Making Power Protection Smarter and Greener

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Clean, uninterrupted power is the goal of every facility, data center manager and executive overseeing continuous business operations and processes. With brownouts and blackouts occurring more often than ever, businesses need critical power protection. According to the Electrical Power Research Institute (EPRI), power disturbances cost U.S. industry as much as $188 billion per year in lost data, material and productivity. In order to minimize these losses, annual spending on backup power systems exceeds $5 billion worldwide, according to industry analysts at the Darnell Group.

Traditionally, these systems include uninterruptible power systems (UPSs) with valve-regulated lead acid (VRLA) batteries to provide energy during short-term power disturbances, diesel generators (gensets) for longer-term outages, and control electronics to bridge the two. However,flywheels and battery/flywheel combinations are common purchases among facility mangers and data center managers looking to enact to sustainability initiatives and reduce total cost of ownership (TCO) expenses, while still maintaining high 9s of availability.

Flywheel Basics

A flywheel system works like a dynamic battery that stores energy kinetically by spinning a mass around an axis. Electrical input spins the flywheel rotor up to speed, and a standby charge keeps it spinning 24/7 until called upon to release the stored energy. The amount of energy available and its duration is proportional to its mass and the square of its revolution speed. In the flywheel world, doubling mass doubles energy capacity, but doubling rotational speed quadruples energy capacity.

During a power event, the flywheel will provide backup power seamlessly and instantaneously. It’s important to know that EPRI’s research shows that 80% of all utility power anomalies/disturbances last less than two seconds and 98 percent last less than 10 seconds. In the real world, the flywheel energy storage system has plenty of time – up to a couple of minutes¬– to gracefully hand-off to the generator.

From 40kVA to multimegawatt, flywheel systems are increasingly being used to assure the highest level of power quality and reliability in a diverse range of applications. The flexibility of these systems allows a variety of configurations that

can be custom-tailored to achieve the exact level of power protection required by the end user based on budget, space available and environmental configurations. In any of these configurations, the user will ultimately benefit from the many unique benefits of flywheel-based systems, including:

- No down time for regular maintenance (no bearings to replace)
- High-power density, small footprint
- Scalable / Parallel capability that allows for future expansion
- Fast recharge (under 150 seconds)
- No special facility requirements
- No special / additional cooling required
- Low maintenance
- 20-year useful life
- Simple installation
- N+1 redundancy options
- Quiet operation
- Wide temperature tolerance

Flywheel implementations comply with the highest international standards for performance and safety, including those from UL and CE. They also incorporate a host of advanced features that users expect to make the systems easy to use.

Best of Both Worlds

Hybrid flywheel/battery UPSs give users who need more backup time the reliability and green aspects of the flywheel system with minutes of extra runtime from the batteries. The flywheel is the first line of defense against power disturbances – saving the batteries for prolonged power outages. By absorbing the power glitches, the flywheel can significantly increase battery life by handling over 98 percent of the discharges that would normally have shortened the battery's useful life.

Because of the extended runtime advantage, the flywheel/battery hybrid gives users further peace of mind for applications including those with automatic transfer switch (ATS) time delays and/or synchronization time requirements for multiple generators. Additionally, for hybrid systems requiring higher power, systems can be paralleled for longer autonomy and/or redundancy.

VYCON's hybrid system connects to the DC bus of a UPS. Receiving charging current from the UPS, the hybrid system provides clean DC power to the UPS during discharge. VYCON's 99.4 percent efficient system includes patented technology consisting of a flywheel hub formed from aerospace-grade steel, a high-speed permanent magnet motor generator, a contact-free magnetic levitation system, and a touch-screen display that provides vital information on system performance. Innovative patented technology enables the flywheel to charge and discharge at very high rates for countless cycles without degradation throughout its 20-year life. Moreover, unlike other flywheels on the market, VYCON flywheels do not require replacement of bearings – saving customers approximately $18,000 per flywheel every few years in maintenance costs and eliminated the 6-8 hrs of downtime per flywheel needed to change out the bearings.

Conclusion

Throughout the U.S. and around the world, data centers, broadcasters, hospitals, casinos, airports, industrial processes, military facilities and other critical applications are introducing clean flywheel energy storage to their UPS systems. Flywheels offer a green choice in protecting critical operations, while providing the industry with a truly reliable DC power solution.

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