

Solution Brief

Situational Monitoring
Artificial Intelligence



Optimizing Quality Assurance in Manufacturing with Constems-AI's BoVi Solution

The BoVi solution automates quality assurance with an AI-powered visual inspection system that leverages Intel® Technology to revolutionize product inspection and dramatically increase throughput in the manufacturing sector.



About Constems-AI

Constems-AI pioneers vision-based AI, surpassing human cognitive abilities to redefine human machine interaction. Specializing in high-performance AI-driven vision solutions via SaaS, they accelerate Industry 4.0 and retail 2.0 digitization while minimizing human intervention. Their flagship offering, BoVi, provides advanced AI-based vision inspection and analytics, optimizing operations for enterprises in production. Constems-AI works to actively shape the future through revolutionary AI solutions.

Managing Production Pressures and the Importance of Accurate Inspection Practices

Manufacturers today face the challenging task of balancing rising expectations for high production throughput while maintaining stringent quality standards and keeping costs down. Each defect on a factory floor can have significant impacts on a manufacturer's bottom line, from machine downtime to delayed shipping and poor customer experiences. Timely and accurate inspections are critical for maintaining smooth operations and ROI, yet this is difficult for manufacturers to achieve, particularly in high-volume production environments.

Traditional inspection methods often rely on manual intervention or outdated technologies, leading to inefficiencies, increased costs, and diminished product quality. In a study conducted by Sandia National Labs, the accuracy of correctly rejecting precision manufactured parts by human operators was found to be 85% while the industry average was 80%.¹ Conversely, modern methods of visual inspection can prove unwieldy and expensive, requiring multiple cameras to detect even rudimentary product features and defects.

When defects are not identified swiftly and with high-accuracy, manufacturers can face a number of costly consequences:

- ◆ Production delays and recalls
- ◆ Reduced product quality and safety
- ◆ Increased rework costs
- ◆ Reputational damage and mistrust
- ◆ Eroded market share

In response to these challenges, companies are increasingly turning to Industry 4.0 solutions.

What is Industry 4.0 and Why Does it Matter?

Industry 4.0, also known as the Fourth Industrial Revolution, marks a pivotal shift in the manufacturing landscape driven by digitization and disruptive technologies such as data analytics, AI, IoT, and robotics. As companies recognize its strategic importance, the adoption of these technologies is becoming increasingly widespread.

A 2022 McKinsey survey report showed 68% of respondents regarded Industry 4.0 as a top strategic priority, with 70% already piloting or deploying new technology.² As companies embrace this paradigm shift, those quick to adapt stand to reap substantial economic benefits. According to McKinsey's analysis, companies leading the charge toward AI and advanced technologies can expect a remarkable 122% positive cash flow change by 2025. In contrast, lagging behind in technology adoption could result in significant downturns for companies to the tune of 23%.²

Recognizing the potential to help manufacturers improve visual inspection through AI, Constems-AI developed the BoVi solution. It serves as a critical enabler for companies striving to advance their operations to Industry 4.0 standards. By automating visual inspections with AI technology, the solution provides rapid defect detection to help operators enhance productivity while maintaining quality standards on the assembly line. As companies navigate the complexities of a digital transformation, BoVi serves as a catalyst for innovation, enabling them to unlock new levels of competitiveness and success in the digital era.



Empowering Manufacturers with AI-driven Inspection: The BoVi Solution

BoVi employs advanced computer vision and deep learning algorithms to analyze visual data in near real-time at the factory level. BoVi uses cameras on the factory floor to capture high-resolution images of products as they move along the assembly line.

Images are processed through a sophisticated AI pipeline, which meticulously examines each product for defects and irregularities. Utilizing a combination of pattern recognition, object detection, and anomaly detection techniques, BoVi achieves high-accuracy product inspection at an average speed 10x faster than conventional methods. With just a single camera shot, BoVi can detect over 100 prebuilt defects. Whether it's surface imperfections, misalignments, or inconsistencies in shape or size, BoVi is equipped to detect even the most subtle deviations from quality standards.

Upon detecting a defect, BoVi generates instant alerts, allowing manufacturers to take immediate corrective action. Whether it's halting the production line, initiating rework processes, or conducting further analysis, BoVi ensures that quality issues are swiftly addressed, minimizing downtime, and reducing the risk of defective products reaching the market. This upgrade in operations translates into a significant cost efficiency boost of around 20%.

Working in tandem with BoVi, The CAInatics cloud platform centralizes data management and aggregates visual data for comprehensive historical analysis and actionable insights. The platform offers interactive dashboards showcasing production trends, defect patterns, and quality control metrics. Visualizing this data empowers manufacturers to optimize their processes, identify areas for improvement, and make informed decisions to enhance overall efficiency and product quality.

Key Features of the BoVi Solution

- 1 AI-driven vision-based inspection:** BoVi employs AI algorithms and vision-based technologies to conduct comprehensive inspections on the assembly line. By analyzing intricate details, BoVi provides precise defect detection, capturing subtle deviations from quality standards. With a single camera, BoVi identifies over 100 pre-designated defects in a single shot, including surface imperfections and misalignments.
- 2 Real-time analytics and rapid processing:** BoVi enables real-time monitoring of production processes, allowing manufacturers to promptly identify and address issues as they occur. Its high-speed processing capability analyzes large data volumes to facilitate efficient inspections and optimized throughput. Operators receive instant alerts regarding any deviations from quality standards, enabling prompt corrective actions.
- 3 Automated Quality Control:** BoVi reduces the reliance on manual inspections and minimizes the risk of human error through process automation. By streamlining inspection tasks and eliminating manual intervention, BoVi accelerates the inspection process while also improving accuracy and reliability.
- 4 Trend analysis and actionable insights:** BoVi offers remote access to dashboards that demonstrate trends in production performance, defect rates, and quality metrics. By aggregating data from ongoing inspections and historical records, BoVi analyzes trends over time, identifying patterns and anomalies to present actionable insights for continuous process improvements.

These features and capabilities enable the BoVi Solution to provide the following benefits to end customers:



Enhance product quality and reliability

By maintaining meticulous quality standards, BoVi helps manufacturers enhance the overall quality and reliability of their products. This translates to greater customer satisfaction and loyalty, as customers can trust in the consistency and excellence of the products they receive.



Boost cost savings

By catching defects early in the production process, manufacturers can reduce rework costs, minimize scrap, and avoid costly recalls. Additionally, BoVi's efficient operation and streamlined processes contribute to overall cost savings, helping manufacturers optimize their use of labor and resources to maximize profitability.



Improve operational efficiency

By streamlining inspection tasks through automation, manufacturers can elevate production efficiency and minimize bottlenecks. Operators can promptly identify and address issues to reduce production delays, increase uptime, and implement preventive maintenance to ensure smooth operations throughout the manufacturing process.



Preserve brand integrity

By intercepting defective products before they reach consumers, BoVi helps companies maintain brand integrity. Consistently delivering high-quality and reliable products promotes customer satisfaction, positive reviews, and repeat business. This, in turn, strengthens brand reputation and fosters long-term success in the marketplace.



Customer Success Story: NTRM Solution at ITC Green Leaf Threshing Plant

Challenge: ITC Green Leaf Threshing Plant was struggling with their tobacco grading process. Despite manual efforts in detection and elimination of non-tobacco related material (NTRM), the process proved ineffective, leading to substantial revenue loss. The inability to accurately identify and remove NTRM resulted in lower product quality that created dissatisfaction among customers.

Solution: In response to this challenge, ITC Green Leaf Threshing Plant deployed Constems-AI's BoVi solution. Leveraging cutting-edge AI technology, BoVi improved the tobacco grading process by automating detection and elimination tasks. The solution enhanced processing speeds and provided precise identification of NTRM, helping ITC Green Leaf Threshing Plant maintain consistency in their quality control.

Result: The implementation of BoVi yielded remarkable results for ITC Green Leaf Threshing Plant. With an accuracy rate exceeding 90%, the quality of tobacco grading soared, leading to improved customer satisfaction. The solution not only minimized revenue loss but also upheld stringent quality control standards, maintaining ITC Green Leaf Threshing Plants' positive reputation among their clientele.

Intel® Technology Helps Optimize the BoVi Solution for Manufacturing Excellence

Intel has been instrumental in elevating Constems-AI's BoVi solution. Constems harnesses the power of Intel® Technology to optimize its performance and scalability for demanding manufacturing environments.

Intel® Distribution of OpenVINO™ toolkit: BoVi utilizes the advanced capabilities of OpenVINO™ toolkit, a powerful deep learning inference toolkit. OpenVINO™ accelerates AI inference with lower latency and higher throughput while maintaining accuracy. This technology provides developers with a comprehensive suite of tools for developing and deploying AI-based computer vision models quickly, optimizing them, and scaling them effectively. By leveraging this toolkit, BoVi minimizes disruptions and maximizes performance, ensuring accurate and high-speed visual recognition processing. Furthermore, the OpenVINO™ toolkit allows BoVi to take full advantage of existing Intel® Processor architectures, enhancing its efficiency and effectiveness.

Intel® Xeon® Processors: BoVi relies on 3rd Gen Intel® Xeon® Scalable processors, tailored for managing complex AI workloads alongside existing tasks. These processors boast AI acceleration and optimization features, markedly enhancing performance for AI applications. They leverage built-in workload acceleration capabilities like Intel® Deep Learning Boost, Intel® Advanced Vector Extensions, and Intel® Speed Select technology. By running AI algorithms through Intel® Xeon® processors, BoVi efficiently categorizes and analyzes data, ensuring precise and timely insights. Integration of Intel® Xeon® processors enables BoVi to achieve outstanding performance and reliability in manufacturing inspection tasks.

Intel® Optimization for PyTorch: BoVi further benefits from Intel® Optimization for PyTorch, a framework that enhances the performance of PyTorch-based deep learning models. Through this optimization, BoVi ensures efficient execution of AI algorithms, enabling faster processing and greater accuracy, enhancing the solution's ability to handle intensive workloads while maintaining reliable and consistent performance.

Conclusion

BoVi's AI-powered visual inspection system leverages Intel® Technology, to revolutionize quality control in high-volume manufacturing environments. With automated defect detection and real-time insights. As manufacturers embrace Industry 4.0, BoVi represents a crucial step in aligning with the goals of digital transformation. With AI-powered visual inspection, Constems-AI helps companies improve their processes, minimize delays, and uphold the highest quality standards. With BoVi, manufacturers can achieve greater efficiency, cost savings, and preserve brand integrity, positioning themselves for success in a rapidly evolving industry.

Learn More

To learn more about the BoVi Solution visit:

- [Constems-AI Website](#)
- [Visual Inspection with Industrial AI Solution Page](#)

To learn about Intel® Technologies visit:

- [Intel® Distribution of OpenVINO™ Toolkit Product Page](#)
- [Intel® Xeon® Scalable Processors Product Page](#)
- [Intel® Optimization for PyTorch Product Page](#)
- [Intel® Distribution for Python* Product Page](#)

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Constems-AI's visual inspection product has transformed quality control. It enhances precision, efficiency, and defect detection. This AI solution redefines quality control, ensuring superior product quality across industry, revolutionizing visual inspection in manufacturing.”

— Global CTO of a Leading FMCG Brand



Sources

1. National Center for Biotechnology Information, [Artificial Intelligence-Based Smart Quality Inspection for Manufacturing](#), 2023
2. McKinsey, [What are Industry 4.0, the Fourth Industrial Revolution, and 4IR?](#), 2022

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