Power Control

Power Control Systems from a Bus Bar Point-of-View

Today's bus bars are multi-conductor devices engineered to take factors into account sometimes overlooked when using cables.

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For years, distribution of primary power in industrial systems has been by one of two means: power cables or bus bars. Typical power strategies would usually involve routing from power supplies to the various use points, making bolted connections along the way to circuit breakers, fuses, or shunts until terminating at use points. Today, integrated packages, known as Power Control Systems, are becoming common solutions in many industries. The telecommunications industry, for example, currently has several safety engineered Power Control Systems currently in use.

Our lifestyle today relies heavily upon high current to power the vast network of equipment and conveniences we enjoy. The explosive growth of cellular communications and Internet use is quite evident throughout the world. However, what is seen on the surface as expanding capacity at lower costs looks quite different when examined more closely. The infrastructure necessary to power and to support this growth in communication is formidable. It is so from several viewpoints: the technology to reliably improve processing and handling times; the demand for and ability to handle voice and Internet communications simultaneously; and the need to package this technology economically to bring quality products to market in record time. The communications industry is responding to these challenges with a continuing array of development, all of which need power.

The hardware used in modern telecommunication infrastructure (base stations, routers and switches) is large and technically complex. A typical development process for this type of hardware requires collaboration between the electrical and mechanical disciplines. First, the electrical engineer defines the product, selects and tests the components needed for an application. It then becomes the mechanical engineer's responsibility to fit and connect everything together in a physical package that works. Prior to the role of the packaging engineer as a specific discipline of the design process, power and its distribution would often be left until the end of the process. And even then, packaging was more utilitarian. In other words, power was routed and connected with bus bars or cables to get the job done without much consideration to system efficiency.

Within these enclosures, cable had been the most commonly used and recognized means for power distribution, and it would seem for good reason. Cable has its strengths: it is inexpensive, available and straightforward in its application. Power cable has its weaknesses though: it is bulky and difficult to handle, especially when manipulating it within the tight confines of an enclosure.

Bus bars, on the other hand, are usually thought of to carry bulk power as overhead raceways to power machinery, or as tarnished, bare copper bars located in the rear of large enclosures to connect power supplies and devices. In this context, bus bars suffer from an identity crisis. Today's bus bars are laminated multi-conductor devices engineered to take factors into account sometimes overlooked when using cables. Factors such as air flow, heat dissipation, space utilization and interconnection with other components. It is this interconnection, or integration with other components, that leads us into Power Control Systems.

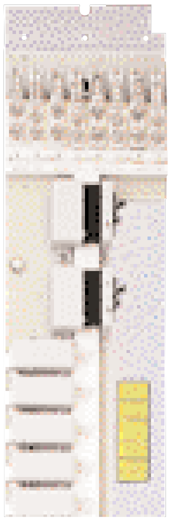

Figure 1. Low-profile, laminated bus bar that hugs the inside of a tall enclosure becomes a Power Control System through the inclusion of circuit breakers, fuses and individual output connection points spread out along its length (safety covers removed for clarity).

Today, infrastructure hardware comes in all sorts of sizes shapes, and power ratings. Most prevalent today are the aforementioned telecommunication systems. These enclosures and others like them require distribution feeds from power supplies to

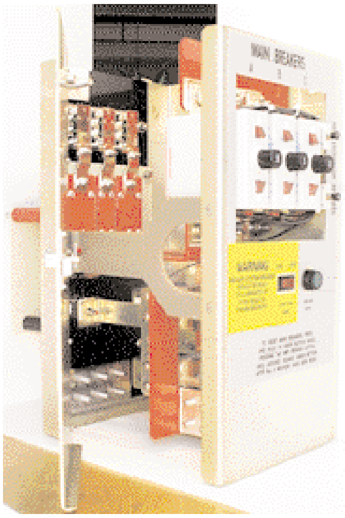

Figure 2. Self-contained Power Control System is housed in an aluminum enclosure, complete with latched door.

be sorted, filtered and routed to multiple locations, and done so with a degree of simplicity and reliability. These examples of different strategies employed for typical 48 V telecommunication systems demonstrate the versatility and characteristics available to the power packaging engineer.

Frontrunners

Early Power Distribution Assemblies contained both wire and cable, snaking their way throughout large enclosures. These same wires and cables would meet up with breakers in often random locations, then continue to ramble along their way to terminal blocks, where smaller gauge wires would branch out to amplifiers and other power related components. DC circuit breakers are the most noticeable component, but there are a number of other "behind the scenes" devices such as electrolytic capacitors, transient voltage suppressors, contactors, EMI/RFI filters, hot-plug interconnects and gaskets that make integration of these components into an outsourced unified, tested system very desirable.

Fuse drawers and fuse panels, designed and developed to centralize these power related components, proved to be a big plus in system design. The idea was good, but homemade packages did not take advantage of the expertise available from outside power specialists. Eldre Corp. has successfully combined power distribution and interconnect expertise with system integration to create custom designed systems. Power Control Systems provide complete, safety engineered solutions allowing for a "plug'n'play" environment for their installation into enclosures.

Safety Engineered Solutions

The concept of complete power control systems provides for three basic styles: vertical mount, rack mount and fuse box style.

The vertical mount system is designed to maintain a low-profile within a given enclosure, and provides pluggable power connections along its length. Note that the power inputs (see Figure 1) provide for four independent circuits. These circuits each run through their own circuit breaker, then extend downward to multiple, fused outputs. The design strategy was to provide for a low-profile feed along the inside of an enclosure, and to offer four different output power options in a repeating fashion along its entire length. This design can easily be reversed to accept power inputs from the bottom rather than the top.

The fuse-box style power control system (see Figure 2) can be thought of as a DC equivalent of a common circuit breaker box found in any home. This particular system is designed to monitor and manage rectified DC power and to route battery back-up power, as needed, in the event of a power outage. The enclosure includes large contactors capable of handling 450 A.

Optionally, Power Control Systems can be configured as a rack mount system. They can accommodate all of the features as the other two styles, custom made for a 2U, 3U height, or greater, as needed. These sophisticated systems include capacitors, contactors, voltage suppressors, breakers, and sense circuitry, providing complete power control in one efficient package.

Quality Power Management

Due to the upfront collaboration between Eldre and OEM engineers during the design phase of these Power Control Systems, OEM manufacturers and their related assembly houses benefit greatly from these production engineered, custom solutions. They represent quality built, serialized and certified products shipped directly to the assembly floor thereby reducing assembly times, as well as improving overall product quality.

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