CONQUERING ELECTRICAL POWER MANAGEMENT, CONTROL AND PROTECTION PROBLEMS WORLDWIDE

Woodward’s solid reputation for providing systems and components that increase the reliability and performance of engine, turbine, and switchgear equipment is well known throughout the power, transportation, and process markets. Major power equipment OEMs worldwide rely on Woodward control systems to keep their equipment operating dependably and efficiently, as do many wind turbine OEMs using Woodward power conversion technologies.

“Our company’s growth is driven by providing technologies to our OEM customers that help them meet tough energy control challenges,” says Chad Preiss, president of Woodward’s engine systems group. “These include the demand for increased energy independence and reliable utilization of renewable energy sources, improving fuel efficiency and emissions, and increasing the connectivity of local and regional control networks.”

Woodward solutions are based on four core control technologies – flow, combustion, actuation, and electrical – that are adapted to meet OEM needs. The company’s electronic controls and software technologies are at the core of delivering power system performance, dependability, safety and connectivity. Efficient electrical converter systems enable the integration of wind power and other renewable energy sources into electric power grids worldwide.

To support the application of these products and technologies, Woodward locations throughout the world respond quickly with solutions tailored to the local demands of our customers.

One such team helped a Brazilian independent power producer set up one of the world’s largest generating set installations. The power plant combines over 500 generating sets to supply a total output of 237 MW of standby power to the national grid in Brazil. The supplier of this power system says this was a cost-effective solution for standby/peak shaving applications for the Brazilian power market. These cost savings are gained through the innovative use of highly efficient diesel engines as the main source of power.

The generating sets operate at 440 V and step up to 34.5 kV transformers, which again step up to the 230 kV transmission grid line. A single plant operator remotely controls each plant via a state-of-the-art SCADA system. This advanced control system dispatches and regulates power from the generating sets as required, allowing the operator to simply input the necessary plant output.

“Our easYgen™ 3200 generator system controllers play a big part in remotely controlling the power plant,” says Clemens Grosskinsky, Woodward sales director. “With the easYgen control, the gensets can be started, synchronized, and load shared remotely and reliably. Remotely controlling the entire operation provides tremendous savings in operating and maintenance costs over the lifetime of the power plant.”
Woodward has a long track record in providing reliable power generation and distribution controls for applications such as standby power in data centers, hospitals, airports and other locations that have a critical need for reliable power. Woodward controls detect the loss of the primary utility source, start the gensets, provide automatic synchronization, and share loads in standby power generation systems.

“The maze of busses and breakers at one particular data center was formidable,” says Dennis Pearson, Woodward account manager. Issues arose at this site because multiple utility feeds supply a complex, redundant internal bus structure. Each of these busses may have their own standby gensets or a central group of gensets that can feed any of the redundant internal busses.

“On each bus segment we had to manage synchronization and load sharing while providing information to the overall control system,” says Pearson. “Our easYgen-3500 genset controller and the LS-5 circuit breaker controllers were ideal solutions for this application. The easYgen 3000 series of products efficiently manage complex paralleling applications by reducing the number of devices needed and therefore the overall cost.”

The data center’s standby power system is monitored and controlled by a centralized SCADA system that communicates with and directs the actions of the easYgen and LS-5 controls. These controls communicate over a separate peer-to-peer CAN network for synchronization and isochronous load sharing. A measure of redundancy is obtained in that if the CAN communications link is lost, the easYgen controls keeps the gensets online and the system stable by automatically reverting to droop load sharing operation until the issue is resolved.

“When you’re dealing with synchronization and load sharing issues, Woodward has a solution for just about any problem,” says Pearson.

Woodward’s easYgen generator system controller also solved a hospital’s growing pains when the facility’s expansion necessitated an increase in standby power capacity. As hospitals expand, they typically add more generating capacity and expand the distribution network.

“The hospital needed to tie additional gensets together with existing units, and still meet a requirement to supply emergency power within 10 seconds of an outage,” says Paul Wilhelm, Woodward account manager. “Starting, synchronizing, and paralleling several large gensets within 10 seconds can certainly be a challenge. But, with the easYgen control, we’re able to provide a ‘run-up’ synchronization feature to parallel multiple units quickly.”

With “run-up” synchronization enabled, all the easYgen controls close their generator breaker and simultaneously begin ramping the generator’s voltage regulators while the engines are still ramping up to rated speed. The generators are “pulled” into synchronization rather than having a lead genset close to the dead bus and wait for the others to synchronize to it. This method allows the gensets to start, synchronize, and pick up critical loads within 10 seconds.

Woodward systems are often used in combined heat and power applications. One of the United States’ largest craft brewers uses a hugely successful combined heat and power (CHP) system that was achieved through its partnership with Woodward.

“The brewery has a cogeneration system that creates electricity on-site from their process waste,” explains John Felts, Woodward senior applications engineer. “Their original system was difficult to operate and had problems synchronizing to the utility. And the engine had gone through two costly rebuilds due to damage from detonation.”

Equipped with a Woodward E3 fuel blending system (upper left), IC-922 ignition system, ProAct throttle, Deltec mixer, and an easYgen 3100 generator system controller, the combined heat and power system (CHP) at a large craft brewer produces electricity and process hot water by recovering and burning methane from the brewery’s waste stream.
Woodward redesigned the engine and generator control system to increase reliability, enhance engine protection, and deliver cleaner emissions.

“Because the brewery’s CHP system runs on biogas from their digester, we knew that one of our E³ gas engine control systems was needed,” says Felts. “We chose the E³ Full-Authority Lean Burn system for its ability to handle wide changes in the digester gas’s composition, while controlling engine exhaust emissions, improving efficiency, and preventing detonation.”

Woodward’s easYgen generator system controller works together with the E³ gas engine control system to start and stop the system, synchronize and share gen-set loading, control breaker operation, and monitor for system faults.

In addition to the E³ gas engine control system and the easYgen controller, the Woodward system includes a TecJet™ gas flow metering valve, an IC-920 high-energy ignition control to provide ignition energy, a detonation detection control to reduce knock, a Flo-Tech™ integrated throttle, and a Deltec gaseous fuel mixer to mix fuel and air.

The results have been impressive. The brewery’s upgraded cogen system has run for more than four years with over 98% availability, running approximately 16 hours per day, 7 days a week.

In the past 18 months brewery production has almost doubled and a second cogeneration unit was added — this time with a Woodward E³ gas engine fuel blending system that can use digester gas and pipeline-quality natural gas at the same time, adjusting between the two in any proportion on the fly. The brewery has achieved the efficient disposal of its brewery waste stream, 100% on-site production of hot water for its production processes, and a 15% increase of on-site power generation — all accomplished with exceptional reliability and availability while staying in emissions compliance.

“We continually develop new products to meet new needs around the world,” says Renato Meola, Woodward marketing director. “When new requirements were recently added to European grid code interconnection requirements, we were ready for them with our High-PROTEC® protection relays. Additionally, these products use intuitive and consistent device menus through the entire product series, which facilitates system commissioning and operation.”

The new interconnection requirements were developed to address the increasing share of renewable energy sources connecting to the European network. Part of these codes requires a low-voltage ride-through response to short-duration problems on the grid. Woodward’s HighPROTEC protection relays have the flexibility to meet these new requirements and help keep the generator online when under-voltage faults occur. The MCDGV4 generator differential protection relay, part of the High-PROTEC family, is highly adaptable to these renewables interconnection requirements.

“We welcome the challenges presented in today’s complex management of energy. Our customers rely on our experience and dedication in providing them with innovative solutions to control and protect their equipment, and we intend to honor that responsibility for a very long time,” concludes Chad Preiss.
GLOBAL SUPPORT

Woodward’s global support network and our partners provide an extensive range of technical and after-sales support services. This global presence allows us to respond quickly to the needs of our customers anywhere in the world. In today’s complex control world, customers have come to recognize our people’s expertise beyond the control system and depend on our global teams as critical plant support assets.

WOODWARD, INC.

Americas | Asia | Europe | Middle East
For location information, visit us at: www.woodward.com/locations

DISTRIBUTORS & SERVICE

Woodward has an international network of distributors and service facilities. For distributor information, visit us at: www.woodward.com/directory

www.woodward.com