

USE CASE

AI Enhances Safety for Cargo Tank Hazmat Offload at Semiconductor Factory

How the NEON-2000-JNX prevents accidents, keeps operators safer, and provides peace of mind for safety-conscious supervisors

Hazardous chemicals such as metals, organic solvent, photoactive chemicals, and toxic gases are essential ingredients for semiconductor production processes. Upon delivery, personnel must offload these materials from the cargo tank motor vehicle into onsite storage facilities. The offloading procedure requires proximity to these potentially dangerous materials, and although the operation is safe, there is the potential for accidents if the process is not handled correctly. Due to the potential for harm, a range of safety precautions, such as the PHMSA's Hazardous Materials Regulations in the US, are put into place to minimize potential damage and ensure that offloading proceeds smoothly and safely. Compliance with these rules is typically the supervisor's task, manually checking adherence to established safety protocols. However, human error due to negligence, omission, or tiredness can inhibit the effectiveness of these checks. Protecting people from harm is a top priority.



Limitations of Traditional Monitoring Systems

Automated video monitoring systems are a tried-and-tested technique to improve compliance and worker safety. Still, hardware and software complexity, inflexibility, and compatibility issues with traditional rule-based monitoring systems often create more difficulties than they solve. The finicky setup is particularly hard to maintain for hazmat offloading because of environmental variables and the level of precision required for manual monitoring setup. For accurate monitoring, the tanker must stop in precisely the same position every time. Even then, different types of tankers and lighting conditions could cause incorrect judgment by rule-based algorithms. When operators move around the tanker, the viewing angle and position also changes, a further challenge to accurate judgment by traditional algorithms. This combination of factors makes accurate real-time monitoring almost impossible and limits the surveillance system to passive video recording, rather than actively monitoring and alerting to potential trouble, and preventing possible tragedy.

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AI Bolsters Monitoring Capabilities

AI vision overcomes these limitations by actively learning from input images, instead of relying on engineers to set specific rules. This approach makes object detection and identification easier and workable, and makes building the system easier. Once taught, the AI can detect and identify people, trucks, and other objects in real-time. Even if camera angles change or vehicles park slightly off-center, the system can still accurately detect safety infringements. AI also learns as it goes, so when new scenarios occur, such as new tankers or vehicles, different operator clothing, or other equipment changes, new images can be fed to the AI system to train it to recognize those new items. Beyond identifying objects, the actions and interactions of those objects (including people) can be monitored for potential dangers. AI works from different angles much better than traditional systems, so it is flexible, and the system can learn from the collected images of people and trucks. Advanced detection capabilities provide real-time monitoring and can sound an alarm for a range of predefined actions, including:

- ***Restricted areas - Actively define restricted or dangerous areas***
- ***Operator identity - Detect unauthorized personnel access to define restricted areas***
- ***Safety gear - Immediately sound an alarm if personnel enter dangerous areas without protective equipment***
- ***Safety perimeter - Monitor personnel proximity to dangerous objects, e.g., truck***
- ***Vehicle stability - Make sure the vehicle remains stationary during offloading***

However, as with much technological progress, the complexity of most AI setups detracts from their appeal. AI systems come with their own set of complications, including hardware compatibility, software dependencies, and peripheral cables with a wider footprint and lower reliability. That's where ADLINK's NEON-2000-JNX shines.

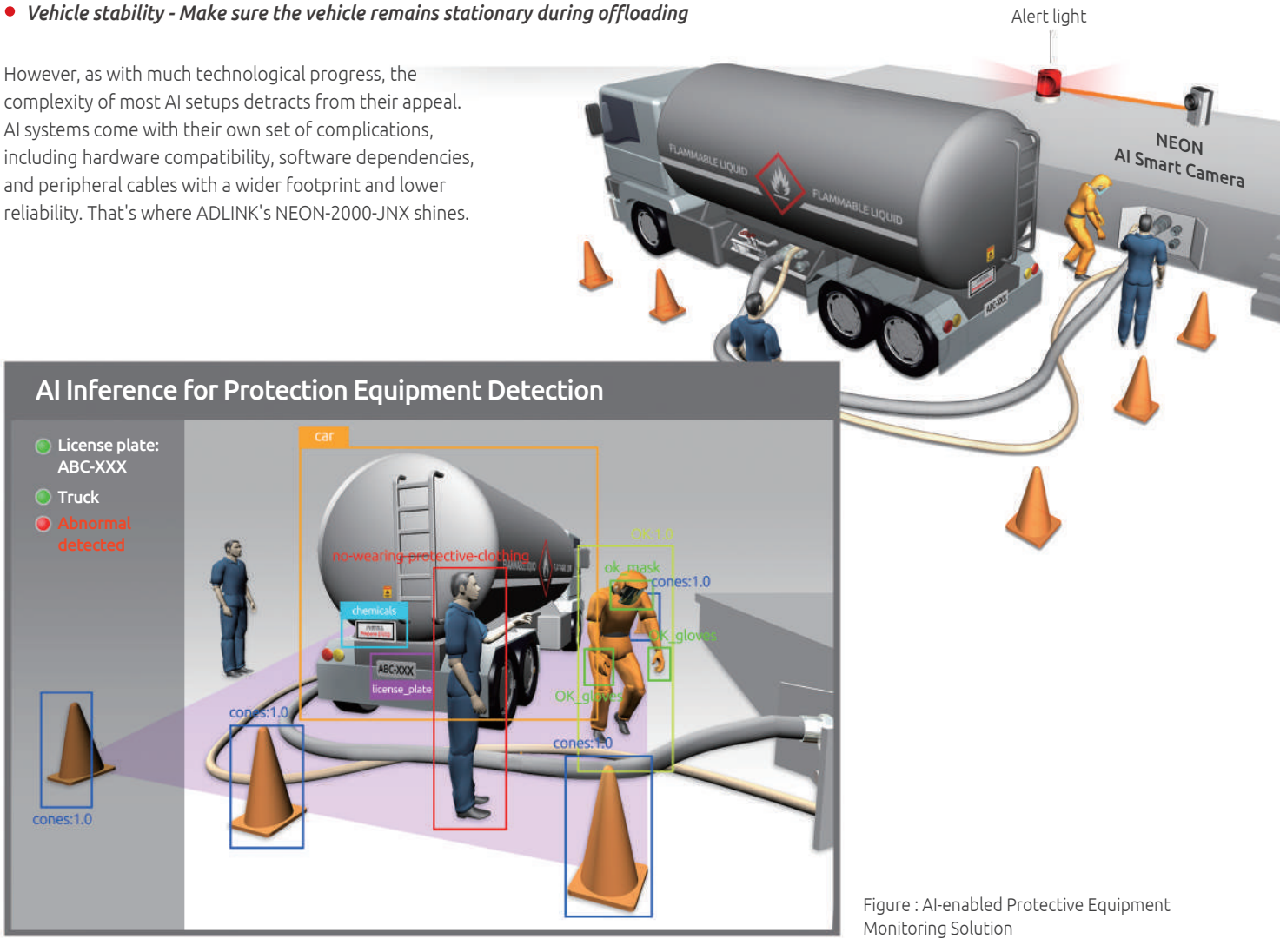


Figure : AI-enabled Protective Equipment Monitoring Solution

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NEON All-In-One AI Vision Camera

The NEON-2000-JNX eradicates the hardware and software difficulties inherent with most other AI vision systems, providing an all-in-one AI vision system with built-in GUI software for easy programming and setup.

- ***All-in-one standalone AI vision camera*** - Traditional systems include cameras, a collection point, and a central processing area. Multiple pieces of hardware to maintain, cables to install, and hardware and software compatibility to tackle. With integrated NVIDIA® Jetson Xavier NX, an image sensor, and an optimized software environment, the NEON rolls all hardware and software into a single affordable package that provides a fully standalone system for superior AI monitoring.

- ***Industrial-grade DIO for lighting or alert alarm*** - AI systems based on regular hardware cannot handle the demands of industrial applications. For AI to be helpful in the field, visual and audio notifications must alert people to hazardous circumstances, The NEON includes DIO to make hardware installation frictionless, enabling the addition of visual and audio warning devices.

- ***More responsive and efficient AI design*** - Other AI systems use compressed video from traditional IP surveillance cameras, using valuable GPU processing resources to decompress the incoming video stream. This loss of power diverts resources away from inference systems, resulting in substandard performance. The NEON uses high-definition raw image data with its MIPI or USB3 image sensor, eliminating encoding/decoding, retaining critical resources for inference, and resulting in higher frames-per-second with lower latency.

- ***Edge AI vision SDK*** - The NEON includes preinstalled software for building AI applications. The EVA SDK provides a visual interface for creating an AI pipeline and includes a suite of plugins that can cut development time to just two weeks. The GUI provides additional features including, a preview of each plugin, bottleneck identification with plugin performance monitoring, drag-and-play pipeline setup, and runtime image and result for visual verification of inference results.

Conclusion

AI-based object detection provides the capabilities to overcome problems previously unsolvable by rule-based algorithms and opens the door to new detection possibilities. Engineers can now leverage AI technology to do active monitoring and control at specific gates or dangerous locations, and issue real-time alerts to prevent accidents. Hazardous cargo offloading is just one application that requires detection of protective gear, but many other places, such as construction sites, also require monitoring for appropriate safety gear. For any project of this nature, the all-in-one NEON solves the legacy compatibility and reliability issues, streamlines installation and maintenance, and allows engineers to save time by focusing solely on application development. The result is a dramatic reduction in the total cost of ownership.



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