Market Segment: Uninterruptible Power Supply (UPS)

POWER PROFILE

Libouchec Tunnel

POWER NEED

The Czech Republic Highways and Roads Management Administration (CRHRMA) wanted to ensure an uninterruptible supply of electric power to serve its Libouchec Tunnel on the D8 Motorway, between Prague and the Czech Republic-German border. The Libouchec Tunnel was bored in dislocated rocks of a gneissic crystalline complex, and the project was completed and the tunnels opened for traffic in December 2006. The Libouchec Tunnel consists of two single-direction tunnel tubes, each with two driving lanes. The western tunnel passage is 480 meters long, and the eastern passage is 388 meters long. The tunnels are interconnected with two safety passes, and the cross-section of each tunnel passage is approximately 57 square meters.

A long history of catastrophic fires in tunnels in the Austrian and Swiss Alps, many caused or worsened by a loss of electric power, had CRHRMA engineers seeking ways to ensure an uninterruptible power supply for tunnel infrastructure. In each accident, tunnel fires erupted that cut off electric power to tunnel safety systems, lighting and ventilation systems.

Even in the absence of an accident, small fires frequently erupt during the normal course of tunnel traffic. In the Gotthard Tunnel alone, approximately five fires occur each year. Although these types of tunnel fires are often brought under control without adverse consequences, any tunnel fire poses the risk of destroying electric power transmission and infrastructure cables, thereby cutting off light and ventilation. Consequently, an increasing emphasis is being put on higher security measures and the highest possible reliability and operability of electric power systems that support lighting, ventilation, firefighting, telecommunication and signaling systems within tunnels.

CRHRMA engineers realized that in some cases, accidents themselves were attributed to a loss of lighting in a tunnel; in others, an otherwise unrelated accident or fire caused a loss of power, which, in turn, eliminated lighting, ventilation and fire-fighting systems within the tunnel. Until now, large batteries were used for backup electric power for tunnels, but these battery systems are plagued by shortcomings: the technology must be stored in air-conditioned rooms, the battery cells must be continuously monitored and maintained and have only a limited service life, and the environmental impact of their disposal is considerable.

CRHRMA engineers' design goal was to prevent a loss of electric power to critical systems at any time when the Libouchec Tunnel was in use. Therefore, CRHRMA's efforts to protect the Libouchec Tunnel quickly focused on solutions allowing continuous energy supply, a high reliability and if possible a low environmental footprint. "In Today's World a reliable electricity supply is critical for many safety systems, tunnels are a prime example of where reliable power can improve safety in our every day lives." said David Crabb, Caterpillar's Geneva-based European territory manager. He added, "If through flywheel UPS technology we can add environmental benefits for the companies operating the tunnels this is an additional benefit."

SOLUTION

Phoenix-Zeppelin Power Systems, the authorized Caterpillar dealer for the Czech Republic, was contracted to design, build, install and maintain an uninterruptible electric power solution for the Libouchec Tunnel. Phoenix-Zeppelin designed and installed a turnkey Caterpillar solution, which had been in use in the nearby Panenská Tunnel, the longest tunnel in the Czech Republic, on the D8 Motorway. This backup power system, using core Cat® components, was developed by Phoenix-Zeppelin in 2002 and has been successfully installed in almost 30 different mission-critical applications, including the Bratislava International Airport, the Prague-Motol University Hospital, and several telephone call centers.

CUSTOMER

Czech Republic Highways and Roads Management Administration

LOCATION

Libouchec Tunnel, on the D8 Motorway from Prague, Czech Republic, to the German border

CUSTOMER BUSINESS ISSUE

Back-up uninterruptible power supply (UPS) for critical safety systems in an alpine tunnel on the Czech-German border

SOLUTION

Cat® C18-700kVA
Cat® Uninterruptible Power Supply (UPS)

CAT DEALER

Phoenix-Zeppelin Power Systems
Liberec, Czech Republic

CATERPILLAR®

The basic construction element of the backup power generation system Phoenix-Zeppelin installed at the Libouchec Tunnel is a robust 6-square-meter steel container that houses all system components. The container is equipped with noise-attenuation chambers both on the cooling-air suction side and on the exhaust-discharge side. The diesel-fueled Cat C18 generator set with electronic regulation installed inside the container provides a nominal output of 700 kVA. The Cat UPS module, a rotary-flywheel power source with 250 kVA type output and the switch for transferring the electrical load, including communication accessories, are the final components of the power generation system installed at the Libouchec Tunnel.

The Libouchec Tunnel is now among the safest and most modern tunnels in Europe, especially in terms of its technological and safety equipment. Phoenix-Zeppelin installed the backup power generation system at the southern tunnel entrance coming from Ústí nad Labem. Because the system is based on a battery-free system, all-important electric components managing the safety, monitoring, automated systems and computers within the Libouchec Tunnel are fed by the UPS module to ensure an uninterrupted power supply.

"Most UPS systems generally are battery systems," explained Crabb. "The Cat UPS system uses flywheel technology. It's more environmentally friendly because you're not faced with the disposal problems of lead-acid batteries and their limited 5- to 7-year lifespan," said Crabb. The module works according to the inertia principle, with the mass of a constantly spinning flywheel providing stored energy to power a generator for the brief period of time between any power interruption and the startup of the C18 Cat generator set. The UPS guarantees a continuous supply of electric power at 250 kVA, effectively maintaining core tunnel operations with no blackout, and the Cat C18 diesel generator set is available for longer-term outages to feed power to all the systems Together, the Cat UPS and the Cat generator ensure complete coverage for the electric power supply at the Libouchec Tunnel for an outage of any duration.

RESULTS

Installation of the backup power system at the Libouchec Tunnel has proven successful, according to Crabb, by meeting the mission-critical power supply needs of the customer.

"Safety is certainly any tunnel operators primary concern," said Crabb. "The peace of mind that all their safety systems are covered by a quality backup power system is almost impossible to quantify." According to Crabb, CRHRMA came to select Caterpillar products because of the ability to provide a complete solution combined with Phoenix-Zeppelin's local knowledge, and a strong reputation.

Quite literally, the total Caterpillar solution was greater than the sum of its parts.

"The backup power system at the Libouchec Tunnel is a complete package, not just a generator set," said Crabb. "Because Phoenix-Zeppelin handled the entire installation, interface with customer operations, switchgear and UPS system, continuity was enhanced—which is a significant advantage for any mission-critical application," Crabb notes.

"The main differentiator for CRHRMA was Phoenix-Zeppelin being able to put a full Caterpillar based solution together for them. It's a high-profile project, so they definitely wanted a reliable partner. Phoenix-Zeppelin does a very effective job of packaging a complete solution for its customers, and its all Caterpillar backup power system was certainly the perfect match for the Libouchec Tunnel project," explained Crabb.

"Whenever key systems, such as fire-fighting equipment, lighting, ventilation, telecommunication to emergency systems and signaling systems for traffic, must work with zero downtime, a solution such as the Caterpillar based system Phoenix-Zeppelin built at the Libouchec Tunnel is just the answer," said Crabb.

Crabb points out that another advantage of Phoenix-Zeppelin's Caterpillar based backup power system is that it is a complete solution

POWER PROFILE

Libouchec Tunnel

that is configured, constructed, and tested at the dealership in a compact, space-saving container, so the installation time is greatly reduced.

"The customer can have it installed and up and running more quickly than some of the competitive solutions—in some cases in as little as half a day." Packaged with a Cat generator set, a fuel tank and a UPS system, only minimal on-site work is required. And, because the components are configured and bench-tested before they leave the dealership, the unit can be brought on line more easily.

"The Caterpillar system will be more cost effective for customers with a medium term view," Crabb notes, "and the reduced environmental impact is also becoming much more important in the customer decision making process."

For more information, please visit www.cat-electricpower.com/pr.

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