T E C

Customer Case Study

Safeguarding Revenues for the North East's Vital Transport Link

The Tyne Tunnel is one of the busiest in Britain carrying 35,000 motor vehicles, daily, between Jarrow on the South bank of the river Tyne and Howdon to the North. It is an integral part of the social and economic infrastructure of Tyneside and provides a link with the commercial and industrial areas of Wearside and Teesside.

The Tyne Tunnel receives no government grants or private donations and is totally self-funded through toll charges. Any interruption to the operation of toll collection booths, at either end, would lead to loss of revenue and possibly even closure of the tunnel itself, which would have a knock-on effect for link roads and bridges in the area. Depending on the time of day this could result in grid lock. It is vital; not only for revenues but for transport in general, the tunnel is kept in operation at all costs.

Hanson Pottinger, systems support officer at the Tyne Tunnel, emphasises this point: "The tunnel operates 24-hours-a-day, seven-days-a-week. At peak times we have as many as 8,400 vehicles moving through. That's a lot of revenue to lose if a power cut happened to coincide."

Power Continuity

The power source to toll booths at the North end is protected by a UPS (Uninterruptible Power Supply), which recently underwent an important upgrade to ensure equipment was up-to-date, reliable and had redundancy built in. This was carried out by specialist supplier, Converteam, formerly Alstom Power Conversion, in collaboration with UPS manufacturer, Riello UPS.

At a time when tunnel traffic is growing, automation of the toll booths has enabled operators, the Tyne & Wear Passenger Transport Authority (PTA), to significantly reduce costs yet maintain constant revenues. Hanson Pottinger explains: "The advantages, particularly financially, of automation far outweigh the disadvantages but it means we are more vulnerable to power problems, which is why we have taken these preventative steps."

Banking on Automation

In 2002 a strategic review found that switching from manual operation to automated cash machines would significantly cut running costs, thus helping the PTA to keep toll charges low. However, the switch was later found to have placed a significant strain on an existing 12kVA Riello UPS. The criticality of toll gate operations also led to the PTA's wish to build redundancy into the UPS system further decreasing any chance of a power cut affecting operations.

The Tyne Tunnel was opened in 1967 after a difficult and protracted plan and build process. It is currently one of three tunnels under the river (alongside a pedestrian thoroughfare and one for cyclists). When first opened, it carried around 4 million vehicles per annum. That figure has now more than doubled to 11.8 million. Substantial growth has prompted plans for a second vehicle tunnel in the area illustrating how crucial it is for the PTA to safeguard revenues.

The Automatic Toll Booths at the Tunnel

This is further compounded by the fact that it receives no government funding and, as well as covering running costs (estimated at around £12 million per annum), has to achieve enough revenue to pay back a loan that part funded the build programme.

The vehicle tunnel is 1,650 meters long with an internal diameter of 9.6 meters. It was constructed using a revolutionary process incorporating compressed air to safeguard the river bed above and prevent any potential collapse. Its construction involved the excavation of 140,000 cubic meters of earth and the use of 45,000 tons of cast iron linings, 350,000 bolts and 380 tons of lead caulking. On the approach, the tunnel gently slopes down to 15.5 meters below the river bed at its lowest point, which is 27.5 meters below high water level. There is one traffic lane in each direction.

Power Needs

In addition to the toll booths, the Tyne Tunnel requires continuous electrical power to run crucial ventilation stations, situated at both ends, which pump 490 cubic meters of air per minute into the tunnel as well as extract thousands of tons of contaminated air.

For safety reasons, it is also important the continuous line of fluorescent tube lighting, mounted in the centre of the ceiling, constantly illuminates the tunnel so that drivers are not subjected to sudden and dramatic changes in the intensity of the light. These too are electrically operated and require a continuous flow of energy.

Each of these crucial systems is protected by back-up generators that have enough capacity to keep the tunnel lit and ventilated for the duration of most power failures. Further assurances stem from the fact that, at either end, the tunnel is supplied by different sub stations.

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The nerve centre of the tunnel is a special control and administration building established near the toll gates on the North bank.

UPS Installation

The UPS installation at Tyne Tunnel consists of two Riello Multi Dialog 15kVA UPS working in parallel, each equipped with its own set of batteries to provide two hours of back up power in the event of a mains failure.

Hanson Pottinger explains: "The old UPS could only provide back up for less than an hour, which was hardly enough time to get men to the site let alone fix the problem. This new UPS gives us peace of mind that our systems will be protected even if we have to manually start up the generators to keep going should they fail to start automatically."

For Riello UPS and Converteam, the installation was far from straight forward. Firstly, the old UPS, which was precariously located in a basement room down a flight of stairs, had to be disconnected and removed without disruption. This included disposing of batteries and an old extension cabinet to ISO standards, a specialist and highly skilled task for which Riello personnel are qualified. It also included relocating an important maintenance bypass switch that enables the UPS to be tested and serviced without disruption to the load.

UPS Redundancy

A parallel redundant (N+1) Multi Dialog system was installed to provide power continuity in the event of a UPS alarm condition or service work. The two UPS modules are synchronised to supply the load. Should one of them fail, or require isolation for maintenance, the other can support the critical load. This mode of operation ensures that the sensitive electronic equipment used within the toll booths is powered at all times and protected from mains power problems on the site. Another advantage of the parallel redundant UPS system is that it can be easily expanded to meet future capacity by connecting additional modules.

A UPS provides more than merely power protection, it is a strategic piece of IT infrastructure, especially within critical applications. In the case of the Tyne Tunnel, the UPS is not only securing the source of power to critical toll booth equipment and systems, but by so doing it is safeguarding the single source of revenue the operation has. The Riello UPS systems also help to ensure that the traffic continues to flow along this vital transportation link in the North East of England.

UPS TEC Technical Energy Consultant

TEC is a specialist consulting team within each Riello UPS company that provides project management, design, specification, and installation advise for both standard and bespoke Riello UPS designs. Each TEC member is appointed based on their engineering background and experience within the power protection field. For more information on Riello UPS call **0800 781 7959** or email **tec@riello-ups.co.uk**