Case Study

Anomaly Detection
Artificial Intelligence

Optimizing Mining and Extraction Operations and Improving Ore Grade Management with NTWIST's nVision POSOC Application

The NTWIST nVision Prediction of Oil Sands Ore Characteristics (POSOC) Application, powered by Intel® technology, helps oil sands extraction and processing operators enhance productivity and quality control through real-time data-driven insights.

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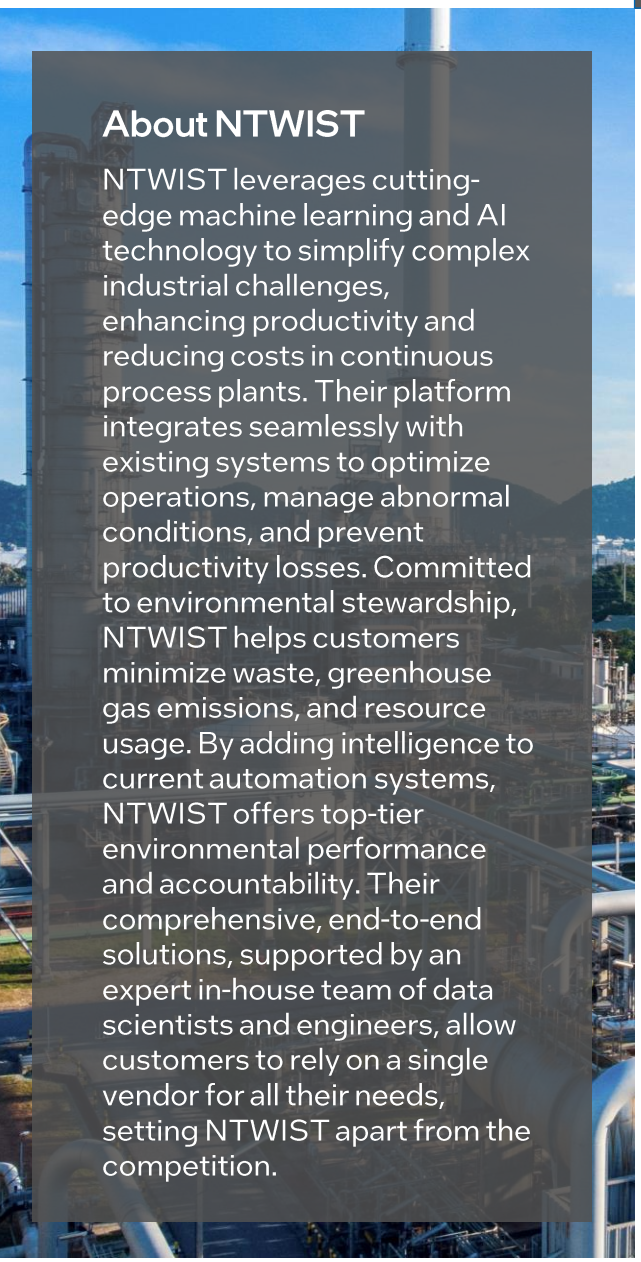

About NTWIST

NTWIST leverages cutting-edge machine learning and AI technology to simplify complex industrial challenges, enhancing productivity and reducing costs in continuous process plants. Their platform integrates seamlessly with existing systems to optimize operations, manage abnormal conditions, and prevent productivity losses. Committed to environmental stewardship, NTWIST helps customers minimize waste, greenhouse gas emissions, and resource usage. By adding intelligence to current automation systems, NTWIST offers top-tier environmental performance and accountability. Their comprehensive, end-to-end solutions, supported by an expert in-house team of data scientists and engineers, allow customers to rely on a single vendor for all their needs, setting NTWIST apart from the competition.

The Critical Role of Accurate Ore Analysis in Oil Extraction

One of the major challenges in the ore processing and mining industry is the reactive nature of anomaly detection and problem-solving. Traditionally, geologists and plant operators only respond to issues after they impact plant operations. When a problem occurs, they investigate possible factors—including the ore being processed itself—to determine the cause.

This involves analyzing color, ambient light, texture, and pour-rate to confirm or rule out ore as the source of the problem. If initial testing suggests the ore is at fault, samples are sent to a lab for testing, which takes at least six to eight hours to yield results.[1]

This reactive approach leads to delays in addressing problems, prolonging inefficiencies, downtime, and increasing operational costs.

NTWIST developed the nVision POSOC Application to address this problem. This solution operates continuously to analyze video footage, detecting anomalies in near real-time before they can affect plant output. With these early warnings, and increased initial ore screening accuracy, plant personnel can more quickly and effectively determine whether to collect samples and conduct lab tests. This approach facilitates timely corrective intervention, reduces downtime, and improves overall operational efficiency by ensuring that potential issues with ore quality are identified and addressed before they impact the plant's performance.

From Reactive to Proactive: Enhancing Ore Quality Management with NTWIST's nVision Application

The NTWIST nVision Application is designed to revolutionize the process of detecting anomalies in oil sands ore by providing a 24/7 automated monitoring system. It utilizes advanced AI algorithms to continuously analyze live video footage captured by closed-circuit television (CCTV) cameras monitoring oil sands ore truck dumping activities. By processing dumping video data in near real-time, the application can detect anomalies based on factors such as color, ambient light, and soil lumpiness, including properties that can only be ascertained during pouring or dumping.

When the system detects an anomaly in the video footage, it can give plant personnel a lead time of four to six hours before the final output is affected.[1] This early detection allows for timely decisions regarding sample collection and lab testing and narrows the sample size needed to be lab-tested. This helps reduce the workload on lab facilities and speeds up the diagnostic process, ultimately improving overall responsiveness, efficiency, and accuracy. Continuous monitoring not only enhances the accuracy and speed of anomaly detection but also transforms the decision-making process, enabling plant personnel to maintain optimal consistency in ore quality.

How the nVision POSOC Application Works

The solution operates through on-premise deployments integrated with an intranet-based live video analysis. Initially, nVision is deployed entirely on-premise, ensuring that all components and operations are localized within the customer's infrastructure to fortify data security and compliance with operational protocols. The first component of the solution involves capturing the live video footage via the customer's CCTV network. This video feed undergoes nVision's analysis using AI-powered algorithms and predictive modeling to identify trucks and ore grade characteristics within the intranet environment.

The ore's grade information is then transmitted within the intranet to the second part of the solution, which processes and presents the data through a graphical user interface (GUI). This GUI is accessible via web-based or application-based interfaces, providing comprehensive predictive insights into ore characteristics. Additionally, the GUI offers cloud connectivity, enabling access to predictive information from remote locations to give users operational oversight and enhance decision-making. This helps ensure that near real-time analysis and prediction occur securely on-premise, while efficient visualization and remote access to insights are facilitated through the cloud-connected GUI.

Key Features

Near Real-Time Analysis: The nVision application processes high-quality video data from multiple sources in near real-time, allowing for immediate identification of ore characteristics during truck unloading.

Predictive Modeling: Utilizing sophisticated AI models like the YOLO V5 architecture, the application accurately predicts ore characteristics by analyzing factors such as ambient light, soil color, and texture.

Scalability: The nVision application is designed for scalability and can be replicated across multiple hoppers in different plants. This enables consistent and optimized performance as operations grow without significant additional investment.

Proactive Anomaly Detection: The application verifies all video data during the dumping process, identifying anomalies based on plant input. This proactive approach allows for immediate action to address inconsistencies in ore grade, minimizing downtime and preventing small issues from becoming major disruptions.

Collaboration with Intel: Leveraging advanced Intel technologies such as the OpenVINO™ toolkit and Intel® Xeon® processors, the nVision application is optimized for AI model performance. The solution offers high inference throughput for near real-time ore analysis, helping improve accuracy, efficiency, and speed.

End Customer Benefits

Enhanced Operational Efficiency: Through near real-time analysis and predictive modeling of ore characteristics, the nVision solution enables plant personnel to maintain consistently high ore grades while reducing sorting time, helping to optimize productivity throughout the extraction process.

Proactive Plant Management: The solution's proactive anomaly detection facilitates timely interventions to minimize process disruptions and reduce machine downtime, helping sustain higher productivity, smoother operations, and fewer unexpected issues.

Cost Reduction: The nVision solution contributes to lower operational costs by decreasing energy consumption, reducing waste management expenses, and cutting truck transport costs by minimizing bad hauls and misrouted hauls. Efficient resource utilization contributes to improved profitability and strengthens the bottom line.

Environmental Impact Reduction: By optimizing the mining process, the solution helps reduce waste and ensures that plants meet regulatory standards, thereby decreasing the environmental footprint of mining operations and promoting sustainable practices.

Improved Decision-Making: The data-driven insights provided by the nVision solution enable plant personnel to make more informed and proactive decisions, enhancing overall plant management and operational outcomes.

Transforming Oil Sands Operations with Real-Time AI: A Customer Success Story with NTWIST

Challenge: A North American oil sands extraction company struggled with maintaining consistent ore quality due to variability in ore grades from different pits. The manual blending process was time consuming and often resulted in errors, leading to inconsistent output and inefficient water usage. Geologists had to reactively monitor plant output to detect anomalies, causing delays and increased operational costs.

Solution: The customer implemented the NTWIST nVision POSOC Application, which leveraged advanced AI and machine learning technologies for near real-time analysis and predictive modeling of ore characteristics through continuous CCTV footage. The nVision Application identified and predicted ore characteristics to help plant personnel maintain ore quality without the need for the manual blending process.

Result: The solution helped transform the company's operations by enabling truly proactive mining process management. Near real-time analysis and anomaly detection helped ensure consistent ore quality, optimized water usage, and reduced waste. This shift minimized downtime, lowered operational costs, and improved decision-making, ultimately optimizing the efficiency of the oil sand extraction process.

How Intel® Technology Helped NTWIST Optimize the nVision Application

The integration of Intel technology, particularly the OpenVINO™ toolkit and Intel® Xeon® processors, helped optimized the NTWIST nVision Application. Initially, the application required GPU-based solutions to manage the high computational demands of processing HD-1080P color video at 30 to 60 frames per second (FPS). This setup was both costly and less efficient.

With Intel's optimizations, the nVision Application transitioned to a CPU-based implementation, hosted on on-premise servers equipped with Intel Xeon processors. These servers provide the robust infrastructure needed for real-time data analysis and prediction. By leveraging the OpenVINO toolkit, the AI models, such as the YOLO V5 architecture implemented in the Intel® Extension for PyTorch, were optimized for inference throughput on Intel Xeon processors. This optimization helped enhance the efficiency and performance of the AI models, enabling accelerated near real-time analysis and prediction of ore characteristics.

The shift to a CPU-based solution reduced the overall setup costs by eliminating the need for expensive GPUs. The improved processing speed and throughput allowed the application to handle more frames per second, helping reduce the previous backlog of unprocessed videos. As a result, it helps the system operate continuously without downtime, processing video data in near real-time.[1]

Conclusion

The NTWIST nVision POSOC Application, enhanced by Intel technology, represents a transformative solution for the oil sands industry. By providing near real-time analysis, predictive modeling, and proactive anomaly detection, the application addresses the critical market challenge of maintaining ore consistency and improves the efficiency of the mining process. The integration of advanced AI models assists plant personnel to make timely, informed decisions, ultimately transforming the productivity and sustainability of mining operations. As the industry continues to evolve, the nVision POSOC Application stands out as a vital tool for driving operational excellence, empowering customers to achieve new standards of efficiency in ore analysis.

Learn More

To learn more about the NTWIST nVision POSOC Application visit:

- NTWIST Website
- NTWIST POSOC Blog Post

To learn about Intel technologies visit:

- Intel® Xeon® Scalable Processors
- OpenVINO™ Toolkit
- Intel® Extension for PyTorch

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Sources

1. Data from internal test results of NTWIST. Intel does not control or audit third-party data. Please review the content, consult other sources, and independently confirm if the data provided is accurate.