

Green Electrical Upgrades Reduce Industrial Facility Operating and Maintenance Costs

This guide is designed to help stimulate the planning of energy-efficient electrical solutions between plant MRO personnel, electrical specifiers, contractors, owners, builders, manufacturers' sales representatives, and NAED member distributors.

The industrial market is ripe for green electrical upgrades

Improvements in industrial sector energy efficiency are generally driven by retrofit equipment replacement, operational or maintenance improvements, or new innovative process or production technologies. Because of ever-increasing energy costs, greater energy-efficiency has become a primary focus of plant MRO managers and maintenance engineers.

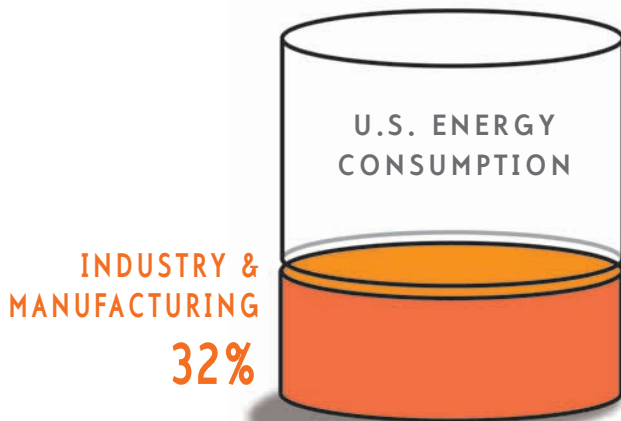
Heavy demand for green electrical products

With an ever-growing list of energy-efficient products available, the electrical industry is well-positioned to play a central role in reducing the energy costs for all industrial manufacturing and processing plants, warehouses, utilities, and other operations. From refineries to mines to automotive assembly and food processing facilities, professionals skillful in adopting new Green Electrical solutions will be positioned to prosper.

Industrial sector is slow to LEED®

There are many opportunities for initiating green industrial upgrades in industrial plants and facilities of all types and sizes. However, the vast majority of green electrical solutions which impact the industrial sector tend to do so in process-specific, or functional equipment areas, rather than as an integrated whole-building solution which is more common in the commercial market.

The United States Green Building Council (USGBC) developed the Leadership in Energy and Environmental Design, or LEED rating system, as a way to insure that green buildings meet certain objectives, including energy efficiency. But despite the fact that the percentage of LEED-rated green U.S. buildings is growing at about 150 percent per year, currently less than 10% of this total are industrial facilities.



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Energy Efficiency Reduces Facility Operational Costs

Reducing electrical consumption is one of the central goals for green industrial retrofit upgrades during maintenance or repair, or for new construction. Currently available green electrical equipment can reduce electrical consumption by as much as 50% for many industrial operations.

Each year a significant percentage of plant motors, power quality systems, lighting systems, automation systems, variable frequency drives, PLCs, and communication systems reach the end of their life cycle and are upgraded. In most cases a more energy-efficient, green electrical industrial upgrade can be selected to replace older, less efficient products.

Today's rising energy costs generate much faster payback periods, a critical issue with plant MRO managers that makes it far easier to substantiate investing in green electrical solutions.



NEMA Premium motors and VFD motor controls

- Industrial motors consume more than 60% of all industrial electricity.
- Motors run fans, pumps, air compressors, conveyors, and HVAC cooling.
- NEMA Premium® motors can save up to 18% on electricity.
- Variable Frequency Drives (VFDs) or Adjustable Speed Drives (ASDs) better control the operation of pumps and fans, moderating flow according to usage. This results in increased energy efficiency and dramatically reduced consumption.
- VFDs/ASDs can reduce a motor's electrical current draw by 10% to 50%.

NEMA TP-1 transformers and reduced-voltage starters

- NEMA TP-1 transformers reduce operating costs with a typical payback period of 1.5 to 3.5 years.
- Solid-state, reduced-voltage starters lower peak starting current as much as 50%.

Energy-efficient switchgear, integrated panelboards, power supplies, and UPS

- New power distribution / conditioning equipment reduces energy consumption and extends equipment life.

Energy-efficient lighting, T8/T5 lamp fixtures, lighting controls, occupancy sensors, dimmers, and CFLs and LEDs

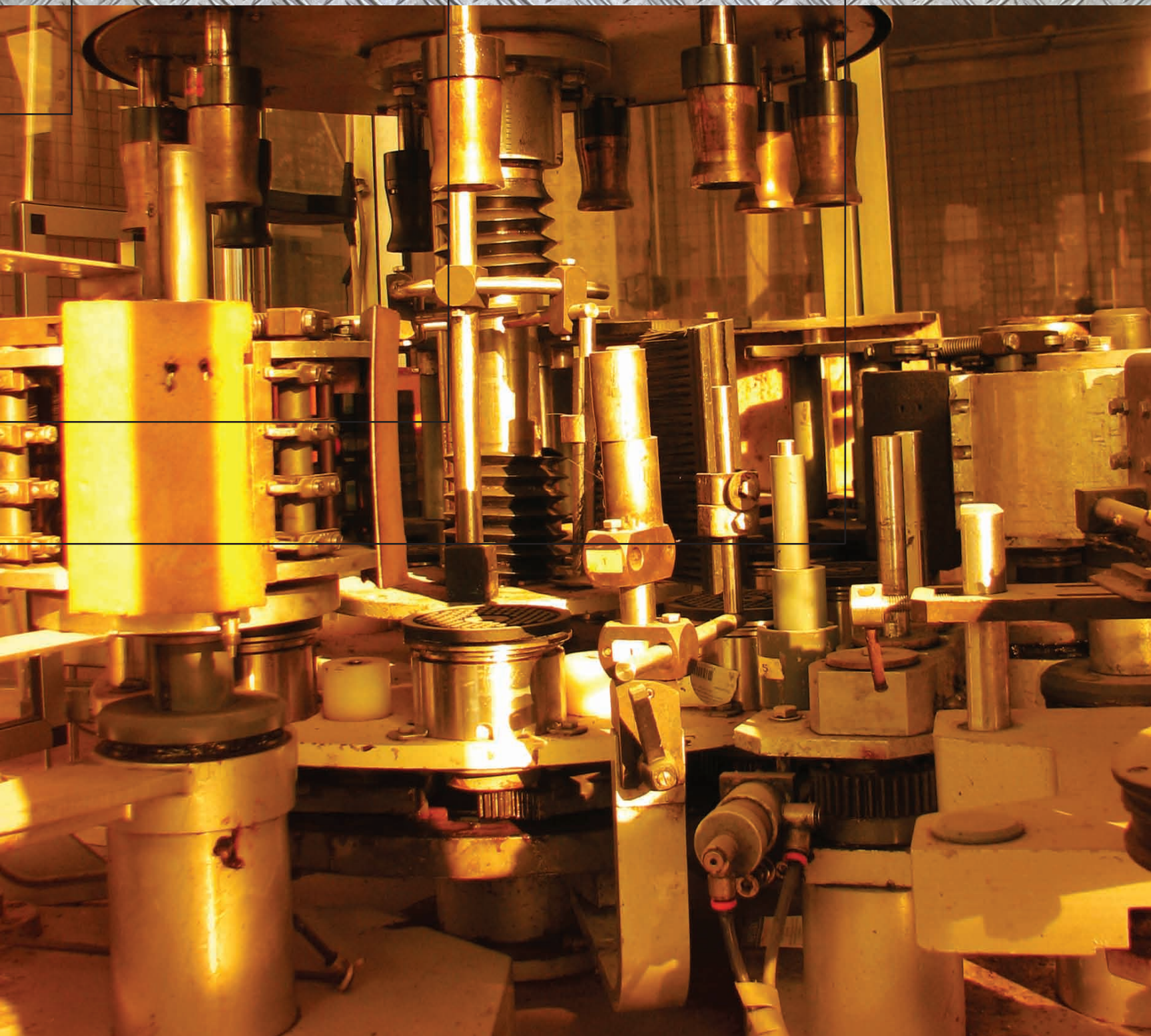
- Lighting alone accounts for nearly 40% of warehouse energy use.
- Vastly improved lighting ballasts, luminaires, and lamps are far more energy-efficient than older systems.
- LED technology is highly energy-efficient and is growing in use.

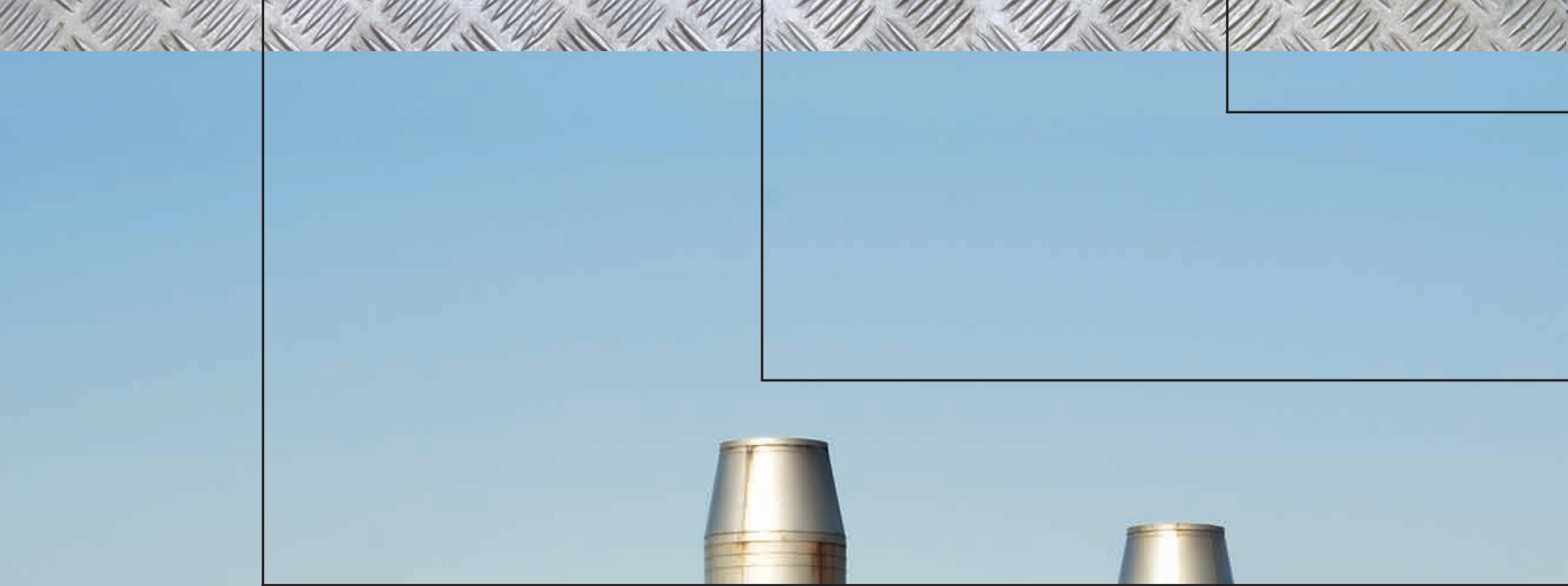
Power factor correction capacitors

- Capacitors increase the power factor available to run industrial equipment and lower plant electrical costs by increasing the connected load by as much as 20% without increasing the size of transformers, conductors, and protective devices.

Electrical generation and solar power systems

- Power generation includes wind turbines, photovoltaic solar-powered panels, and stand-alone photovoltaic (PV) systems.







Energy-Saving Industrial Power Distribution Solutions

Green Electrical power distribution for industrial facilities emphasizes the use of highly sophisticated integrated systems that combine energy-efficient power handling control with advanced Ethernet/IP-based or wireless energy monitoring and controls that provide plant managers with a level of detailed energy data previously unavailable. Other green electrical solutions, including paralleling switchgear, busway, capacitors and filters, and UPS systems, are engineered to reduce energy loss and consumption and extend equipment life.

Power & energy management systems

- Poor quality power reduces productivity, shortens equipment life and erodes profits.
- A power management system provides critical information needed to implement and verify energy-saving initiatives.
- Systems use hardware and software to analyze, store, and share real time energy data through a standard Web browser.
- Systems enable facility owners to renegotiate lower electrical rates, prevent costly power quality problems, correct power delivery issues, and control demand to avoid rate penalties.

Integrated panelboards and integrated switchboards

- Innovative industrial panelboards/switchboards integrate multiple functions within a single pre-wired enclosure.
- Systems may include breakers and bus, sub-metering, lighting control, and energy monitoring equipment all 'bundled' together to control energy costs.

Paralleling switchgear

- Paralleling switchgear manage the transition from utility power to on-site power sources and make practical the use of Combined Heat and Power (CHP) systems using wasted heat energy.

Power factor correction capacitors and filters

- Capacitors and filters lower energy costs by supplying power to loads such as HVAC and elevators upon demand decreasing energy consumption and reducing energy loss.

Uninterruptible Power Systems (UPS)

- Higher efficiency UPSs result in 50% less power loss while reducing overall energy costs.

Busway / Power bus

- Factory pre-wired busway or power bus reduces power loss.
- Power is easily distributed precisely to the required location.
- Busway or powerbus is easily moved and reassembled in new location.

Submetering and monitoring systems

- Electrical submetering/monitoring of energy usage by system, process, or plant supports billing and budgeting.
- Systems are used to track energy consumption of a specific system or function for data acquisition for use in energy cost reduction efforts.

Lighting & Lighting Controls Lower Operational Costs

Lighting is an obvious target for green electrical industrial upgrades. Plant owners and MRO managers need energy-efficient lighting systems and controls to directly reduce their bottom line operational costs. Demand for energy-efficient, performance-driven lighting products that integrate dimming or bi-level switching continues to grow.

- Incandescent lighting uses < 10% of input energy to produce light wasting 90%.
- High output fluorescent products are replacing retrofit lighting systems in factories, processing plants, and warehouses.

Intelligent lighting control systems and lighting controls

- Legislation, including California's Title 21, EPA Act, and ASHRAE/IESNA Standard 90.1-2004, has made energy-efficient lighting control systems central to energy reduction and cost savings. Lighting control systems are scalable to handle facilities of virtually any size or complexity.
- Centralized lighting control systems provide precise control over switching, dimming, energy management, daylighting, and window shade control.
- Fluorescent high-bay luminaires provide up to 70% energy savings in retrofit H.I.D. applications.
- New 150w T5 high bay fluorescent lighting fixtures reduce energy costs by up to 60% compared to metal halide industrial lights.
- High performance T8 or T5 fluorescent lighting systems deliver energy savings of 20% over traditional 3-lamp T8 Parabolic luminaires.
- T5 fluorescent lamps are available as plastic-coated shatter-proof safety lamps.

Electronic dimming ballasts and timeclocks

- Dimming ballasts cost more than non-dimming ballasts, but quickly pay for themselves by reducing energy use and operating costs.

Compact Fluorescent Lights (CFL) lamps

- Screw-in CFLs save as much as 80% in energy costs.
- CFLs last 10 times longer than standard incandescent lamps.

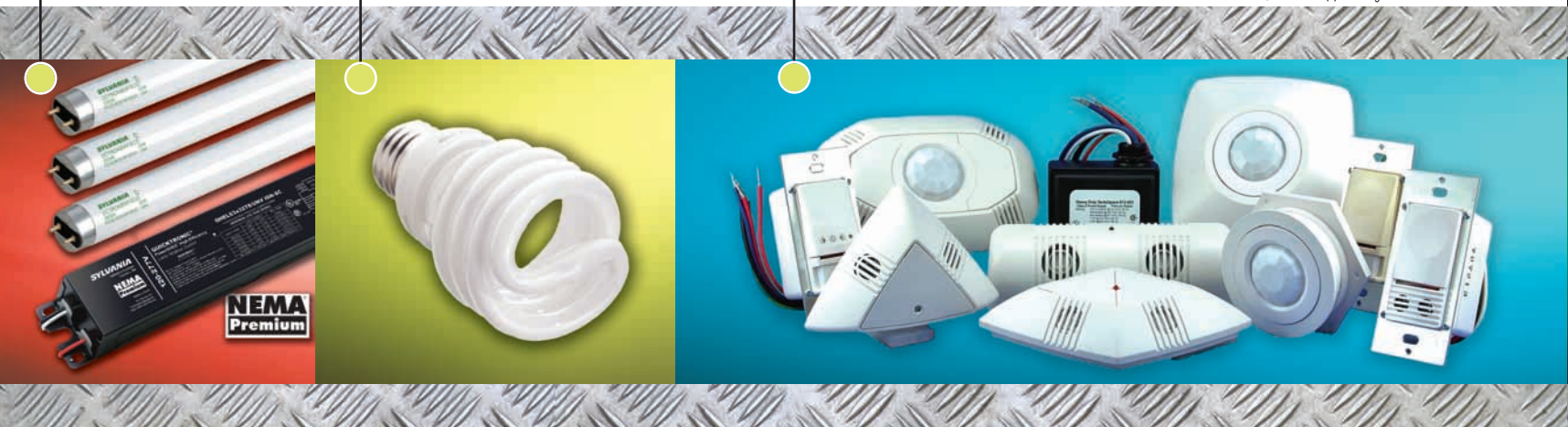
Dimmers, occupancy sensors, timeclocks and photocontrols

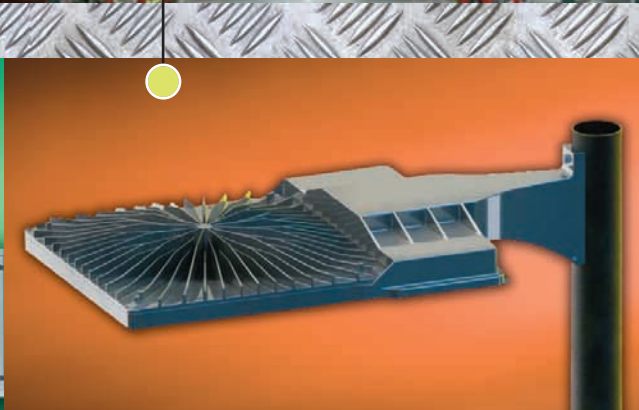
- Dimming lights by 25% saves 20% in electricity while extending bulb life by years.
- Occupancy sensors deliver energy savings of >50% in a meeting rooms, 28% in an office.

Light Emitting Diode (LED) lamps and LED exit/emergency lights

- LEDs provide improved brightness.
- Purchase price is recouped as LEDs last 10 times longer than CFLs and 133 times longer than standard incandescent lamps, reducing maintenance costs.

Photo to the right courtesy of Cooper Lighting. Below from left to right, photos courtesy of: Osram Sylvania, GE Consumer & Industrial, Cooper Controls, Hubbell Building Automation, Watt Stopper/Legrand





Energy-Efficient Automation, Control & Communications Systems Save Money

According to Tom Meyer, executive director for Green Mechanical Council, a non-profit organization that supports green sustainable construction, "Energy costs have created a requirement for energy management systems and software in commercial buildings whether new design or retrofit."

Automated power management systems

In large facilities, campus settings, and multi-location plants, an automated power management system can provide an invaluable and labor-saving way to visualize and manage an overall operation.

- Power management systems determine ways to conserve power, control escalating energy bills, allocate energy costs, and reduce maintenance/repair costs.
- Systems identify poor power quality, correct billing errors, and reduce peak usage surcharges.
- Web-based network control centers optimize facility energy usage by better managing the electrical loads.
- Customers achieve competitive advantage through operating cost efficiencies gained from reducing energy consumption and extending equipment life.
- Systems integrate operational and energy data from large functional groups, such as metering, power quality, equipment diagnostics, alarming, analysis, and cost allocation.

Diagnostics monitoring systems

- 50% of all downtime causing plant equipment failures involve pumps, motors, compressors, and turbines.
- Predictive diagnostics field device monitoring products help MRO managers troubleshoot and manage maintenance.
- Diagnostics metering hardware/software helps reduce plant operational and maintenance costs.
- Systems can indicate areas that will most benefit from energy-efficient upgrades and scheduled preventive maintenance.

Wireless plant control systems and Power over Ethernet (PoE)

- Wireless plant control systems and PoE connect building, systems, and machine controls.
- PoE supports controls and diagnostics.
- The need for additional cabling/cable management infrastructure is reduced.

Fiber optic cables and cable with flame retardant insulation

The smaller outer diameter of fiber optic cables reduces the need for installing additional conduit or cable tray. New cable and wire products with low-smoke producing insulating jackets produce far less deadly smoke in case of fire.

From left to right, photos courtesy of: Phoenix Contact, Phoenix Contact, Schneider Electric/Square D

