When online monitoring goes wrong

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For more than 20 years, consultants at Lord Consulting have been working with utilities in a range of sectors to implement real-time condition monitoring and assisting companies to improve asset management practices. Although this has been largely successful in many companies, we have started to see some concerning trends in some organisations.

Some companies have not recognised that their traditional monitoring techniques are hopelessly inadequate and key assets such as transformers are vulnerable to catastrophic failure.

Future Challenges

There are some common and universal challenges and trends around the world and the complexities of our roles as asset managers has increased. Not only do we need to understand the complexities of high voltage equipment from a technical perspective but increasingly there are regulatory and commercial constraints that are a necessary part of decision making in a modern utility.

Increasingly we hear of the development of "Smart Grids" and the need for increased security, automation and self-healing capability in networks. In this context, the universal challenge for all organisations is still making the best asset decisions including optimisation of:

- maintenance.
- refurbishment

– End of life replacement

It is almost a given that as responsible managers, we want to avoid premature and catastrophic failure that may have safety or reliability consequences. There will be a continued need for better decision-making into the future.

A commonly expressed aim of modern asset management is to make the best possible asset decisions, balancing often conflicting objectives related to safety, risk, economic and technical outcomes within the particular regulatory and commercial constraints of the relevant organisation. Expressed in different ways, but this is common amongst all responsible asset management worldwide.

THE HISTORY OF ONLINE MONITORING

During the mid 90's there was an emergence of what is now, modern asset management practices, particularly in the UK, New Zealand and Australia. The growth in awareness of asset management as a discipline led many companies to explore some of the emerging new technologies in online condition monitoring and many saw this as the way of the future. Here for the first time, with appropriate selection of technology, the industry could monitor asset condition in real-time, enabling optimal and timely decision-making support.

Sadly today, we find that not all organisations have shared the passion and commitment of many of us to asset management and particularly the inclusion of real time and online monitoring solutions and highly integrated asset information approaches into a comprehensive condition monitoring approach.

In some cases, organisations that have previously successfully began integrating online monitoring but then either never properly adopted the technology or have abandoned the approach after some early failed attempts. In some cases, the condition monitoring regime was working successfully for a time but with management or organisational changes the systems were left to decline.

THE INSURANCE ANGLE

Terence Rademeyer and Terence Lee of the insurer FM Global presented a great paper[1] at TechCon 2017 on the insurers perspective on transformer failures and aging. FM Global is an insurance company with a unique approach to underwriting the risk of transformer failure based on the belief that "*the majority of property loss is preventable*". In the last 10 years, FM Global spent $94 million a year replacing failed transformers. The paper showed that the failure rate of transformers less than 20 years old was actually showing an increasing trend due to a range of reasons. Older transformers (>30 years) failure rates were shown to be decreasing! The data suggests that transformers are not failing due to aging but a range of other factors that occur anywhere during life. The main theme of the paper was that the probability of detection of a problem that might otherwise lead to a catastrophic failure was significantly increased using online monitoring systems.

WHAT ARE THE TYPICAL THINGS THAT WE DO WRONG?

So with all the evidence that online monitoring is an essential part of asset management, why is that we see some companies apparently not hearing the message. With the benefit of experience with a range of

[1] Lee, T., Rademeyer, T., Managing the Risk of aging transformers, TechCon Aus-NZ 201

organisations and also with the added benefit of hindsight we can summarise the problems in the following four categories:

1

Lack of strategic direction and vision and lack of effective leadership.

This is closely linked with the need for all asset management practices to be established with a clear "line-of-sight" to higher level corporate objectives. We see many organisations who adopt new technology as a trial of new and interesting equipment rather than as part of a clear strategic direction to for example, "improve real time asset decision-making". This approach often leads nowhere and no asset management benefits are achieved. Related to this is lack of adequate strategic leadership related to asset management in some organisations. Often an internal champion is needed to assemble the required resources to implement effectively with appropriate levels of leadership and support from upper management.

2

Inability to economically justify new capital expenditure.

This is often used as an excuse for not implementing new technology and purchases. Often the underlying problem is lack of skills in the relevant engineering group responsible for asset monitoring systems. It's not that the implementation of real time monitoring cannot be justified economically, rather it is the fact that the engineering group do not have the relevant economic skills to be able to carry out the assessment, preferring to keep to the trusted traditional approaches for condition monitoring.

3

Non-appropriate processes in place to manage the new data sources

Real time data is not the same as traditional asset condition information and needs to be managed differently. A new online partial discharge device may provide alarms warning of potential failure but often the organisation has not considered what action is required in the event of an alarm. The default is often to connect alarms to SCADA and treat as for other substation alarms and monitor using network control centre staff. Such staff often are trained in real-time operations so there may appear to be some logic to this approach. However, alarms related to asset condition may require quite different approach than traditional operating requirements and certainty new skills are required. The Network Control Centre may not be the ideal place for real time asset condition alarms and warnings and one large Australian utility has taken the decision to establish an asset monitoring centre, closely linked to the operational control centre but clearly equipped with skills and equipment to monitor the full range of online monitoring devices and other disparate data sources in this company. It is also interesting to note that this same company was accredited to ISO 55000 recognising their asset management system and processes are aligned with agreed international best industry practice.

4

Lack of confidence in online condition monitoring technology.

Online equipment is usually electronic and operating in a harsh substation environment. As we know, modern secondary equipment does not have the lifetime expectation of older technologies and it is important that secondary equipment, including protection and control and online monitoring devices are treated as an asset in their own right with asset management plans that include on-going maintenance and replacement at end of life. The expectation,

sometimes heard, that the monitoring equipment should have a lifetime and reliability as good as the primary equipment to which it is connected is unrealistic.

Characteristics of High Performing Organisations

Many organisations have successfully and sustainably implemented new technologies such as online devices and effectively improved asset management decision-making using real time information. The organisations where it has been most successful approaches to new technology implementation, especially online monitoring system have some common characteristics:

- ✓ Strong asset management culture, either with or without relevant accreditation
- ✓ Good leadership, clear direction and vision for the future
- ✓ Good skills in risk management and cost vs risk decision-making at all levels of the business
- ✓ Engineers with good economics analysis knowledge and the ability to undertake simple cost vs risk vs benefit studies
- ✓ Specific business processes to manage real-time asset condition information as well as other sources of asset condition data.
- ✓ Good information systems that enable disparate data sources and are geared towards optimised asset decision-making.

Formulating an Effective Strategy

Effective strategy provides a picture of the desired long-term future and this is linked to organizational objectives. In order to make sound day to day decisions, all members of the organization must be able to begin with the end in mind. All steps must ultimately keep the company on course toward the long-term objective.

To achieve the intended benefits of on-line monitoring we need to be able to clearly articulate a strategy and our intended objectives for condition monitoring as a key aspect of our overall asset management approach. This can be done by developing and documenting a Condition Monitoring Strategy for our power transformer fleet.

There are several essential 'key' elements to this strategy:

- It is implemented from an asset management perspective. Lord Consulting use experienced asset managers who will work with your asset management team. It is not a "templated" process or a "canned solution";
- The strategy is prepared as a key part of the existing Asset Management Plan, ensuring an on-going relevance and status and full "Line of Sight" with overall asset management objectives;
- The strategy is risk based and includes consideration of all monitoring on your transformers, not just online systems;
- It is an 'end-to-end solution', fully managing the condition assessment devices from specification to replacement through to end of life; and
- It includes people and organisational processes such as what to do when an alarm occurs.

Developing a robust and comprehensive 'Transformer Condition Monitoring Strategy' ensures that the transformer failure risk is suitably managed throughout its entire lifetime.

CONCLUSION

At Lord Consulting we are passionate and focused on assisting our clients to optimise the value of their investments in a range of new technologies, including online monitoring. We believe that the majority of transformer failures have precursor indications that are detectable and that many catastrophic failures can be prevented with early detection.

Effective asset management is more than just a focus on the assets themselves and includes the whole range of management activities including the approach, the planning, the plan and the implementation. Most importantly, it involves people.

Our approach is to help organisations find the right technologies, ensure they are properly installed and commissioned with the necessary processes and systems re-designed to ensure that our clients have the lowest risk of unplanned failures.

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