ADLINK
LEADING EDGE COMPUTING

Minimizing Downtime for Food & Beverage Industry with Superior AI Smart Camera



A Breakthrough in Product Inspection Efficiency with AI-Driven Vision Analytics Solution

Use Case

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Minimizing Downtime for Food & Beverage Industry with Superior AI Smart Camera

Superior camera technology combined with AI-driven machine vision analysis help revitalize a bottler's production line performance. Benefits include higher uptime, improved product quality, lower operating costs, and higher equipment effectiveness.

Introduction



Within the automation space, machine vision continues to be one of the most widely adopted factory automation solutions. The technology uses digital imaging and analysis as the basis for product inspection and process control. After four decades of refinement, modern MV solutions have all the automation benefits one would expect compared to human inspection: higher accuracy, far greater speed, and lower total cost, as labor expenses are all but eliminated.

A recent report by Grand View Research* expects the global machine vision market to continue compounding at nearly 7% annually through 2028. The report calls out automotive, pharmaceutical, and packaging as key verticals in machine vision adoption but notes that "the food and beverage industry is expected to register the highest growth rate." Illustrating this, ADLINK and Australia-based artificial intelligence (AI) software provider ANSCenter partnered to create an AI-based machine vision solution for one bottler in great need of a revamped production line.

* Data Citation. Grand View Research: Machine Vision Market Size Worth $21.17 Billion By 2028 | CAGR: 6.9%.
https://www.grandviewresearch.com/press-release/global-machine-vision-market

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Challenges: Production Downtime up to 15%

Bottling operations show containers flowing neatly along conveyor belts, effortlessly passing through filling, sealing, labeling, and crating. In reality, many factors can interfere with smooth bottling operations, including:

- **Fallen containers**
- **Lid feeder jams**
- **Pasteurizer faults**
- **Pasteurizer to packer jams**
- **Sensor malfunctions**
- **Container flaws**
- **Improper lid seals**
- **Label misalignment and other errors**

Between November 2020 and August 2021, a particular bottler in the Australia/New Zealand (ANZ) region experienced roughly 90,000 minutes, or over two months, of downtime in one site alone. (The company maintains over 20 factory sites globally.) Some of this downtime arose from human error.

Manufacturers are well-acquainted with such issues. People on manufacturing lines get tired and bored. Accidents happen, and they miss things. Beyond the immediate and downstream costs of production stalls, those human inspection workers draw wages, experience sick time, and incur other costs. Fortunately, machine vision systems now offer the ability to automate many of those repetitive inspection tasks and allow workers to focus their skills in other productive areas.

The ANZ-region bottler had attempted to implement a machine vision system once before, but shifting daylight levels and other technical considerations proved too difficult for the solution to handle. Error rates were too high, and the company returned to human-only methods and the same downtime issues as before. At last, the company reached out to ANSCENTER, an AI software solutions provider based in Australia. ANSCENTER had considerable experience in deep learning applications, but the firm needed a hardware partner that could help create a total solution that would be affordable, easy to implement and maintain, and operate effectively and unobtrusively in the bottler's environment.

Limitations of Surveillance Cameras and Conventional AI Box PC

Conventional machine vision approachesinvolve multiple elements, including a camera connected to a computer, often with a specialized frame grabber for extracting high-quality still images from a video stream. In solutions requiring high throughput (e.g., multiple frames per second at sufficient resolution and clarity for analysis), GPU acceleration may be required for the system to keep pace with the incoming image flow. Modern systems will use AI to help analyze imagery and improve detection algorithms over time, which also requires sufficient processing resources.

Insufficient Imaging of Surveillance Camera Solution

The bottler client understood only some of these concepts. It had sought to use a conventional, entry-level surveillance camera tethered to a PC, but the camera lacked enough quality to capture high-resolution, clear images at high speeds. The PC lacked the appropriate processing power to analyze the data stream in real time. Not least of all, with no on-staff expertise in AI and image analysis, the company's software tools were cumbersome and unable to cope with production conditions.

Heavy Integration Effort of AI Box PC

Fortunately, the market offered better solutions for this application. NVIDIA helped advance the MV field with its Jetson embedded computing platform, which paved the way for solution designers to bundle a small-form-factor Jetson box PC with industrial cameras and connection cabling. Alternatively, creative solution designers could craft custom enclosures for a Jetson module, carrier board, Mobile Industry Processor Interface (MIPI) sensor module, and MIPI cabling. This approach still works well for low-demand applications.

However, some applications, such as this bottling operation, demand such rapid performance that there's no time to communicate with external devices. Thus, ADLINK took the Jetson model even further and devised the industry's first fully integrated industrial camera solution. This approach simplified hardware design and implementation, lowered total cost, improved ease of software integration and compatibility, and delivered some of the highest MV performance available today for industrial use cases.

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Solution: 24/7 Nonstop Defect Inspection with Edge AI Smart Camera and Comprehensive Video Analytics Software

ANSCENTER provided the customer with additional solution cost savings by tailoring the NEON deployment to mesh with the manufacturing line's existing systems. Often, new machine vision inspection systems will be costly to implement, so buyers wish to use as much of their existing equipment as possible, including signal tower lights and controllers for halting conveyor lines. ANSCENTER customized its software ANS Intelligent Video Management System (ANSVIS) on the NEON camera to integrate with as much of the bottler's prior workflow as possible, saving on both on-site configuration and the need for inexperienced tech staff to attempt the integration on their own.



ANS Intelligent Video Management System

Benefits of Industrial-Quality Smart Inspection

- **Increased effectiveness and lower costs:** The bottler realized a 2% gain in overall equipment effectiveness (OEE), the key measurement for manufacturing productivity. Improvements in OEE mean incremental energy savings and the ability to execute shorter product runs, which then means less stored inventory and lower warehousing costs.
- **Higher quality:** Elevated inspection accuracy and quality control led to fewer customer complaints as well as improved supplier quality check compliance.
- **Simple, clean installation:** The inspection system mounted unobtrusively into the customer's manufacturing line, with very little cabling and no need for any changes in the environment.
- **Instant alerts:** The NEON/ANSVIS solution provided instant notifications and video bookmarks upon detection of any abnormalities on the production line.
- **Issue troubleshooting and prevention:** Video analysis of abnormalities help identify root causes of downtime and thereby improve yields. Similarly, inspection and analysis could warn of potential accidents during operation, aiding in their prevention.

Most importantly, the manufacturing line experienced drop downtime significantly, and when downtime was experienced, ANSVIS analysis helped guide workers to quicker root cause identification and resolution. By pairing the ADLINK NEON smart camera with ANSCENTER's AI analysis platform, the bottler finally achieved the results that had eluded it for years: relief for human labor, improved automation, and higher profitability.

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Our Offering:

NEON All-In-One AI Vision Camera and ANSVIS Real-time Intelligent Video Analytics and Management System



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 that can cut development time to just two weeks. ANSCENTER's ANS Intelligent Video Management System (ANSVIS) is a comprehensive, AI-based analysis package that covers camera management, AI model functions, and trigger management through a straightforward graphical dashboard.

- **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 AI Smart Camera 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.

- **ANS Intelligent Video Management System (ANSVIS)**
  is a comprehensive, AI-based analysis package that covers camera management, AI model functions, and trigger management through a straightforward graphical dashboard. With its low overhead and streamlined design, ANSVIS can perform AI analysis of images at full camera speed — 60 FPS, for example — when running on a task-optimized hardware platform. ANSVIS is featured with a training engine, Object Detection Hub (ODHUB), which helps the system learn how to identify components correctly and spot errors, such as text located the incorrect distance from a can lid's edge. Moreover, if ODHUB determines during training that accuracy is not high enough, it prompts users to input more source images to improve the model until desired accuracy is reached.

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Head Office

ADLINK Technology, Inc.

No. 66, Huaya 1st Rd., Guishan Dist.,
Taoyuan City 333411, Taiwan
Tel : +886-3-216-5088
Fax: +886-3-328-5706

www.adlinktech.com

Worldwide Offices

Ampro ADLINK Technology, Inc.

6450 Via Del Oro, San Jose, CA 95119-1208, USA
Tel: +1-408-360-0200
Toll Free: +1-800-966-5200 (USA only)
Fax: +1-408-360-0222
Email: info@adlinktech.com

ADLINK Technology (China) Co., Ltd.

上海市浦东新区张江高科技园区芳春路300号 (201203)
300 Fang Chun Rd., Zhangjiang Hi-Tech Park
Pudong New Area, Shanghai, 201203 China
Tel: +86-21-5132-8988
Fax: +86-21-5192-3588
Email: market@adlinktech.com

ADLINK Technology Beijing

北京市海淀区上地东路1号盈创动力大厦E座801室
(100085)
Rm. 801, Power Creative E, No. 1 Shang Di East Rd.
Beijing, 100085 China
Tel: +86-10-5885-8666
Fax: +86-10-5885-8626
Email: market@adlinktech.com

ADLINK Technology Shenzhen

深圳市南山区科技园南区高新南七道数字技术园
A1栋2楼C区(518057)
2F, C Block, Bldg. A1, Cyber-Tech Zone, Gao Xin
Ave. Sec. 7 High-Tech Industrial Park S.,
Shenzhen, 518054 China
Tel: +86-755-2643-4858
Fax: +86-755-2664-6353
Email: market@adlinktech.com

ADLINK Technology Singapore Pte. Ltd.

84 Genting Lane #07-02A, Axxel Innovation
Centre, Singapore 349584
Tel: +65-6844-2261
Fax: +65-6844-2263
Email: singapore@adlinktech.com

ADLINK Technology Singapore Pte Ltd. (Indian Liaison Office)

#50-56, First Floor, Spearhead Towers
Margosa Main Road (between 16th/17th Cross)
Malleswaram, Bangalore - 560 055, India
Tel: +91-80-42246107, +91-80-23464606
Fax: +91-80-23464606
Email: india@adlinktech.com

ADLINK Technology Japan Corporation

〒101-0045 東京都千代田区神田鍛冶町3-7-4
ユニゾ神田鍛冶町三丁目ビル4F
Unizo Kanda Kaji-cho 3 Chome Bldg. 4F,
3-7-4 Kanda Kajicho, Chiyoda-ku,
Tokyo 101-0045, Japan
Tel: +81-3-4455-3722
Fax: +81-3-5209-6013
Email: japan@adlinktech.com

ADLINK Technology Korea Ltd.

경기도 용인시 수지구 신수로 767 A동 1503호
(동천동, 분당수지유타워) (우) 16827
A-1503, U-TOWER, 767 Sinsu-ro, Suji-gu,
Yongin-si, Gyeonggi-do, Republic of Korea, 16827
Toll Free:+82-80-800-0585
Tel: +82-31-786-0585
Fax: +82-31-786-0583
Email: korea@adlinktech.com

ADLINK Technology, Inc. (Israel Liaison Office)

SPACES OXYGEN, 62 Medinat, Ha-yehudim st
4673300, Herzliya, Israel, P.O.Box – 12960
Tel: +972-54-632-5251
Fax: +972-77-208-0230
Email: israel@adlinktech.com

ADLINK Technology GmbH

Hans-Thoma-Straße 11
D-68163 Mannheim, Germany
Tel: +49 621 43214-0
Fax: +49 621 43214-30
Email: germany@adlinktech.com

Ulrichsbergerstraße 17
D-94469 Deggendorf, Germany
Tel: +49 991 290 94–10
Fax: +49 991 290 94–29
Email: germany@adlinktech.com

ADLINK Technology, Inc. (French Liaison Office)

Bâtiment Thalès - Parc des Algorithmes,
Route de l'Orme des Merisiers,
91190 SAINT AUBIN, France
Tel: +33 (0) 1 60 12 35 66
Fax: +33 (0) 1 60 12 35 66
Email: france@adlinktech.com

ADLINK Technology, Inc. (UK Liaison Office)

First Floor West Exeter House,
Chichester fields Business Park Tangmere,
West Sussex, PO20 2FU, United Kingdom
Tel:+44-1243-859677
Email: uk@adlinktech.com

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