



Electrical Distribution System

Electrical Preventive Maintenance (EPM) Self Assessment Survey

Risk Solutions

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A great deal can go wrong if an electrical distribution system is not adequately maintained. As electrical loads cycle between high and low demand, thermal expansion and contraction cause connections to loosen. Electrical panels that are never cleaned accumulate dust and dirt that deposit on these connections. The loose and dirty connections provide a high resistance path that are directly responsible for electrical failures.

Electrical preventive maintenance (EPM) is cost-effective in several different ways. First, it is cheaper to make repairs to equipment before it fails. When electrical equipment fails, particularly protective devices like circuit breakers or relays, there is usually subsequent damage to other components in the system. In addition, an effective EPM program will improve equipment efficiency and reduce utility bills. A loose or dirty connection has increased resistance which results in higher power losses. By simply cleaning and tightening electrical connections, you can lower these energy costs.

This self assessment survey (http://www.hsb.com/eLearning/Electrical_Preventive_Maintenance/story.html) should provide you some insight into ways to improve the reliability and operation of your electrical distribution system. To further help you identify and correct potential deficiencies, here are five key points to consider.

Electrical Preventive Maintenance (EPM)

No system or piece of equipment can operate forever without proper maintenance. An EPM program should be implemented using a licensed electrical contractor or qualified in-house electrician. It should include planned annual inspections and evaluations of the electrical systems. According to the Institute of Electrical and Electronics Engineers, the failure rate of electrical components at facilities where formal and regular EPM is not performed is typically three times higher than at facilities where it is. An effective EPM enhances equipment performance and reliability, and reduces the likelihood of equipment failure. The program should include completion of a written or computer-generated log of the maintenance procedures and schedule. EPM is best performed by a licensed qualified electrical contractor. The scope of work performed by in-house maintenance staff should not exceed their qualifications.

An EPM program also positively impacts equipment life, efficiency and reliability by helping maintain the equipment in proper operating condition and within manufacturer's guidelines. A general guide for maximizing the service life of your electrical system can be obtained from www.hsb.com.



Infrared Survey

Loose electrical connections or worn parts generate heat and eventually lead to equipment failure or fires. These conditions are easily uncovered during infrared inspections. An infrared survey of the complete electrical system should be performed and repeated every three years. The survey should include, but not necessarily be limited to, all electrical connections, cable runs, busway and electrical distribution panels. Survey results and recommendations should be made available to qualified maintenance department staff or an electrical contractor to address corrective actions noted. All electrical and mechanical equipment emits heat in the form of electromagnetic radiation. Abnormal or unexpected thermal patterns can be indicative of problems with the equipment that could lead to a breakdown or failure, or cause a fire. Infrared cameras are sensitive to thermal radiation and can detect and measure temperature differences between surfaces. Infrared thermography is a noncontact and nondestructive way to detect problems such as "hot spots" or heat imbalances which may indicate loose or corroded connections or overload conditions that should be corrected in an electrical system.

Heat loss resulting from loose or corroded connections can also mean reduced operating efficiency and corresponding increased energy costs. While a single loose connection may represent only a small, incremental energy loss, numerous loose connections throughout the electrical system could in sum translate to a larger energy savings opportunity that could be executed by qualified personnel. Infrared thermography integrated with the other elements of a well constructed EPM Program can address both loss and efficiency.

Surge Protection

Electrical surges can occur from conditions inside or outside of the facility. They can come from natural occurrences (lightning strikes) or from accidents to the equipment or simply the cycling of large motors or other pieces of equipment. A qualified, licensed electrician experienced in the application of surge protection devices should be contacted to determine the proper level of surge protection required for the electrical distribution system and equipment at your facility. An electrical surge is a short duration, high-energy impulse that is imparted on the normal electrical power system whenever there is a sudden change in the electrical circuit. Even though exterior sources such as lightning or the utility line may seem to be most obvious sources of electrical surge, the majority of electrical surges originate from inside facilities due to the type of equipment or the types of operations at the facility. Surge protection devices are designed to absorb and divert high-current surges to ground and bypass your equipment, thereby limiting the voltage that is impressed on the equipment. Appropriate surge protection helps protect electrical equipment and reduce downtime.

Cool * Clean * Dry * Tight

The care of electrical equipment is relatively easy and inexpensive. Electrical service areas should be cleared of all stored material which does not serve the electrical equipment. No material should be stored within three feet of the operating surfaces of the equipment or any ventilation openings. Flammable or combustible materials should not be stored in electrical equipment areas.

Stored material in electrical service areas prevents adequate and safe access to equipment for routine and emergency operation. Flammable or combustible materials near electrical equipment represent hazards that can result in damage to the equipment and adjacent structures or equipment in the event of overheating, arcing or other abnormal electrical events.

Junction boxes, panels, switches and receptacles should be properly covered and sealed. Exposed electrical conductors allow dirt and moisture to reach parts of the system and can lead to premature failures and can also represent a safety hazard. Dirt, debris or moisture present in electrical panels should be removed and the source of the contamination investigated and mitigated. The most common problems leading to excessive temperatures, poor connections and electrical fires and failures result from electrical equipment being exposed to excessive dirt, debris or moisture. Excessive dirt, debris or moisture on electrical equipment also reduces efficiency and consumes more power and can result in higher utility costs.

Temporary Wiring

Temporary electrical wiring should be replaced with new, approved permanent wiring. Homemade equipment or spliced wiring should also be identified as temporary and removed from service at the first opportunity by a licensed electrical contractor. Temporary wiring does not meet the electrical system requirements for loading and may not be properly sized for the voltage and current. Temporary wiring can produce sparks and overheating and increases the risk of electrical equipment failure and fire. Temporary electrical wiring that is overheating also likely represents reduced operating efficiency, energy loss and a potential energy savings opportunity.

HSB not only provides equipment breakdown insurance and loss prevention services, but is also committed to helping its customers save money and resources by identifying equipment energy efficiency opportunities. To learn how you can potentially save money and resources with your boiler, electrical, mechanical, and HVAC equipment, please visit www.hsb.com/calc/ENG and use our online tools and calculators developed by our engineering staff. In addition, you may find useful information specific to equipment care, operating logs and maintenance fact sheets on our web site.

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NOT IF, BUT HOW