

Delivering plantwide control for Arrium's Iron Knob mine

Designing, installing and commissioning modular crushing and screening equipment to process and stockpile hematite iron ore with minimal downtime

Challenges

- To design, install and commission modular crushing and screening equipment to process and stockpile hematite iron ore with minimal downtime.

Solutions

Plantwide control and safety

- Allen-Bradley® ControlLogix® and GuardLogix® provided integrated control and safety for the entire plant
- 75 Allen-Bradley PowerFlex® drives were used for the feeders, conveyors and crushers
- FactoryTalk® View SE provided plantwide monitoring

Network architecture

- The DLR network topology with Stratix™ managed switches delivered a reliable network architecture

Results

Mobile and modular equipment

- Using mobile equipment reduced plant costs by 50%

Reduced downtime

- The plant processes approximately 5 million tonnes of ore per annum
- The high availability of the control system results in minimal downtime for the plant



Iron Knob is an entire pit to port operation, including mines, crushing and beneficiation facilities, rail, trucking and port facilities.

Background

Arrium Mining is an exporter of hematite iron ore and also supplies iron ore feed to Arrium's integrated steelworks at Whyalla. The business currently exports approximately 9-10 million tonnes per annum of hematite ore, primarily to China.

Iron Knob is located in the Middleback ranges approximately 60 kilometres north west of Whyalla, South Australia. It is said to be the birthplace of Australian steel with commercial mining dating back to the 1890s.

The site is an entire pit to port operation, including mines, crushing and beneficiation facilities, rail, trucking and port facilities.

Arrium engaged Striker Australia to prepare infrastructure to access the ore reserves in the Iron Knob mine. Striker provides quality, reliable and tough crushing, screening and materials handling equipment to the mining and related industries.

The task at hand was to design, supply, assemble, install and commission modular crushing and screening equipment to process hematite iron ore sourced from the Iron Knob Mining Area for rail transport to Arrium's port facilities with minimum ground works and in a short on-site construction timeframe.

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To achieve this, Striker Australia contracted SAGE Automation, a Solution Partner of Rockwell Automation and leading provider of industrial automation and control systems. The company is committed to deliver the highest technical solution and customer service, leading with Rockwell Automation technologies and this project was no exemption.

SAGE Automation was contracted to supply the control system and visualisation together with the complete electrical design, construction and installation works for the new crushing and screening plant.

Keeping it mobile and modular

The Iron Knob crushing and screening plant was designed to have a 10 year life expectancy, making the use of mobile crushing and screening equipment as a more cost-effective solution compared to a fixed infrastructure solution.

“The plant was originally estimated to cost approximately \$40 million, but by using mobile equipment, this cost was able to be reduced by half,” said Christopher Poetsch, Senior Electrical Engineer at SAGE Automation.

Poetsch knew that the control and visualisation solution from Rockwell Automation would provide the required flexibility and reliability for this application. As a result of the maintainability and easy integration of the solution into the systems at the site, Rockwell Automation is the

control and visualisation vendor of choice for Arrium Mining.

According to Greg Schultz, executive account manager at Rockwell Automation, “By having the crushing in close proximity to the mine, the requirement for transport and materials handling is reduced dramatically.”

The modular design of the plant made integration easy and also delivered the flexibility required to adapt to changes. “The new plant has had a number of design revisions but because it is modular and mobile, it has been easy to adapt to changes,” explained Jonathan Delua, Principal Control Systems/Maintenance Engineer at Arrium Mining.

Designing a flexible control solution

The overarching control requirements for the entire plant including the conveyors, crushers, feeders and stackers were provided by Allen-Bradley ControlLogix. With safety being a vital consideration for the plant, Allen-Bradley GuardLogix - with local and distributed safe POINT I/O™ modules – provided integrated safety control and the ability to stop either a particular piece of equipment or a section of the plant if required.

Due to the size of plant, over 75 variable speed drives were required. The more complex of these were from the Allen-Bradley PowerFlex family, used for the synchronisation of the vibrating feeders and for the speed control of



More than 75 variable speed drives were required due to the size of the plant



The site now processes approximately five million tonnes of ore per annum

Using the Rockwell Automation platform for control and visualisation of the plant provided peace of mind and reliability.

Rockwell Automation tools for the design and deployment of the control system, which proved to save significant time and cost," said Poetsch.

Due to the delivery sequence for the crushing and screening equipment, it was necessary to start commissioning sections of the plant while others were being mechanically and electrically installed. Poetsch

the conveyors to optimise flow rates to the crushers. FactoryTalk View Site Edition (SE) supervisory-level HMI software is used for monitoring and controlling the plant. It provides operational insight into the complete site, including the conveyors, crushers and feeders.

"Using the Rockwell Automation platform for control and visualisation of the plant provided peace of mind, reliability and improved maintenance response times. The plant operators are familiar with, and have confidence in, the ControlLogix and FactoryTalk platform. Because it is used on other Arrium sites, maintenance requirements are also reduced," explained Poetsch.

One of the most significant challenges the project team faced was the extremely tight timeframe. "To deliver the project within these timeframes, we leveraged previous project experience, industry knowledge, SAGE Automation team agility, and the use of the



Mobile crushing and screening equipment provided a more cost-effective solution

explained that “the use of POINT I/O for the system allowed for flexibility in design and scope changes, right through to the commissioning and handover phase, which helped to deliver the project within time and budget.”

Reducing downtime

Being an Arrium project, the automation control system had to adhere to the strict design, implementation and testing standards that have been developed over recent years.

“Integration between plant equipment was made easy with the Integrated Architecture platform from Rockwell Automation which we stipulate as a standard for Arrium sites. This allows us to benefit from common spares and resources, minimises training requirements and helps the plant capitalise on the core infrastructure,” said Deluao.

The high availability of the ControlLogix control system and associated components gives Arrium the assurance of a high mean time between failure (MTBF) and mean time between repair (MTBR) and low mean time to repair (MTTR), which ultimately equates to minimal downtime, planned or unplanned.

Integrated Device Level Ring (DLR) connectivity was used to optimise the network architecture, increase its fault tolerance and provide consolidated network diagnostics.

The Allen-Bradley Stratix switches included integrated DLR connectivity, and although the control system did not require redundancy to the level of other Arrium plants, the DLR network topology delivered a reliable network architecture for the plant.

“The site now processes approximately five million tonnes of ore per annum and the control system has been embraced by operators and maintenance staff with minimal training. The system was designed and installed to meet Arrium’s stringent requirements, which are not only site specific but company-wide,” said Poetsch.



The modular design of the plant delivers the flexibility required to adapt to changes



Rockwell Automation and PartnerNetwork companies collaborate to help you develop an ongoing approach to plant-wide optimization, improve your machine performance and achieve your sustainability objectives.

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