



Axo33 Smart Automation Products

Axo33 STOCKYARDS™ | Axo33 SHIPS™ | Axo33 TRAINS™

Smart Automation Products

MRA Automation History

An Australian pioneer in bulk materials handling and mobile machine automation for over 25 years, MRA Automation has helped the world's largest miners and material handling specialists automate and optimise their mine-to-port bulk material flow.

The Smart Products Suite has been developed over 10-years and several generations of cutting-edge technology, to bring significant value gains to our customers:

- Increasing throughput efficiency
- Protecting valuable machinery and infrastructure
- Reducing injury risk to personnel

The performance metrics speak for themselves:

- Stockyard Management – processed 1.65 billion tonnes of bulk materials
- Ship Loader Collision Avoidance – incident-free loading of 2,075 vessels
- Train Load-Out and Dump Stations – automated the loading and unloading of 11.5 million rail wagons

Axo33 was founded by MRA Automation to bring the Smart Automation Product Suite to the world.

Axo33: Automation – eXpertise – Optimisation

Our customers:



Global system integrators:



Axo33 STOCKYARDS™

Axo33 STOCKYARDS™ is the most advanced stockyard management system in the world.

It's a mature, modular technology, and available in a suite of customisable options. Our stockyard management solution is installed at 9 sites and fully automates 4 export terminals including, Port Waratah Coal Services, the world's largest coal export terminal, processing 145 MTPA.

Axo33 STOCKYARDS™ can be delivered in stages, each providing demonstrable value to site operations.

Tier 1 – Insight.

Our stockpile modelling shows the volume and position of material within the stockyard, including machine-to-stockpile separation distances. The stacking and reclaiming of material and machine activity can be tracked in our 30-Day Playback.

Tier 2 – Automation.

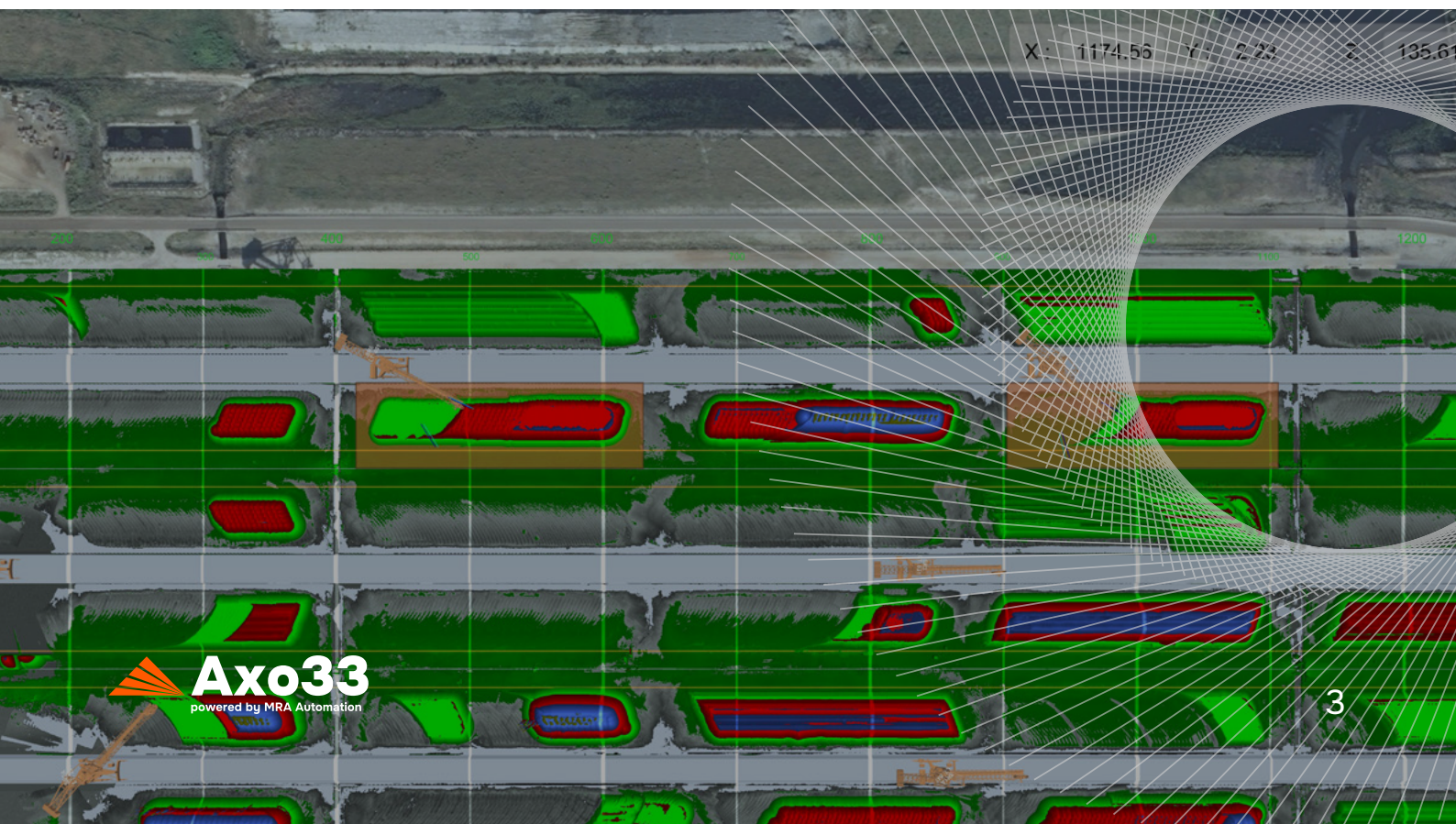
A stockyard and all its machines can be taken from manual to full automation, with optimised stacking and reclaiming delivering throughput gains in excess of +25%. A more even material flow can help reduce wear on machines and infrastructure. A job and task management system can enable a single operator to manage the largest export terminal.

Tier 3 – Lookahead.

A space planning tool can optimise your stockyard capacity and machine utilisation by forecasting future operating scenarios for up to two weeks into the future.

Quality Management System.

Allows you to integrate a site's lab sample data into your stockpile model. Instead of dealing with stockpile averages, you can micro-model quality within stockpiles in 0.1 cubic metre “Lego” blocks. This allows operations to track the quality and position of material, help blend it into the stockyard when stacking and to know in advance, the quality outcome when reclaiming.



Axo33 STOCKYARDS™

Key Points of Difference

Our PLC control centric design philosophy.

All machine activity is best controlled by the PLC and accessible to site operations. No black box solutions.

It's a "smart sensor"

The PLC control system is extended with scanning technology giving the system "eyes" and the positional accuracy for optimised automation activity. A PC is used to off-board complex data processing and analytics.

A multi-layered approach to stockpile modelling

More cost effective and higher accuracy with:

- An underlying volumetric model takes TPH and machine position data to build a stockpile model, drone verified to a positional accuracy of 98.3%.

- Scanning technology can be installed on the reclaimer targeting to enhance stockpile model. This increases stockpile positional accuracy to 99.9%.

Agnostic to Scanning Technology

MRA has deployed vision systems, radar, 2D LiDAR and 3D LiDAR. Given the quantum leap in quality, range and value in scanning technology, the optimal system is recommended for each application. Accuracy levels down to 10mm makes 3D LiDAR compelling option.

Proprietary Environmental Filtering

The accuracy of 3D LiDAR combined with our filtering, delivers high performance in the most challenging of dusty environments, solar glare, rain, sleet, snow, fog and steam. Radar can be used in the most extreme environments.



Axo33 SHIPS™

Ship Loader Collision Avoidance System

Protecting the safety of the operator and port personnel is a key driver for collision avoidance systems, along with preventing damage to valuable assets and ensuring the continuity of operations.

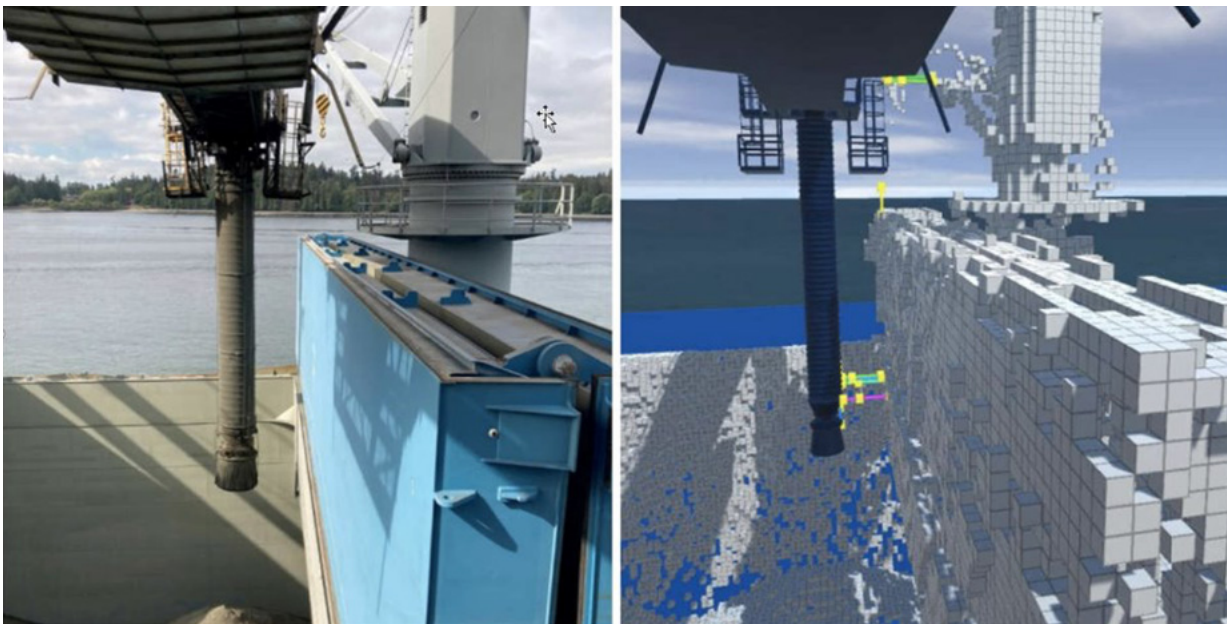
Axo33's ship loader Collision Avoidance System (CAS) supports the operator by protecting the boom and the spout from collisions.

A typical installation would have seven 3D LiDAR scanners creating a highly accurate digital twin of the ship loader relative to the vessel. Horizontal hatches, butterfly hatches and deck gear are all dynamically and accurately modelled. Combined with our environmental filtering, the CAS creates a protection zone that will automatically trigger a system slow down or stop to prevent collisions.

First deployed in Australia in 2016, the CAS is widely regarded as a world leader, using the latest in 3D LiDAR to cost effective protection. The CAS has several installations in progress in North America.

Measure of Success

A true measure of the CAS's effectiveness lies in its 99% uptime with the operator switching to manual control less than 1% of the time.



CCTV footage and the digital twin showing separation can be seen in the Pembina Wharves.

Advanced Collision Avoidance

Our advanced CAS protects the ship loader from objects on the wharf and includes a suite of utilities tracking the vessel including drift, deck height and load balance during loading.

Semi and Full Automation

Semi-automated loading can automate hatch fill sequence up to 80% capacity. Full automation includes hatch change sequences that can fill up to the hatch combing.

Axo33 TRAINS™

The Train Wagon Automation Suite includes a set of modules to fully automate train load-outs and dump stations based on volumetric loading. This LiDAR-based technology can replace manually controlled facilities and ageing PE cell-based systems that suffer from environmental sensitivity, high failure rates and costly maintenance.

The benefits of automated loading and unloading aside from operational cost savings, include the increased safety of personnel, the elimination of costly human errors, and optimised loading. Underloading can typically reduce throughput capacity by 10%; overloading can cause network penalties; and, the failure to detect carry-back in empty wagons can cause overflows and derailment.

Core components of the Train Wagon Automation Suite include:

- **Speed Reader** to calculate highly accurate measure of speed.
- **Position Sensor** to automates wagon edge detection and set points for trigger control in load-in and chute control.
- **Profile Monitor** automates the detection of hang up in the empty train wagon, the profile of loaded wagons for over or under loading and the potential for derailment.
- **Train Speed Indicator** communicates train speed information to the train operator via TSI.
- **Train Wagon Door Detector** automates detection of wagon door status preventing costly material loading mistakes at a train load in afeatures.



Axo33 Case studies

Stockyards:

Port Kembla Coal Terminal, NSW, Australia. 18 MTPA, metallurgical and thermal coal. From 2016, implemented stockyard management in stages taking four manual machines to full automation. Commencing with stockyard modelling and 3D visualisation, a job and task management system enabled a single operator to manage the facility. Laser-optimised reclaimer turnarounds were introduced to increase throughput and reduce machine stress.

- Planning fully controls of site operations.
- Saved 4 hours per day with optimised stacker and reclaimer start positions.
- Increased gross loading rate by 35%.
- Space constraints minimised by enabling two machines to operate simultaneously on the same stockpile.

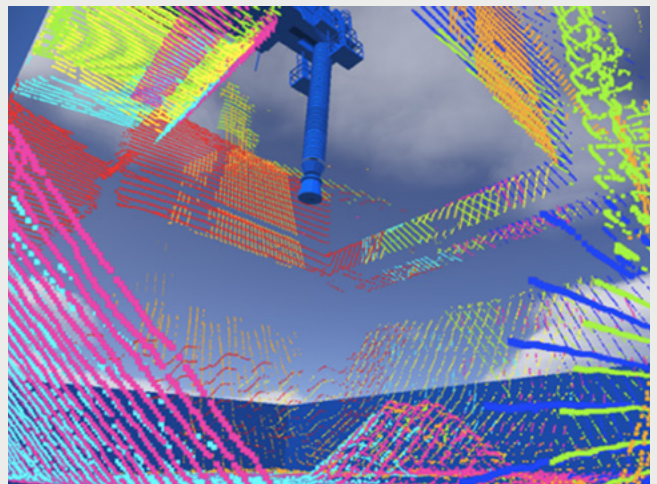


One operator at PKCT can control inbound and outbound material flow.

Ships:

Vancouver Wharves, Vancouver, Canada.
Copper ship loader anti-collision system

Prior to the Collision Avoidance System, wharf-based personnel were actively supporting the operator to help prevent ship loader to vessel collisions. The CAS has reduced the number of personnel exposed to wharf-based dangers and protects the ship loader from accidents. Operators by-pass the automated CAS less than 1% of time.



Ships: Vancouver Wharves, Vancouver, Canada. Copper ship loader anti collision system.

Trains:

German Creek, Qld, Australia. AngloAmerican metallurgical coal automated train loadout. An ageing PE-cell based loading system was replaced by a fully automated train load-out. There were several benefits:

- Operators were redeployed to other tasks.
- Average loading capacity of each train was increased by 700 tonnes to 10,000 around tonnes.
- Variable sized rail engines could be dynamically detected
- Overloading fines from the rail network were eliminated.
- A volumetric detection of carryback in the empty wagons was factored into the loading model and reducing track spillage.



German Creek Train Load Out

Keen to find out more?

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