

Systems integration key to mine capacity expansion

Information from Iritron



Sound system integration is the key to any automation project. Assmang, which developed the Khumani open cast mine near Kathu, placed major emphasis on the systems integration process.

Driven by world-wide demands for raw materials, in this case iron ore, South African companies have increased iron ore mining activities in the Northern Cape. The new Khumani Mine has been established by Assmang to supply the demand from overseas steel mills. Assmang is jointly owned and managed by African Rainbow Minerals and Assore Limited. Most of the ore is exported to the Far East and Europe.

The Assmang Khumani open cast mine is located near Kathu, Northern Cape. The mine was initially established with a capacity of 8.4-million tons per annum of product (Phase 1). Present capacity of the mine is 10-million tons per year of product for approximately a 40-year lifespan (Phase 1A).

The Phase 2 feasibility study is currently underway to increase the capacity of the mine to 16-million tons per annum of product and is scheduled for completion in early 2011. After mining the ore in the pits, it is transported by trucks to the primary and secondary crushing plant. A 5 km overland conveyor is used to transport the crushed ore to the main run of mine stockpiles feeding the Parson beneficiation plant. On-grade ore is crushed, washed and graded to lumpy, medium and fine products. The off-grade ore is treated identically except that it is also processed through a jig beneficiation plant to improve the grade to the required specification. A rapid load-out station loads the ore onto trains at a rate of 342 x 100 ton wagons over an eight hour period. The ore is then exported via Saldanha Bay to clients all over the world.

Assmang appointed DRA Mineral Projects as the managing contractor for the Khumani mine project and the engineering, procurement, construction management contractor for the plant and infrastructure section. Iritron was appointed by DRA for their extensive knowledge of Assmang's Scada standards and their sound knowledge of the Wonderware ArchestrA System Platform 3.0. Iritron also played a major role in the systems engineering, instrumentation design and PLC control system portions of the project. The company has provided Assmang with these services for the past nine years.



The mine has standardised on Wonderware for all their SCADA, historian and plant information system requirements country-wide. In line with the mine's standardisation approach, Iritron implemented Wonderware's System Platform 3.0 based on ArchestrA technology. After experimenting with the beta versions, the Gold version was released in August 2007. The official version was released in September 2007.

The control system architecture implemented on site consists of the following:

- 14 x Scada Intouch Views
- 5 x Archestra servers
- 84 x PLCs (mostly ABB ControlLogix)
- 25 x controllers (geoscans, compressors etc.)
- 47 x MCCs and control rooms

The size of the Khumani Galaxy after the completion of phase 1 was:

- 165 templates
- 6746 object instances
- 48,358 tags on the I/O topserver

- 33,636 historised tags
- During Phase-1a this increased by about 5% and during Phase-2 will increase by about 75%.

Plant networking

Three separate high-level 1GB networks have been installed on site – an IT or corporate network, a Scada network and a PLC network. Both the PLC and Scada networks have been implemented as redundant ring (Hirschmann HiperRing technology) networks.

Each plant area was assigned to a dedicated PLC. Software Toolbox's Topserver is used for communications between Archestra and all PLCs using the EthernetIP protocol.

Local low-level DeviceNet and ControlNet networks were implemented to interface to all intelligent E3+ motor overloads in the MCCs, all VSDs and to all the belt-scales.

A limited number of controllers required RS485 interfaces. This was resolved by utilising Anybus

converters to develop third party interfaces between RS485 and ControlNet.

PLC coding

The project standardised on Allen-Bradley ControlLogix PLC, firmware revision 16. To ease and expedite coding, all recurring functions such as motor blocks, etc. were coded into add-on instructions. User-defined data structure were also standardised. This ensured that all PLC coding remained completely standard between the PLCs in the different areas. The following Allen-Bradley equipment was used:

- PowerFlex VSD drives on ControlNet
- Power Monitor 3000 on ControlNet
- DSA modules for the HT switchgear on DeviceNet interfacing to the ControlNet via CN2DN modules
- E3+ intelligent overloads on DeviceNet interfacing to the ControlNet via CN2DN modules to the ControlNet.

Archestra

Key to the ArchestrA technology is the concept of scalability. It is easy to expand the system at minimal cost through the development of standards.

During the second phase of the project the development time, factory acceptance test and commissioning time will be greatly reduced due to the standard templates that were developed during the first phase of the project.

Lessons learnt

Some of the lessons learnt during the Wonderware Orchestra implementation, are the following:

It is of the utmost importance to do your engineering upfront before starting with the ArchestrA development. Take the time to draw up an approved naming standard, design your templates and standards properly and draw up a system checklist according to which you set up all the computers and networks.

The Galaxy repository is a critical component.

It is advisable to have an off-line system available to run tests and as a backup for the Galaxy repository.

Keep Wonderware, as the supplier of the software, in the loop.

Training is critical as the skill levels required to develop and maintain an ArchestrA system are significantly higher than for a stand-alone Intouch system.

At the end of the day Iritron has a happy client and a system which works brilliantly. The dedication of the team members resulted in their always finding solutions to the problems they encountered and thus increasing the client's confidence in their solution. Currently the team is working on the completion of Phase 1A and on the feasibility study for Phase 2 of the project.

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