Case Study: Revolutionizing Ore Management with NTWIST's Integrated Mining Platform

NTWIST

Our solution	
Situation:	Hectic ramp-up
Challenge:	Ore & waste went to wrong places
Opportunity:	Track ore movement and identify misplacement
Value:	Prevention of $0.5MM ore loss

Facilities' specifications	
Customer:	Open-pit gold mine/plant in Brazil
Production	50 koz/y

PROBLEM

An open-pit gold mine in Brazil faced significant challenges during a hectic ramp-up phase. Variability in ore grade, detected through lab samples, highlighted inefficiencies in their material handling processes. However, because lab results were post-event indicators, they provided no real-time insights to resolve the issue. As a result, operational inefficiencies persisted, with misplaced ore and waste causing dilution, grade variability, and inconsistencies in the plant's throughput and recovery.

To address these challenges, the customer initiated data analysis to investigate the sources of ore loss and grade variability. However, the immediate priority of ramping up production left them without actionable steps to resolve the identified problems.

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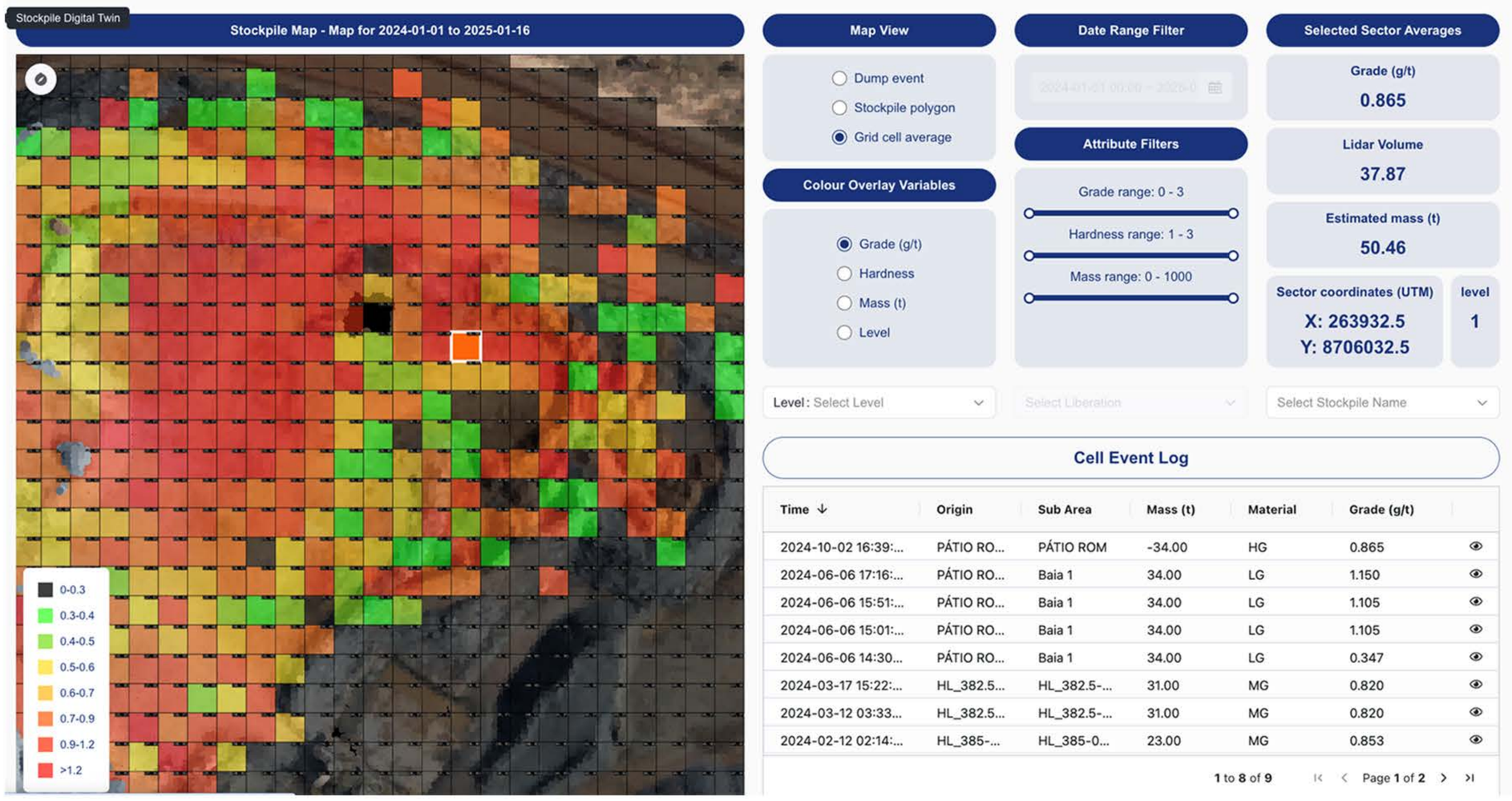
OPPORTUNITY & SOLUTION

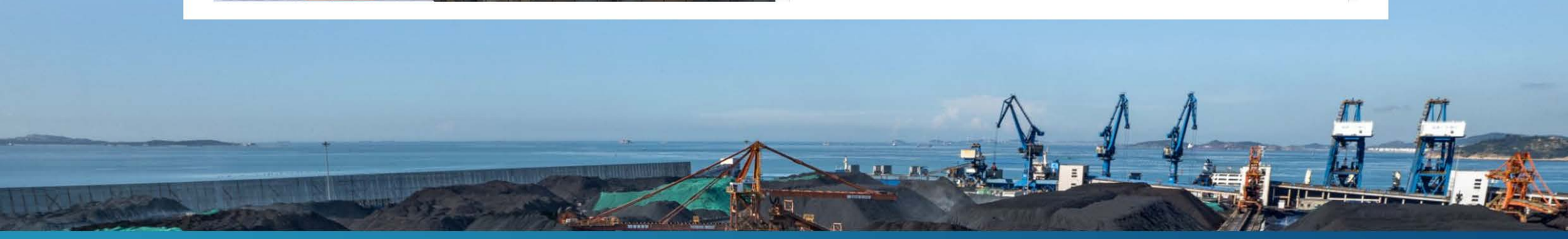
The customer needed a solution to streamline their operations, eliminate material misplacement, and reduce plant variability. With misplaced ore and waste leading to potential financial losses valued at $0.5 million annually, NTWIST recognized the opportunity to provide a comprehensive material tracking system. This solution would not only identify misplacement events in real time but also deliver actionable insights to improve the efficiency and accuracy of ore handling processes.

NTWIST deployed its Integrated Mining Platform (IMP), an advanced material tracking system designed to address the operational inefficiencies at the mine. The platform tracked ore properties from truck data through various stockpiles to the plant, providing the customer with much-needed visibility into their material flows.

A core component of the solution was the Stockpile Digital Twin, which offered a detailed visualization of grade distribution across stockpiles. By integrating monthly drone surveys into the digital twin, NTWIST ensured that the stockpile models were accurate and reconciled against real-world data. The platform also included dynamic dashboards to analyze material flows and uncover misplaced ore and waste, enabling the customer to take corrective action in real time.

The solution was integrated with the customer's existing systems, including their Fleet Management System (Smart Mine) for real-time tracking of truck movements and polygon data stored in SharePoint. Monthly drone surveys provided x, y, z, and RGB data points to update the digital twin and generate stockpile visualizations. To ensure data security and control, NTWIST deployed the platform on the customer's servers, offering a seamless connection to SharePoint while allowing for manual data entry as a backup.



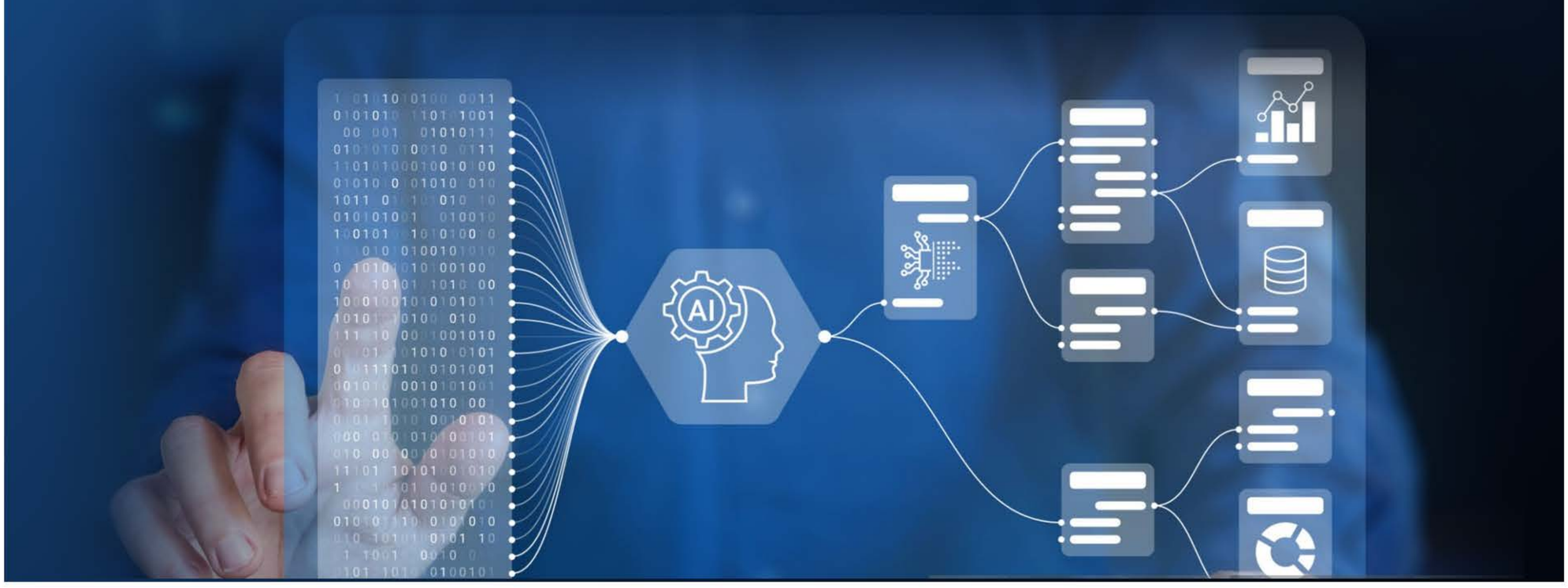


IMPLEMENTATION

The implementation of the solution was a collaborative effort involving NTWIST, the customer's IT and Technical Services teams, and the University of São Paulo's Tecnogreen group. The Tecnogreen team, under the supervision of Professor Giorgio De Tomi, played a critical role in data collection, process documentation, and onsite training. Their bilingual expertise helped bridge gaps in mining terminology between Portuguese and English, ensuring a smooth rollout of the solution.

NTWIST worked closely with the customer to develop and refine data-handling procedures, particularly for managing SharePoint uploads. Frequent staff changes at the mine required a scalable, easy-to-teach procedure that NTWIST reinforced through training sessions. These efforts cultivated a culture of effective data management at the mine, a crucial factor for the project's success.

The accuracy of the digital twin was validated through calibration dumps, which confirmed GPS precision within ±5 meters. This high level of accuracy enabled granular modeling of the stockpiles. Additionally, feed predictions from NTWIST's platform were compared with plant measurements, ensuring the solution's reliability.



KEY INSIGHTS AND RESULTS

The implementation of NTWIST's Integrated Mining Platform delivered substantial improvements to the customer's operations. By identifying the root causes of plant variability, the platform helped address inconsistencies that arose when trucks carrying ore of varying grades dumped material in the same locations. The granular stockpile model offered visibility into these inefficiencies, enabling the customer to optimize their processes and reduce grade inconsistencies.

One of the most significant impacts was the reduction in ore misplacement events. The platform's dashboards revealed instances where ore was sent to waste piles and waste was dumped on the ROM pad. This actionable insight allowed the customer to take corrective measures, improve training, and prevent such occurrences in the future. Over time, these tools enabled the operation to shift from reactive problem-solving to proactive process management.

The implementation also brought broader organizational benefits. By reinforcing data-handling procedures through training and fostering a culture of effective data management, NTWIST helped the customer maintain operational continuity despite frequent staff changes. The software not only resolved immediate challenges but also evolved with the operation, supporting new objectives and ensuring its continued relevance post-implementation.

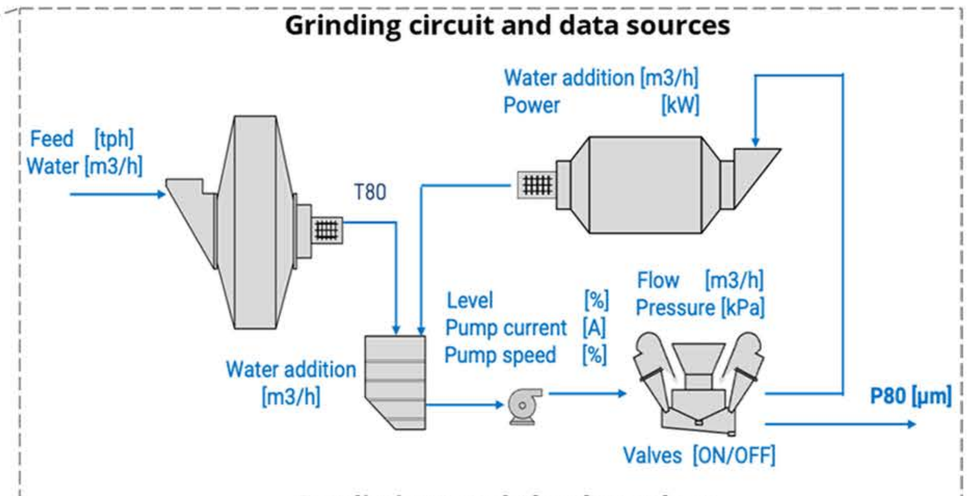
The collaborative nature of the project, particularly the involvement of the Tecnogreen group, underscored the importance of cultural and language considerations in successful solution deployment. Their bilingual expertise bridged gaps in terminology and helped build trust among the customer's teams, enabling smooth adoption of the solution.

NTWIST's Integrated Mining Platform successfully addressed the customer's operational challenges, transforming a hectic and inefficient ramp-up phase into a streamlined and well-organized process. The solution prevented annual ore misplacement losses valued at $0.5 million, reduced grade variability, and improved plant throughput and recovery. By combining technical innovation with cultural awareness and robust training programs, NTWIST delivered a long-lasting impact on the customer's operations.

This case highlights NTWIST's ability to deliver tailored solutions for complex mining challenges while fostering strong, collaborative relationships with customers. The success of this project reinforces NTWIST's commitment to empowering mining operations with data-driven decision-making tools and scalable, long-term solutions.

Our solution	
Situation:	Nickel concentrator experienced inconsistent grind size. The particle size instrument is offline.
Challenge:	Recovery suffers below 90 and above 110 µm (happens 51% of the time).
Opportunity:	Infer grind size (P80)
Value:	$860k/y addition revenue from Ni loss prevention
CO_2 reduction:	230 tpy
Facilities' specifications	
Customer:	One of top nickel producers
Ore throughput:	7000 tpd
Head grade:	2.2% Ni, 1.0% Cu
Value of Ni & Cu:	2/3 of LME = 12k US$/t Ni and 6.2 US$/t Cu
Preventable recovery loss:	20% of total opportunity

Grinding circuit and data sources



Predictions and Shapley values