

# Global Energy Management System Implementation: Case Study

## Australia, Energy Efficiency Opportunities Program

### AngloGold Ashanti Australia

*Optimising existing data and control systems to  
improve energy management*

### Energy Efficiency Opportunities



AngloGold Ashanti Australia is a gold exploration, mining and marketing company headquartered in Johannesburg, South Africa. In Australia AngloGold Ashanti own the Sunrise Dam gold mine near Laverton, Western Australia, which has been in operation since 1995. The mine consumed 2.69 PJ of energy in the 2011-12 financial year.

**Industry:** Mining, minerals processing

**Key driver for optimisation:** Productivity

**Improvement Focus:** Process control

**Location:** Laverton, Western Australia

**Product(s):** Gold

**Cost to implement:** NA

**Annual Savings:** NA

**Payback Period:** NA

**Employees:** 500

**Energy sources:** natural gas and diesel

**Energy reduction goal:** The company's goal was to improve productivity by reducing downtime in the milling and crushing plant.

### Business Benefits Achieved

AngloGold Ashanti Australia achieved significant productivity improvements at their Australian gold mine by optimising the control of the crushing and milling circuit. This was achieved by modifying the software logic and control algorithms of their Programmable Logic Controllers (PLCs), without the need for new hardware.

Process operators now proactively use the control system to keep the plant working within defined operational parameters. The benefits achieved to date include:

- fewer maintenance events (less downtime)
- increased throughput
- improved energy efficiency
- reduced unit costs.

### About Energy Efficiency Opportunities (EEO)

The Australian Federal Government's Energy Efficiency Opportunities (EEO) Program requires corporations that consume more than 0.5 PJ annually to assess their energy use to identify opportunities to improve energy efficiency and report publicly on assessment outcomes and the business response. Assessments are undertaken in line with a legislated framework and decisions regarding the implementation of identified energy efficiency opportunities remain at the discretion of the participating corporation.

## Business case for systems optimisation

Improved energy management through systems optimisation was initially considered by AngloGold Ashanti as a way of improving productivity. This would be achieved by reducing downtime in the milling and crushing plant.

The project received additional impetus from a number of energy efficiency initiatives. The process engineering team at Sunrise Dam conducted an energy management study in 2007, in part to meet the requirements of the Energy Efficiency Opportunities (EEO) program. One of the findings from this study was that a significant amount of data had been collected by the existing systems at the plant, but it had never been analysed to identify opportunities for improvement. The Supervisory Control and Data Acquisition (SCADA) system was already in place but it was underutilised.

## Implementation of systems optimisation

### Taking stock of existing data and control systems

Before looking at any equipment upgrades, the engineers first investigated how they could unlock the potential of the operating equipment that was already installed.

The existing control systems and operating methodologies were designed to avoid out of control or unstable events, and were working reasonably well in this regard. However, the plant was avoiding these unstable events by running well below the capability of the equipment. Maximising the throughput of the plant would reduce the energy consumption cost per tonne.

The project team investigated options to minimise the amount of idling time in crushing and milling equipment, and the time that equipment spent operating outside their ideal speed or throughput range. They also investigated instances when the circuit became unstable, to gain a better understanding of the constraints and limitations of the plant.

Before making any changes to the control system, the project team developed a full understanding of the ideal operating range for each part of the circuit. They looked for other events that caused faults and downtime, and fixed these first.

### Modifying existing systems

All systems optimisation upgrades were implemented through changes to the logic and control algorithms of the PLCs.

Prior to implementation the initiative was given a high profile and actively promoted by the processing manager at Sunrise Dam. The process manager for each area of the plant was responsible for identifying opportunities, developing the business case, implementing opportunities and measuring the results with the SCADA system. Optimisation projects were scoped and budgeted, and then ranked based on payback period and

### What is systems optimisation?

*Industrial processes are subject to numerous variables, which have traditionally required skilled and experienced operators to maintain optimal operating conditions.*

*Modern systems optimisation technology allows for this experience and judgment to be understood, modelled and automated. It sits above existing process control systems (Figure 1).*

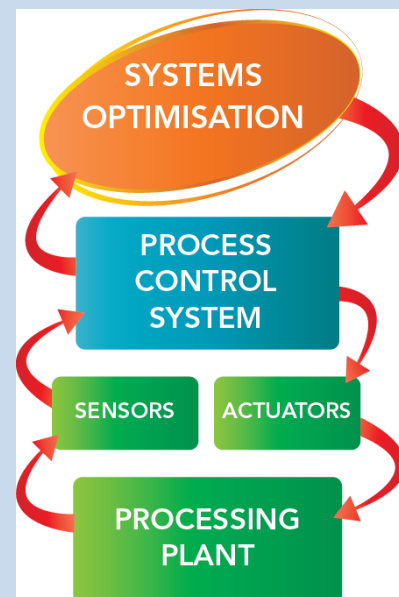


Figure 1: Systems optimisation sits above the existing process control system

production improvement. Once approved, external contractors were engaged to implement the programming changes.

### Training operators

As new control system upgrades were implemented, it was important to minimise manual intervention by the plant operators. Systems were put in place to monitor how often control loops were in automatic mode and to log times when the plant was switched to manual control.

A training program for plant operators was introduced to support the changes. Operators were still able to take manual control of the system at any time, and were instructed to do so if they felt the need to switch off the automatic control system.

### Results

The business benefits include fewer maintenance events (less downtime), increased throughput, improved energy efficiency and reduced unit costs.

### Reduced maintenance and downtime

Increased stability in the processing circuit has resulted in less damage and therefore fewer unplanned maintenance events. This in turn has improved throughput and energy efficiency. Under the new system it is clear when efficiency is starting to move away from the optimum band or power range. The operators can investigate and either make adjustments or schedule machine maintenance.

### Improved crusher operation

The crusher is now controlled within a power band, as defined by the ore being fed to the ROM (run of mine) pad. This mode of operation has reduced energy consumption through the crushing circuit by reducing the amount of recirculating load in the circuit. In the past, recirculating load has meant that energy is wasted ‘crushing out’, where the circuit is run with no fresh feed being added. The estimated energy saving for this project is approximately 50 GJ/year.

### Mill optimisation

The efficiency of the milling circuit has also been increased through improved process control. Grind surveys are being regularly undertaken to ensure the mill is operating effectively. The overall aim is to reduce incidences when a ‘grind out’ is required. This occurs when the mill is overloaded and must be operated with no fresh feed being added, to remove some of the load from inside the mill.

*The processing circuit at Sunrise Dam is controlled by a PLC. A SCADA system provides the human-machine interface, with a mimic of the plant and display of key performance measurements (Figure 2).*

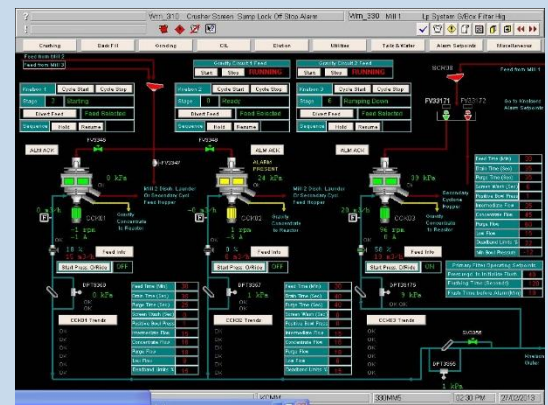


Figure 2: A screen shot from AngloGold Ashanti's SCADA system

## Lessons Learned

### Before you invest in expensive control systems, look at what you already have

Process control can be improved without large up-front capital investments. This was illustrated by AngloGold Ashanti, who improved its process control by changing the logic and control algorithms of the PLCs. The SCADA system was already in place but it was underutilised.

### Manage the learning process

The new process control system initially met with a degree of resistance from the operators. However, as operators became more accustomed to the capabilities of the control system, they were less likely to intervene.

It was important to let the control system manage the process and observe the results, so that it could continue to be improved. Operators were asked not to switch out of automatic mode unless there was an alarm. By letting the system run, and then observing the results, engineers could determine whether they could run processes closer to their operating limits.

Once the operators learned to trust the PLCs to safely operate the plant, the number of operator interventions, and the number of alarms, dropped off significantly.

### Next steps

Having optimised the processing plant, AngloGold Ashanti engineers are now looking at upstream processes prior to the crushing circuit. The objective is to understand what causes the crushing circuit to stop, and how the running time of the crushing circuit can be maximized.

The lessons learned about systems optimisation at Sunrise Dam will be applied to the company's new Tropicana mine near Kalgoorlie (Western Australia) and to mines in Columbia.

*An effective training program enables operators to understand the process and gain confidence in the system's ability to control critical processes and react appropriately to disturbances.*



*The crushing and grinding circuit at Sunrise Dam*

The Global Superior Energy Performance (GSEP) initiative was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC). Through GSEP's Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. For more information, please visit [www.cleanenergyministerial.org/EnergyManagement](http://www.cleanenergyministerial.org/EnergyManagement).

Further information about how Australian industry has improved energy management can be found at <http://energyefficiencyopportunities.gov.au/templates-and-tools/case-studies/>.