

Problem:

If Delta Dental experiences a prolonged power outage, penalties may have to be paid to customers for missing service level agreements.

Solution:

To assure the highest level of power back-up, Christian Briggs, Delta Dental's data center manager, chose two sets of VYCON's clean energy flywheel systems to back up two 500kVA three-phase UPS systems.



Clean Energy Storage Systems are a First Line of Defense Against Power Problems

Delta Dental's Data Center Depends on VYCON's VDC Flywheel System

Delta Dental of Michigan has been passionate about making dental coverage accessible to employers, groups and individuals since the 1950s. In 2008, the enterprise paid out more than \$2.1 billion for dental care for more than 6.6 million enrollees. The computer systems that handle claims processing, email, document storage, records retention and online activities for enrollees, groups, providers, employees and the public, are all handled at the company's new data center. Assuring that all the computer servers stay up and running 24/7 – no matter what – is of the highest priority.

In order to meet its ongoing uptime needs, Delta Dental just put in place a state-of-the-art data center that has earned the distinction of being one of only 19 sites worldwide to earn a Tier III design rating from the Uptime Institute™. The Institute's tier system evaluates data centers based on their ability to remain up and running despite damaging power failures, natural disasters, or other potential power outage challenges.

"If systems were improperly shutdown it could result in corrupt data and other system failures," said Delta Dental's data center manager, Christian Briggs.

Located in Michigan, weather related issues are a concern. Delta Dental engineers and contractors installed tornado-proof heavy steel doors and a layered roof that covers the data center with metal, rubberized roofing and concrete sandwiched together in order to create a sturdy barrier for whatever Mother Nature throws at them.

UPS and Flywheel Technology Always on Alert

In the event of a power brownout or black-out, the new data center's dual 500kVA Uninterruptible Power Supply (UPS) systems activate automatically, leveling any dips in the power stream. They also keep the power flowing until the diesel-powered generators fire up or emergency backup systems begin. In such situations, VYCON's four 300kW VDC flywheel systems will carry the load and make a graceful handoff to the generator if the power does not resume in time.

Briggs describes the flywheel technology as a sophisticated spinning top capable of generating enough energy to run the data center while backup electrical systems activate.

Benefits of VYCON's Clean Energy Storage Solution:

- 20x reliability vs. VRLA batteries
- High-power density, small footprint
- Parallel capability that allows for future expansion
- Fast recharge (under 150 seconds)
- Full monitoring for predictive performance
- No hazmat requirements
- Low maintenance
- 20-year useful life
- Simple installation
- N+1 redundancy options
- Quiet operation
- Wide temperature tolerance
- High efficiency

"While you have power coming in, it's making the top spin. Remove the power and the top's inertia will keep it spinning for another 30 seconds. The inertia is used to generate power for the servers," said Briggs.

The UPS units maintain the server's "up time" for 15 minutes under full load and can do so for about 45 minutes with a reduced load. As a further safety precaution, the UPS units support each other. Therefore, if one cannot activate or is undergoing routine maintenance, the other UPS unit assumes the power load.

Crucial to the power configuration, the VYCON flywheels are the first line of defense against any incoming power variations and help to prolong the life of the UPS' batteries. A major consideration for Briggs was that by front ending the batteries with the flywheel, the flywheel will cover the majority of discharges and thus, extend the life of the batteries. This is important as every time a battery cycles, it shortens the life of the battery.

The flywheels provide an opportunity for the chemical reaction of the batteries to get started and work. "If the flywheels were ever depleted and we needed to transfer to battery, that process would be a gradual transition rather than a hard drop," said Briggs.

According to the Electric Power Research Institute (EPRI), "Batteries are the primary field failure problem with UPS systems." Predicting when one battery in a string of dozens will fail is almost impossible, even with regular testing and frequent individual battery replacements.



Batteries have a limited number of discharge cycles they can provide during their expected life. While this cycle life may be adequate in some applications, oftentimes when a battery bank is discharged frequently, it could fail. In fact, every time the batteries are used (cycled), even for a second, the more likely they will fail the next time they are called upon. Even testing batteries shortens their lives and just one cell in a battery string can render the entire battery bank useless.

Today's flywheel systems replace or work in tandem with lead-acid batteries. They function 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. For flywheels, doubling mass doubles energy capacity, but doubling rotational speed quadruples energy capacity. And unlike batteries, flywheels have a 20-year operating life, require very little maintenance and have no special cooling needs – making them environmentally friendly by reducing costly energy consumption.

The Gold Standard in Electric Power Handling

According to Briggs, their new data center is poised to become the gold standard for electrical power handling. "We should never have to power down the data center. If we do, it's because something so catastrophic occurred that it wiped out several levels of redundancy." Briggs emphasized that the data center generally receives stable power from its Michigan utility company. "The main problem that we might encounter would likely be weather related, such as snow or ice storms."

Brenda Laird, senior vice president and chief information officer, shares Briggs' pride in data center capability both now and in the future. "We've put a design in place to accommodate technology needs for at least the next 10 years. Plus, we built in capabilities for expansion as needed. This significant investment serves and protects our company and customers, while showing our commitment to the economic future of mid-Michigan."

Currently, about 5,000 square feet of the 22,500 square-foot building is used for computer hardware. The remainder of the area is needed for the electrical and mechanical support systems. "The technology we're using has been around for awhile, but we chose, based on our business model, to have a level of redundancy most businesses don't," explained Briggs. His staff of nine employees continuously maintains and monitors the data center.

A Cleaner, Greener Future

For data protection as well as conservation, Delta Dental's new data center has reduced utility consumption by raising the output air on the computer room air conditioners (CRAC) to 75 degrees and using outside air economizers to minimize use of compressors on the CRAC units.

"We focused on energy efficiency as our green initiative in the data center," said Briggs. "Specifically, we attempted to do things to improve our cooling." He added that the maintenance staff placed all cabling overhead to prevent under-floor obstructions from blocking airflow. The center has a 36" floor plenum to move cold air into the center. His staff created a ceiling plenum and purchased cabinets with chimneys to push heat up into the plenum.



The staff also installed blanking panels and sealed floor penetrations with brush grommets. "We had several Computational Fluid Dynamic (CFD) studies done to model the data center prior to placing equipment," Briggs explained. To minimize electrical use, the data center uses occupancy/vacancy sensors on its lighting controls.

"As our in-house skills grow with this infrastructure, we will use it to measure and improve our overall energy efficiency," Briggs said. "And, as we add additional equipment into the data center our power needs will increase. I will not hesitate to add more UPSs and flywheels to assure the levels of protection and redundancy we require. Moreover, while we didn't purchase the flywheels specifically for their green aspects, it's another great benefit to the technology that helps us reduce our carbon footprint while assuring we have the highest level of protection for our IT infrastructure."

About VYCON:

VYCON is an innovator in the design and manufacture of technologically advanced flywheel energy storage systems that enable a highly reliable, cost-effective and “green” energy storage solution for a variety of applications. The company’s REGEN flywheel systems, used in regenerative power applications such as container cargo handling crane applications and light electric rail, reduce power and energy costs to port and rail operators as well as provide a reduction in green house gasses. In addition, VYCON’s line of VDC and VDC-XE systems are deployed in mission-critical operations around the world protecting critical computing assets against costly power outages.

For more information on our innovative clean energy storage systems for your application, contact us at 714-386-3800 or visit our web site at: www.vyconenergy.com.



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