

AngloGold Ashanti's Navachab gold mine installs Wonderware Application Server-based expert system

by Wonderware Southern Africa

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Andre Vuilleumier, Managing Director,
Systems Anywhere cc



Company Overview

AngloGold Ashanti Ltd. – Navachab, Namibia
AngloGold Ashanti has a single operation in Namibia, the Navachab open pit mine located near Karibib. In 2005, the mine produced 81,000 ounces of gold at a total cash cost of \$321 per ounce. While gold has enjoyed some major successes on the world markets of late, production costs keep rising and profitability can only materialize as the result of efficient operations. To help achieve this goal, Navachab needed an expert system that would continuously monitor and automatically adjust the milling process to cater for changing conditions and ensure consistent production.

With the ever-increasing need to maximize production efficiency and lower costs, AngloGold Ashanti was after a mill control system that would maintain a consistent level of process control while continuously maximizing performance at its Navachab gold mine in Namibia. But there was a catch - the changeover to the new system would have to occur without interrupting production in any way.

Normally, optimizing the milling process is a difficult job needing constant input based on the skill of operators to cope with the different sizes of raw material collected from the blasting areas. But maximizing output can result in overloading the mills and it can take hours to recover from such a condition. Consequently, mills tend to be run conservatively.

AngloGold Ashanti's goals for the Navachab project included:

- The installation of an expert system that would optimize the milling process in spite of raw material variances;
- Upgrading an obsolete PLC;
- The standardization of automation within AngloGold Ashanti;
- Allowing for changeover within scheduled maintenance shutdowns;
- Installation of a state-of-the-art control system.

To achieve this, AngloGold Ashanti selected system integrator Systems Anywhere cc who, in turn, chose Wonderware Application Server with redundancy facility, real-time Wonderware Historian (formerly known as IndustrialSQL Server or InSQL), ActiveFactory software analysis and reporting tool, InTouch HMI (Human Machine Interface) and a Modicon Quantum PLC. The expert system would be integrated within the ArchestrA architecture which would also serve to develop, deploy and maintain automation standards within AngloGold Ashanti.

“Our main concern,” says Andre Vuilleumier of Systems Anywhere “was how to replace an entire control system, including hardware, without causing downtime. It was made very clear that no additional downtime would be scheduled and that system changeover would have to occur during one of the regular maintenance shutdown which was planned for one day every three weeks.”

During the first phase of the changeover, the new PLC was connected in parallel to the existing PLC during one of the maintenance shutdowns. This ensured that one could switch back to the proven

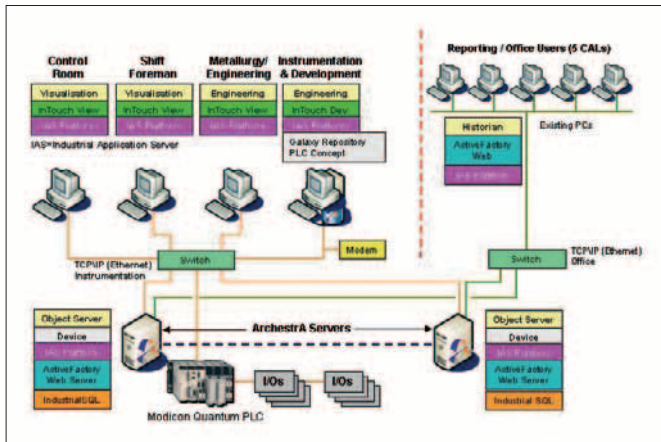


Figure 1: Navachab system topology

system in case of problems. “During another maintenance shutdown, the integrity of the I/O structure was checked and found to be almost completely error-free thanks to the excellent maintenance the system had received during the past 16 years,” says Vuilleumier.

The next tasks included defining the Wonderware Application Server interface to the PLC and the configuration of the object template with the previous standard. Vuilleumier says “We used the latest version of Wonderware Application Server (IAS v2.1) and immediately took advantage of its new features, especially the user-definable objects with their powerful field attributes. We built templates that can be used in the future and that use all the features of the Archestra platform.”

For the HMI, Systems Anywhere used InTouch HMI version 9.5 and its Smart Symbol feature for all animations together with indirect tagging. Although the graphical appearance for all objects could be changed at will, their scripting was retained since this was now the standard. “The ability to simply change the parent template and have the system automatically deploy the changed objects to all their instances throughout the plant was a huge benefit for us,” adds Vuilleumier. Pop-ups on the InTouch HMI screens include plant item status displays as well as real-time trends, which are used for fine-tuning purposes.

Pop-ups also include photos of the indicated plant items so that they can be readily recognized by plant personnel (see AngloGold Fig.2)

Insofar as alarm management was concerned, this is already fully configured within Wonderware Application Server. “We used the automatic alarm messaging scripting feature as well as the alarm Pareto display,” says Vuilleumier. “This all proved to be a very simple exercise since one doesn’t have to be concerned about the alarming structure because Wonderware Application Server handles all of that automatically.”

Next came the design of the expert system, which is intended to take over or assist in the changing the set points and to make the mill operate at peak performance.

In order to do this, three elements are involved:

- Filtering of the process variables individually through a moving average (rather than instantaneous sampling) and checking them against their parameters. In other words, what is the moving average value of tonnage handled compared to the current set point;
- Comparing the result of each variable against the rules that are stored in the database. The result is analyzed to determine whether the set point needs to be increased or decreased;
- Applying the results to a time interval which determines how quickly the system needs to react to the rule to ensure that production is kept consistent.

“The ‘Expert Operator’ is programmed to check the average of the variables and to adjust the set point at predetermined intervals in order to maintain peak performance, in spite of an ever changing environment,” explains Vuilleumier. “The operation of the expert system is based on the experience of operators and that of metallurgists. Operators have, in the past, learned the best way to correct errors and we try to teach the expert system the same rules. We have made the Interaction with the expert system as simple as possible so that supervisors can easily change its rules according to inputs from the operators. As to how often set point are changed, the milling process is a slow one and also slow to react to changes. It can take half an hour for the effects of a change to be noticed. So, bringing the mill to optimal operating capacity is a slow process which needs to be based on the best possible real-time information and decisions.”

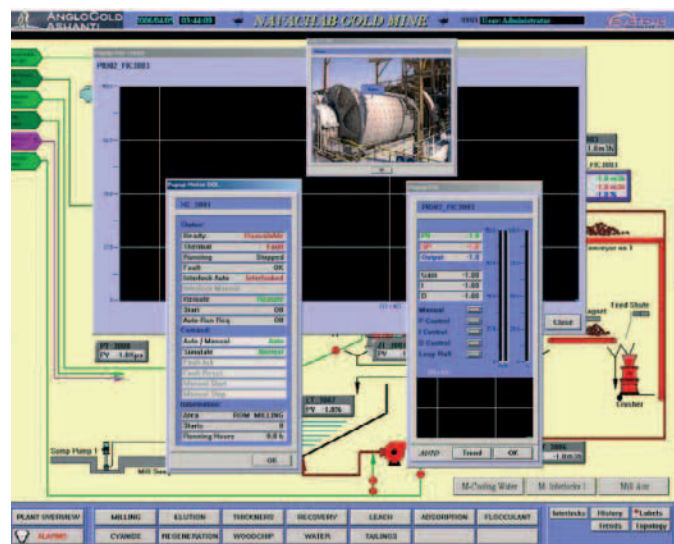


Figure 2: InTouch HMI screen showing Smart Symbol pop-ups showing the status of objects as well as their real-time trends for tuning purposes

Goals achieved

The changeover was achieved on a live plant and no additional downtime was required as it was all done within regular maintenance shutdowns as per the original instructions.

Mining

ActiveFactory software, InTouch HMI, Wonderware System Platform

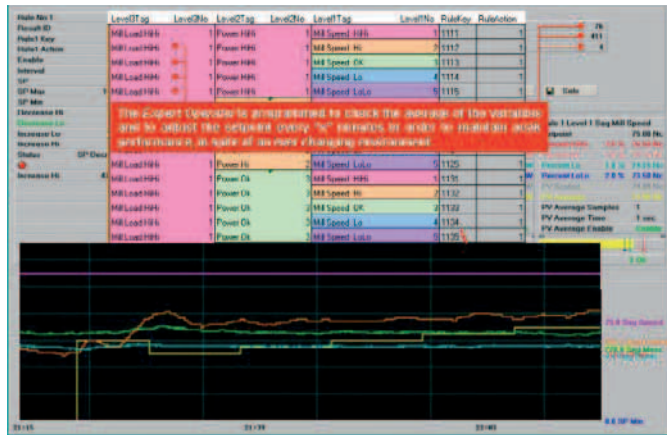


Figure 3: 'Expert Operator' graphical user interface

Considering the complexities of the project, the implementation time was rapid thanks to a good system specification, the adherence to S95/88 guidelines and the use of domain knowledge and technology to define models, structures and concepts before starting any implementation. "For us and the Navachab team, we can report good success," says Vuilleumier. "I had one of the best compliments ever given to me for the project management and a highlight for me was that, after leaving the site, we had no comebacks."

Benefits

"The ArchestrA platform allowed us to reduce engineering time considerably," says Vuilleumier. "We also have full traceability of the software model (structure) so that the site instrumentation engineer has a good overview of the structure of the plant. This will serve as a roadmap for future projects and it is a state-of-the-art control system with an excellent support and training infrastructure through Wonderware Southern Africa team."

In conclusion

"The highlights of the project can probably best be summarized in examining the contributions of the various technologies we used," says Vuilleumier:

Wonderware Application Server & ArchestrA architecture

- This is a new platform designed to facilitate future developments;

- Security – incorporates Windows, InTouch and ArchestrA security all in one which means that security is defined only once and you're done with it;
- ArchestrA plant modeling – jump-starts the project and provides a roadmap for implementation;
- Smart Tags – the ability to copy information to all relevant motors shortens engineering time drastically as it only has to be done once;
- Wonderware Application Server v2.1 – new user defined objects and User Defined Attributes;
- Access to all I/O tags through scripting;
- Powerful field attributes – moving average, alarming etc.;
- Alarming – no room for error, no engineering required.

InTouch HMI

- Smart Symbols – really and fully enabled with ArchestrA technology;
- The latest version of InTouch HMI makes it easy and quick to build new applications while maintaining standards;
- Indirect Tagging means reference to a single data source (facilitated via ArchestrA technology).

Wonderware Historian

- The ability to configure this real-time historian through Wonderware Application Server saves a great deal of time.

ActiveFactory software

- Like the Wonderware Historian, the ability to configure this through ArchestrA technology saves a lot of time;
- The newly-enabled tag hierarchy feature is truly useful.

Expert System

- Increases productivity and facilitates an automation-based result as opposed to a result based on human interface.

This document was realized thanks to the support of: Systems Anywhere cc., ArchestrA-certified system integrator