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Design for the Future, Design for Success, Design for Safety

Editor's Note:
Design for Safety and Success

Whenever you come across something that makes you ask yourself, "why hasn't this been common best practice all along?," more than likely it is because it took a practitioner to see the light and to make it a Better Practice. That practitioner is Martin Robinson, author of this article and one of the most respected professionals making the connection between reliability and safety today.

At our company, we have charter policies and procedures, values and all the things that successful companies have, but one of the most important is "Work Safe, Home Safe." It is not a mantra printed on wall posters but a deep commitment at every level of the company.

We took the principles of Monitor, Inspect and Manage that Martin is sharing and made it part of our reliability program for our transformer fleet and, of course, many of our line managers asked the very same question from above, "why hasn't this been common best practice all along?".

Safety and reliability: Two sides of the same coin! Who would have thought? Enjoy Martin's powerful insights.

Adopting a Monitor, Inspect, and Manage approach is a proactive way to avoid the concerns at hand by maximizing the value of workforce time and skill.

The critical importance of electrical power to every aspect of our world cannot be exaggerated. It must be generated and distributed effectively to end-users, and any disruption in that process means loss of operations, money, and in extreme cases, life. Therefore, the reliability of electrical power creation and distribution must be continually safeguarded and improved. This does not happen by chance or through reactionary-maintenance tasks, and it must be focused on from the early design stages and continue through the life of the assets tasked with these functions.

Adopting a Monitor, Inspect, and Manage approach is a proactive way to avoid the concerns at hand by maximizing the value of workforce time and skill. Scalability is no longer an issue when, instead of going through the time and cost of expanding their workforce, plant managers can apply condition-based reliability technologies to maximize their available workforce skills and availability. These reliability technologies can be specified with the specification engineer and Original Equipment Manufacturer at the initial design/build stage or retrofitted into existing equipment through a simple and inexpensive process.

Additionally, by taking the Reliability Engineering by Design (RED) approach espoused by the Safety and Reliability Association (SaRA), coupled with the Monitor, Inspect and Manage approach as detailed in this article, we will create a practical system approach to asset reliability.

When we, as practitioners, connect reliability and safety, we build momentum, access more resources, and create an environment where ensuring transformer reliability inherently enhances safety.

Modal Amplified™, a camera-based Modal Test and Analysis solution, enables a new shift from the time-consuming sensor mapping, placement, fixation, and animated modeling of typical Modal Testing to instant capture, visualization, and analysis on real-life structures

Photo: Shutterstock, IRISS Inc.

Monitor

With the use of a monitoring system on transformers and throughout substation electrical equipment, asset conditions can be continually collected, trended, and assessed. Monitors feed data through a gateway to software and apps, allowing the information to be continuously accessed from workstations and mobile devices.

When the new equipment arrives from the manufacturer with these monitors built-in, customized parameters can be set for the specific operating and environmental conditions the asset is exposed to that keep it within a "safe zone" to maximize functional reliability. When the asset condition data exceeds the custom parameters, alarms can notify electrical technicians of a possible issue that may require inspection. Keeping human interaction with equipment to only instances where confirmation inspections of potential faults are deemed necessary minimizes workers' risk and eliminates the human-error threat to asset functionality.

As stated earlier, when we, as practitioners, connect reliability and safety, we build momentum, access more resources, and create an environment where ensuring transformer reliability inherently enhances safety. And safety continues to play a more prominent role relative to electrical systems.

Inspect

Once the wireless monitoring system notifies technicians of a possible issue with a transformer or other piece of electrical equipment, the use of pre-installed inspection windows on the asset allows a safe, efficient method of inspecting and assessing any possible issue during an energized condition. Once solely designed for thermographic inspections using infrared cameras, advancements in manufacturing have led to the inclusion of ports that allow for ultrasound and partial discharge technologies to be incorporated into the inspection. Visual, infrared, and ultrasound inspections can be done simultaneously by a single employee.

Additionally, this design protects inspectors from arc flash/electrocution risk, removes the need for bulky and expensive PPE, and allows the inspection to be accomplished more efficiently. Not only does this represent a significant process improvement driven by original design, but it also falls in line with the most recent NFPA 70E updates and continues to protect critical assets from human interaction/mistakes that may cause failure.

Manage

The data collected during inspection can be stored through intelligent asset management tags attached to the pre-installed inspection windows. From the asset location, information can be transmitted into a dashboard system accessible from workstations and mobile devices.

Customizable routes can be established before, and condition reports generated after data analysis to further increase efficiency. These designed aspects allow managers to assess operations and decide how best to increase Mean Time Between Failure (MTBF).

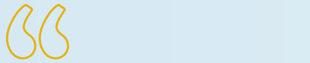
Proper Training

One major issue facing the industry is a coming wave of retirements from the workforce, with fewer new workers entering the industry than the pending need created by this exodus. As the electrical industry expands worldwide, creating the need for a larger workforce, the problem is multiplied. The only way to succeed is to capitalize on reliability technologies designed into the system that allows the industry to do more with less.

While Designing for safety and reliability from the equipment side should drive the overall process toward continuous improvements, the proper tools are only as useful as the hands wielding them. Hardware and software designed/specified by the engineer and constructed by the OEM are ineffective if the people responsible for their oversight are not adequately trained.

Shifting to an engineered reliability system for the electrical maintenance team means training new and veteran staff alike. With "Monitor, Inspect, Manage," the use of technology allows single individuals to accomplish inspection tasks with minimal training. Specialized skill sets of electrical-focused staff can be used for actual necessary maintenance/repair activities.

Another Covid-era issue with learning is that most educational institutions have transitioned to online models. The electrical world can benefit from adding this type of education and certification to on-the-job training programs. These online systems offer on-demand educational and training resources that teach the use of these specific reliability technologies. The workflow is streamlined, which means that the skill-set requirements can be minimized to particular tasks.



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Conclusion

As the old saying goes, "if you fail to plan, then you should plan to fail." From the inception of equipment design and manufacture, all possible measures to ensure asset reliability should be specified and implemented. These measures should prove themselves to be learnable, repeatable, and continued throughout any workforce changes to cement the successful practices into the very culture of the role requirements.

Photo: Shutterstock

Transformers and other critical electrical power assets being monitored remotely cut down on technicians' routine tasks focused on engineering and electrical operations by providing around-the-clock coverage. When an alarm notification is received, inspection windows allow an individual technician to easily do visual, infrared, and ultrasound, and partial discharge assessments of the energized equipment. The data collected on the asset can then be stored, trended, and analyzed through the management software. This process increases the Mean Time Between Failure (MTBF) by allowing for planned shutdown and maintenance only when it is necessary.

Staffing issues brought about by the combination of an expanding market and a shrinking labor pool can be overcome by streamlining operations through technology. Both hardware and software involved can be easily integrated at minimal expense. The employees responsible for their use can be trained through a combination of online and on-the-job training.

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Martin Robinson is the founder, owner, and CEO of IRISS Inc., a leading manufacturer of infrared inspection windows. Robinson focuses on innovation and is a pioneer of Electrical Maintenance Safety Devices (EMSDs) that help protect technicians from harm while protecting their companies' bottom line. He holds several patents for condition-based maintenance devices and has designed multiple maintenance programs that include infrared, ultrasound, partial discharge testing, non-destructive testing (NDT) and energy management strategies. He holds a NEBOSH certificate in Occupational Safety and Health, an IAM Certificate in Asset Management, is a certified Level III Thermographer, a Certified Maintenance and Reliability Professional (CMRP) and a Certified Reliability Leader (CRL). He is a member of IEEE, NFPA and is a standing member on the technical committee CSA Z463 guidelines on maintenance of electrical systems.