Integrated Power Management in Commercial and Industrial Spaces

Introduction

Power monitoring in commercial spaces began as a manual process. Each electrical panel in a large building was equipped with a power meter, and an employee was tasked with checking these meters and entering the data into a spreadsheet. This system was prone to numerous errors and inefficiencies. However, advances in metering technology have allowed this process to become automated. Meters installed throughout a large commercial or industrial building space can be networked together and linked to a central building control and data storage system, creating a "smart" building. Power usage is monitored from a whole-building perspective, and better decisions are made regarding efficient energy management and cost-effective practices.

Power Monitoring Applications

Numerous monitoring options are available to the creative building owner. The building's needs and functions must be carefully evaluated to make the best choices of meter or combination of meters.

Cost Allocation. Energy consumption throughout a large space is never uniform. Some areas, like warehouses, use little energy per square foot, while offices and retail spaces use larger amounts. Manufacturing areas and datacenter rooms generally consume the most energy per square foot in any commercial space. Power use in different areas of a building are accurately calculated using a meter that measures power at the branch level.

Branch level metering also allows accurate tenant sub-metering. By measuring energy consumption in each tenant's portion of a shared commercial space, a power bill from the utility company is fairly divided.

Infrastructure Maintenance and Improvements. Accurate metering pinpoints areas or equipment that are in need of upgrades or repairs. Monthly energy consumption is compared to baseline consumption data. A sudden spike in a heating bill, for example, can indicate a faulty thermostat or a leak in the building envelope. An increase in the power drawn by a motor is a sign of wear and can help to predict equipment failures, reducing costly downtime. Lighting loads can be reduced by upgrading hardware, and datacenter energy efficiency can be increased by monitoring and optimizing the cooling units used in server rooms.

Power Factor. Power factor is the ratio of real power to apparent power. A circuit with a low power factor draws more current to move a given amount of power than a circuit with a high power factor, which results in a loss of useful energy. Because of this waste, utility companies often charge more for power drawn by circuits with a low power factor. Equipment with inductive loads, such as electric motors, lamp ballasts, induction heaters, and transformers, often have low power factors. A meter capable of quantifying the power factor will pinpoint these circuits, offering the opportunity to balance loads, reduce waste, and lower costs.

Bidirectional Monitoring. Buildings with renewable power capabilities, such as a building equipped with solar panels, are usually still connected to a main power grid. When the electricity produced on-site is insufficient for the building's needs, power is drawn from the utility. When the electricity produced exceeds the building requirements, the excess power is sent into the grid. A bidirectional meter measures the power drawn in both directions so that the costs to and credits from the utility company are calculated accurately.

Network Integration

Once the right meters have been installed throughout a commercial or industrial space, they can be linked to a single control system, creating a smart building. Building operators then have easy access to all power information, enabling better decision-making. Using a holistic approach, energy management practices are improved building-wide, increasing efficiency and lowering costs. Several networking options exist to accomodate any power monitoring applications in place.

Data Acquisition Systems. Storage of energy monitoring data is important in trending applications. A datalogging and data acquisition system equipped with non-volatile memory stores energy data for 30 days and retains this information for up to ten years without risk of loss. Data acquisition devices also connect to building control systems, making energy data accessible to facility administrators. Many data acquisition devices feature a display screen for easy readability.

Wireless Networking Devices. In a large space, networking numerous meters to the central control system is labor intensive. But a wireless data transmitter links meters to the controller without costly wiring. The transmission distance for these devices is known, so a facility administrator places transceivers at intervals between power meters and the control system. The energy data then "hops" from one transceiver to the next.

Pulse/Analog-to-Modbus Converters. Many building sensors, such as environmental sensors, water meters, and gas meters, have a simple pulse or analog output. To integrate these outputs into the overall energy management network, facility administrators employ a device that converts the pulse or analog output to a Modbus signal. This output works seamlessly with the Modbus signals from energy monitoring devices. This signal conversion allows full integration of all building sensors.

Demand Response. Many utility companies provide their customers with peak time and pricing information. During peak usage times, electricity rates are highest. Using integrated power monitors, a building owner tracks areas of a building or even individual pieces of equipment that consume large amounts of energy and arranges to perform these tasks during off-peak hours, when prices are cheaper.

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Critical Power. In many applications , power quality is less of a concern than the need for a constant, reliable power supply. These applications include datacenters, hospitals, financial institutions, e-commerce businesses, large-scale manufacturing centers, public safety agencies, and scientific research facilities. In any of these services, a few seconds of downtime causes huge financial loss and even real, physical risks to human life and health. Networked multi-circuit monitors continually watch incoming voltage from the power grid, generating immediate alarms if the voltage drops. This alarm allows facility administrators to compensate by quickly switching to some form of backup power. In a fully automated building, this switch happens even faster by programming critical thresholds into the building control system.

Conclusion

Power and networking devices work together to generate a complete, real-time picture of a building's energy consumption patterns. This data is more reliable, more accurate, and less labor-intensive than older, manual practices. Since cutting costs and increasing efficiency are priorities for any building owner, the advantages of this holistic approach are clear.

A Fully Integrated Smart Building