

A fine result

Installation of SIMATIC PCS 7 with Profibus PA Ring Technology for Instrumentation leads to productivity increase at Rio Tinto

The Pilbara region in Western Australia has some of the world's most ancient natural landscapes, dating back two billion years and stretching over 400,000 square kilometres. Visitors worldwide are drawn to the Pilbara region, known for its deep rocky canyons, peaceful plunge pools, dazzling white beaches and untouched coral gardens. And yet, the Pilbara is also the engine room of Australia's mining industry, rich in crude oil, salt, natural gas and iron ore.

It is here in the Paraburdoo area of the Pilbara region where Siemens SIMATIC PCS 7 and Profibus are helping Rio Tinto Iron Ore achieve higher productivity and improved product quality on the Further Fines Processing Plant (FFPP).



Processing the ore

Raw iron ore is sourced from the Paraburdoo, Channar and Eastern Range mines which are located in close proximity to each other and are operated as the Greater Paraburdoo operation by Pilbara Iron, a division of Rio Tinto Iron Ore. The mines produce hematite ore in lump and fines, with Paraburdoo receiving ore from Channar and Eastern Range by conveyor for processing and transport. Fine ore is then upgraded in the Paraburdoo FFPP which processes the raw iron ore, upgrading the concentration of iron while simultaneously reducing the amount of alumina, phosphorous and silica.

Processing around 22 million tonnes of iron ore per annum, the FFPP is a central part of the operation, reducing impurities and increasing iron concentration. However, trials at the plant had identified that a range of issues were compromising the expected throughput. Rio Tinto commissioned numerous

optimisation works in order to reinstate plant throughput to original design levels while ensuring that the quality of the final product met or exceeded customer specifications for the Rio Tinto blend.

Finding a solution

For years, engineers at the Paraburdoo FFPP battled with a succession of problems, which led to production losses and system unreliability. With a booming resources sector and unprecedented customer demand, opportunities for major shutdowns to undertake any upgrade works were limited. Nevertheless, decisive action had to be taken to address these worsening issues.

Ed Tsang, Senior Electrical Engineer, Rio Tinto Iron Ore said that once the problems were identified, engineering and maintenance staff were tasked with finding a resolution as soon as possible. "There were several issues with the fines plant, but the main one was an inability to control the pressure in the slurry process, creating endless problems. Crude knife gate valves were the main devices in slurry pressure control which presented us with massive maintainability issues. This led to very poor process performance and the inability to adapt to sudden in-feed changes to ore quality."

Acting on the results of the trials, Rio Tinto engaged Perth based Calibre Projects to act as EPCM. A primary objective for Calibre was to resolve issues relating to the slurry process which required work on the process water and gland water piping, including associated valves. The goal here was to reduce the risk of failure and ensure sustained operation into the future.

As part of these works, Mr. Tsang and his team had made the decision to implement a robust control solution connected to intelligent devices to give them greater visibility of plant operations. At the end of an exhaustive evaluation process, they opted for a Siemens SIMATIC PCS 7 process automation solution with drives connected via Profibus DP and redundant Profibus PA for instrument communication. SIMATIC PCS 7 not only provided Rio Tinto with a common platform for control, instrument and electrical devices, but it possesses an intuitive engineering environment for simplified implementation and

Case study

Innovation for generations.

SIEMENS

maintenance. With a successful track record in mining projects throughout the world, its selection also provides a high degree of assurance to Mr Tsang that it is up to the stringent demands being placed upon it.

As the world's leading process fieldbus, Profibus offers extensive device diagnostics for effective operations and predictive maintenance while also offering high levels of availability - both critical requirements of Rio Tinto.

Through the use of a ring architecture, Profibus PA can provide protection against loss of communications through cable breaks as well as allowing hot swapping of devices. This is possible through the use of Active Field Distributors (AFD's) which are used for connection of instruments, ensuring the integrity of the network through providing short circuit proof spur lines and active termination.

Mr. Tsang outlined the importance of this: "With plant availability critical for us, the ring architecture of Profibus PA provided the level of robustness and assurance of data access we needed for operations and maintenance of the plant."

Connected to the Profibus PA network were Siemens SIPART PS2 electro-pneumatic positioners, offering a number of advantages over those used previously. Such advantages include reduced air consumption, easier set-up and calibration plus advanced diagnostic information which can be used for valve performance monitoring and predictive maintenance.

Completing the Totally Integrated Automation (TIA) approach, Siemens 400kw SINAMICS drives were also used. Compact in design, robust and modular, the SINAMICS drives also provide a high degree of diagnostic information through Profibus DP, with drive diagnostic information fed back to the PCS 7 system for maintenance purposes.

Approaching the engineering challenge

The design, development and implementation of the application and Profibus networks was carried out by Calibre Controls, who pride themselves on being able to support clients through implementation of leading edge technologies in a timely and efficient manner. Their goal was to ensure timely implementation and that Rio Tinto benefitted from the increased throughput which trials had predicted.

In order to do so, Calibre Controls set up a test rig in their offices to help in the engineering and factory acceptance testing as well as to ensure the proposed redundant Profibus PA architecture would meet Rio Tinto's expectations. The test rig proved invaluable, especially for team members who were new to the PCS 7 platform and Profibus.

Nick Parker, Project Engineer, Calibre Controls was extremely pleased with the system's ease of use, "The equipment was very easy to configure, even for one of our graduate engineers who hadn't previously programmed Siemens equipment."

A key component of the PCS 7 solution throughout the project was the highly flexible SIMATIC PDM (Process Device Manager) software which enabled swift implementation and calibration of process instruments. For a project with a tight nine month schedule, there was little room for manoeuvre thus heightening the importance of efficient engineering tools.

"During commissioning the use of the SIMATIC PDM software was very useful and made it easy to make changes to the instrumentation and monitor the network for issues. With regards to the set-up of the Profibus PA valve positioners, this was very easy requiring only a few basic commands to calibrate each device," Mr. Parker said.

Reaping the rewards

Completed on time and within budget, Rio Tinto have been reaping the rewards ever since. The solution has not only exceeded the original expectations of the plant operators, but according to Mr. Tsang, has far outweighed the initial goal of increasing production, improving quality and reducing water and power consumption.

"By implementing advanced control methodologies, our goals have all been exceeded with significant financial returns as well as improvements in production quality and quantity, with the added bonus of reduced maintenance."

With much of the implementation being carried out while the plant was running, it was important that they selected a platform which was flexible enough to address this requirement. SIMATIC PCS 7 not only matched this expectation, it also provided the basis for a solution which eased the integration of field and electrical devices as well as reduced engineering and commissioning times on the project.

As for the future, Mr. Tsang sees further opportunities for a TIA style solution with Profibus. "Our solution, which incorporated SIMATIC PCS 7, SINAMICS drives and SIPART valve positioners on Profibus PA, would be particularly useful for a new mine or processing plant where there are a large number of tightly controlled process loops."

With increased productivity, reduced downtime and improved product quality, the Further Fines Process Plant has been given a new lease of life. Never before have plant operations and maintenance personnel been in a position where they have access to so much operational and performance information. Furthermore, the initial design performance levels are being achieved once more, something which can only be considered to be a "a fine result" for such an important part of Rio Tinto's iron ore operations.

Sean Cahill

Siemens Industry Automation



Siemens Ltd.
www.siemens.com.au

Head Office Australia
885 Mountain Highway
Bayswater VIC 3153
ABN: 98 004 347 880

Telephone 137 222
Facsimile 1300 360 222

© 2009 Siemens Ltd.
Subject to change without prior notice.

The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.

