COOLING FAN SOLUTIONS FOR TELECOM BATTERY BACKUP SYSTEMS

ORION FANS

Wireless systems play a fundamental role in everyday life. The general public does not take notice of a wireless network until it's not working properly. Telecom battery back-up systems are vital when municipalities experience brownouts and power outages. To ensure proper operation of telecom equipment when primary power is not available, battery back-up systems must be efficiently and effectively cooled. Extreme temperatures can degrade the performance, safety and operating life of battery back-up systems. Telecom battery back-up systems often use compressor-based air conditioners or thermoelectric assembly systems for cooling. Both systems utilize high-performance fans to more efficiently move hot air away from sensitive telecom electronics. However, specifying a fan for a battery backup application may not be as straight forward as one would think.

BACKGROUND

Emerging technologies like artificial intelligence, autonomous vehicles, cloud computing, IoT, gaming/virtual reality and smart homes demand higher data speeds and data bandwidth. This ever-increasing requirement for high-speed mobile networks means updates to existing 4G/LTE systems and upgrading to 5G networks. These new systems require more advanced equipment that draws more power and generates more heat. These updates also often include packing more electronics into smaller enclosures, further adding to the system heat loads. As a result, temperature sensitive telecom equipment must be more efficiently cooled to ensure proper performance and quality of service.

Mobile network operators must enhance more than the wireless infrastructure equipment to keep up with data speed demand and ensure quality of service. Network service disruptions can lead to substantial problems, particularly for mission-critical applications that rely in highspeed wireless connectivity. Service interruptions from power outages can be avoided with appropriate back-up battery systems.

BATTERY BACK-UP SYSTEMS

A telecom base station battery back-up system consists of a series of power inverters, charge controllers/rectifier, and storage batteries. According to FCC order 07-177, when the power to a cellular antenna tower goes out, emergency batteries must provide back-up power for at least 8 hours. Many base stations are located in remote areas and can see temperature and weather extremes, making access more challenging. Long life battery operation is required to minimize replacement as many of these systems are difficult to reach.

Batteries used in cellular base stations are typically located in weather resistant GR-47 cabinets that are vented to protect the vital equipment from the fumes and corrosive chemicals found in wet cell batteries, which are often lead–acid or valve regulated lead-acid (VRLA). Several lead acid batteries are wired together in a series circuit forming a group providing DC electric power. The more batteries that are wired together, the greater the amount of heat generated within the cabinet. Usually, there are two or more groups of series-connected batteries. These groups of batteries are connected in a parallel circuit, allowing one battery group to be taken offline for repair or replacement without removing the availability of backup power. Typically, the larger the battery cabinet's electrical capacity, the larger the size of each individual battery and the higher the room's DC voltage.

Depending on the location of the base station, temperatures may range from a high of 50°C to a low of -30°C. The heat generated within the battery cabinet can vary with ambient temperature. Telecom equipment can typically operate in temperatures ranging from -20°C to +55°C. However, for reliable operation and maximum useful back-up battery life, the enclosure must be maintained between +20°C to +40°C. Temperature control systems with rugged and reliable fans are essential to long term operation of battery back-up systems.

TELECOM TEMPERATURE CONTROL SYSTEMS

There are many configurations and applications of water resistant outdoor storage cabinets for housing and protecting sensitive telecommunications equipment. Temperature control systems must be designed specifically to maximize air flow to effectively cool the electronics, especially in these types of enclosures.

When power goes out, telecom temperature control systems operate on 48V back-up battery systems. Components in these systems, including the fans, are rated to 48V. However, when a fully-charged back-up battery system is switched-on, it can deliver a power surge up to 58V. Continually running lower voltage fans at higher voltages can cause two major issues. First, the voltage spike can quickly burn the fan motor, degrading the performance of the cooling fan and ultimately causing premature failure. Secondly, excessive heat build-up in the equipment due to malfunctioning fans can cause additional damage.

Some telecom networks feature regulated 48V power supplies to protect electronics from voltage spikes. This is typically a more costly solution and many telecom systems don't have available room in the enclosure for a larger regulated power supply.

An alternative solution is telecom battery-backup systems utilizing higher rated 60V fans to prevent voltage spikes from burning out the fan motor when the back-up battery system is activated. This is a simpler, more cost effective solution, as the 60V fan is a drop in replacement for the 48V versions. 60V fans are typically available up to 115 CFM in sizes of up to 120 x 38mm. Fans can be made to be IP55 and/or salt-fog rated, to withstand wet and salt-corrosive environments.

Although Orion Fans 60V telecom fans have a nominal voltage rating of 60V, they can accept a wide range of input voltages, from 36 to 72V. This makes them an excellent choice for standard telecommunications applications, but also enables them to function extremely well when the equipment is running in battery backup mode. The life expectancy of these 60V fans is 65,000 hours at operating temperatures of 45°C or 113°F.

In addition, 60V fans can be used with a high density foam filter to reduce maintenance and expand the operating life of telecom and back-up battery equipment subjected to airborne particles that can damage vital electronics. Reusable high density foam filters offer low pressure drop and the ability to capture microscopic and large airborne dust particles. Additional filter options include moisture resistance and fire resistance. Fire-resistant filters are popular in telecom applications, as they comply with UL 94 HF-1 self-extinguishing flame safety standards. Standard high density foam air filters have a rating of 45 PPI. With the ability to easily clean and reuse, the 60V fans and high density filters from Orion Fans provide considerable savings for customers.

CONCLUSION

As more electronics are packaged into smaller enclosures to meet data rate and bandwidth demands, heat sensitive telecom electronics must be kept at optimum temperatures to ensure proper performance. Fans are a vital component to compressor-based and thermoelectricbased temperature management solutions. When 48V battery back-up systems kick-on during a power outage, fans must be rated to a higher voltage or protected by regulated power supplies. 60V telecom fans operate at a higher voltage to prevent excessive heat buildup in telecommunications equipment and to prevent premature failure of the cooling fans. 60V fans offer a safeguard to voltage spikes to ensure the fan motor will not burn out when a back-up battery system is activated.