TRACKTALK

RAILWAYS COMMUNICATIONS E-ZINE

HIGH RESILIENCE TUNNEL COMMUNICATIONS – CORNERSTONE OF SAFE OPERATIONS AND CONNECTED PASSENGERS

Although they are largely hidden from public view, tunnels are an engineering wonder of the modern world.

From Japan's Seikan tunnel to EuroTunnel, the Channel Tunnel between Britain and France and Switzerland's Gotthard, advances in tunneling techniques have allowed engineers to push deeper and further beneath the surface, through even the most difficult ground conditions, to build these transformational transport links. This issue of TrackTalk focuses on how the latest telecommunications systems can enhance tunnel operations and allow nonstop connected passengers, bringing together four distinguished perspectives on this topic from industry experts.

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GOING UNDERGROUND

BY: ROLAND LEUCKER, CEO OF STUVA

HIGHLIGHTS

- **Transport planners look underground to solve transport problems on the surface with underground rail and metro transport considered the most effective way of moving people fast and efficiently**
- **ICT Technology has improved safety during construction and operations as well as journey experience for passengers**
- **Access to wireless communication services might mean the difference to taking the car or a train for a long-distance journey**

Life in today's modern urban environment is very much an above and underground experience. As urban populations swelled during the 20th century transport planners found that they could no longer rely solely on a city's increasingly gridlocked road network. In many cities the green light was consequently given to dig more tunnels that would provide the fast and efficient transport services demanded by an increasingly suburbanized population.

"The idea when developing many of the world's cities was that habitation should take place on the surface and transport should happen underground," says Roland Leucker, CEO of Stuva, an independent, non-profit research institution that focuses on underground construction.

"While we have seen this in European cities which are home to 1 or 2 million people, it is a particularly pertinent issue now in some of the world's megacities like São Paulo and Tokyo. These cities each have over 10 million residents which are increasingly spread out. It is essential to have an above ground transport system here, but planners have found that many of the oldest tunnels on some of the world's most important underground networks were constructed over a century ago and inevitably tunnel engineering has changed significantly since then. Stuva was founded in 1960 at the point when concerns were rising about road congestion in urban centers and tunnel construction was increasingly viewed as the answer to these problems. While tunnel engineering has continued to advance through a steady demand for new transport tunnels, Leucker says that perhaps the most striking technological advance has occurred in the past two decades with the development of tunnel boring machines (TBMs).

> "Underground transport, particularly rail which has higher capacity than individual vehicles, is the most effective way to move thousands of people very quickly."

"TBMs are built flat faced so that employees can work under atmospheric pressure," Leucker says. "TBMs are very effective at boring and their use is more conducive to worker safety, particularly as considerations for occupational health standards have increased in recent years in Europe and North America. TBMs have also helped to reduce the amount of time it takes to construct tunnels and decreased costs because you are not so reliant on manual labor."

ICT ADVANCES AID ENGINEERING PROCESS

In addition to improvements in technologies and techniques associated with fundamental tunnel construction, advances in ICT technology are also aiding the engineering process and improving safety for workers. For example RFID tagging of construction workers and machines is now in widespread use all over the world.

"Every worker should wear an RFID tag in their clothes," Leucker says. This electronic

> "Communication Technology has also improved the quality and the extent of communications possible in a tunnel environment, both during construction and when the tunnel is operational."

chip transmits a signal to the control centre so if there is an accident or a problem, controllers can identify exactly where they are and exactly how many people are in a certain area."

Another major advance that is aiding safety is the use of sensors to measure settlement displacement as tunnel construction is carried out. These sensors again transmit a wireless signal to the control centre from the continual measurement of ground movement above and below the tunnel structure. Leucker says that displacement of 5-10mm is normal during construction, with the sensor able to detect any dangerous movements immediately, therefore minimizing the chance of damage to structures on the surface which is essential during construction under heavily-developed urban areas.

As well as measuring movement of settlement, sensors are also being used to detect the condition of the tunnel ahead of boring and fitting out. This might include locating old communications and sewage lines that might not have been recorded during previous construction projects thus avoiding any surprises and potential difficulties with relocating this infrastructure.

Leucker says that technology has also improved the quality and the extent of communications possible in a tunnel environment, both during construction and when the tunnel is operational. Previously telephone lines were laid in tunnels during construction to provide links between the various construction sites. Today the availability of advanced wireless technology means every worker can carry a mobile phone, ensuring constant contact with operators above and underground.

Advances in communications technology are also benefiting train operations. Drivers can stay in constant contact with control centers so they are capable of immediately reporting any problems experienced during the journey, improving response times and safety. Passengers can also access this GSM signal on their mobile phones so calls are not dropped when travelling through a tunnel improving journey experience. Onboard Wi-Fi systems are also not impacted when passing through a tunnel.

MAKING THE DIFFERENCE

Leucker says that the success of installing systems with these capabilities means that passengers now expect a mobile phone signal when travelling around an urban metro network, or when entering the city on a commuter train. He says that with many long-distance rail journeys taking the same amount of time as a car journey, this could be the difference between a passenger driving and taking the train where they can use their time more productively.

"Wi-Fi and mobile phone services are not essential for passengers to use an underground railway, but they do improve the quality of journey," he says. "This gives rail another distinct advantage over the car when travelling long distances."

By offering high capacity and the capability to move large numbers of people quickly, rail and metro tunnels are improving quality of life and helping the mega metropolises of the 21st century function more effectively. However, tunnel construction is a dirty and noisy process, and can also be very disruptive to the surrounding neighborhoods and environment, particularly in already crowded cities. Leucker therefore says that adopting the right approach to managing these projects is crucial to completing projects on time and on budget.

"People need to be consulted from the very start," he says. "Stuttgart 21 is an example of where this did not happen and people have since voiced their disapproval quite strongly against a project that I believe will improve transport in Germany. If they were involved in the process and consulted about the plans and the improvements they are going to provide from the very beginning the problems that they have experienced here might have been avoided."

"Passengers now expect a mobile phone signal when travelling around an urban metro network, or when entering the city on a commuter train. With many long-distance rail journeys taking the same amount of time as a car journey, this could be the difference between a passenger driving and taking the train where they can use their time more productively."

ALPTRANSIT GOTTHARD AG: THE PIVAL ROLE OF COMMUNICATIONS IN TUNNELS

BY: JOSEF ELMIGER, CHIEF ENGINEERING OFFICER RAILWAY INFRASTRUCTURE, ALPTRANSIT GOTTHARD AG

HIGHLIGHTS

- **Communications systems play a pivotal role in the safe and reliable operation of the Gotthard base tunnel**
- **Highly complex installation process involving a close degree of coordination among all contractors**
- **Key to the safe operation of the tunnel is the Tunnel Control**

The Gotthard base tunnel will be the longest railway tunnel in the world at 57km when commercial operations begin at the end of 2016. Tunneling work on the twin tubes was completed in 2011, and now railway infrastructure installation is in full swing. This includes laying the track, mounting the catenary lines and installing the electric power supply and safety systems, and also a comprehensive set of communications systems for both voice and data.

"We want a safe operation for both people and freight, so efficient communications are essential in such a complex system," says Josef Elmiger, chief engineering officer for railway infrastructure at AlpTransit Gotthard, which is responsible for the construction of the tunnel. "It's a long tunnel, with many different zones and installations, so we must have high availability, and the systems must work all the time even under difficult conditions. The requirements are high, but this is essential for safe and reliable operations. And in case of incident it's important to have the right information in the right place at the right time."

> "The biggest challenge is actually coordinating everything, so that everyone can complete their part of the overall project in good time. There are thousands of interfaces and the logistics side is highly complex, but it can be managed with today's sophisticated techniques."

INSTALLATION: A COMPLEX PROCESS

The only feasible access points for bringing equipment and materials into the tunnels are the portals at either end. As a result project management has to be carried out extremely carefully with clear interfaces and precise scheduling. "The biggest challenge is actually coordinating everything, so that everyone can complete their part of the overall project in good time" explains Elmiger. "There are thousands of interfaces and the logistics side is highly complex, but it can be managed with today's sophisticated techniques."

The planning structure is in fact like an enormous pyramid. AlpTransit is at the top, coordinating the entire project, with TranstecGotthard, the Swiss consortium awarded the SFr 1.7 billion ($US 1.88bn) contract for railway infrastructure, in charge of coordinating the work of the companies taking part, who in turn coordinate the work of their sub-contractors.

> "We want a safe operation for both people and freight, so efficient communications are essential in such a complex system."

What comes first when the railway infrastructure contractors move into a completed section of the tunnel? The most important thing is to lay power supply cables and for a temporary communication system, for without those nothing can be started. In the meantime equipment and supplies are brought in by road. As one of the partners in Transtec Gotthard, Alcatel-Lucent is responsible for installing both the temporary and the permanent telephone and radio systems; the temporary systems are only removed when the fixed systems are installed and have been thoroughly tested.

Once the permanent track and catenary supports are in place, the all-important installations can begin in the cross-tunnels between the two main tunnels. This is where the communications equipment is located. "Equipment includes not only telecommunications systems, but also transformers, boosters, data networks and so on, though not all elements are necessarily in all cross-tunnels," explains Elmiger. "There are 176 cross tunnels, located every 325m on the 57km stretch. As they contain a great deal of essential equipment they are fairly full, but as they serve as emergency escape routes in the case of an incident in one of the tunnels, there is always a gangway at least 2m wide."

"Each cross tunnel has a power-assisted mechanism for operating the doors at each end. These fire-proof doors are extremely heavy as they have to withstand very high air pressure. The temperature of the rock above – up to 2000m – can be 45° or more, so air conditioning is installed to make working conditions more bearable. Later, when the trains are running, they push air in front of them, so no extra cooling is needed."

A RANGE OF COMMUNICATIONS SYSTEMS

Operational, communications and safety systems in the Gotthard base tunnel are highly automated, and they all require comprehensive and efficient telecommunications systems. Data network terminals will be located in all cross-tunnels for transmitting, processing and operating data, as will emergency phones with separate lines in the east and west tunnels. Telecom facilities are being provided for mobile phone systems, through several different networks: UMTS for mobile and smart phones which will be accessible to passengers; Polycom for the fire-fighting services; and GSM-R the communications component of the ETCS train control system.

There is also the Tunnel Control System for monitoring the many electro-mechanical elements installed in the main tunnel. This, and the Ceneri tunnel on the continuation of the Gotthard line to the south, will be controlled from the Tunnel Control Centre now under construction at Pollegio, very near the southern portal of the tunnel. This centre will monitor every conceivable aspect of tunnel operations, including the train control system, signal boxes, contact lines and traction power supply, ventilation and lighting, repair and construction service, logistics, and emergency services.

One key factor is the scheduling of maintenance which is completed during the night shift on Friday, Saturday, or Sunday when there are fewer passenger and freight trains. Any repair and maintenance work can be carried out during this time, and units can be exchanged or replaced as necessary.

Elmiger says that the risk of using new technology and the teething troubles that might be experienced as a result is regarded as unacceptable for this project due to its enormity and complexity. There is also the question of price, because it is important to keep within budget as well as deliver on time. "As far as the technology itself is concerned, we do not want any new technology," he says. "We want standard, tried and tested systems."

At present, the first part of the railway infrastructure, on a stretch of around 15km at the southern end of the west tunnel between Bodio and Faido, is virtually complete, and installation work is now starting from the northern end on both tunnels, as far as Sedrun. Before the tunnel comes into operation, an exhaustive series of trial runs will be carried out, starting on the completed Bodio-Faido section.

"We will start trial operations at the end of 2013," says Elmiger. "This is to carry out preliminary running tests and correct any faults that may arise, including the telecommunications systems. They will be followed by another series of tests in October 2015, which should be complete by May 2016. In November 2016 we should have an unconditional operating license, ready for full operation when the tunnel opens to commercial traffic in December 2016."

Elmiger is confident that everything will go according to plan, and that the tunnel can be handed over in full working order to SBB as contracted. It is in fact an entirely new project for SBB, due to the complexity and capability of systems that will be installed which vary significantly from its current tunnel infrastructure. This again highlights the importance of the Gotthard Base Tunnel project and how it is going to transform rail operations through Switzerland and the Alps.

"What is new is that although the SBB has a great many tunnels, these tunnels have virtually no technical installations; they are not regarded as necessary as the tunnels are all comparatively short," Elmiger says. "So at 57km in length the Gotthard base tunnel is a totally new venture for them."

"In November 2016 we should have an unconditional operating license, ready for full operation when the tunnel opens to commercial traffic in December 2016."

EUROTUNNEL: ENHANCING COMMUNICATIONS BENEATH THE SEAFLOOR

BY: JOHN KEEFE, COMMUNICATIONS DIRECTOR, EUROTUNNEL

HIGHLIGHTS

- **Eurotunnel is renewing its telecoms infrastructure after 18 years of operation**
- **GSM-R provides interoperability with other European rail networks**
- **Through GSM-P, the Channel Tunnel will become the first tunnel**

May 6th marks the 18th anniversary of one of the engineering wonders of the modern age. At 50.4km, the Channel Tunnel is the longest undersea tunnel in the world, reaching depths of up to 75m below sea level. On an average, more than 49,000 people pass through the twin tunnels between France and England each day, with headways between trains often as short as three minutes at peak times.

After almost two decades of intensive service, Eurotunnel is investing in asset renewal to ensure this vital piece of infrastructure remains safe and reliable. A key focus of this programme is the renewal of the telecommunications network, which dates from the opening of the tunnel. At the time of construction, Eurotunnel chose to adopt proven analogue technology in an effort to optimise availability. The system is composed of two elements:

- A limited-capacity 3RP concession radio network for general communications through the two running tunnels and the service tunnel
- A track-to-train system based on contemporary British Rail standards, for communication between train drivers and the control centres, used only in the running tunnels

Eurotunnel Shuttle trains are equipped with cab radios for communication through both concession radio and track-to-train, while Eurostar trains and locomotives used on freight trains are fitted with International Train Radio (ITR), a specially-developed cab radio that allows drivers to communicate on British, French, and Eurotunnel systems.

"The age of these systems is increasingly a challenge," explains Eurotunnel Communications Director John Keefe. "Concession radio is becoming increasingly difficult to repair and replace. We have capacity issues at times, and because it is a pure radio system, we only have one-way communication, which limits the usefulness and flexibility of the system."

Furthermore, the tough environment of the tunnel had taken its toll on radiating cables, causing communications quality problems. "We normally maintain our telecoms infrastructure during scheduled maintenance periods, but if there is a problem with the system that requires immediate attention, you have to manage the railway around it. We want to avoid that type of situation," says Keefe. "We have also invested to extend the life of the existing radio systems and increase the quality of radio coverage in the tunnels."

A STRONG CASE FOR NEW TECHNOLOGY

By 2009, with increasing traffic levels putting greater pressure on ageing technology, the case for renewal had become unequivocal.

In December 2009 Eurotunnel awarded Alcatel-Lucent the contract to install GSM-R in the tunnel, and last year it signed a deal with Réseau Ferré de France (RFF) to share the French infrastructure central equipment Network Subsystem (NSS) until 2025.

"The business case for GSM-R was very straightforward because this is the European standard telecoms system for railways and it gave us interoperability with national networks," explains Keefe. "This meant the priority was to find a good deal on the technology. Alcatel-Lucent put in the bid that suited us best because it offered simplicity of installation, robust equipment, and added value for our customers because it meant we could offer services that were not possible with the old system."

In the longer-term, the installation of GSM-R will also support the installation of the European Train Control System (ETCS), when the current signalling system reaches life expiry.

The infrastructure is made up of active components (optical repeaters every 750m) and passive elements (transmission cables,

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"The business case for GSM-R was very straightforward because this is the European standard telecoms system for railways and it gave us interoperability with national networks. Alcatel-Lucent's solution offered us simplicity of installation, robust equipment, and added value for our customers because it meant we could offer services that were not possible with the old system."

fibre optics). Radio coverage in the running tunnels will be provided by 750m-long sections of radiating cable. The radio signal will be transmitted to the radiating cable by optical repeaters and fibre-optic cable installed in the service tunnel, minimising the number of base stations, and bringing down both the overall cost of installing and operating the network. Installation is now underway, with work being carried out in scheduled six-hour overnight maintenance slots at weekends.

The GSM-R network will be fully operational by mid-2014. Alcatel-Lucent will be responsible for maintenance of the GSM-R infrastructure for the first two years, and RFF will provide the GSM-R core network service.

However, Eurotunnel will start to reap the benefits of this investment much sooner. An advantage of the GSM-R project is that it supports the rollout of a public GSM-P public network, and this summer the Channel Tunnel will be the first tunnel in the world to provide 3G coverage throughout its entire length. Eurotunnel will make the retransmission infrastructure available to the French and British mobile operators for 2G (GSM 900 and DCS 1800) and 3G (UMTS 2100) services.

CONNECTING PASSENGERS WITH A WORLD FIRST

On March 6 Eurotunnel, French telecoms operators Orange, SFR, Bouygues Telecom and Free together with Alcatel-Lucent signed an agreement to deliver the first half of the €14 million GSM-P programme. The business case for developing this functionality was straightforward, and was well supported on both sides of the Channel. "The telecoms operators were really keen to extend their networks," Keefe says. "This is one of the last borders in Europe where there is still a gap in signal between countries. The only problem was the position of the border, which is situated at the mid-way point of the tunnel. Under various European treaties, operating licenses are defined by national borders, and that didn't work for us. The operators didn't want the geographical frontier between the United Kingdom and France to act as the limit to the transmission zone."

"The telecoms operators were really keen to extend their networks. This is one of the last borders in Europe where there is still a gap in signal between countries."

Overcoming this meant achieving a consensus between companies and the regulatory authorities in France and the UK. The GSM-P system is not built on the legal definition of the frontier, but on the basis that one tunnel is covered by the French networks whilst the other will be covered by the British telecoms operators. Eurotunnel suggested that the most practical technical solution would involve the French telecoms operators providing coverage in the South tunnel (France-UK) all the way to the British portal, and British operators T-Mobile, Orange, Vodafone and Three providing the corresponding service for the north tunnel (UK-France). "This required a little bit of discussion between French and English telecommunications regulatory bodies, but everyone jumped on board," says Keefe.

For Eurotunnel, this investment offers an important competitive advantage over ferries, which lose coverage soon after leaving the port, and helps to give high-speed rail operators an edge over their airline rivals. GSM-P will provide consistent 3G coverage for the 9 million Shuttle passengers and 10 million Eurostar passengers who travel through the tunnel each year.

Alongside the public functionality, GSM-P will also give Eurotunnel a further advantage as a supplementary operating communication system in the tunnel, which can be used as a complement to GSM-R and analogue radio, or in the event of an interruption to these systems.

The installation of GSM-P will be completed by July and French operators will begin providing 3G service for UK-bound passengers in time for the start of the 2012 Olympic and Paralympic Games, which London will host this summer. It is planned to extend the service to passengers travelling from the UK to mainland Europe in September.

GUARANTEEING SUCCESS IN THE WORLD'S LONGEST TUNNELS

BY: ROLF SIGRIST, ALCATEL-LUCENT'S GLOBAL CENTRE FOR EXCELLENCE RAIL/TUNNEL

HIGHLIGHTS

- **Communications play a vital role in the most technically advanced Rail tunnel in the world, during the building phase as well as when it will be in commercial operation.**
- **Handling, integrating and managing huge amounts of functional interfaces and systems requires a combination of in-depth expertise and experience.**
- **Forming and maintaining relationships with partners and subcontractors is the most challenging aspect of tunnel projects, as demonstrated by the Gotthard base, the world's longest tunnel project, construction of which is underway in Switzerland.**
- **Network transformation offers an opportunity for innovative new services as shown by EuroTunnel which will soon launch 3G**

The huge strides made in tunneling techniques in recent decades have allowed engineers to overcome formidable natural barriers, and these mega-structures continue to push further and deeper, with a string of technically-impressive projects underway or planned around the world.

However, it is no longer enough to only successfully operate trains through these long tunnels. As Roland Leucker points out, “today's rail passengers and rail operators increasingly expect to have uninterrupted access to mobile and high speed internet services while on the train, even while they travel underground. Safety standards are also much more stringent in part due to the requirement to maintain a constant radio signal onboard trains travelling at up to 250km/h in highly-pressurized environment. Tunnels therefore have to be fitted out accordingly to provide these services as reliably and effectively as possible.”

> “Today's rail passengers and rail operators increasingly expect to have uninterrupted access to mobile and high speed internet services.”

Alcatel-Lucent is currently undertaking some of the most important and technologically innovative tunnel communications projects in the world, including the 57km Gotthard base tunnel in Switzerland, which will be the world's longest when it opens in 2016. It will also arguably be the most technically advanced ever to be constructed. This will be largely due to the integrated communications systems that have been planned, designed and implemented by Alcatel-Lucent. The work started very early on with the various consortium partners offering to the end customer a state-of-the-art finished product but also, offering the construction partners a safe and secure environment during the construction stage, for what is still in the 21st Century a high risk endeavor.

MANAGING AND FORMING THE RIGHT RELATIONSHIPS

While installing a reliable and efficient communication system in the world's longest tunnel is certainly a major undertaking, Rolf Sigrist from Alcatel-Lucent's global centre of excellence for tunnel/rail says that the greatest challenge he has encountered during the Gotthard project is managing relationships with all the different parties involved. Unlike most of its previous railway projects, Alcatel-Lucent has worked on the tunnel as part of a larger consortium. This meant the company had to manage relationships with not only its partners and subcontractors, but all other parties involved in tunnel and railway construction, overcoming what Sigrist describes as “a clash of industry cultures”.

> “We know how to dealing with anyone from tunnel excavators to track-laying companies whose part of the story is completely different.”

“We know how to deal with anyone from tunnel excavators to track-laying companies whose part of the story is completely different,” Sigrist says. “After years of working in this environment, we are used to a multi-vendor management and integration projects and have learnt a great deal from it.”

The scale of this type of project, which can take up to 10 years to complete, also means that forming the right relationships and partnerships with subcontractors is essential in the very early stages to avoid difficulties down the line. In the Gotthard project for instance, thousands of interfaces (whether electrical, mechanical, system) are required for reliable operation, all of which are transmitted to and integrated at the tunnel control centre managed by Alcatel-Lucent. Sigrist says that work began to form these partnerships up to a year before the RFQ was issued, which he says was critical in getting experienced partners on board.

"You have to be careful who you get into a contract with," Sigrist warns. "In many ways it is like getting married. You have to anticipate potential obstacles or problems and mutually work on a common solution, find ways to solve the issues, and very often reach a compromise that will produce the end result. We have found that working in such a way cements the relationship with our partners, making us even stronger for when we might work together again."

EMPOWERED CONTROL CENTERS

In addition to monitoring communications, the control center can also be responsible for screening the performance of the tunnel's entire infrastructure, from energy use to access doors. For this to work effectively in the Gotthard Tunnel, Alcatel-Lucent developed an expert system to correlate all telecom alarms and minimize the number of processes in order to focus on the root cause. "In fact in the Gotthard project, there are approximately 70,000 data points to the tunnel control center, all of which need to be handled effectively so all relevant information is displayed and easy for operating personnel to understand."

With so many subcontractors to work with, managing the installation of the systems and interfaces in any complex tunnel project is a difficult process that requires an established and expert partner. Sigrist also emphasizes that it is important that the technology used remains up-to-date. "The installation can take more than five years to complete and of course during that time there will be updates to the technology used, and also fluctuations in price and functionality."

CHALLENGING ENVIRONMENT

Inevitably there are a number of significant challenges once construction gets underway. On a tunnel that is 57km in length and with just two access portals, reaching the work site is a challenge in itself, particularly as work progresses, with workers entering in the morning and often not able to leave the tunnel before the end of the day.

Working conditions are also far from ideal. No air-conditioning systems are installed in some rail tunnels because once it is operational passing trains move sufficient air to ventilate the space. Temperatures can consequently reach up to 45˚C, as they will during operation on the Gotthard tunnel. With this in mind, Sigrist says that from a technical perspective Alcatel-Lucent had to select equipment capable of operating without cooling systems to minimize energy consumption as well as the number of components that might fail.

> "Minimizing the number of components is integral for a piece of infrastructure on which maintenance might only be able to be carried out during four-hour windows at night on the weekends."

Indeed, minimizing the number of components is integral for a piece of infrastructure on which maintenance might only be able to be carried out during four-hour windows at night at the weekends. In the Gotthard tunnel, all of the data backbone, tunnel radio equipment and voice communication equipment, along with emergency phones, were installed in the cross tunnels that are situated 325m apart between the two running tunnels. Alcatel-Lucent made sure during design phase that the major parts of the telecom equipment are only located in the two multifunction stations in the tunnel and at the two portals. This simplified approach was also adopted through the use of a single leaky cable in the tunnel which can carry the GSM-R, public GSM, UMTS and professional mobile radio (PMR) systems used by emergency services.

INFRASTRUCTURE RENEWAL UNLOCKS INNOVATION

While new construction is designed with installation of reliable telecommunications systems in mind, there is a growing demand to upgrade existing infrastructure to the latest standards. After nearly two decades of operation in tough conditions, Alcatel-Lucent is currently revamping the communications infrastructure of the EuroTunnel, which is the world's longest undersea tunnel.

Like the tunnel itself, the renewal of the network is in many ways a pioneering endeavor. In December 2009, Eurotunnel selected Alcatel-Lucent as its partner for the rollout of GSM-R, which not only makes the tunnel interoperable with adjoining railways but delivers much greater flexibility in its communications architecture.

A key advantage of the GSM-R project is that it supports the rollout of a public GSM-P public network, and this summer the Channel Tunnel will be the first long tunnel in the world to provide 3G coverage throughout its entire length. Eurotunnel will make the retransmission infrastructure available to the French and British mobile operators for 2G (GSM 900 and DCS 1800) and 3G (UMTS 2100) services.

This has obvious benefits to passengers, who will for the first time enjoy seamless mobile connectivity as they speed beneath the Channel. It also gives rail a key competitive edge over its air and ferry rivals, demonstrating how Eurotunnel is continuing to innovate in service delivery.

INCREASING SAFETY AND SECURITY

Inevitably safety is of paramount importance in a tunnel environment. One area where there has been significant progress in recent years is the general evacuation concept, particularly the improvement of surveillance systems. Alcatel-Lucent is responsible for RFID tagging devices being used in the Gotthard tunnel during construction which identify the location of anyone in the tunnel and provide vital statistics such as their name and job title to the control room. It is possible to extend this concept further through the installation of CCTV surveillance which, in an emergency, could help operators make a more informed decision to minimize potential risks.

While working on a tunneling project of such magnitude as the Gotthard base or Eurotunnel is a very challenging and demanding undertaking, it does have its rewards. Sigrist says that everyone working on the Gotthard Base tunnel feels an enormous sense of pride at playing their part in building what will be the world's longest tunnel and a true engineering landmark, and the same can be said for the Eurotunnel before it opened in 1995. Indeed he says that working on such important pieces of infrastructure is an opportunity that does not come around very often.

"It is a fascinating project, and in many ways a once in a lifetime working experience that is very different from projects I have worked on previously with Alcatel-Lucent," he says. "It is special and it is one of those things that you feel very proud to be a part of."

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