

MRA's Smart Stockyard Management System improves mine to port efficiency

Smart stockyard management for materials handling applications

Challenge

To improve the safety and efficiency of stockyard and stockpile management for mined materials.

Solutions

High-Level Control

- Allen-Bradley® ControlLogix® controllers provide the control capabilities for MRA's Smart Stockyard Management System.
- Allen-Bradley GuardLogix® controllers deliver integrated control and safety for MRA's anti-collision systems

Results

Improved safety and efficiency

- Operators can see stockpiles and machine activity through a real-time visualisation that removes the need for site inspection.
- MRA's machine to machine and stockpile anti-collision system integrates seamlessly with the Stockyard Management System to enhance safety.
- MRA's Smart Stockyard Management System with machine-level laser optimisation had increased the average reclaim rate by 11.3% for automated bucketwheel reclaimers that had been optimised in the PLC.



Port Waratah Coal Services, one of four major coal export terminals that use MRA's Stockyard Management System based on Rockwell Automation technology.

Background

As mining product stockpiles across the world continue to rise steadily, companies are faced with the challenge of balancing the benefits provided by maintaining stockpiles – such as guarding against supply fluctuations while also managing costs associated with stockyard management.

The stockyard is a critical component in the bulk materials handling supply chain at both the mine site and port. The port-based stockyard can represent a billion-dollar investment in real estate, large-scale machinery and automation.

Given such a significant investment in infrastructure, the more efficiently materials can be processed through the stockyard, the faster the payback and higher the operating profits. Smart automation can help organisations optimise material flow into the stockyard and onto the train or vessel.

MRA is an engineering firm based in Newcastle, New South Wales, that specialises in mine and port machine automation. MRA has developed the Smart Stockyard Management System that combines smart engineering and leverages the latest control and automation technologies from Rockwell Automation. The system can optimally manage and automate the inbound receipt and outbound delivery of mined material including, coal, iron ore and bauxite.

**Rockwell
Automation**

Advanced stockyard management

The Smart Stockyard Management System is deployed in four major east coast coal-handling facilities which together manage over 250 million tonnes per annum and includes, Port Waratah Coal Services, the largest coal exporter in the world. All four terminals use Allen-Bradley® ControlLogix® PLC to drive machine-level automation and real time monitoring. The system uses real-time machine metrics, combined with laser enhanced stockpile modelling and smart analytics to send optimised instructions through to the PLC.

MRA's system enables the stockyard, stockpiles and machines to be viewed in a highly accurate real time 3D visualisation. Material, quality and age can be tracked in 0.064 cubic metre blocks throughout the stockyard. Core components of the System include: short term machine planning and anti-collision, stockpile modelling, real-time monitoring and visualisation, quality tracking and machine optimisation.

A 48-Hour Play Forward feature enables multiple stockyard scenarios to be run to best meet targeted outcomes, which are in turn, translated into machine-level instructions. A 30-Day Playback enables operations to review performance and incident investigation.

Significant gains from laser optimised reclaimers

To increase the accuracy of the stockpile model, MRA has introduced machine-level laser optimisation which will adjust for irregular stockpile profiles and post stacking slumps that can occur due to weather and the reclaiming process. The refined model has resulted in a significant

improvement in performance with optimised turnarounds being able to increase a reclaimers time-in-material.

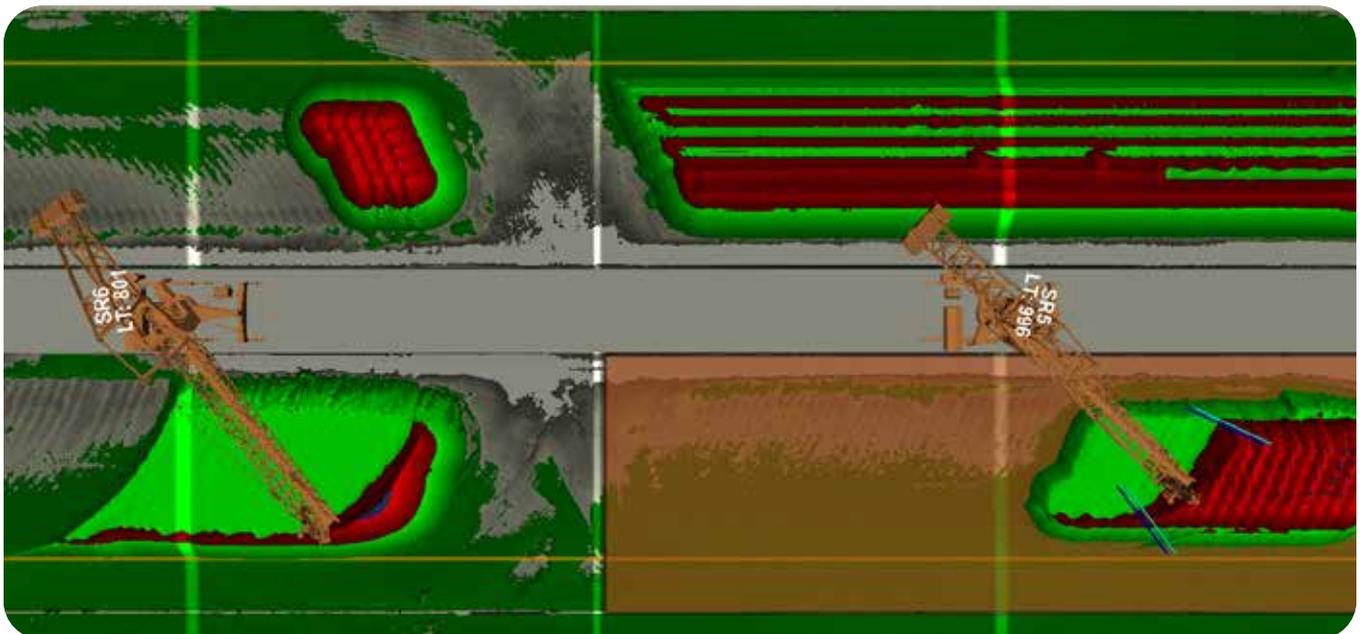
“Our Smart Stockyard Management System represents a major advancement in the automation and management of a stockyard, its stockpiles and machines. Laser optimisation of reclaimers has helped boost throughput by more than 10% over machines that are only optimised in the PLC. It comes down to more accurate decision making leveraging the existing infrastructure.” explained Peter McPherson, MRA's head of Engineering.

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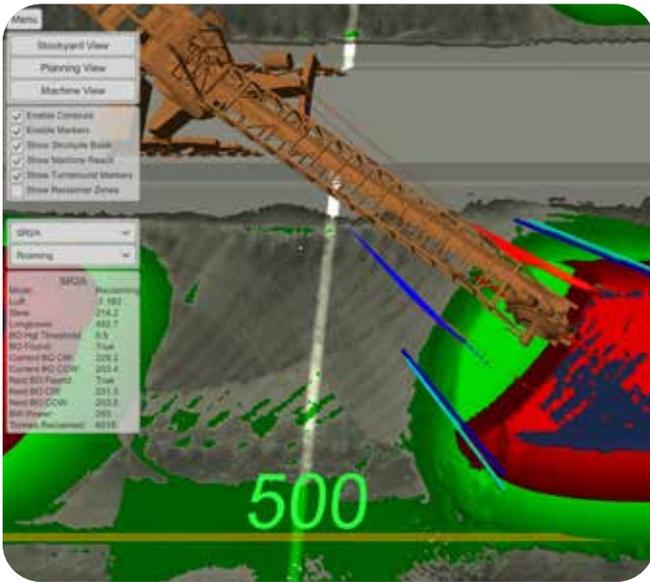
“We are confident in the increase in throughput that can be achieved with laser optimisation, particularly for bucketwheel reclaimers. Our Reclaim Performance Check allows us to project these gains by analysing machine data and help build a business case.” says Andrew Wilshire, commercial director.

Enhanced quality management

Another significant advancement for the stockyard is in quality management, where mine and port systems can



Highly accurate 3D visualisation with the colours showing bench heights and a mix of stacking methods including windrow and cone slew.



Machine metrics and laser data points are used to calculate turnaround slew position for the current and next slew swings.

Improved safety and productivity

Safety and productivity are of paramount importance for stacking and reclaiming coal. Being large machines, it is critical to avoid collisions between the stackers/reclaimers and other moving equipment or fixed obstacles at the terminal. Allen-Bradley® GuardLogix® PLC is used for machine anti-collision systems in these coal-facilities.

“Operators can now see the stockyard, stockpile and each machine from the Operations Room through a real time visualisation and monitoring system that removes the requirements for physical site inspection. Where the anti-collision system provides the functional safety,” said McPherson.

MRA won the 2019 Australian Bulk Handling Award for Innovative Technology for a 11.3% gain in throughput performance achieved through laser optimisation.

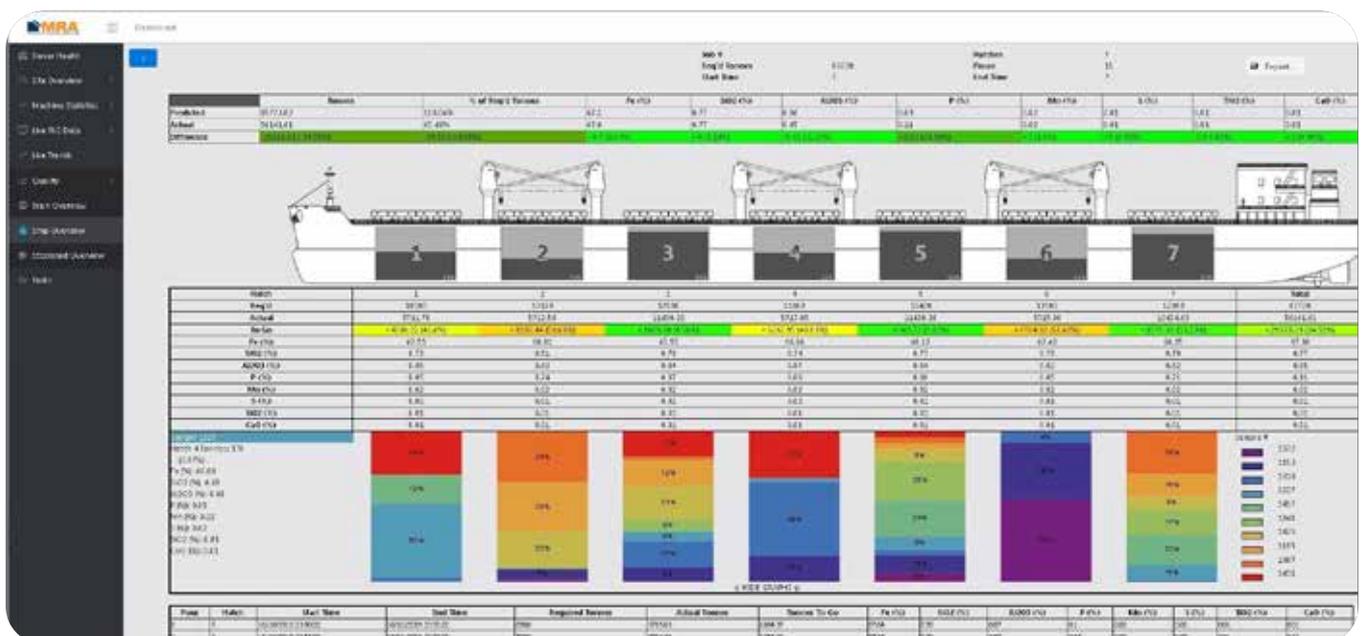
“We are delighted to have collaborated with MRA and this high value application – the Smart Stockyard Management System is a key piece in bringing the “Connected Mine” to life for our mining customers,” said Geoff Irvine, enterprise account manager, Rockwell Automation.

“MRA continue to develop their Smart Stockyard Management System and bring a high level of domain expertise for mining customers. Rockwell Automation is delighted to have been a part of the development of this system which optimises the supply chain, and enhances safety for shipping terminals,” he concluded.

be linked to provide seamless quality reporting from source all the way to supplier.

MRA’s system can track quality properties including age, from the mine site, onto the rail wagon, to the port, through the dump station into the stockyard and onto the vessel on a per pour and hatch basis. All this is enabled through the Rockwell Automation PLC.

“Our ability to track the quality of the material onto the vessel is becoming increasingly critical in competitive markets”, says McPherson.



The quality properties of iron ore being shown for each vessel hatch.

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