Automation IT

Automation IT PTY. LTD. ABN 92 093 758 564
qld. 07 3299 3844 wa. 08 6102 3144 e. sales@automationit.com w. www.automationit.com
WA Office Unit 18, The Business Building, 328 Albany Hwy. PO Box 567 Victoria Park WA 6979
QLD Head Office Unit 7-8, Springwood Business Centre, Cnr Murrajong Rd & Pacific Hwy. PO Box 1166 Springwood QLD 4127

Automation IT provides welcome relief for operators on Saraji's Draglines

Construction of the Saraji open cut coking coal mine began in late 1972 and production commenced in the latter part of 1974. Saraji has a current production capacity of 6.5 million tonnes of high grade coking coal a year.

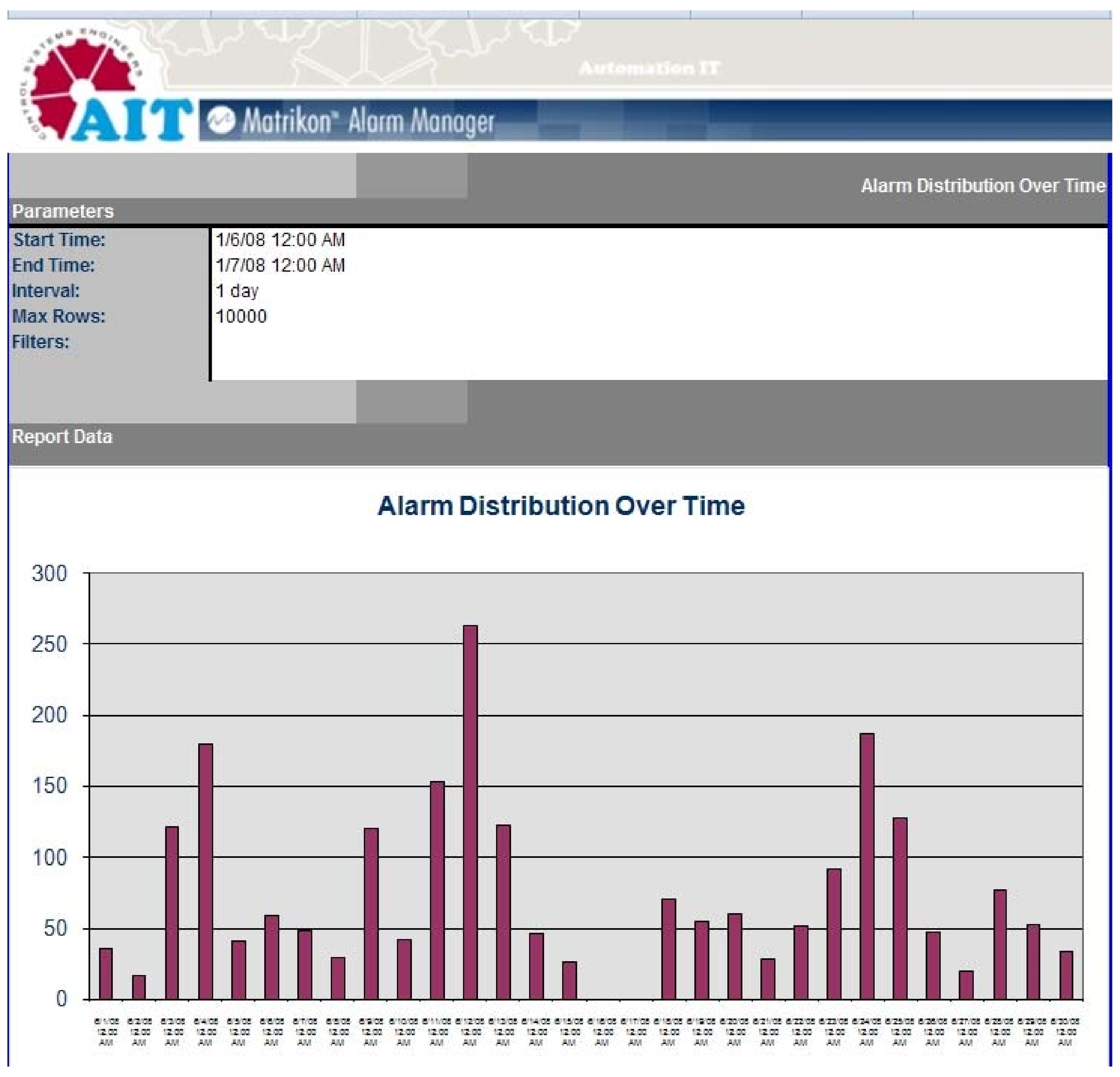
Saraji Mine is located 24km south of Peak Downs mine and 213km south west of the Hay Point coal export terminal. Saraji mines the Dysart seam, which lies within the Moranbah Coal Measures, ranging from 4m to 6m in thickness.

THE BACKGROUND

Typically dragline control systems are complicated and highly detailed. Due to the nature of the large equipment, potential for expensive mechanical damage and personal injury, the control system must be extremely robust and finely engineered. The Draglines have a detailed alarm system to advise the operato anything untoward and a speedy response from the operatc critical.

THE PROBLEM

All of the inherent complexity in the Dragline has led to an astounding number of alarms being generated and a large demand being placed on the operator. Guidelines exist for the amount of alarms that an operator can reasonably be expected to respond to in a certain amount of time. The EEMUA guidelines, specifically EEMUA #191, outline acceptable quantities of alarms for an operator to manage and Saraji were well above these goals.



Sample Report– Alarm Distribution over time

THE CHALLENGE

A couple of decades ago, hard-wired alarms were the main mechanism for alerting operating staff to potential problems. Given the cost of running wire and mimic panels, the addition of alarms was done very sparingly, so operators were rarely flooded with alarms during abnormal situations and, instead, relied more heavily on strip charts, panel lights, and field operator support to diagnose problems.

The advent of the Programmable Logic Controller (PLC) provided significant benefits in improving control, as well as alerting operators to potentially costly or dangerous situations. But, since the addition of alarms was perceived to cost nothing, a rigorous engineering process was not always employed when new alarms were configured. As a result most facilities alarmed virtually every reading, creating a much more costly issue—alarm floods that prevented operators from properly assessing the root cause of problems.

Increased levels of automation and fewer operators taking responsibility for increasingly larger systems compounded the difficulty of handling large numbers of alarms. Even seasoned operators faced the challenge of understanding and knowing how to monitor and handle specific events, especially during stressful, safety-related situations where their colleagues' health and safety were at risk.

Another problem, often not considered, is misdiagnosis of a seemingly insignificant alarm. Understanding the meaning of an alarm and the consequence of not responding to it is crucial to the operator's effectiveness. If the engineers struggle to interpret certain alarms, how can the operators be expected to know?

Date	Time	Equipment	Alarm Description
20/01/2009	16:43:41	Station	Data Communications From Generator 3 PLC Failed Warning
20/01/2009	16:43:38	Station	Data Communications From Generator 2 PLC Failed Warning
20/01/2009	16:43:36	Station	Data Communications From Generator 1 PLC Failed Warning
20/01/2009	16:43:35	Station	Voltage Transformer Isolation Switch (22VTIS) Open Warning
20/01/2009	16:43:33	Station	GCB Trip Relay Operated Warning
20/01/2009	16:43:31	Station	Station Multilin Control Circuit Breakers Not Healthy Warning
20/01/2009	16:43:28	Station	HV Switchboard Control Circuit Breakers Not Healthy Warning
20/01/2009	16:43:25	Station	Protection VT Secondary Circuit Breaker Open Warning
20/01/2009	16:43:24	Station	Isolation Control Panel Isolated 24VDC Supply Not Healthy Warning
20/01/2009	16:43:22	Station	Station Fuel Flow Meter (FQIT310) Out Of Range Warning
20/01/2009	16:43:20	Station	Air Compressor Air Pressure Low Warning
20/01/2009	16:43:18	Station	Supplier HV Switchboard AC & DC Auxiliaries Not Healthy Warning
20/01/2009	16:43:16	Station	Transformer Differential Protection Relay Operated Warning
20/01/2009	16:43:14	Station	Fuel Methane Concentration Low Warning
20/01/2009	16:43:13	Station	Hallam Road Workshop Zone Security Alarm Warning
20/01/2009	16:43:10	Station	LFG Temperature High Warning
20/01/2009	16:43:07	Station	22kV Average Line Voltage From Station Multilin Out Of Range Warning
20/01/2009	16:43:05	Station	Station Emergency Stop Warning
20/01/2009	16:43:02	Station	Condensate Knockout Vessel Pump Excessive Run Time Warning
20/01/2009	16:42:59	Station	22kV Voltage Level High Warning
20/01/2009	16:42:55	Station	Ethernet Switch Not Healthy Warning
20/01/2009	16:42:53	Station	Loss of Mains Relay Not Healthy
20/01/2009	16:42:50	Station	Feeder Circuit Breaker (22FCB) Trip Circuit Supply Not Healthy Warning

Typical modern SCADA alarm page

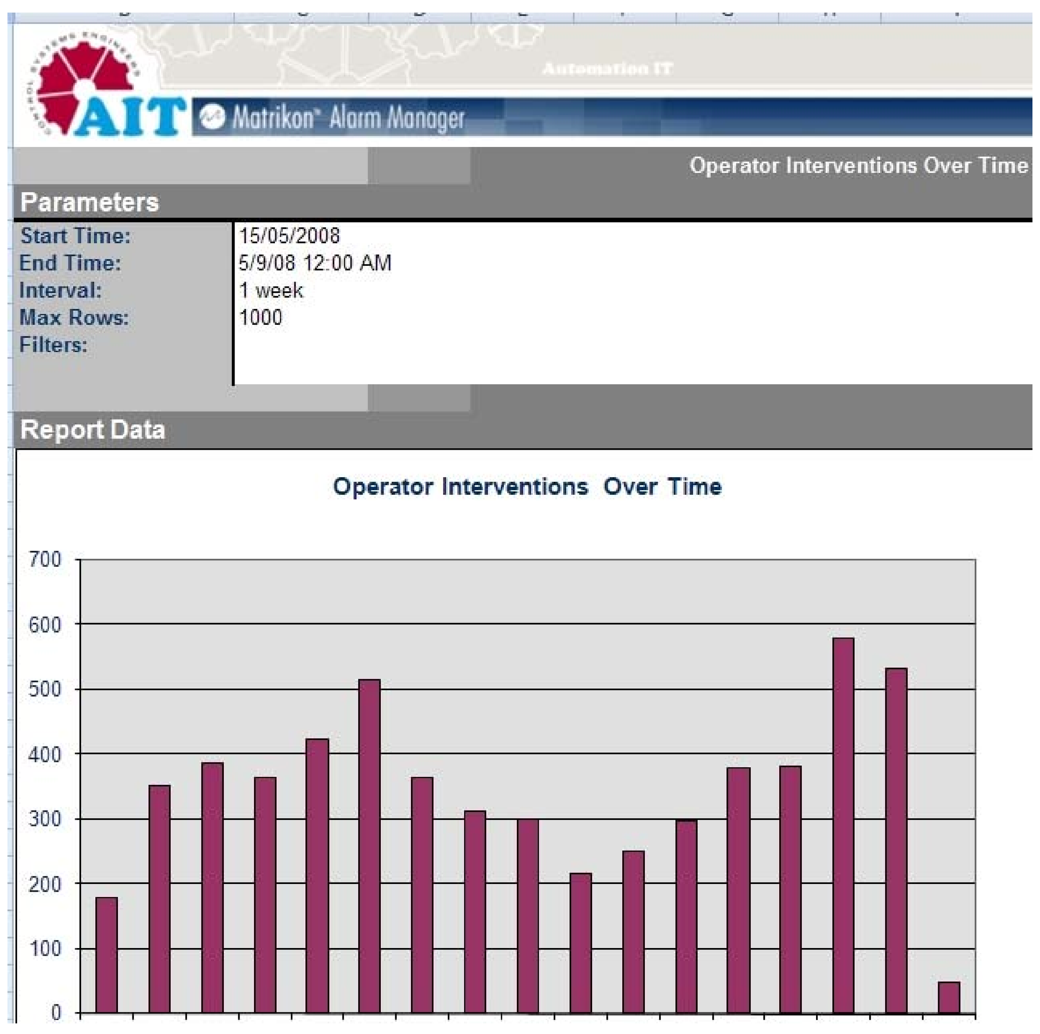
Automation IT

Automation IT PTY. LTD. ABN 92 093 758 564
qld. 07 3299 3844 wa. 08 6102 3144 e. sales@automationit.com w. www.automationit.com
WA Office Unit 18, The Business Building, 328 Albany Hwy. PO Box 567 Victoria Park WA 6979
QLD Head Office Unit 7-8, Springwood Business Centre, Cnr Murrajong Rd & Pacific Hwy. PO Box 1166 Springwood QLD 4127

project using other means, the use of an advanced software package such as Alarm Manager cuts the time required and the cost by a significant amount. AIT performed detailed analysis on a trial machine, Dragline 11 and identified a number of areas where the alarm system was in serious need of attention.

Alarm management standards such as EEMUA 191, ISA S18.02 and NAMUR NA102 state that an operator should receive a maximum of one alarm per minute and an average of 300 alarms per console per day in order to effectively monitor the state of the plant.

The reality is that many plants receive an average of 6000 alarms per day per console, as reported by industry averages consulting company Solomon Associates. This is 20 times higher than the suggested alarm count. When health, safety and environmental concerns—not to mention productivity and profitability— are dependent on a clear understanding of Dragline performance, the need to reduce daily alarm counts becomes obvious.



Sample Report—Operator Interventions over time

The Alarm Manager software incorporates a detailed alarm and event historian so that data can be collected over a large period and recorded for future analysis. The main aim is to provide a continual improvement process where machines can be bench-marked against each other as well as against themselves to en-sure that operators can concentrate on the task of moving dirt rather than responding to problems.

The results of these reports were analysed and a recommendation was made as to how to address each issue to reduce the unnecessary alarms.

Reports are generated to identify issues such as:

- Top Alarms by frequency
- Chattering alarms
- Symptomatic alarms (Parent/Child relationships)
- Operator Interventions

DOCUMENTATION

As with all Automation IT projects a fully documented project solution provided detailed reports for the BMA Saraji team. These reports can be kept and referred to on an ongoing basis as questions arise about the continual improvement process.

THE FUTURE

With the alarm count reduced to a manageable level, attention can be placed on correctly prioritising alarms as low, high, emergency and critical, thus achieving the recommendations set out in the EEMUA 191 Alarm Management Standard. The benefits of achieving such standards include:

- High priority alarms are clearly defined and can be responded to immediately, improving plant safety.
- Operator response times are improved through reduction of total number of alarms, reducing plant downtime.
- The root cause of alarms can be identified, providing the ability to focus maintenance and reducing plant downtime.

CONCLUSION

A more comprehensive understanding of any plant or process can be acquired from root cause analysis of the alarms and events just prior to downtime events. An understanding of causes of downtime enables engineers to prevent future occurrences. By requesting AIT to perform an alarm system rationalisation, BMA Saraji has given themselves the ability to increase Dragline profitability and safety. The business benefits BMA Saraji has achieved include:

- Improved safety
- Reduced production losses
- Reduced risk of equipment damage during upsets, shutdown and start-up
- Minimised environmental upsets
- Reduced equipment wear and failure
- Fewer incidents

Automation IT helping to increase safety and efficiency in the coal mining industry