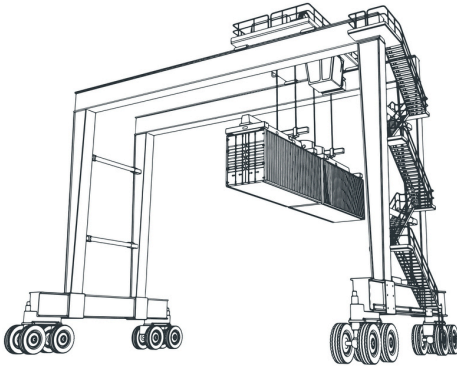


Twist-Lock Cone Detection System (TCDS)



TCDS integrates computer vision models with crane control logic to ensure safe container handling during hoisting. It automatically detects the presence of twist-lock cones on containers before they're hoisted. Whether you're running RTGs, ARMGs, or other crane configurations, TCDS helps operators avoid dangerous lifts caused by unremoved locking devices.

Unlike traditional hardware-based solutions, TCDS uses **AI and deep learning** to visually inspect containers, just like a human would — but faster, more consistently, and without fatigue. Think of it as a second set of eyes—trained by AI—watching each lift in real time.

HOW IT WORKS

TCDS uses AI-powered image recognition to scan corner castings as the container is lifted:

- **Job Begins:** The crane's PLC sends job and height info
- **Camera Views Activated:** TCDS monitors corners via primary and/or secondary cameras.
- **Neural Network: Stage 1 – Castings Detected:** The system identifies valid corner regions.
- **Neural Network: Stage 2 – Twist-lock Check:** A second AI model determines if cones are still present.
- **If Detected:** An alert is triggered or hoist is halted to prevent a dangerous lift.

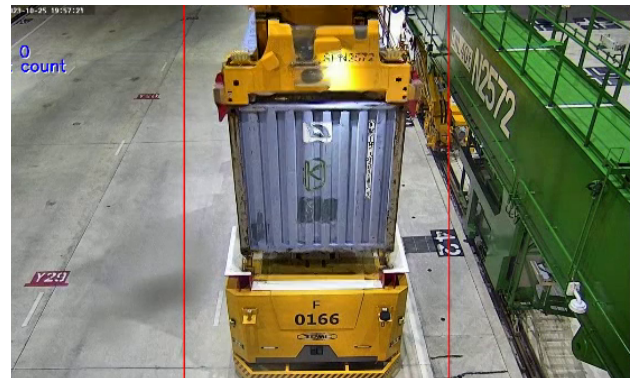
The system requires multiple confirmations to reduce false positives — it's smart enough to distinguish between debris, shadows, and real cones.

CAMERA INTEGRATION

TCDS can be adapted to work with **customer-specific camera layouts**. Depending on the site:

- Primary cameras are trained for high-accuracy detection.
- Secondary cameras can be configured to provide early or supplementary detection.
- Camera selection logic is automated based on crane job data.

Note: Camera models and configurations are project-specific and will be customized per deployment.



KEY FEATURES

- **AI-powered dual-stage detection:** identifies corner castings and twist-lock cones using specialized deep learning models.
- **Precision targeting with multi-frame validation:** reduces false positives through high-confidence detection and frame-based verification logic.
- **Real-time, adaptive monitoring:** automatically adjusts based on container type, hoist height, and crane job information.
- **Intelligent camera management:** dynamically switches between primary and secondary cameras based on operational context.
- **Modular and camera-agnostic design:** deploys with existing or new camera setups, and adapts to different crane types and container sizes.
- **Built-in reliability scoring & alerting:** each detection includes a reliability score for TCDS performance.

PERFORMANCE CONSIDERATIONS

Detection accuracy may be impacted under conditions where:

- Visibility is obstructed (e.g. by chassis structures)
- Cameras are affected by glare, water, or poor lighting
- Twist-lock cones are too small or flush-mounted

TCDS is designed to **match human-visible performance**, identifying cones only when they are reasonably visible to a human observer in real-time video feeds.

DEPLOYMENT & INTEGRATION

- Integrates with existing crane automation and job control systems (e.g. via PLC).
- Trigger logic and monitoring flows are customizable to meet your operational needs.
- Designed for on-premise or edge computing environments with AI model deployment support.
- Each deployment uses tailored AI models trained on relevant container and twist-lock profiles. Model tuning and maintenance are part of our support offering to ensure continued accuracy across evolving port conditions.

WHAT TCDS IS NOT

- Not a generic object detector – it is trained specifically for container twist-lock scenarios.
- Not reliant on a fixed camera model – adaptable to customer environments.
- Not enabled for degraded modes unless specifically configured.

mVizn develops AI-powered computer vision systems that enhance safety and automation in industrial environments. Based in Singapore, we specialize in edge-deployed solutions for container terminals, ports, and logistics yards—integrating seamlessly with cranes and control systems to deliver real-time operational intelligence.

Computer vision offers a distinct advantage in dynamic, visually complex environments. By delivering object-level understanding and context-aware detection, mVizn enables operators to respond to real-world situations with greater speed, accuracy, and confidence.

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