



Albert 3 Relies On Eaton 9395 UPS

Product:

Eaton® 9395 UPS

Location:

Hinwil, Switzerland

Market Served:

Formula 1 Racing

Background

In the final lap of the Canadian Grand Prix, BMW Sauber drivers Robert Kubica and Nick Heidfeld narrowly edged out their competitor David Coulthard. The two racecar drivers achieved a historic one-two finish for BMW Sauber. In Formula 1 racing, a fraction of a second often makes the difference between victory and defeat. The aerodynamic characteristics of the race cars thus become a key factor. That is why BMW Sauber has a specialist on its development team—Albert 3.

Albert 3 is a supercomputer—the largest and fastest in all of Europe and the third-fastest industrial-use computer in the world. The 38-ton giant processes complex aerodynamic models for vehicle development.

Because its calculations are critically important for the success of the team, BMW Sauber needs to be able to depend on it at all times. System downtime? Not an option. To prevent current and voltage irregularities from impacting the supercomputer, an uninterruptible power system (UPS) protects Albert 3. Because of the team's high expectations in a UPS, the search for a cutting edge system with the best fault tolerance available and a small footprint led BMW Sauber straight to the Eaton® 9395 UPS, part of the Powerware® series.

Competing since 2006, BMW Sauber quickly made a lasting impression by achieving their biggest goal—a win—in the seventh race of the team's third season with the one-two finish in Montreal. But the two drivers don't command all the glory—the credit goes to the entire team for maintaining a constant level of perfection. And that applies to Albert 3, as well. The supercomputer has been supporting BMW Sauber since December of 2006 at the production location in the Swiss town of Hinwil. The plant's 450 employees are constantly optimizing the race cars, with 80 people assigned

to aerodynamics alone. The process of testing, modifying and testing again continues throughout the entire race season. The team needs at least eight hours after a race to disassemble a car, check and replace individual components, and rebuild it. Albert 3 performs calculations including grid models containing more than 100 million cells to design everything from front, rear and side wings through to engine and brake cooling systems. The key concept is computational fluid dynamics (CFD), computer-aided flow simulations. The models allow the developer team to virtually test the impact on performance before time-consuming and expensive modifications to the actual car are performed. With Albert 3 playing such a critical role, system downtime is simply unacceptable. To run a successful race, everyone on the team needs to be able to count on other team members doing their jobs. The drivers depend on their developers to give them the best possible machine. And the developers rely on the availability of the tools they need, most notably the mission-critical Albert 3.



Powering Business Worldwide

Challenge

Knowing that the system is always running is essential to the success of the team. This dynamic makes the UPS a key player. If Albert 3 is the brains behind BMW Sauber development, then the UPS is the heart. It ensures that the brain is continually supplied with blood—or rather clean electricity in this case. And the job of the UPS is not easy: Albert 3 has 4,224 processor cores and 8,448 gigabytes of RAM. Its maximum performance is 50.7 teraflops, or more than 12 trillion floating point operations per second. This massive computational power necessitates a corresponding physical mass. Over three stories high, Albert 3 weighs in at 38 tons and resides in the basement of the wind tunnel building in Hinwil. The massive computer was designed by Dalco, the Swiss company that built Albert 3's predecessors, Albert and Albert 2. In mid-2007, performance was quadrupled for Albert 3, doubling power requirements to 350 kW. The UPS needed to grow to meet these new demands, but the previous model was not up to the task. What Albert 3 needed was a system with state-of-the-art technology that could reliably provide the level of performance required by the BMW Sauber F1 team: excellent energy efficiency and exceptional fault tolerance, all with the smallest footprint possible. Although this combination is very difficult to achieve with many UPS manufacturers, BMW Sauber found the ideal solution from Eaton. With its modular construction for energy-saving, redundant operation the 9395 fulfills all of their requirements.

Solution

Among the special features of the 9395 is its modular, load balancing design that utilizes scalable power modules to achieve an energy-efficient and redundant system. Two 225 kVA modules ensure the UPS is always prepared. If one of the two primary modules goes offline for maintenance or any other reason, the third module takes over its duties, ensuring identical functionality and performance. This allows the UPS to attain 99.99 percent availability. Other redundant systems require two 450 kVA UPSs to achieve redundancy, which results in unnecessary power consumption and considerably impacts operation and acquisition costs. With the 9395, BMW Sauber saves roughly one-fourth of the energy used by comparable systems.

With its double-conversion technology, the 9395 eliminates anomalies such as spikes and noise voltages to provide perfect output current with stable voltage and frequency to Albert 3. Thanks to modern high speed front end IGBT rectifiers, the system is particularly efficient. Using active input power factor correction, the UPS is able to achieve an input power factor of 0.99, enabling the UPS to achieve an almost completely active power load consuming only minimal reactive power. With a power factor output of .9, the UPS is ideally suited to the input power factor of the computer. This means hardly any energy is lost on reactive power during power transmission. An additional advantage of the transformerless design is that the IGBT rectifiers provide exceptionally low harmonic rates of three to five percent THDi, which considerably minimizes irregularities such as the harmonic content of the

input power. Consequently, the 9395 attains an overall efficiency of 95 percent. This results in considerably lower power loss and heat dissipation, allowing BMW to save on electricity and air conditioning. Even more, the components in the UPS experience less strain, which ensures continual, reliable operation and reduces costs for maintenance and replacement parts. In addition to the other advantages, this reduces weight and volume—two important factors for BMW Sauber due to the space limitations in the wind tunnel building. Eaton is one of the few manufacturers to use IGBT rectifiers in its high-performance UPS products.

Implementation

In August of 2007, BMW Sauber and Eaton began planning the new UPS concept. By December of 2007, the system was completely operational. The 9395 was installed beside Albert 3 in the wind tunnel building. Because the available floor space was limited, the space-saving design of the 9395 was especially advantageous. Providing redundancy within a single unit, the 9395 offers savings over parallel systems thanks to its installation, cabling and space requirements. Particularly for the battery system, compact size was essential—a maximum height of 1.2 meters was prescribed since it was to be located directly beneath the wind tunnel. And the 9395 is space saving in this respect as well as it is equipped with a compact three-phase battery system rather than a separate battery for each UPS module. BMW Sauber was very satisfied with the delivery and installation process as well as the quality of Eaton's service.



Result

The system is running smoothly for the BMW Sauber team, which was impressed with the 9395's innovative technology and overall design that fit within their space constraints. Because there are no more concerns about downtime and backup power is always available, the BMW Sauber F1 team was able to start the 2008 season with full confidence in Albert 3. The early season one-two finish in Canada is proof that the team is running like a well-oiled machine.

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