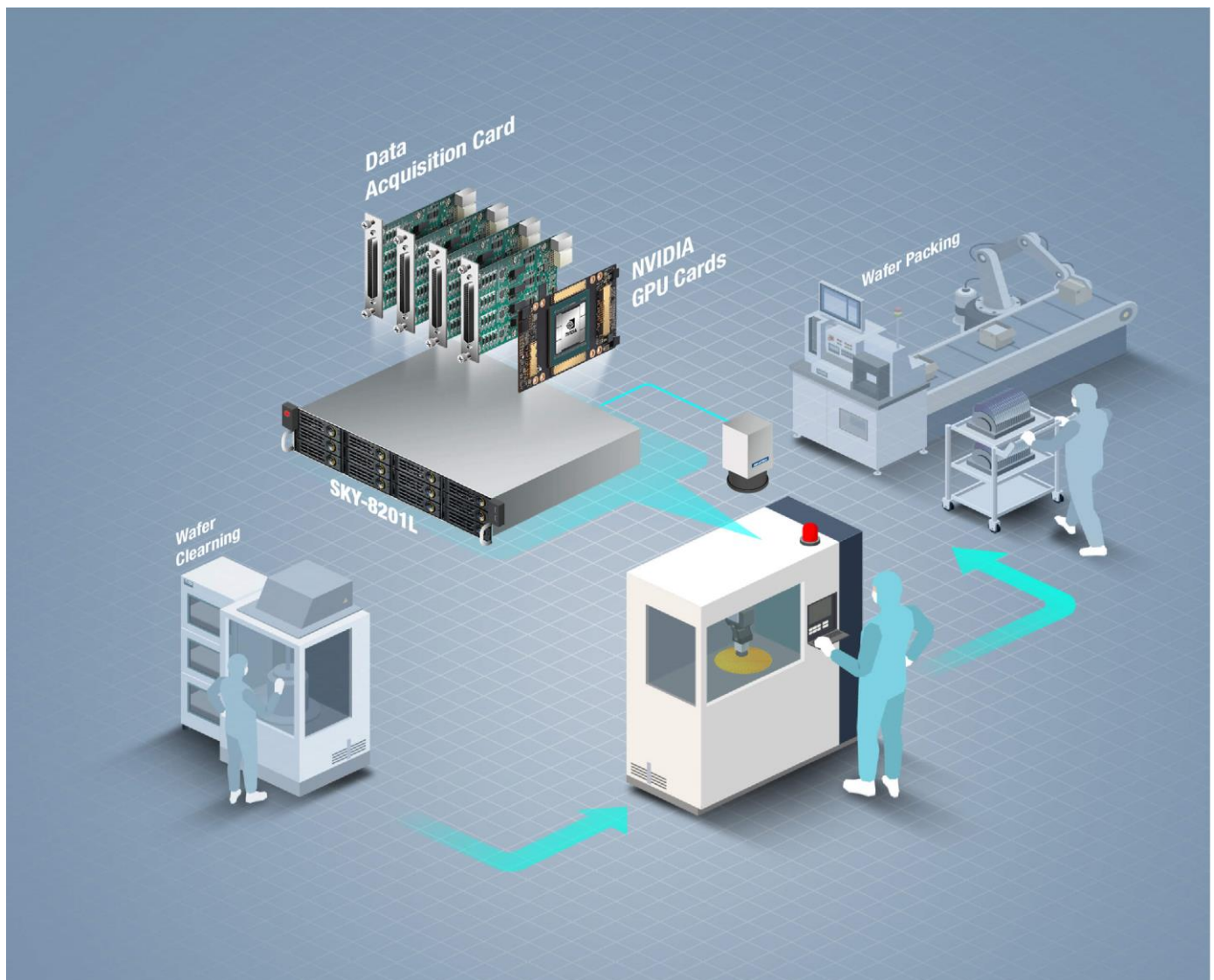
The impact of digital transformation on our lives and businesses has accelerated and semiconductor markets have boomed with sales growing by more than 20 percent to about US\$600 billion in 2021. McKinsey analysis, based on a range of macroeconomic assumptions, suggests the industry's aggregate annual growth could average from 6 to 8 percent a year up to 2030.

A global semiconductor company that has been providing advanced surface defects inspection systems such as wafer inspection, optical surface analyzers, and HDD defect detection, needed to upgrade its operating systems as well as its hardware for new more advanced projects.

System Requirements

Semiconductor equipment has a lot of moving parts. From the equipment to the people managing it, a lot of things need to happen correctly for it to operate effectively. Because of space constraints and harsh environments, this customer was looking for a short depth server that can not only provide high performance, but also operate in wide temperature environments. Moreover, with wireless connected solutions and high-speed computers all demanding faster processing, enabling high-performance (faster decision-making) features for semiconductor manufacturing solutions is a vital requirement. While not all silicon products are produced by faster processing, there are several application areas where a quick decision making is still a most basic requirement. Lastly, as huge amounts of data also need to be processed, more PCIe slots are required for data acquisition and other types of cards. To sum up, what they needed was a high performance and flexible solution.

System Diagram



Benefits

- Advantech SKY-8201L is a 2U high performance server with high density and rich PCIe extension slots, which can accommodate up to 8 x PCIe cards.
- Four rear PCIe x8 (FH/FL) + 2 x rear PCIe x8 (FH/HL) + 2 x rear PCIe x8 (low profile) for an Advantech personalization card.
- Window Server 2019

Recommended Offerings



SKY-8201

Compact 2U Carrier Grade, High Performance Server based on Intel® Xeon® Processor Scalable Family



HPC-6240+ASMB-622V3

2U 20" Short-Depth Edge Accelerator Server with Single Intel® 4th Gen Xeon® Scalable Processors, Supporting 8 Expansion Slots



NVIDIA RTX 6000 Ada

(Bundle Sale) NVIDIA Quadro RTX 6000 Ada PCIe 48GB DSFH w/ATX BKT BUL

Why Advantech

Because the surface defect inspection system solution required four data acquisition cards, a GPU card and a RAID card, the multiple PCIe slots of SKY-8201L was easily able to tick these boxes. SKY-8201L accommodates multiple high-density PCIe slots and up to 8 x PCIe cards including four rear PCIe x8 (FH/FL) + 2 x rear PCIe x8 (FH/HL) + 2 x rear PCIe x8 (low profile) cards. SKY-8201L is specifically designed for applications requiring higher capacity, front loading, and hot-swappable storage with RAID support. It also offers up to twelve 3.5" removable drive bays at the front, eight/twenty of which support SATA/SAS connectivity and each can be connected to a PCIe Gen3 x4 Intel OcuLink bus. With support for Intel VROC hybrid NVMe and SATA RAID, the server is ideal for video caching and edge transcoding, data acquisition, storage and processing as well as accelerated edge processing and analytics. The SKY-8201L meets a variety of acquisition, preprocessing and high performance needs and can operate in environments with limited space, higher ambient temperature, and low noise level constraints.

Industrial Quotient (IQ) Partner - Micron



Micron is an industry leader in innovative memory and storage solutions transforming how the world uses information to enrich life for all. With a relentless focus on our customers, technology leadership, and manufacturing and operational excellence, Micron delivers a rich portfolio of high performance DRAM, NAND and NOR memory and storage products through our Micron® and Crucial® brands. Every day, the innovations that our people create fuel the data economy, enabling advances in artificial intelligence and 5G applications that unleash opportunities from the data center to the intelligent edge and across the client and mobile user experience. To learn more about Micron Technology, Inc. (Nasdaq: MU), visit www.micron.com



Consultation, Integration Services, and Production and more Technical Requirement for Semiconductor Equipment & Electronics Manufacturing.

Vision Positioning Solution for Wafer Cleaning

Introduction

Wafer cleaning is a crucial part of the semiconductor manufacturing process. The wafer cleaning process removes the photoresist, organic substances, metals, particles, and impurities. It then polishes the wafers using chemical solvents and water, which ensures a precise wafer yield rate. Wafers are cleaned before and after each process throughout the entire IC production line and takes up approximately 1/3 of the whole production time. In the highly competitive IC wafer production business, precision, efficiency, and optimization are what manufacturers look for.

System Requirements

Semiconductor manufacturers have strict criteria for material suppliers and equipment vendors, only certified system integrators/vendors are allowed in their supply chain. Advantech has a long-time partnership with a system integrator (SI) who serves a top tier semiconductor manufacturer in Taiwan who were looking for a solution to optimize and shorten wafer cleaning and positioning times. Before the cleaning process there is a step called “wafer centering”, which sits after the wafer is picked up from the cassette. This is performed by a kind of mechanical gripper device used to re-center each wafer using a positioning algorithm. Unfortunately this results in a slight decrease in cleaning efficiency as time is lost when wafers are carefully re-centered. In addition, there’s a small but significant risk of wafer cracking caused by the gripper tool contact, which could result in efficiency loss. Advantech proposed using a machine vision solution to replace the mechanical positioning equipment and results show that each wafer can now be accurately re-centered in milliseconds rather than seconds—without wafer damage.

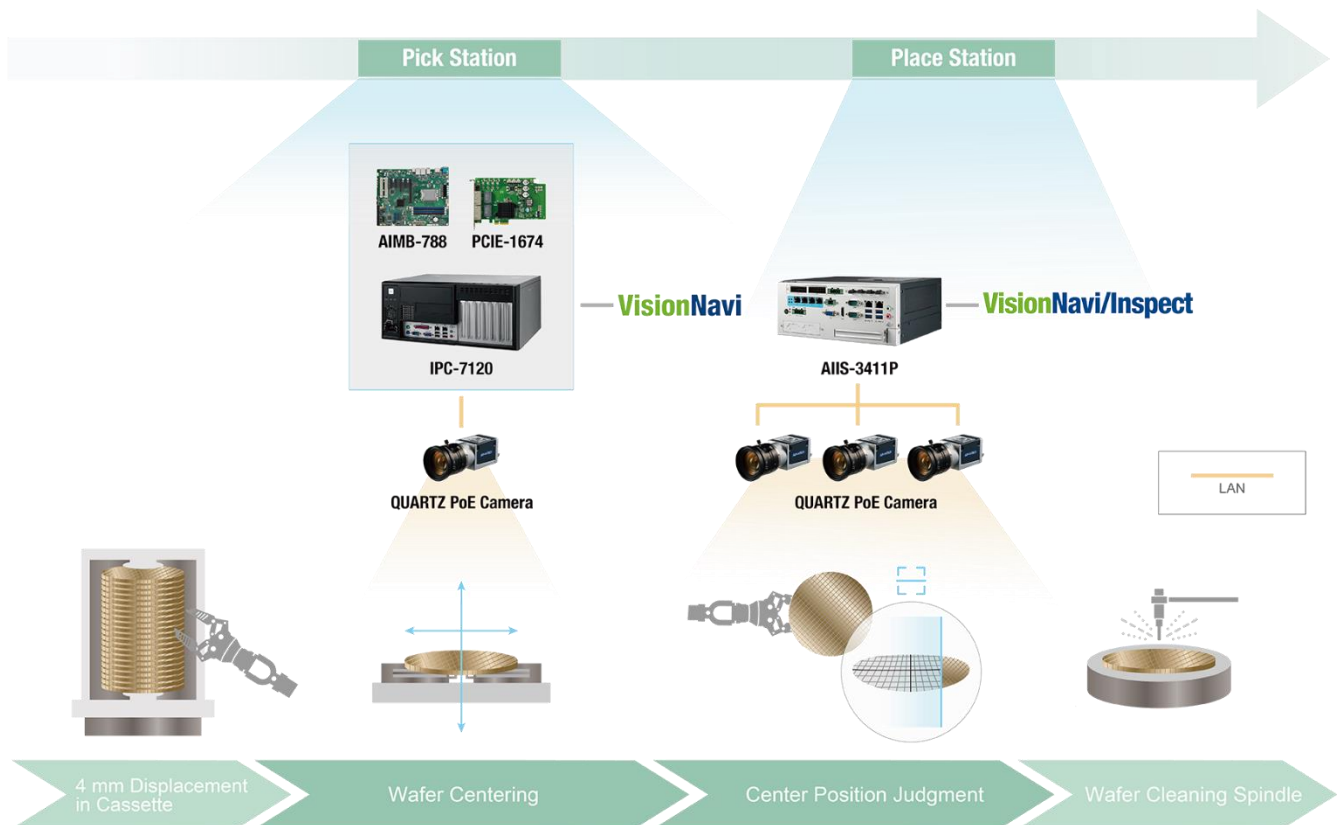
System Description

Because every process and mechanical movement causes a slight displacement from a wafer’s original absolute position, the exact center position must be recalculated to allow the precise adjustments needed for the next step. There are two stations between a pick and place machine: the pick station—a location and process whereby the robot takes a wafer from the cassette carrier to the intermediate station for centering; the place station, a location and process whereby the robot measures the wafers position and transfers it to the spindle for cleaning. On the pick station, wafers in the cassette can typically have up to a 4 mm displacement error caused by the cassette carrier action. The grabber tool then picks each wafer up from the cassette and places it on an intermediate station for error correction.

For this project, the system integrator contractor integrated Advantech's IPC-7120 + AIMB-787+ PCIE-1674 with built-in VisionNavi and one Advantech QCAM mega pixel PoE industrial camera on an intermediate station to help with position correction. The QCAM was installed above the wafer to capture visual data, which is sent back to IPC-7120 + ASMB-787 and VisionNavi for analysis and action.

An AIIS-3411P compact vision system computer is used on the place station with VisionNavi and three QCAMs to judge the center position and any warpage before a wafer is moved to a wafer spindle for cleaning. Once the center position and warpage are calculated, the robot is notified and told to place the wafer onto a cleaning spindle in a precise position without imbalance or vibration to complete the final cleaning process.

System Diagram



System Implementation

- [IPC-7120](#): Desktop/wallmount chassis with front I/O interfaces
- [AIMB-787](#): 10th Gen. Intel CPU motherboard
- [PCIE-1674](#) : 4-Port PCI Express GigE vision frame grabber
- [AIIS-3411P](#): Compact vision analysis platform
- [QUARTZ](#): 20.0 Mega Pixel PoE industrial camera
- [VisionNavi](#): Machine vision edge solution ready platform

Conclusion

Achieving a yield rate 99.9% across millions of wafers a year is very challenging in IC wafer production that involves complex physical interactions throughout the whole production. Advantech vision positioning solution greatly shortened the time for wafer cleaning from seconds to milliseconds (ms) and allowed precise pick and placement that avoided wafer damage. The solution comprised of a high computing vision analysis platform for 20.0 megapixel PoE industrial cameras that performed high-speed wafer dimension calculations and center position measurements. The intelligent vision analytic solution helped the IC manufacturer transform their wafer cleaning process into a smart optimized process. This helped them continuously manage and improve production yield rates and improve efficiency to maintain their premier position in the semiconductor manufacturing industry.

Advantech Recommended Offerings



[IPC-7120](#)

Desktop/Wallmount Chassis with front I/O Interfaces for ATX/mATX Motherboard



[PCIE-1674E-BE](#)

4-ports PCI Express PoE+ GigE Vision Frame Grab



[AIIS-3411](#)

Compact Vision System supports 10th Gen Intel® Core™ i CPU, 4-CH Lighting control and Isolated DIO, 4-CH Camera Interface for GigE PoE or USB 3.0



Consultation, Integration Services, and Production and more Technical Requirement for Semiconductor Equipment & Electronics Manufacturing.

Modular AI Defect Inspection Solution Makes Semiconductor Equipment Upgrades More Efficient

Introduction

The use of Automatic Optical Inspection (AOI) technology to check the quality of products is a commonly used inspection method in manufacturing. Since AOI equipment finds defective products by taking pictures and comparing them with reference images in a database, it can only play the role of quality control to eliminate defective products. What it cannot do is trace the cause of those defects.

Fortunately, Artificial Intelligence (AI) technology can make up for the shortcomings in AOI. Unlike regular AOI, which only performs image comparison according to the script, AI uses deep learning to adjust conditional expressions. Therefore, it can distinguish whether a product is qualified or not based on experience just like a human. AI can even classify and grade defective products, thereby tracing back the cause of errors in the manufacturing process. This assists manufacturers in further optimizing the manufacturing process and increases yields.

As such AI applications require a large amounts of computing resources, whether they can give full play to their functions depends on the pros and cons of the hardware equipment. With a combination of multiple MIC series products, Advantech provides a modular solution for defect detection AI applications, which not only have high efficiency and stable performance, but also enable adding of computing resources through a plug-in approach. This allows System Integrators to configure hardware according to the current needs of the project, while providing convenience for future expansion. End customers can also benefit from this cost-effective solution to realize AI applications as soon as possible.

System Requirements

Spingence technology Co., Ltd. is a System Integrator that develops industrial automation software and offers AI application solutions. Its self-developed AINavi-AOI-Seq automated software platform and AINavi-AOI-Semicon AI defect inspection tool have been well liked and adopted by the semiconductor and electronics industries. Recently, the company was commissioned by a semiconductor equipment manufacturer that manufactures Extreme Ultraviolet Light (EUV) pod inspection machines to implement defect AI inspection features.

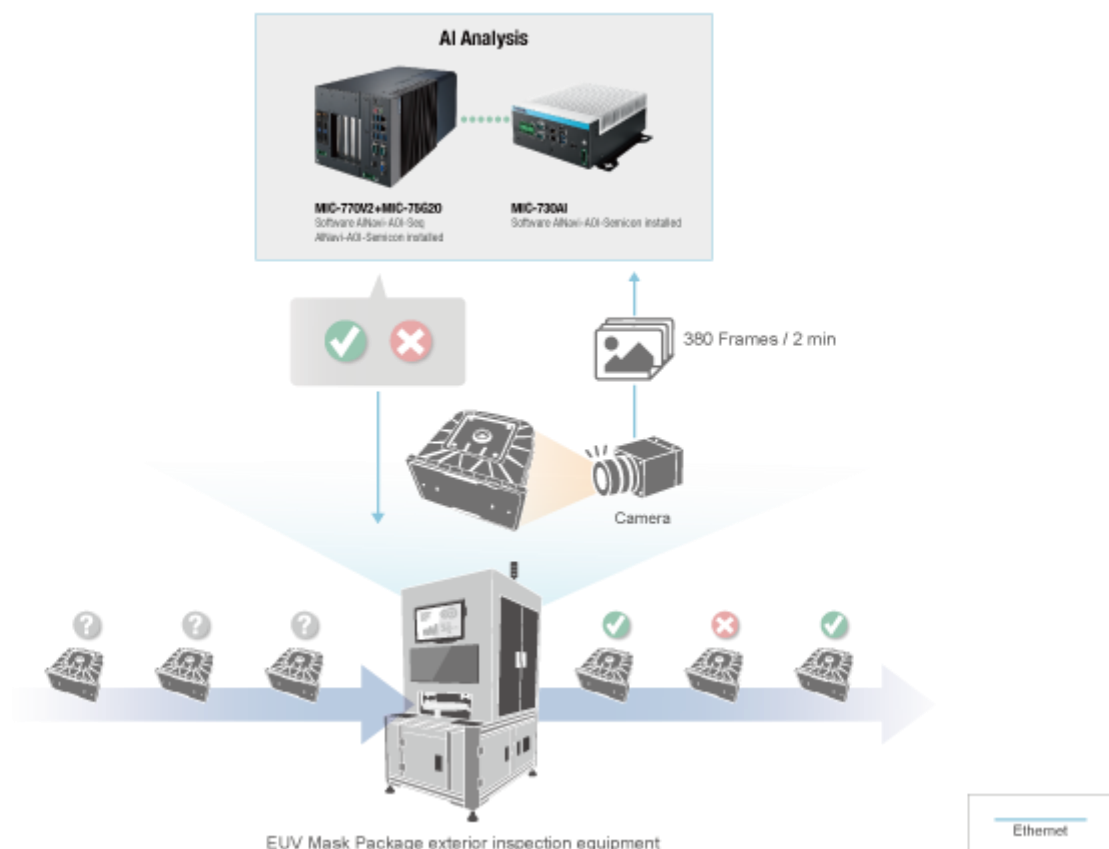
The EUV pod inspection machines have built-in AOI software, but can only find defective products, not determine what is causing the issue in the manufacturing process. To make products more useful, the semiconductor equipment manufacturer decided to upgrade their EUV pod inspection machines with AI features.

According to the customer's request, Spingence's AI solution must complete the analysis of 380 images for a single pod within two minutes and inspect different materials at the same time. Consequently, multiple sets of AI models (algorithms) were needed for interpretation. In addition, because the solution needed to be installed in a cabinet in the lower half of the machines, the size and configuration of the hardware had to be constrained due to the limited space.

To this end, Spingence would implement two sets of software, AINavi-AOI-Seq and AINavi-AOI-Semicon, to distinguish the types and locations of defects through AI, and then classify defects by threshold screening. Moreover, the results would be exported into a test report to facilitate identifying the source of the problem.

To meet these software requirements, Spingence needed to purchase a hardware solution with strong computing performance and stable operation. The solution needed to be compact in size and flexible in configuration to overcome physical space constraints.

System Diagram



After a rigorous selection, Spingence tested the hardware products of multiple vendors for several days. The company finally chose Advantech's solution (including compact fanless system MIC-770, GPU expansion module MIC-75G20, and AI inference system MIC-730AI), because its performance, modularity, and stability were deemed the best.

The first step in the implementation process was to install the AINavi-AOI-Seq and AINavi-AOI-Semicon software on MIC-770 and install the AINavi-AOI-Semicon on the MIC-730AI. After that, the EUV pod inspection machine could take images and transmit them to the MIC-770 (built-in MIC-75G20) for preprocessing. The pre-processed data is then analyzed by MIC-770 and MIC-730AI for different AI models. After the analysis, AINavi-AOI-Seq classifies and grades the selected defective products according to the types and severity of defects (such as stains, scratches, and watermarks), while generating quality inspection reports for customers to review.

Among the multiple hardware products used in this project, the MIC-770 is a refined system. This industrial-grade computer with a compact design is most suitable for applications where space is limited. The built-in Intel Core i series processors give it high-efficiency computing capabilities and low power consumption characteristics.

Supporting Advantech's i-Module Series enables the MIC-770 to easily meet the needs of different application scenarios by plug-in expansion. For example, the project chose MIC-75G20 from a variety of modules. Through this expansion module, the system can not only provide powerful GPU graphics processing capabilities, but also can increase storage space with an additional hard drive slot to meet the needs of backing up important data.

Another hardware product, the MIC-730AI, is a master of inference for AI. Just like the MIC-770, this high-performance computer with embedded NVIDIA Jetson AGX Xavier processor is a fanless, compact and low-power design. It can be used as an inference machine for deep learning and can also be responsible for analysis tasks of defect inspection.

In terms of software, the AINavi-AOI-Seq is an automated development platform that connects traditional algorithms and AINavi-AOI-Semicon AI inspection. Users can quickly setup the AI defect inspection process via the user friendly interface. There is no need to develop programs, which greatly reduces the burden on developers and speeds up the development of AI functions for the automated machines.

AINavi-AOI-Semicon has a variety of AI detection algorithms specifically designed for the semiconductor industry and defect inspection tool applications. It can perform multiple tasks such as defect image classification, defect location, defect segmentation, abnormal image detection, and the identification of various flaws in the tested product.

Furthermore, AINavi-AOI-Semicon, which uses a visual web interface, guides users to build AI model training through a step-by-step approach. Its flexible and scalable computing architecture allows AI models and inspection methods to be developed according to the item of inspection and can upgrade inspection equipment without affecting existing machine functions.

Project Implementation

- [MIC-770](#) Compact Fanless System with 8th/9th Gen Intel® Core™ i CPU
- [MIC-75G20](#) GPU Expansion Module for Video AI Edge Computing with MIC-7 Series
- [MIC-730AI](#) AI inference system based on NVIDIA® Jetson™ AGX Xavier™
- AINavi-AOI-Seq Automated machine development software developed by Spingence
- AINavi-AOI-Semicon AI defect inspection tool for semiconductor industry developed by Spingence

Conclusion

There are many difficulties for manufacturers to implementing AI applications by themselves. To upgrade, it is necessary to hire dedicated AI expertise and spend a lot of time and money. Fortunately, the modular solution provided by the cooperation of Advantech and Spingence was able to greatly reduce the threshold for introducing AI applications into manufacturing.

Since AINavi-AOI-Seq is a development tool with non-coding features and AINavi-AOI-Industrial is a guided AI training interface that anyone can use, these two software products from Spingence make the implementation of AI applications much easier. Plus, Advantech's MIC series products are the ideal hardware platforms for Spingence's software matchmaking. Taking this project as an example, the customer currently only uses two AI models for defect inspection. If there is a need to create more AI models in the future, the customer only needs to plug in a new AI inference system under the original architecture configuration.

Such a cost-effective AI solution is not only suitable for semiconductor equipment, but other manufacturing industries. The implementation of this project has been highly successful for the semiconductor equipment manufacturer. So they decided to implement AI defect inspection for all their other automated machines. This is the best proof that this combined solution has been recognized for its valuable contribution by the industry.

Advantech Recommended Offerings



[IPC-730](#)

Desktop/Wallmount Chassis with front I/O Interfaces for ATX/mATX Motherboard



[AIMB-788](#)

LGA1700 12th/13th/14th Generation Intel® Core™ i9/i7/i5/i3 ATX Motherboard with DP/HDMI/VGA, DDR4, USB 3.2, M.2



[PCIE-1121](#)

Axion Series, Camera Link 2.0 Base, Medium/Full/80-Bit, supports up to 4 independent cameras



Consultation, Integration Services, and Production and more Technical Requirement for Semiconductor Equipment & Electronics Manufacturing.

Advantech and Spingence Optimize Defect Detection with AI for Passive Component Manufacturing

Abstract

Passive components are vital for electronic products, and their production is important in Taiwan's electronics industry. For the past few years, Taiwan's passive component industry has seen active development for high-end applications such as electric vehicles, aerospace, and 5G equipment. A key contribution to this development has been the upgrade of Spingence's AINavi manufacturing defect detection software in partnership with Advantech to improve production yields and reduce costs.

Benefit 1:

AOI Rule-Based Inspection Results in Three Major Blind Spots in Defect Detection

Inspection for external defects is a critical step in quality assurance before passive components are shipped. Jem Wu, Spingence's Director of Business Development for Greater China, pointed out that passive components are mainly used for storing or releasing electricity, and external damages or other defects may cause these components to behave irregularly or fail, leading to dangerous situations such as short-circuits, fire, or explosion.

In the past, passive component manufacturers mostly conducted appearance defect detection using six-sided inspection machines based on automated optical inspection (AOI) technology, which compares optical images of items with prescribed rules to identify defects. "Such a rule-based inspection method is highly prone to missing defects, difficult system maintenance, and high overkill rates," said Wu.

To reduce the number of missed defects in inspections and get closer to the goal of zero missed defects, engineers generally use stringent parameters to define rules for identifying defects, which leads to a high overkill rate where flawless products may be misjudged as defective, resulting in increased cost and the need to double-check with human visual inspection. "Both the false alerts and the need for additional personnel are draining more production cost from our clients," said Wu.

Benefit 2:

Spingence Integrates AOI with AI to Maximize Defect Detection Performance

To solve issues with defect detection, Spingence launched the AINavi defect detection software to overcome some of the limitations of AOI technology with artificial intelligence. Since AI can learn the characteristics of defects from large amounts of historical data and identify defects through those characteristics, AI is superior at defect detection and can detect more defect types than AOI. This allows companies to reduce their risk of missing defects, while also reducing the overkill rate and the operating cost of hands-on maintenance.

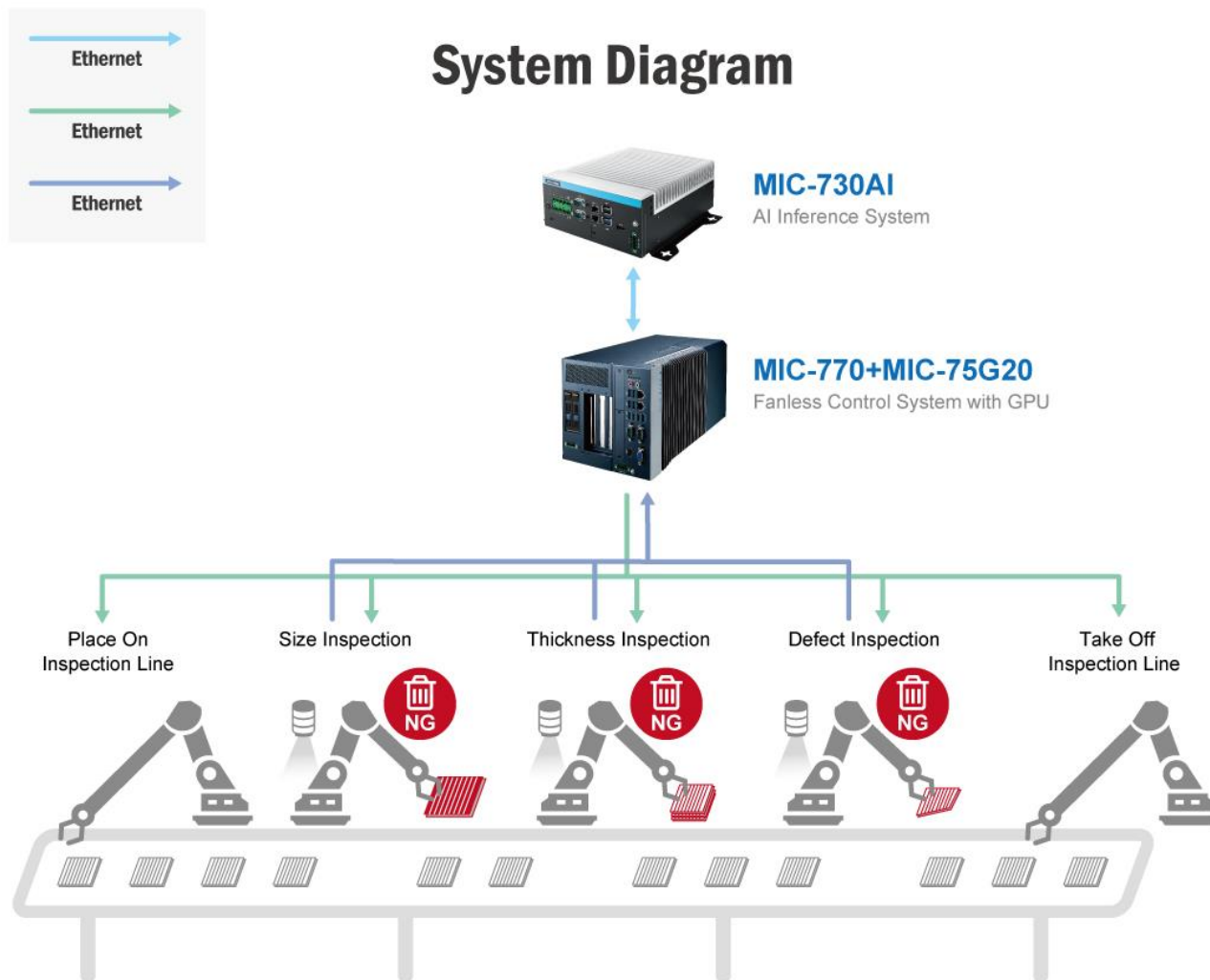
"AOI and AI apply different principles to identify defects, and there is no way in which one is definitely better or worse," Wu noted. "But by using both methods, they complement each other and maximize the performance of defect detection." AOI inspection is based on rules, which are optimized for identifying defects related to measurements such as product length where a specific standard has been defined, and it does not require parameter adjustments. On the other hand, the strength of AI lies in identifying common features among many defects, making it more suitable for handling complex or ambiguous defects.

When supporting passive component manufacturers in implementing AINavi, Spingence provided standard APIs and also integrated existing inspection machines (6-sided) with TCP/HTTP, allowing production line processes to remain unchanged. Manufactured items would still pass through the six-sided inspection machines, except that the machines would send extra sets of images to the AINavi for AI system recognition. Then the results would be sent back to the six-sided inspection machines for follow-up processing. This means that workers do not need to learn new processes, which ensures continuous production line stability.

In addition to helping passive component manufacturers integrate their existing equipment, Spingence also takes into account the need for high efficiency within the manufacturing industry. AINavi runs on Advantech's fanless MIC-770 system with a graphics card, or it can run on the MIC-730 AI inference system. AINavi can thus inspect thousands of parts in just one minute, meeting the high-speed inspection needs of production lines by a wide margin.

According to Wu, two main factors contributed to their decision to collaborate with Advantech. The first is that Advantech hardware is highly diversified and lightweight, suiting the preferences and needs of a wide variety of clients. The second advantage is hardware stability. As industrial computers become loaded with graphics cards to run AI models, maintaining the integrity of the hardware system can be quite a challenge. As a reputable and trusted global hardware provider, Advantech provides some of the most stable and robust hardware on the market, making Advantech the best hardware partner for Spingence.

System Diagram



Benefit 3:

AINavi Defect Detection Software Reduces Operating Time, Labor, and Costs

After successful cases introducing AINavi to passive component production lines, three major benefits have become clear. First is the saving of engineers' valuable time. In the past, engineers had to know every detail of a system to set parameters and rules to define particular types of defects, such as defining what constitutes a defective corner of a manufactured item. And if just one single defective corner was missed, they would have to adjust the AOI parameters. After the implementation of AINavi, however, engineers now only need to collect product images, draw circles around the defects, and leave the rest to the system as it learns the characteristics of the defects on its own. "AINavi's training interface is simple and intuitive. Production line operators can learn how to operate it easily," said Wu.

The second benefit is the reduction in manpower required for visual inspection. sometimes being able to eliminate the whole manual double-check. For example, a manufacturer of passive automotive components originally had three operators for each six-sided inspection machine that were responsible for the loading, unloading, and double-checking. Since the introduction of AINavi, every three six-sided inspection machines only require one operator to handle both the loading and unloading. Such improvements not only reduce labor costs but also eliminate risks associated with labor shortages.

The third benefit is the reduction in unnecessary waste from the production process, which reduces production costs. A factory that produces passive components originally had an overkill rate of 4-5%. After the introduction of AINavi, many products that were originally classified as defective were recovered, while the overkill rate was reduced to 1%. This dropped production costs by 3-4% as a result.

Wu emphasized that since end customers' expectations have been on the rise, the passive component industry can no longer solely rely on existing AOI equipment to avoid defects. Only by integrating AI technology to improve quality control capabilities and ensure that all shipped products meet customers' needs will companies earn recognition and support from the market. This is true not just for the passive component industry, but for any manufacturing industry that is suffering from a high overkill rate with a need to allocate extra manpower for re-inspections. For manufacturers of ICs, fasteners, metal parts, etc., the introduction of AINavi will ensure product quality, offering opportunities to expand their markets by offering more refined products.

Advantech Recommended Offerings



MIC-730AI

AI System Based on NVIDIA Jetson®
AGX Xavier



MIC-770 V3

Compact Fanless System with
12th/13th/14th Gen Intel® Core™ i
CPU Socket (LGA 1700)



MIC-75G20

MIC-75G20 GPU i-Module, 1 PCIe
x16 + 1 PCIe x4, dual front
accessible storage bay



Consultation, Integration Services, and Production and more Technical Requirement for
Semiconductor Equipment & Electronics Manufacturing.

Advantech Partners with Orbbec to Enhance 3D Vision in the Autonomous Mobile Robots Market



Advantech, a leading provider of industrial edge AI platforms, is excited to announce its collaboration with Orbbec, a pioneer in 3D vision technology since 2013. Through this partnership, Advantech and Orbbec aim to assist end users in enhancing robotics deployment within the in-vehicle and autonomous mobile robots (AMR) market.

Orbbec 3D Vision Cameras Compatible with the NVIDIA Isaac Robotics Platform

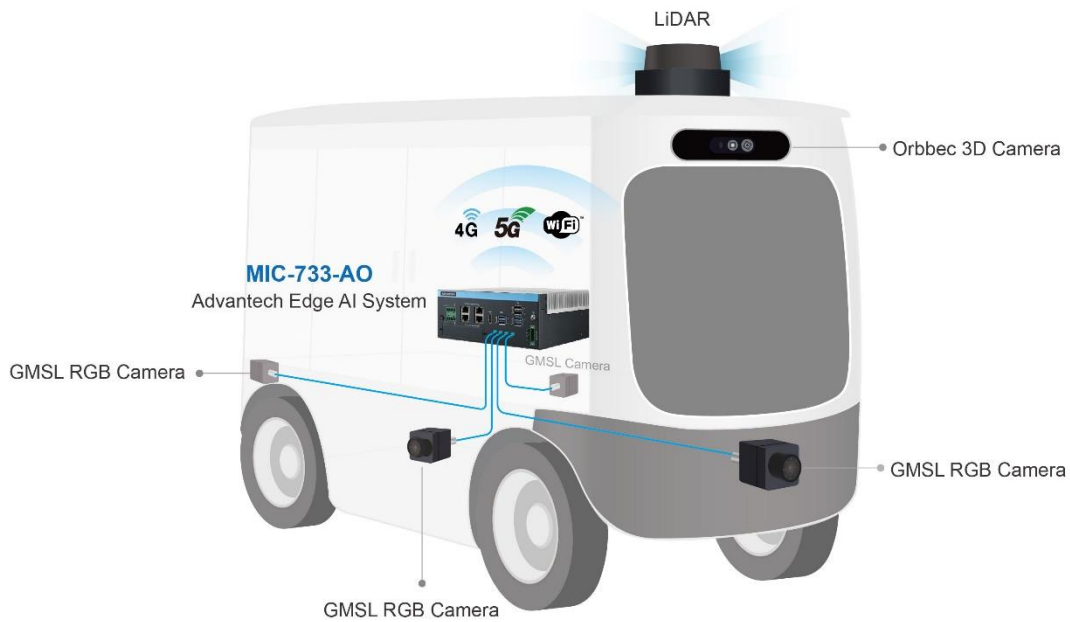
AMRs can travel at an average speed of 1.5 meters per second, which places strict demands on video transmission and analysis speed within the visual perception component. The AMR market is continually evolving with technological innovations, with some AMRs now incorporating AI algorithms and intelligent sensor devices to enhance perception and analysis capabilities, resulting in more efficient, safer, and more flexible mobility.

In an AMR system, depth perception, spatial mapping, motion tracking, volumetric data capture, and real-time depth sensing are crucial. Orbbec 3D cameras enable developers to create immersive experiences, perform precise measurements, and generate advanced visualizations that were previously unattainable with traditional 2D cameras. The Orbbec Gemini 330 cameras feature built-in depth processing and provide high-precision Depth+RGB vision with the NVIDIA Isaac Perceptor AI-based perception workflow, making them suitable for AMR applications.

Advantech AMR Edge AI Systems Advance with NVIDIA ISAAC and Orbbec

To accelerate AMR deployment, Advantech is collaborating with NVIDIA and its partners to develop an integrated solution package featuring NVIDIA Isaac ROS with the MIC-732-AO, based on NVIDIA Nova Orin. By integrating Orbbec's 3D vision technology with NVIDIA Isaac Perceptor, Advantech can quickly deliver a comprehensive AMR solution package to its edge customers.

Currently, the Advantech MIC-732-AO and MIC-733-AO, powered by the NVIDIA Jetson AGX Orin system-on-module (SOM), along with the MIC-713-OX, featuring the NVIDIA Jetson Orin NX SOM, are compatible with Orbbec's 3D cameras, the Gemini 335L and Femto Mega I. The MIC-732-AO, delivering AI performance of up to 275 TOPS, supports up to 8 Orbbec 3D cameras. Similarly, the MIC-733-AO, also offering 275 TOPS, and the MIC-713-OX, with 100 TOPS, can support 4 to 8 cameras. In collaboration with Orbbec, Advantech has successfully developed AMR solutions suitable for both indoor and outdoor applications. For more information, please visit the Advantech website.



Advantech Recommended Offerings



MIC-733-AO

AI System Based on NVIDIA® Jetson AGX Orin™



Claxon Series

1- to 4-Port PCI Express CXP12 Frame Grabber



QUARTZ

0.3-20.0 Mega Pixel PoE Industrial Camera

Consultation, Integration Services, and Production and more Technical Requirement for Semiconductor Equipment & Electronics Manufacturing.



Scalability and Flexibility: AI-Powered Collaborative Robot for 3D Stacking and Precision Detection

Overview

As production lines require greater accuracy in transporting and stacking goods, collaborative robots equipped with AI-powered machine vision become critical for exact positioning and alignment. Moreover, these robots can enhance quality control by accurately detecting surface defects and other flaws during operations.

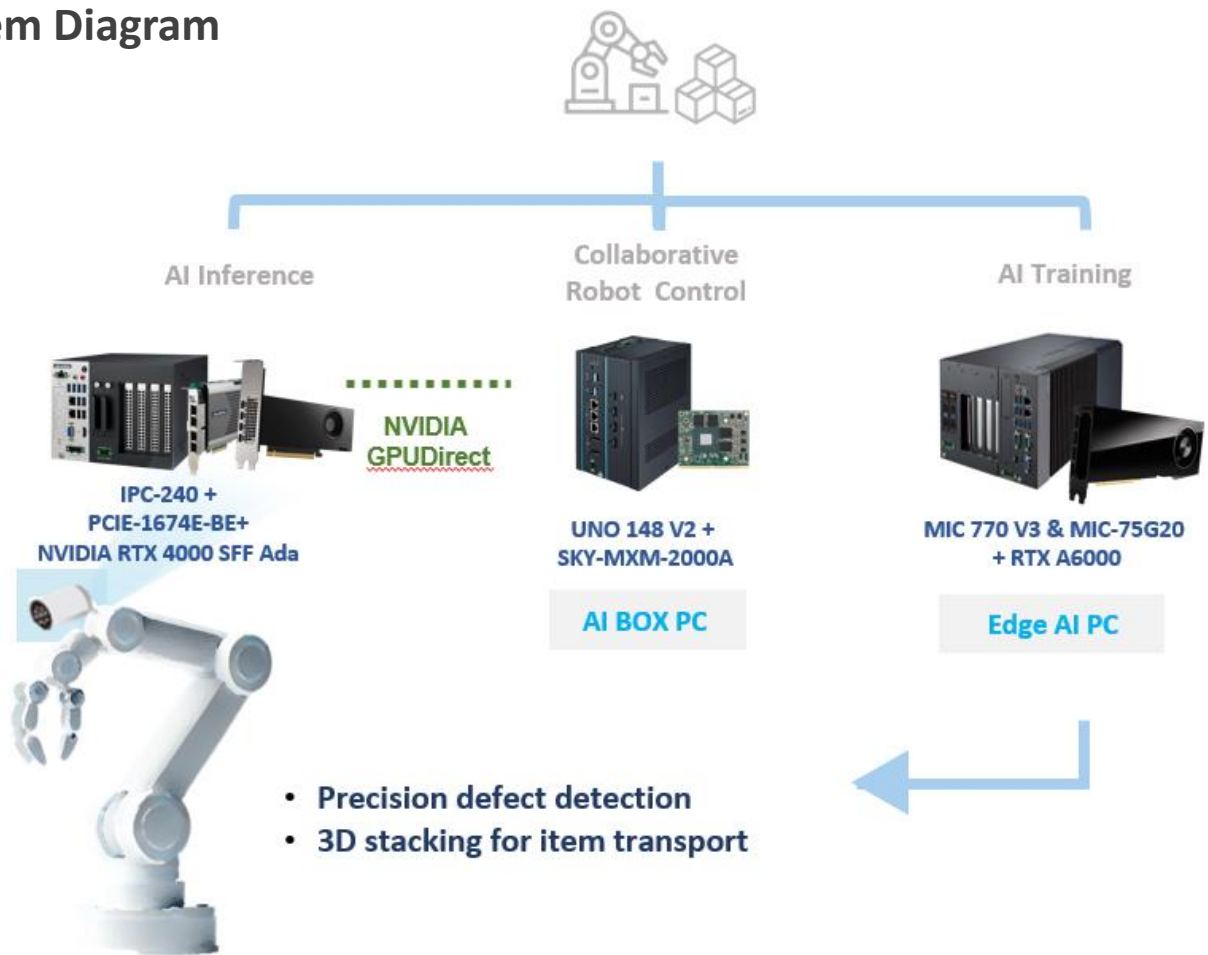
Solution

Advantech's industrial edge AI solution offers real-time vision processing to customers through a combination of compact IPC (IPC-240) with PCIe frame grabbers, AI box PCs (UNO-148V2 with an embedded NVIDIA GPU), and Edge AI PCs (MIC-770V3 with an NVIDIA RTX GPU). This enables precise control of AMRs and facilitates AI model training.

Benefits

- **High Precision with NVIDIA GPUs and IPCs:** Combining NVIDIA GPUs with advanced IPCs enhances image processing by providing exceptional precision and speed, enabling accurate and efficient execution of industrial tasks.
- **Real-Time Processing with Frame Grabbers:** Utilizing PCIe frame grabbers, the system processes visual data in real time, allowing AMRs to make quick decisions and adapt efficiently to changing conditions.
- **Scalability and Flexibility:** Our modular design ensures easy scalability and customization, making it adaptable to a wide variety of applications and environments.

System Diagram



Advantech Recommended Offerings



IPC-240

Compact Industrial Computer Chassis for PCE-2000 Series CPU Board



UNO-148 V2

Fanless DIN-Rail IPC with Intel® Core™ Processors (13th Gen)



NVIDIA RTX 4000 SFF Ada

(Bundle Sale) NVIDIA Quadro RTX 4000 Ada PCIe 20GB SSFH w/ATX BKT BULK

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Contact Us Now! ▶

Building AOI Technology to Accelerate Yield in Precision Manufacturing

Introduction

Automated optical inspection (AOI) technology is widely used in the precision manufacturing of electronics such as flat-panel displays, semiconductors, and printed circuit boards (PCBs). These products involve thousands of densely crowded joints and micro components that must be precisely installed. However, with technology becoming smaller and more complex, manual visual inspections are no longer adequate for quality control.

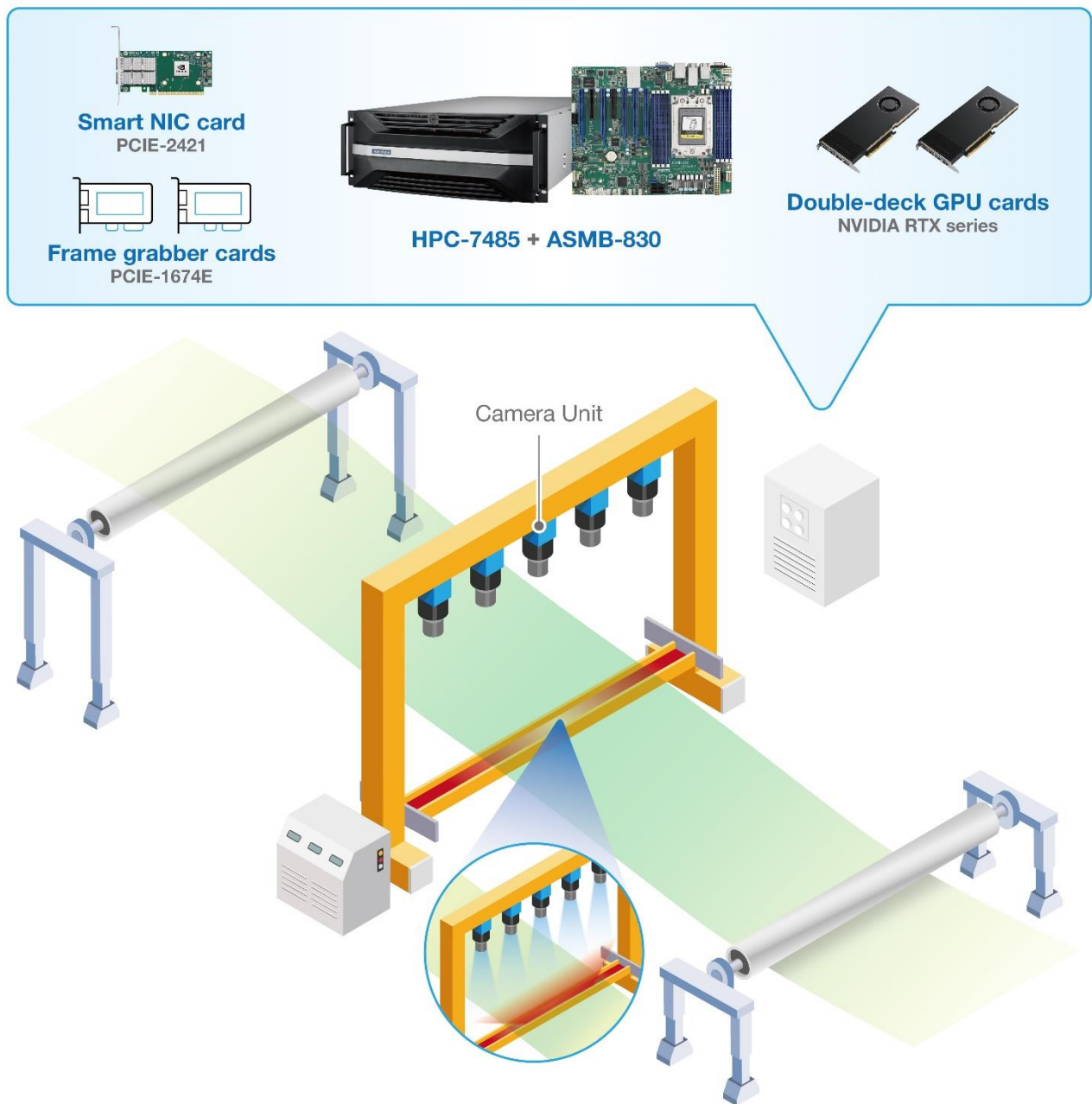
To provide a dependable solution for mass-production product inspections, many manufacturers have turned to AOI technology. AOI involves using machine vision to scan products and identify missing parts, short circuits, or poorly soldered joints. With the integration of additional devices such as robotic arms and CCD cameras, AOI systems can now very accurately identify tiny product defects with minimal failure rates.

For this project, a leading provider of image processing and automated inspection solutions required a high-performance platform to function as the server for AOI applications. In addition to AOI equipment for inspecting glass substrates, thin film, and silicon wafer surfaces, the company offers customization according to specific environments and production line types. For this reason, they needed a cost-effective platform that could be easily developed for diverse manufacturing sectors.

System Requirements

The development of AOI systems is a challenging process that depends on many variables, including the manufacturing process, product complexity, production volume, and required inspection coverage. Inspection machines capable of controlling the entire production line generally comprise image capture, fine-scale measurement, optical processing, and pattern analysis technologies. To integrate these technologies, a high-performance server with support for multiple expansion cards and flexible configuration is required for realizing AOI with AI machine vision. For film inspection applications, AOI systems must perform high-speed, high-resolution image analysis and judgement during roll-to-roll transfer of sheets, films, and metal foils. This continuous capture, long-distance transfer, and processing of big data can significantly elevate system temperatures. Accordingly, the platform must be industrial grade and capable of withstanding long-duration operation at extreme temperatures.

System Diagram



System Description

Advantech's solution comprised its HPC-7485 4U rackmount server chassis with ASMB-830 AMD® EPYC™ ATX server board and Micron DDR4 DRAM memory. Designed to help manufacturers control and track data across processes, the ASMB-830 server board is powered by an AMD® EPYC™ 7003 series processor that supports wide operating temperature and up to five PCIe x16 and two PCIe x8 linkups to GPU cards, NIC cards, or other expansion cards.