Circuit breaker advances bring new intelligence to data centers

In recent years, IT professionals and design engineers have fundamentally changed the way they approach data centers. Traditionally, they have pursued expansion, building in more power with more infrastructure, more IT equipment, more control devices and more networking. Data centers became so complex and power so expensive, however, that a shift has been underway toward more compact and efficient systems that can do the same work without sacrificing performance.

Among the top-of-the-list concerns of today's data center owners are reducing, rather than expanding, the space dedicated to power distribution and equipment, as well as increasing automation, cutting down the time required to repair or replace components, and improving power usage effectiveness (PUE).

In addressing this, it makes perfect sense for owners seeking significant savings in space, time and money to look toward their largest systems and investments. For instance, virtualization has made a tremendous difference in the number of racks and servers that must be purchased, maintained and incorporated into the data center. To cut down on huge cooling costs, owners have tried everything from free-air cooling to water-cooled processors and time-shifting to run chillers during cool, lower-priced evenings, creating ice in heat exchangers to cool equipment during the warmer days.

Yet, in the quest for reducing footprints and doing more with less, data centers must go to the next level – not only exploring the large systems but also examining even the smallest elements at every component level to capture every possible gain in efficiency, reliability and functionality. In this process, it is important not to overlook the basic data center building blocks, such as the fundamentally important circuit breaker.

Recent advancements in circuit breakers

As with most other aspects of the data center, innovation has occurred in circuit breaker technology. No longer is the

breaker simply a passive device to protect the data center's electrical system by opening when a short circuit or overload is detected. Today it has evolved into a smart system that both protects electrical circuits and manages power to reduce energy consumption based on the needs of the data center.

The first example of this type of technology is the SACE Emax 2 low-voltage air circuit breaker developed by ABB. It is a power circuit breaker system that exemplifies the type of improved component that is changing conventional thinking. Key advantages of the breaker for data centers are in the following areas:

- **Footprint** – Power circuit breakers allow switchboards to be built as much as 25 percent smaller than conventional switchboards, resulting in greater power density. For example, ILS Electro Mechanical Supplies Ltd. installed 50 power circuit breakers in its data center in Israel and reported footprint savings of 20 percent for the switchboard, providing an additional 15 square meters for IT equipment.
- **Reliability** – Robust design and long-lasting contacts of power circuit breakers improve mean time between failures significantly over standard breakers. In addition, power breakers provide maintenance data, history logs and contact wear indication; and they employ self-diagnostic functions to proactively plan their own maintenance requirements.
- **Serviceability** – Power circuit breakers can significantly reduce data center downtime and mean time to repair, because their modularity makes them simple to replace. All the internal wiring is already in place, and the module drops in with just two screws. Modularity therefore decreases

wiring needs, with up to 25 percent cost savings on copper and a 30 percent time savings for wiring connections.
- **Visibility** – This technology furnishes highly accurate metering of the breaker, integrating a network analyzer into the device and enabling the monitoring of voltage, current and power even from a remote location. Measurements are accurate to within 0.5 percent for voltage, 1 percent for current and 2 percent for power.
- **Connectivity** – Power circuit breakers are designed to be compatible with Ethernet and the new IEC 61850 standard that allows intelligent electronic devices in the electrical network to communicate with each other using multiple protocols for highly advanced performance and control.

A breaker that manages power

Perhaps the most significant advancement for the circuit breaker is in the area of power management. A data center operator can set a peak power limit that must not be exceeded, and power circuit breakers automatically ensure that power is kept below that limit. The power controller within the circuit breaker box will disconnect low-priority devices—such as electric-car charging stations, lighting or refrigeration units—when the consumption limit is approached and then turn these devices back on again once consumption eases. It will even activate generators automatically as necessary to supplement power supplies.

These types of advancements have transformed circuit breakers from passive devices to proactive systems that manage power while consuming less space and budget. They eliminate handshaking devices by integrating multiple functions in a single module, significantly reducing potential points of failure. They use less energy to carry out more functions, the ideal for data center managers.

"This technology is a new pacesetter in helping create a more efficient and more automated infrastructure in today's data centers," observes Alberto Pagano, Segmentation Manager for ABB's Breakers and Switches Business Unit. "Power circuit breakers lower energy waste; improve efficiency; and measure, analyze, and share information, providing intelligence and control. Circuit breakers switch power. This new technology manages it."

Read more about power circuit breakers at this link.

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