SCADA ALARM MANAGEMENT

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ABSTRACT

In the past many alarm systems have been implemented without any consideration to a holistic approach, and what we know now to be ill considered practices being implemented.

This approach has resulted in a vastly over-alarmed system which had been producing thousands of alarms per day. Poorly performing alarm systems have been cited across all Supervisory Control and Data Acquisition (SCADA) monitored systems as specific contributing factors in major incidents and adding significant operational costs as outlined in the Schneider Electric White Paper Titled "Alarm Management".

The development of an alarm philosophy is seen as an important initial step in the journey to alarm management; essentially without the rule book there will be no structure to your management of alarms and often results in an ad hoc and inefficient approach.

The control system must be in a state of continuous improvement to consistently reduce the intervention of operational staff at a failure point.
This presentation will delve into the journey that our Operational Management Centre (OMC) Staff are on to rationalize and optimize our SCADA System, the tools and processes which have been used.

1.0 INTRODUCTION

GWMWater serves a population of approximately 72,000 people with a geographic spread of 62,000 square kilometres, which is approximately26% of Victoria. This area is similar in size to Tasmania and covers 13 municipalities either fully or partially. This includes 266 active SCADA Sites with more coming on-line each year.

Since the introduction of GWMWater's SCADA system, little has been done in regards to alarm management and rationalization. In the past eighteen months the Operational Management Centre (OMC) team has been developing an alarm management philosophy as an important first step to better manage SCADA alarms. This along with the rationalization of alarms, nuisance alarm reduction and a review of the alarm response procedure has gone a long way in the optimization of our SCADA system.
Before the beginning of this project we were regularly receiving alarm counts in excess of three hundred thousand per month.

2.0 DISCUSSION

2.1 Identifying Requirements

The purpose of any SCADA Alarm Management Program is to construct a system which can be utilised to assist the OMC Operator to interrogate and action alarms in a timely manner.

This will only be achieved if:

- Alarms are rationalised at implementation;
- Alarms are configured in a consistent process;

- Alarms are generated at a rate that the operators can effectively handle;
- Operators can easily see the priority in which action should be taken;
- The alarm system is properly controlled, monitored and maintained.

2.2 Alarm Definitions and Criteria

The Instrument, Signals and Alarms Standard (ISA)-18.2 Definition of an Alarm is: "An alarm is an audible and/or visible means of indicating to the operator an equipment malfunction, process deviation, or abnormal condition requiring a response.".

2.3 Alarm Management Philosophy

To ensure that the integrity and the efficency of the SCADA system is maintained in relation to alarms the development of an Alarm Management Philosophy was adopted

This document is a guide that includes:

- Definition of an Alarm
- Guideline for how to configure alarms including severity
- Response times depending on severity
- Management of Nuisance Alarms
- Change Management
- Rationalisation Criteria for Alarms

This is a living document that can be adapted to resolve any new issues as they arise.

2.4 Identifying the Key Performance Indicators (KPI) for the Number of Alarms that are Manageable.

The industry has established KPI's for Alarm System Performance that can be found in ISA-18.2 Alarm Management Standard.

Table 1: ***A Summary of Alarm System KPI's***

Alarm Performance Metrics Based on at least 30 days of data			
Metric: enunciated Alarms per Time per Operating Position	**Target Value: Acceptable by operator**	**Target Value: Maximum Manageable Alarms by Operator**	**Current Values for the Calendar Month of May 2015**
Alarms Per Day	~150 alarms per day	~300 alarms per day	~ 1698 alarms per day
Alarms Per Hour	~6 (average)	~12 (average)	~71 (average)
Alarms Per 10 Minutes	~1 (average)	~2 (average)	~12 (average)
Metric	**Target Value**		
Percentage of hours containing more than 30 alarms	~<1%		
Percentage of 10-minute periods containing more than 10 alarms	~<1%		
Maximum number of alarms in a 10 minute period	≤10		

Percentage of time the alarm system is in a flood condition	~<1%	
Percentage contribution of the top 10 most frequent alarms to the overall alarm load	~<1% to 5% maximum, with action plans to address deficiencies	
Quantity of chattering and fleeting alarms	Zero, action plans to correct any that occur	
Stale Alarms	Less than 5 present on any day, with action plans to address	
Unauthorised Alarm Suppression	Zero alarms suppressed outside of approval framework	
Unauthorised Alarm Attribute Changes (alarms types, setpoint, severity, deadbands, etc.)	Zero alarm attribute changes outside of approval framework	
Taken from ISA-18.2 Alarm Management Standard Summary		

At the commencement of this process we were operating well outside these guidelines with an average of 3,000 alarms per day.

We are currently running at 1,698 alarms per day which is still outside the guidelines but heading in the correct direction.

2.5 Rationalising Alarms

One of the significant issues that have been identified through the alarm rationalization process is the ignorant view when initially implementing GWMWater's SCADA System of "Alarm everything so we don't miss anything and sort it out later."

This approach has created the need for this current process to be undertaken. We currently have a substantial number of alarm points in the SCADA system that are alarmed without a subsequent follow-up action.

This is a significant contributor in the systems high volume of alarms.

To reverse this issue we are initially removing unnecessary alarms by aligning our alarm rational to the definition of an alarm. "An alarm is an audible and/or visible means of indicating to the operator an equipment malfunction, process deviation, or abnormal condition requiring a response."

In addition to this reference is made to our newly adopted Alarm Management Philosophy as noted in 2.3

The next step in the process is consultation and engagement with stakeholders to ensure that any alarms that are no longer required, as well as all decommissioned sites, are removed from the system.

2.6 Alarm Suppression

To add further value the decision was made to introduce alarm suppression in conjunction with alarm rationalization. Alarm rationalisation is the process of disabling alarms for a finite period.

Suppressed alarms are logged and monitored on a predetermined period to allow for review and follow up.

Alarm suppression allows for alarms to be suppressed and not forgotten. Once an alarm is suppressed a work order is created for the alarm to be resolved, this adds a control measure to reduce the risk of alarms being forgotten as they are no longer seen.

After the designated suppression time has expired, the alarm if still active will regenerate alerting the OMC Operator that the issue is still present which in turn triggers the follow up on the Work Order to resolve the issue.

This process is also ensuring that during maintenance on equipment alarms are not generated.

The Field Operator simply calls the OMC and advises that maintenance is being carried out on a piece of equipment or at a site and the expected duration.

The alarm is then suppressed for that period of time and no alarms are generated.

At the conclusion of the suppression the system is returned to normal operating conditions and any active alarms reactivate.

2.7 Nuisance / Chattering Alarm Management

Nuisance/Chattering Alarms are alarms that activate and clear more than three times within one minute.

These are often a large contributor to alarm counts as they can often be missed or simply dismissed as unimportant. To assist in overcoming this issue we have implemented Alarm Suppression as detailed in 2.6

3.0 CONCLUSION

The Alarm Management Project is ongoing as our SCADA System is continuing to grow and evolve.

The results thus far are very encouraging and tend to indicate that we are heading in the correct direction with alarm counts lowering each month.

The alarm rationalization process is the largest hurdle we have to face but will eventually have the biggest impact on the reduction of alarms.

With OMC staff now much more aware of the importance of alarm reduction we are using the change management process more effectively to rid the system of unnecessary alarms.

Alarm suppression is also having an impact with numbers of chattering alarms and alarms created by staff maintenance being significantly reduced.

Further work is required to achieve our alarm management goal of maintaining alarm numbers at a manageable level but early indications show we are well on the way to achieving the desired outcome.

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5.0 REFERENCES

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GWMWater Alarm Management Philosophy