

Design for the Future. Design for Success. Design for Safety.

by **Martin Robinson**

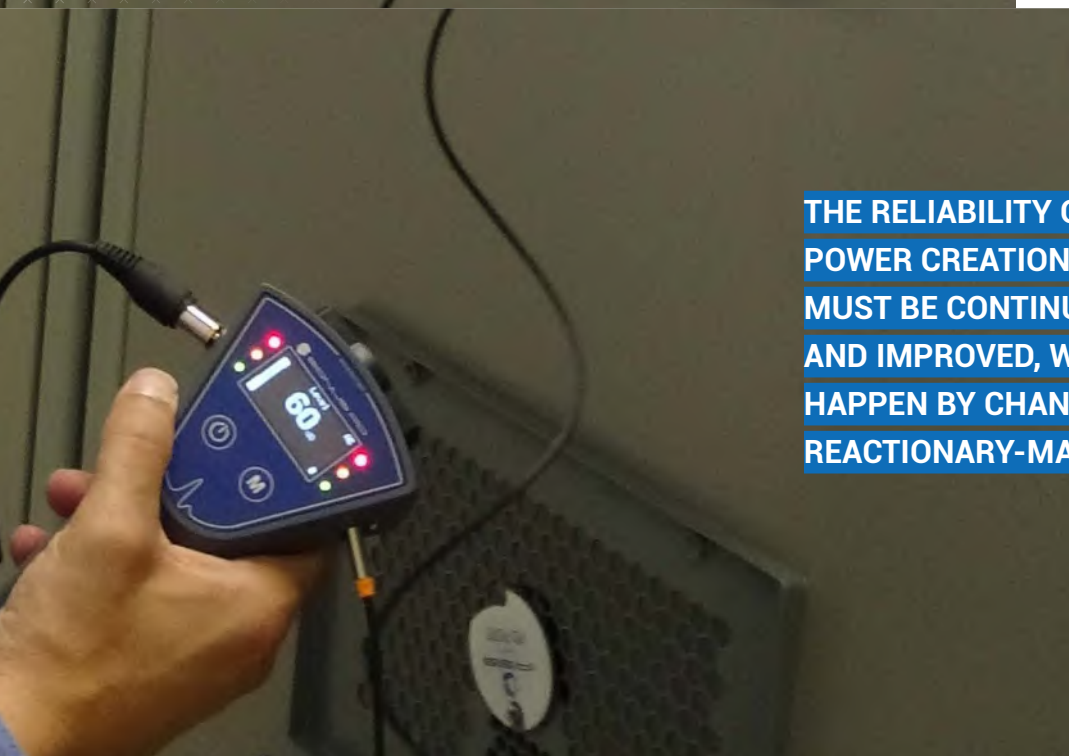


Martin Robinson is the founder, owner, and CEO of IRISS Inc., a leading manufacturer of infrared inspection windows. Robinson focuses on innovation and is a pioneer of Electrical Maintenance Safety Devices (EMSDs) that help protect technicians from harm while protecting their companies' bottom line. 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.





The critical importance of electrical power to every aspect of our world cannot be exaggerated. Electricity 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. This must be focused on from the early design stages and continued through the life of the assets tasked with these functions.



THE RELIABILITY OF ELECTRICAL POWER CREATION AND DISTRIBUTION MUST BE CONTINUALLY SAFEGUARDED AND IMPROVED, WHICH DOES NOT HAPPEN BY CHANCE OR THROUGH REACTIONARY-MAINTENANCE TASKS.

Adopting a "Monitor, Inspect & 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, they 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 Electric Power Reliability Alliance (EPRA), coupled with the Monitor, Inspect and Manage approach as detailed in this article, we will create a practical system approach to asset reliability.

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 applications, 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, which 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 risk to workers and eliminates the human-error threat to asset functionality.

As stated earlier, if we, as practitioners, connect reliability and safety, we will gain much more momentum, access more resources and create an environment where we can make sure our transformers are reliable, which also leads to increased safety. And safety continues to play a more prominent role in relation 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.

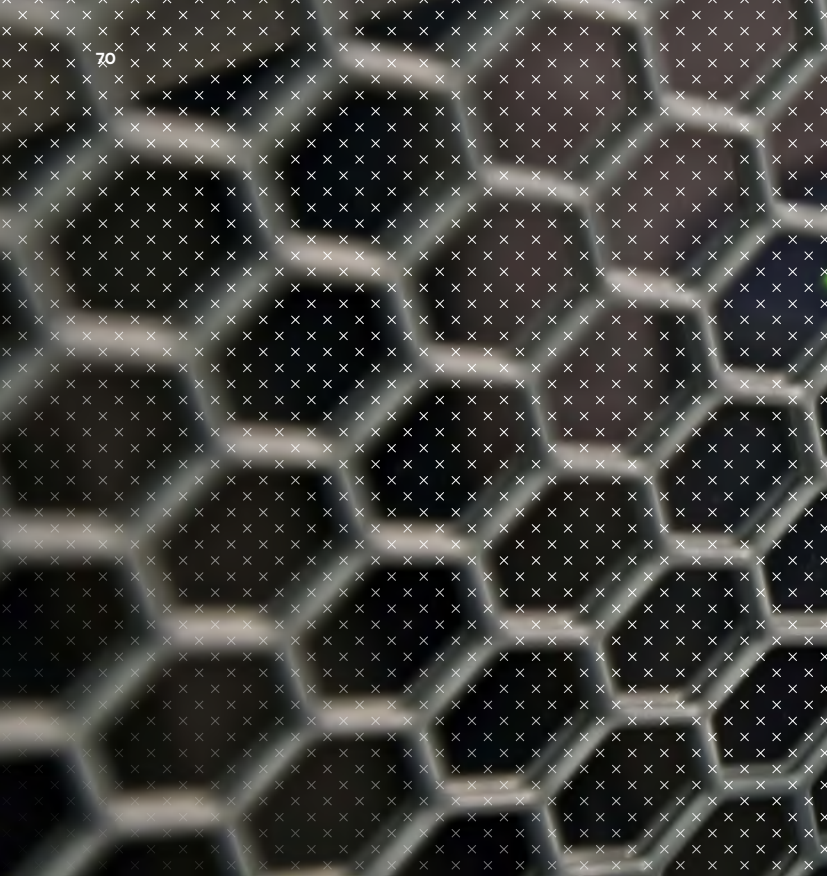
Manage

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).

IF WE, AS PRACTITIONERS, CONNECT RELIABILITY AND SAFETY, WE WILL GAIN MUCH MORE MOMENTUM, ACCESS MORE RESOURCES AND CREATE AN ENVIRONMENT WHERE WE CAN MAKE SURE OUR TRANSFORMERS ARE RELIABLE.





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 meaning that the skill-set requirements can be minimized to particular tasks.



ALL POSSIBLE MEASURES TO ENSURE ASSET RELIABILITY SHOULD BE SPECIFIED AND IMPLEMENTED FROM THE INCEPTION OF EQUIPMENT DESIGN AND MANUFACTURE.

Conclusions

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.

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, correctly designed and installed inspection windows allow an individual technician to easily do visual, infrared, 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, while the employees responsible for their use can be trained through a combination of online and on-the-job training.

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