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Using Electrical Maintenance Safety Devices to Bridge the Skills Gap

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The modern world has become disposable, accustomed to throwing away things when they break and replacing them with new ones. For critical electrical assets, this approach is impractical, expensive and unsafe. A more nuanced approach involving risk identification and quantification, critical asset prioritization and a proactive maintenance plan is required. With an impending skills gap among technical workers, proactive maintenance plans must also be safe, efficient and easier to implement. Electrical maintenance safety devices (EMSDs) are well suited for both improving the overall safety and efficiency of inspections while simplifying physical and technical demands. This allows for more frequent inspections conducted by a less technical workforce.

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A 2017 survey, conducted by Klein Tools and completed by 600 electricians, highlights the continued concerns among electricians over the scarcity of skilled workers. According to the survey results, seven in 10 electricians are concerned about the skills gap in the U.S. labor market. Fifty-six percent of those surveyed have noticed more experienced electricians leaving the field over the last few years, a 12 percent increase from 2015. A majority of the surveyed electricians list the physical demands of the job as the reason for the increase.

These survey results are not surprising, according to the Bureau of Labor Statistics, there are over 500,000 electricians in the United States. The average age of licensed electricians is 55 and, because of the physical demands of the job, most will not work beyond age 65. At the same time, electricians are dealing with higher demands, more

Figure 1: Electrical Maintenance Safety Devices can ease some of the physical burden of work on aging electricians by redesigning common tasks to be less hazardous and strenuous. Source: IRISS

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complex control systems and difficult integrations in projects under tighter regulatory environments. These advanced systems bring their own set of challenges for electricians and require a certain level of skill that will be in short supply in the next decade.

Industries have recognized this gap among skilled workers such as electricians, welders and machinists. Government programs and private organizations are setting up and promoting vocational schools to produce a new generation of skilled workers. This approach will likely increase the available workforce, but is unlikely to completely meet growing demand or overcome age demographics. It is therefore imperative that businesses find other ways to bridge this skills gap. A safe and efficient approach is the use of EMSDs.

EMSDs ensure personnel safety while reducing the cost of performing critical inspection work on electrical assets. Inspections of energized equipment are becoming increasingly time consuming, restrictive and costly due to tougher regulations and more complicated electrical systems. EMSD technologies maintain energized compartment's closed and guarded condition ensuring that personnel are not endangered. The design allows electrical test equipment to be used safely at any time, especially when equipment is under full load conditions, which is when the inspection yields its greatest value.

There are many types of EMSDs that can add efficiency and safety to the inspection/maintenance process. Some are designed to make inspection quicker and safer. Others are designed to continuously monitor in order to spot issues very early on. Still, others are designed to track equipment maintenance and failures to help a business identify patterns and improve processes. EMSDs include windows, ports, online monitoring and intelligent asset tags. These EMSDs can be used to create a proactive, safer, less physically demanding workplace. This allows employees with less technical knowledge or older electricians with physical limitations to inspect electrical assets as part of an electrical maintenance program.

An electrical maintenance program is a schedule of regularly planned maintenance testing and corrective actions with the intent of preventing failures of critical electrical assets. An effective electrical maintenance program will find faulty components before they can actually fail, as well as assess the useful remaining life of existing assets. It ensures optimal working conditions and conserves the life span of the equipment, as well as reduces the need for highly technical skilled labor by simplifying and error-proofing the inspection tasks. Risk priority numbers (RPNs) can be calculated for critical assets as a means of quantifying and prioritizing risk. Preventive steps are taken to mitigate risk on the highest priority assets, and then RPN is recalculated. This process allows a business to understand the criticality of its equipment and to quantify the business risk and potential return of an effective inspection process.

There is a misconception that equipment failure rates always increase with time. The reality is that there are many different equipment failure patterns that require specialized approaches. Reliability centered maintenance (RCM) is an effective approach for determining the appropriate strategy based on understanding equipment failures. RCM curves are the age-reliability behavior curves that graph the conditional probability of failure against age. The curves are referred to as bathtub, wear out, fatigue, initial break-in period, random and infant mortality. They can be broadly categorized into age-related failures and random failures. The failure patterns reinforce that failure can happen at any time in an electrical asset's life and that regular inspection is necessary throughout equipment life to detect and correct problems.

As equipment becomes more complex and expensive, these inspections become even more important and are required more frequently. With the impending skills gap, a less technical workforce being able to conduct these inspections becomes essential. The technical workforce must be conserved for the highly complex repair tasks that require specialized skillsets. Given the limited availability of the technical workforce, and the increasing expense of downtime, a better understanding of equipment failure combined with a more intelligent design of inspection and maintenance activities is required. An effective way of mitigating risk is through critical asset surveillance technologies (CAST).

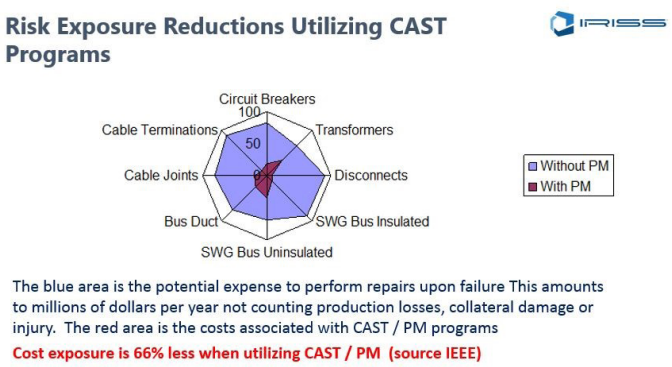

Figure 2: Risk exposure utilizing programs. Source: IEEE & IRISS

Condition based monitoring through CAST allows for safe, efficient and cost-effective inspection of electrical distribution assets. These inspection methods determine the condition of the individual electrical asset or system being inspected and can include technologies such as infrared thermography, airborne ultrasound, motor current analysis, partial discharge testing, corona cameras and visual inspections. Many hidden electrical equipment problems can be detected with these CAST inspection

technologies. More importantly, implementation of CAST inspection technologies is not physically demanding, nor does it require extensive technical experience or training to conduct most CAST data collection activities.

For instance, airborne ultrasound can detect arcing tracking and corona, infrared thermography can find hot spots and UV cameras can spot corona on high-voltage equipment. All of this can be achieved, provided appropriate EMSD have been fitted, without downtime or having to disassemble the electrical assets. Safe, efficient visual inspection is important for checking audible noises, vibration, dust and critter ingress. Learning what to look and listen for takes only minimal training and collected data can be analyzed by fewer — but more highly trained — technical personnel as needed. In addition, some Data analysis can also be augmented with the use of AI embedded into software into which the data has been entered. Inspections that would previously require downtime, multiple personnel or have higher inherent worker risk factors can be simplified, made inherently safe and performed while the critical asset is operating.

EMSDs allow for critical real-time inspection, maintenance data collection and logging while the equipment remains in a closed and safe condition and can be used to perform multiple types of inspections. Simplified and automated data collection leads to more frequent inspections and data collection, spurning a virtuous circle of improved reliability. Thresholds and alarms can be set for the early identification of potential issues. This in turn leads to earlier identification of potential problems and a better understanding of equipment failure patterns. Over time, the data collected can be analyzed and better inspection and maintenance schedules can be developed. All of this reduces the business' dependence on skilled technicians, who can be held in reserve for detailed data analysis, preventative action work orders spawning from this analysis and when equipment breaks down unexpectedly, which after CAST implementation should be less frequent. The analysis portion of the work may even extend the careers of some technical personnel, also helping to reduce the technical skills gap.

Critical electrical assets are becoming complicated and expensive. At the same time, regulations are increasing while technical skilled labor is decreasing. In the next decade, a growing skills gap will force businesses to reevaluate how they inspect and maintain electrical assets. New strategies involving automation and proactive inspection and maintenance will become necessary in order to stay competitive. EMSDs offer an opportunity for businesses to address these issues in a way that also increases safety and reduces downtime. EMSD programs that utilize CAST will allow businesses to work smarter by identifying and prioritizing critical assets and understanding failure patterns leading to less downtime and longer asset life. The skills gap is expected to accelerate over the next decade and it is essential that businesses prepare now to stay competitive.

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ABOUT IRISS, INC.

IRISS is the global leader in Electrical Maintenance Safety Devices & Solutions. We help our customer's reduce downtime related costs & maximize efficiency by reducing inspection times. EMSD's warn you of potential equipment failures before they occur, maintain the energized compartment's closed, safe and guarded condition ensuring workers are never exposed to the dangers of Arc Flash or electrocution, & automate asset inspection data collection process driving more efficiency improvements. Our EMSD solutions reduce risk, minimize cost and maximize efficiency.