

## Solution Spotlight: Circuit Breaker Replacement & Retrofilling For Industrial Facilities

Written by Jane Alexander with Joseph Weigel Square D Services Schneider Electric  
Tuesday, 01 May 2007 00:00

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Electrical distribution is pretty simple in an industrial facility, at least for those who aren't involved in MRO activities. As long as the lights are on and machinery is humming, everyone is generally happy. On the other hand, if the constant flow of electricity is interrupted for an extended period, it could lead to grave consequences like missed deadlines, lost sales and a tarnished reputation.



Circuit breakers are the linchpin of a facility's electrical distribution system, so it's probably not surprising that several warning signs of an aging system relate to these devices. That includes a steadily increasing amount of breaker nuisance tripping or failure of a main breaker. When these warning signs occur, it's a message that breakers may need to be upgraded to help the power distribution system meet current and future needs.

### **Replacing and retrofilling**

When an electrical distribution system is new, it doesn't require a great deal of attention outside of routine maintenance. But loads increase over time, through expansion and other factors, and equipment ages, including circuit breakers. Nuisance tripping and minor outages become more common, translating to increased maintenance costs that strain budgets.

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More ominous is the possibility of a massive power outage that could occur at any time. Suddenly, an entire system upgrade—including brand-new equipment purchases, short circuit coordination and revision of the facility's single-line diagram, along with downtime and all the related labor issues—is required, costing thousands of dollars and potentially weeks to complete.

Replacing or retrofilling existing decades-old circuit breakers with the benefits of today's devices can go a long way in modernizing a system and avoiding the problems associated with removing old switchgear and replacing it with new equipment. For example, fused switches and circuit breakers have provided arc flash protection in the past, but breakers have been introduced to the market that provide high interrupting ratings without fuses, up to 200,000A at 508Vac. Such breakers eliminate problems common to fused switches and breakers, including hazards associated with changing fuses and the need to stock/replace fuses, as well as dependence on related mechanical hardware that requires maintenance or replacement. Plus, they are built to trip faster in order to protect both equipment and workers nearby, and typically feature a smaller footprint than fused breakers.

Replacement and retrofilling options don't require a major time commitment, either. For example, replacing a breaker may require a short 15- to 20-minute outage that can be done during off-hours. A retrofill process is a bit more extensive; it might take 8 to 10 hours per breaker section—but, that's certainly more desirable than a complete system upgrade.

Consider the following information as a primer regarding replacement and retrofill processes for LV and MV circuit breakers.

### **Replacement circuit breaker**

A replacement LV or MV power circuit breaker is a new breaker that uses a modern modular drawout assembly, designed and tested to interface with components inside the existing switchgear's breaker compartment. An MV replacement breaker is simply a like-for-like replacement that requires no interface to rack into the existing cubicle. With the LV upgrade option, a new cradle interface is inserted into the existing breaker compartment. The cradle design typically includes a new racking mechanism, safety interlocks, primary and secondary disconnecting devices, truck operated contact (TOC) mechanisms, a new breaker compartment door and other provisions.

A replacement LV or MV power circuit breaker matches the original breaker in form, fit and

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function and is designed and tested in accordance with ANSI C37.59 and C37.09 standards. Because a number of breakers manufactured more than 50 years ago are still in operation but no longer supported, the replacement breaker provides facilities utilizing older switchgear with a viable alternative for increasing performance and reliability.

Another key benefit of LV breaker replacements is that they allow maintenance personnel to exchange older, existing breakers for one common breaker that is interchangeable throughout a facility's power distribution system. Another advantage is that they allow for equipment upgrades without having to schedule a bus outage.

### **Circuit breaker retrofill**

An LV or MV circuit breaker retrofill entails the replacement of the old breaker and related compartment components, such as the stationary primary and secondary disconnects, cell interlocks and racking mechanisms, with a drawout circuit breaker and cradle of a modern, previously qualified design.

During the retrofill design and installation, the existing switchgear cell is modified and equipped with a new drawout cradle assembly. Significant changes are made to the structural components of the existing circuit breaker compartment as well as to the line and load bus structure and bus bracing. New isolating barriers are installed to conform to the latest electrical switchgear industry standard requirements.

LV or MV circuit breaker retrofills are employed when and where a facility can afford modifications that require extended switchgear shutdown (minimum 8-10 hours). When the available fault current is higher than the withstand capabilities of the existing circuit breaker, a retrofill or replacement can upgrade the capacity of the existing system. In such cases, the entire switchgear bus structure and bus bracing must be evaluated and upgraded, which requires the switchgear to be de-energized during modifications.

### **Heed the warning signs**

Confronted with the warning signs of an aging power distribution system, a maintenance organization should consider commissioning a facilities audit. Such a study includes evaluation of the entire electrical infrastructure, and can indicate if replacement or retrofill options are appropriate or if a more extensive upgrade is recommended.

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The bottom line, however, is to do something if the warning signs are present. Doing nothing runs the risk of extended downtime and higher costs.

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