

Case Study

Industrial AI
OpenVINO™ Toolkit



Safety Matters: Aotu and Intel Automate Worker Safety for a Leading Bottling Company

Machine vision and artificial intelligence revolutionize employee safety by transforming standard video cameras into smart IoT devices.

“Today’s artificial intelligence technology offers opportunities for capabilities that were unimaginable in the past. By applying Aotu’s algorithms and software platform with the aid of Intel’s OpenVINO to Health, Safety, and Environment (HSE) workflows, the bottling company was able to elevate its safety practices while improving the efficiency of their staff.”

– Stephen Li
CEO, Aotu

An Eye on Quality and Occupational Safety

Highly automated factories deliver enormous benefits for manufacturers. Yet machines, equipment, and automation represent genuine risks. Add humans to the mix, and the stakes get higher.

Humans are prone to errors. They get tired, become distracted, and occasionally make mistakes and miscalculations. An inability to adhere to occupational safety guidelines can lead to employee injuries—and worse.

For manufacturers, these errors and inefficiencies add up. They boost costs, undermine productivity, pose regulatory and reputational risks, and put workers at further risk. The result? Falls, slips, burns, cuts, bruises, blunt force injuries, and numerous other problems.

Many factories use manual safety systems that rely on a human-centric and reactive approach. These systems are costly to operate, slow to detect violations and problems, and human error is a constant concern. Unfortunately, safety violations frequently slip through the cracks.

As a result, a major beverage bottler in Asia turned to Intel and Aotu to build a framework that could transform various manufacturing and safety inspection processes at ten regional factories. The company recognized that there was a more effective way to manage occupational safety through machine vision and artificial intelligence (AI).



Labor Intensive



Long Hours



Inefficient



Not Timely

Figure 1. The drawbacks of manual safety management

Manual Processes = Errors & Problems

Manufacturers understand that occupational safety is critical for business. However, manually monitoring conditions, events, activities, and human behavior within facilities is typically difficult and human-intensive. Machinery, equipment, vehicles, tanks, and other tools represent a significant risk if they are not used correctly and if employees fail to follow safety guidelines, such as using protective gear and following specific protocols and procedures.



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On average, a typical factory with a 10,000 square meter footprint requires approximately ten or more safety personnel who require extensive and ongoing training on safety standards. In many cases, the need for 24-hour safety supervision results in long working hours that in turn, cause miscalculations and errors, safety violations, and injuries.

In addition, manufacturers often encounter regulatory issues that can put them at risk. In many cases, fines can range from tens of thousands to hundreds of thousands of dollars *per violation*. Longstanding and repeated problems can lead to government actions, including lawsuits, that can top \$1 million.

Many manufacturers rely on video feeds to analyze processes and events along production lines. Staff review these videos, looking for errors, infractions, or larger problems. For this bottling manufacturer, the manual video review workload was significant and only offered a reactive approach to safety.

To safeguard workers, specialists checked for several important things, including whether workers on the line were wearing equipment and goggles correctly, handling machinery and equipment correctly, staying in authorized areas, avoiding vehicle and robotic paths, and following guidelines about how products and materials should be stored or transported.

The existing monitoring and inspection process was costly and time intensive. The task required dozens of safety personnel working long hours. Workers had to stay focused at every moment. If an inspector's attention waned, an error or violation could go undetected. As hours passed, the odds of missing a violation piled up.

Unleashing the Power of Machine Vision and AI

There's a better way. Machine vision and AI can automate monitoring and inspection—and deliver instant notifications and alerts when something goes awry. Moreover, with real-time visibility, an organization can build the safety framework with a best-in-class solution that's quickly and easily deployed—using prebuilt algorithms, existing cameras and Industrial PCs (IPCs), and a browser-based dashboard.

The bottling company recognized the need to establish a more automated and proactive monitoring framework. Ease of use and speed of implementation were critical success factors. It required a technology framework that could be installed easily and, ideally, a system that could automatically flag problems in real time, greatly reduce, or even eliminate human errors and dramatically cut costs. And a system that would also allow the bottler to improve training processes to help further reduce injuries and associated problems.

The company hoped to take the safety monitoring process into the digital age through machine vision and AI—but without revamping its core IT systems. The bottler already had a great deal of infrastructure in place. For example, one 37-acre site with 1,500 employees had 65 cameras. Another 11-acre site with 1,000 employees had 54 cameras. IoT-connected safety cords and smart locks were also used for protection in high places and underground wells. All of these devices and systems had to be integrated with the new system.

Recognizing that it could adopt a more advanced and evolved way to automate occupational safety, in March of 2022, the bottler began exploring options and vendors—eventually deciding to move forward with a sophisticated and “smart” factory production safety solution from Aotu and Intel. Aotu's automated video management solution, built on Intel architecture, offered an efficient way to evolve to smart manufacturing and an advanced level of automated safety.

With Intel and Aotu on board, the company embarked on a safety transformation project to revamp security processes at the ten factories covering half of China.

“Today's digital technology offers opportunities for gains that wouldn't have been imaginable in the past. By combining the right set of tools, technologies and workflows, the bottling company was poised to take its safety practices into the digital age.”

– Stephen Li
CEO, Aotu

Transforming a Vision into a View

Aotu's BrainFrame platform was the foundation for the new safety automation framework. The platform optimized on Intel offers plug-and-play Vision Capsules, which are pre-designed and pre-tested algorithms designed explicitly for factories optimized on Intel hardware. As a result, the company could skip AI training and transition straight to a fully functional safety automation system. From the moment the video stream from the existing cameras were connected to the Aotu solution, it was possible to spot violations in real time.

The technology framework enabled achieving results within three months of initiating the project. The bottler switched on the new machine vision systems at the first two sites in June 2022.

Yet the goal to improve safety and operations didn't stop there: the existing camera infrastructure – including settings and configurations – was redesigned and updated to address specific business scenarios. Together, these represented a complete set of safety procedures that addressed behavioral issues, transport practices in the factory, the misuse of safety equipment, and other general workplace issues.

Altogether, the bottler incorporated more than 1,000 existing cameras into the system. The smart cameras oversaw manufacturing line practices and a variety of other areas and activities, including:

- Roofs
- Source pool areas
- Climbing areas
- Elevator wells
- Tank and boiler areas
- Grease traps
- Septic tanks
- Product delivery areas
- Loading areas
- Logistics warehouse spaces
- Hard hat-wearing areas
- Mobile phone use detection
- Entry into unauthorized areas
- Illegal climbing
- Correct use of worker equipment, including seat belts and ropes

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The bottler aimed to take humans out of the safety monitoring loop wherever possible. The results were transformative. The company:

- Reduced manual workloads by 80%
- Trimmed total costs related to Health, Safety, and Environment (HSE) compliance task workload by 60%³
- Boosted the safety violation detection rate from less than 20% to 90%, a 4-5x time improvement³
- Reduced safety violations by 35%³
- The system completely changed employee safety behavior towards using personal protective equipment (hard hats, safety vests, safety harnesses) and pedestrian pathways.³

Almost overnight, the bottling company witnessed enormous benefits that totally altered how it approached monitoring and inspection. It had an advanced solution in place that accommodated today's complex and highly automated requirements.



Figure 2. The bottling company reduced manual workloads by 80 percent and reduced the costs related to HSE compliance by 60 percent. Overall safety violations were reduced by 35 percent.³

Aotu and Intel Deliver Results

The safety platform is among the most advanced and simple to implement machine vision and AI frameworks available. Jointly developed by Aotu and Intel, the intelligent video solution for factory production safety is built on 11th Generation Intel® Core™ processor-based Industrial PCs, Intel® Xeon® scalable processor-based edge servers, OpenVINO™ toolkit, and deep learning reference algorithms. The no-code solution runs on Windows and Linux and provides VisionCapsule algorithms tested in actual scenarios and integrated into the Aotu BrainFrame open AI vision operating system. Using a Smart Vision AI Developers Kit eliminates the often complex and lengthy process of developing algorithms—a task that can require up to 18 months.

Instead, it's a turnkey process, like setting up a shop on Amazon or eBay. With this platform, there's no need to endure the typical process of developing specific vision algorithms, building a video pipeline, running inference and application logic, recording results, and setting up APIs to integrate everything with an existing system. This means that a transformative safety inspection goes live in days or weeks.

The Aotu and Intel solution uses an industrial vision AI box/ AI edge server, providing Graphics User Interface (GUI) for AI video algorithm management and deployment and supporting factory production safety. The Intel OpenVINO

toolkit supports deep learning algorithms that accelerate deep learning, AI, and machine vision while delivering powerful AI computing power.

The bottling company's final factory production safety solution included twelve customized algorithms, covering eighteen key scenarios and nearly 1,000 supervision points in the factory and surrounding spaces. What's more, the Aotu video processing and AI inference system provide a high level of programming and functional flexibility through a no-code platform that supports Python, C/C++, and SQL.

The easy installation and extreme flexibility of the Aotu and Intel frameworks were especially appealing. The bottler has the flexibility to install Intel's OpenVINO and the Aotu BrainFrame platform on any combination of computers with a wired or wireless TCP/IP connection. The VisionCapsules Library, with built-in computer vision algorithms and deep learning models, made it possible to run algorithms and start inference in seconds.

For the bottler, this meant they could layer the advanced machine vision and AI framework atop an existing IT infrastructure. There was no need to revamp the IT infrastructure or software in any significant way—or undergo major changes to actual safety processes. The company simply needed to add Intel® Core™ i7 based Industrial PCs to further extend the Aotu solution's capabilities. This avoided disruption and the myriad problems and costs that can stem from a technology initiative.

The result was an ability to monitor real-time video automatically, with immediate warnings and alerts when a violation occurs, including light and sound alarms, smart lock alarms, and other mechanisms that remind people to act or react. Staff can also initiate a 30-second replay of a suspected violation to confirm that it took place or view the event more closely.

The benefits don't stop there. The videos and the data collected from the Aotu system also help improve safety content and training. For example, the bottler has achieved 100 percent real-time scanning for safety compliance, which exceeded its initial objectives. Now the safety staff spends less than five minutes daily focusing on video feeds and the associated data. As a result, they're focused on more strategic tasks, such as further improving training methods. In the future, when the bottler is interested in connecting with additional existing or new factory applications, Intel® Edge Insights for Industrial (EII) software is available to make that integration easier. The software incorporates Docker, an open source microservices architecture that speeds development and includes advanced AI analysis.

"The technology framework represents an enormous step forward for the bottling company. Automating an array of manual processes is helping the company achieve the goal of becoming a smart factory and realizing the benefits of Industry 4.0."

— Jonathan Luse
Senior Director, Federal and Industrial Solutions
Intel

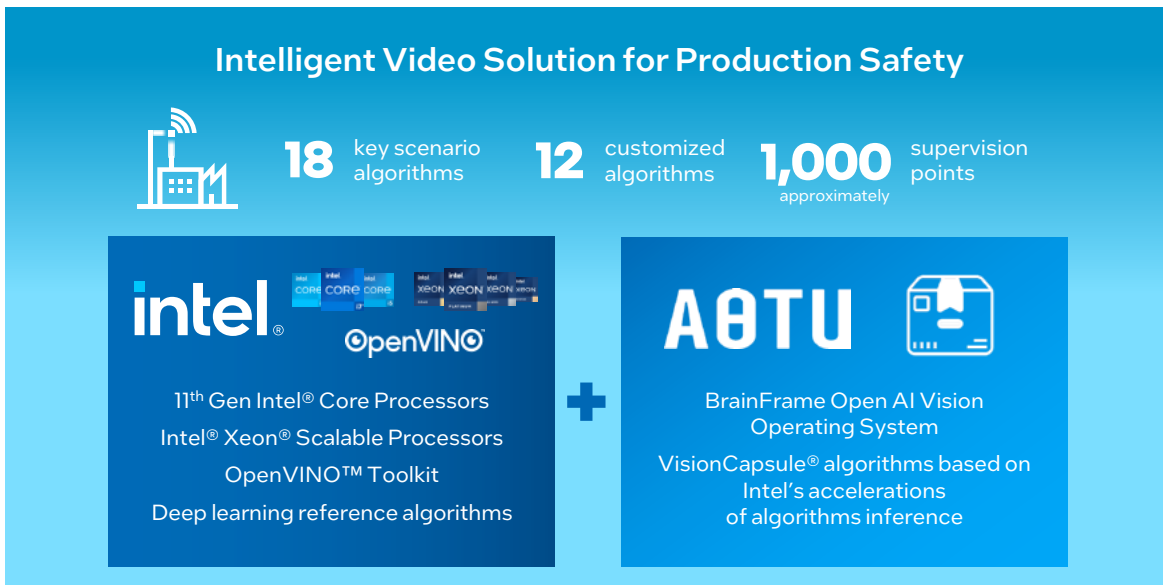


Figure 3. The intelligent video management solution for factory production safety jointly developed by Aotu and Intel.

Aotu and Intel Offer a Framework for Success

Improving safety practices is critical as manufacturers look to upgrade and advance their operations to the digital age. Companies require the most sophisticated framework and capabilities available. Today’s machine vision and AI deliver the capabilities that organizations require to develop next-generation safety framework.

At the same time, there’s a need for a fast and streamlined deployment—with the ability to expand and change the system over time. Together, Aotu and Intel deliver compute power, AI, and automation capabilities that are state-of-the-art—and transformative.

With Aotu and Intel, the beverage bottler embraced a proactive approach and transformed its safety and inspection practices. It achieved significant gains along with cost savings. Most importantly, the company is better equipped to keep workers safe.

Learn More

Explore ways to take safety monitoring and inspection to a best practice level. Aotu and Intel offer a machine vision and AI framework that’s designed for today’s exacting requirements. The real-time monitoring solution can be installed fast, and it delivers a proactive and transformative safety framework.

- Aotu
- Intel® Distribution of OpenVINO™ toolkit
- Intel® Core™ processors
- Intel®Xeon® processors
- Intel® Edge Insights for Industrial
- Contact: Email: Info@aotu.ai

About Aotu

AOTU

Aotu is committed to innovation in the field of AI. It focuses on computer vision algorithms and AI operating system software technology, including deep neural network (DNN) algorithms, and software engineering. Its core product BrainFrame is used in multiple sectors, including industrial/IoT and enterprise/management.

Today, smart machines offer people opportunities to improve work and life. Aotu strives to be a leader in rapid AI deployment, infusing advanced AI technologies into production processes with unprecedented ease, thus enabling machines to see and understand the world—and ultimately aid humans.



¹Based on Aotu experience.

²<https://www.cbias.com/news/hr-safety/costly-consequences-oshha-violations/>

³Aotu results.

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