

WHAT YOU NEED TO KNOW

A PowerHawke Informational Series
Electrical Maintenance Solutions

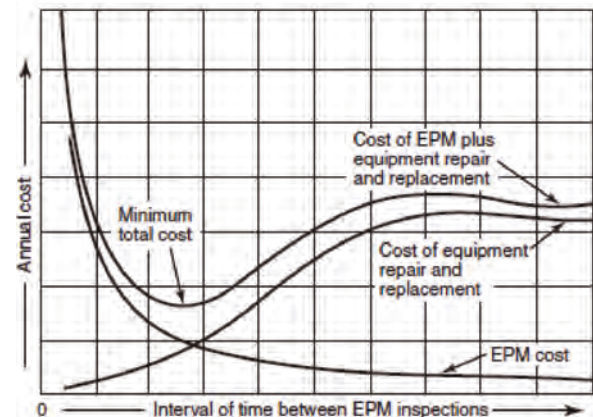
De-Energized Maintenance

De-energized maintenance is an essential part of any asset and safety management program for your electrical systems. It increases safety and efficiency, can identify potential problems before they become major, and overall, is plain good business.

ANNUAL MAINTENANCE COSTS AGAINST TIME

Consider:

- An electrical failure in your system causes, on average, 6 hours of business interruption. (Laskey 2012)
- Equipment not under an electrical preventive maintenance program is 3 times more likely to fail. (HSB 2010)
- Loose connections or parts, moisture, insulation problems and accumulation of dust, dirt and oil account for nearly 60% of electrical distribution system failures. (Based on Hartford Steam Boiler claims data)



FIVE THINGS YOU NEED TO KNOW ABOUT DE-ENERGIZED MAINTENANCE

1. Code requires it!

Almost. Code does not always spell out specific requirements, but every major standard for electrical systems refers frequently to electrical maintenance, clearly assuming that you are doing it. Many variables determine the maintenance types and schedules right for your installation, but it goes without saying that some level of maintenance is required.

Code examples:

- NPFA 70B-2013, Recommended Practice for Electrical Equipment Maintenance, 4.1.3 states that without an Electrical Preventive Maintenance (EPM) program, management assumes a greatly increased risk of a serious electrical failure and its consequences.
- ANSI/NETA Maintenance Testing Specifications 2011, Appendix B specifies annual visual and mechanical testing and biannual electrical testing of switchgear and switchboard assemblies.
- NFPA 70E 2012 Section 205.4 requires that overcurrent protective devices be maintained per manufacturer's instructions or industry consensus standards, and that all maintenance be documented.

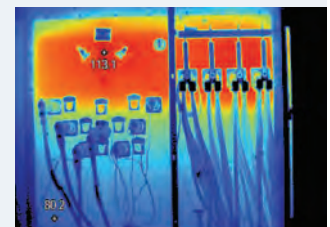
2. Energized maintenance is not enough.

Visual inspection, infrared thermography, ultrasonic tests—these are all valuable and valid, but can go only so far. Exclusive reliance on energized maintenance can miss critical issues, for example:

- The primary cause of electric distribution bus failures—neglecting to re-torque connections every year.



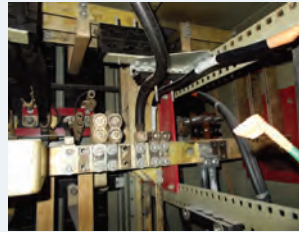
- Oil that was not refilled after samples were taken for transformer tests.



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- Systems that are not loaded heavily enough during IR inspections. This can lead to good IR testing results but failure of de-energized tests. A number of these lightly loaded connections that were inspected during a recent IR, were then found to be loose during a later de-energized service.



3. NFPA 70E guidelines assume regular de-energized testing.

Been thinking that once you perform an arc flash analysis you're done? In fact, starting down the arc flash path means traveling the de-energized testing and maintenance path as well. If you are not maintaining your equipment, the analysis becomes invalid. And having no ongoing plan wastes your substantial investment in arc flash and increases your liability.

Protect your arc flash investment:

- Remember that NFPA 70E (arc flash) assumes properly functioning equipment.
- Tighten bus connections annually.
- Maintain molded case breakers follow a regular schedule, available on our website.

4. Maintenance keeps equipment working.

Without maintenance, it is a matter of when, not if, your system stops working as intended—or at all. Stuck bolted pressure switches (notorious for malfunctioning), inoperable GFI “protection,” phase imbalances, and transformers low on oil—each of these alone represents a potential disaster, and a poorly maintained system may well have more than one such problem.

Find potential costly failures before they find you!

Often, replacements for failed equipment must be special-ordered, adding lengthy down time to high monetary cost. Yet the down time for de-energized maintenance can be minimal to none since it is usually done on the weekend or off-shift. NPFA 70B Standard for Maintenance of Electrical Equipment can help you with the types and frequencies of maintenance you should consider.

About unmaintained equipment:

- Lubricant in most unoperated equipment turns to “glue” in 5 to 10 years.
- Circuit breakers malfunction—30% after 3 to 5 years of service, 50% after 7 to 10 years and 90% after 17 to 20 years. (according to a major petrochemical company study)

- If you have one of these—we need to talk. Bolted pressure switches have one of the highest failure rates of equipment we see. They are everywhere and regularly have problems with incomplete opening or closing.



5. A basic program is very cost effective.

A typical Saturday service, costing about \$3,500 to \$10,000, can give you 1 to 3 years of peace of mind. In most cases, a basic service means a single Saturday shutdown. Of course, pricing and time between services depends on such variables as the amount and types of your equipment, its initial condition and active duty, and the scope of work required.

About basic service:

- Typically, a basic service includes:
 - visual inspection
 - cleaning, lubrication and adjustment of mechanical components
 - insulation resistance testing
 - contact resistance testing
 - primary injection testing
 - transformer turns ratio testing
 - transformer oil testing
- Inspecting and testing the main switchgear offers the biggest value for money spent.
- It is generally more cost effective to replace molded case breakers under 225 amps than to test them.

Please see our website for more information on De-Energized Maintenance and other subjects to help you keep your system up and running well.

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