AlpTransit Gotthard San Gottardo

ALPTRANSIT GOTTHARD AG

CROSSING NEW FRONTIERS

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CROSSING NEW FRONTIERS

CEO, Marco Ceriani, discusses the creation of the New Rail Link through the Alps (NRLA), a project that has been dubbed 'the construction of the century'

WRITTEN BY: WILL DAYNES
RESEARCH BY: ABI ABAGUN

Construction of the railway systems building and ventilation centre at the Faido portal has been in progress since 2012

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Truly a natural wonder of our planet, the Swiss Alps have been attracting tourists from across the world since long before the construction of the first hotels and mountain huts in the mid eighteenth century. This continues to this day with the Alpine area as a whole attracting some 100 million visitors each year.

The Alps themselves cover some 65 percent of Switzerland's surface area. Looking at that statistic alone it is perfectly understandable that, since the Middle Ages, transit across the Alps has played an important role in history, and remains a key issue at a national and international level. Since the beginning of industrialisation the country has worked tirelessly to improve its transalpine network, beginning with the building of the Gotthard Rail Tunnel in 1882.

Today, construction of the New Rail Link through the Alps (NRLA) is creating a fast and efficient railway link with two tunnels under the Gotthard and Ceneri at its heart. Crossing the Alps with minimal gradients and wide curves, the new railway link will stand at only 550 metres above sea level at its highest point.

The idea of a flat crossing of the Alps is nothing new, what with the first vision of a Gotthard base tunnel having been conceived in 1947, however it is the NRLA Gotthard Axis project, running from Altdorf in the north to Lugano in the south, that is creating the first flat route through the Alps.

"Several key aspects characterise the AlpTransit project and differentiate it from other modern railway infrastructure

The Gotthard Base tunnel project

The sheer scope and complexity of the project are literally unprecedented. No less daunting is the job of ensuring that railway employees, train operators and dispatchers can communicate with each other deep underneath 3,000 meters of Alpine granite. To make that happen, Alcatel-Lucent Switzerland trusted one of the premier global RF solutions providers, CommScope®.

Project parameters and objectives
As the in-tunnel DAS provider, CommScope engineers were asked to design, commission and provide system integration support for the DAS solution. The technical requirements were significant. Trains must be able to connect reliably and seamlessly to the railway's railway's GSM (GSM-R) network—the system that allows train operators, dispatchers and in-train personnel to communicate. The DAS must also support traffic from public GSM- 900MHz and GSM-1800MHz networks, one UMTS 2100MHz network and the railway's PMR-400MHz public safety network. The objective was to ensure accurate, precise voice and data signal handoffs while trains speed through the tunnel at up to 250 kilometers per hour.

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Through its Andrew Solutions railway connectivity portfolio, CommScope has built an impressive resume of successful high-speed rail projects. The first Andrew Solutions distributed antenna systems (DAS) for railway tunnels were developed in the 1980s for use in the construction of the Channel Tunnel—the world's longest underwater passage, connecting England to France. Since then, CommScope has provided critical communication networks for rail projects in Italy, Taiwan, Spain, Switzerland, Canada, Russia, China and Norway.

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The Gotthard Base tunnel project

CommScope® provides reliable DAS coverage 3,000 meters underground at 250 km/h

At times we can't even get a strong enough cell phone signal in our own home. Imagine being asked to provide reliable, consistent signal strength for passengers speeding through the Swiss Alps at 250 kilometers per hour. That's right, through the Alps, not over or around them.

In 1998, the Swiss government envisioned a high-speed rail line connecting the international trading hubs of Zurich, Switzerland and Milan, Italy. Only one thing stood in the way: The Swiss Alps. The solution was a 57-kilometer subterranean rail line blasted and bored through solid rock. When it opens in 2016, the Gotthard Base Tunnel will be the world's longest railway tunnel.

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projects," explains Chief Construction Officer, Marco Ceriani, "for instance the fact that it will operate with mixed traffic. Passenger trains will travel through the Gotthard Base Tunnel, which at 57 kilometres will be the world's longest railway tunnel, at a maximum speed of 250 kilometres per hour and goods trains at up to 160 kilometres per hour."

The Gotthard Base Tunnel will go into operation in 2016, while three years later, in 2019, the flat route through the Alps will be completed with the Ceneri Base Tunnel. The flat route will cut 40 kilometres off the former distance of 330 kilometres from Basel to Chiasso and has a maximum gradient of only 12 per thousand. That is much less than the 26 per thousand on the 130-years-old existing Gotthard mountain route.

100 MILLION

Visitors to the Alps each year

"The Gotthard Base Tunnel," Ceriani continues, "consists of two single-track tubes which are separated from each other but linked every 325 metres by cross-passages. In addition, two multifunction stations at Sedrun and Faido divide the tunnel tubes into three sections of approximately equal length. The multifunction stations each contain an emergency-stop station for evacuation and two track-crossovers, thus allowing trains to cross over from one tube into the other. The tunnel's maximum capacity is 50-80 passenger trains and 220-260 goods trains per day, depending on the operating regime."

> "IT IS THE NRLA GOTTHARD AXIS PROJECT, RUNNING FROM ALTDORF IN THE NORTH TO LUGANO IN THE SOUTH, THAT IS CREATING THE FIRST FLAT ROUTE THROUGH THE ALPS"

Work in progress at Camorino, north of the north portal of the Ceneri Base Tunnel, includes the Lugano-Bellinzona viaduct and the new underpass of the cantonal road

Looking back over the history of the project itself, Ceriani is quick to highlight some of the larger, and indeed more challenging undertakings that have been encountered. "One of the biggest tasks was the construction of the shaft at Sedrun, which the miners began excavating in 1996. They started from a mountain valley in the Bündner Oberland 1,300 metres above sea level and sank a shaft 800 metres down to the level of the tunnel. From this intermediate heading, they started driving the Gotthard Base Tunnel to the north and south. The purpose of the intermediate heading was to shorten the construction time."

It perhaps goes without saying that the final breakthrough of the project also stands out prominently in Ceriani's mind. "This took place in the east tube on 15 October, 2010, at 2:17 pm local time, when the tunnel-boring machine travelling from Faido broke through into the Sedrun section. The breakthrough error itself was minimal, measuring only eight centimetres horizontally and one centimetre vertically, yet it marked a historic moment for not only this project, but the country as well."

Of course, with a project of this size challenges are difficulties are inevitable.

> “WHAT THE NEWLY CONSTRUCTED GOTTHARD ROUTE WILL DO IS MAKE RAIL TRAVEL COMPETITIVE WITH ROAD AND AIR TRAVEL”

In the Ceneri Base Tunnel at Sigirino, progress continues on four drives

One of particular note occurred during work at the Piora syncline. It is here that on the surface by the road over the Lukmanier Pass, about 1,500 metres above the level of the tunnel, there are outcrops of whitish sugary dolomitic marble. The syncline itself was thought to consist of an inverted cone of loose aquiferous material extending down to a great depth. This zone was also encountered when a 6.5-kilometres-long exploration tunnel was drilled 300 metres above the level of the base tunnel.

The Amsteg installations site has been removed and is now being renatured

57 KM

The total length of the Gotthard Base Tunnel

Ceriani goes on to recount what happened next. “Sugary dolomite under high water pressure flooded out and blocked the tunnel-boring machine with sand. The whitish mixture of water and sand flowed out of the tunnel and covered the cantonal road in the Leventina with a sandy layer. The media reported this with the headline “D-day at Piora Beach” and predicted the death of the project.”

This was not to be of course. “The point where the water flowed out was successfully sealed,” Ceriani highlights. “Diagonal bores were drilled down to the level of the base tunnel to investigate the consistency of the material. Fortunately, hard, compact dolomitic marble without water was encountered. The geologists put forward the hypothesis that in the 300 metres height difference between the exploration tunnel and the base tunnel, there must be a geological discontinuity. It probably takes the form of a solidified gypsum cap that separates these two different formations. The entire campaign cost around 100 million Swiss francs. It was executed before it was known whether this project could be implemented and the financing had been secured. Ten years later, when actually driving, this controversial zone was traversed without difficulty. At

The points for the Sedrun multifunction station are assembled at Erstfeld before being transported into the tunnel

the level of the tunnel it was about 150 metres wide and was driven through at a speed of about ten metres per day."

As of July 2013 structural work on the project is largely complete, with around 50 percent of the railway infrastructure systems within the Gotthard Base Tunnel having been installed. Meanwhile, in the Ceneri Base Tunnel, excavation work is in full swing, with more than 60 percent having already been cut, making AlpTransit Gotthard confident that the Ceneri Base Tunnel will be ready for scheduled train services in 2019. Additionally, pilot operations between Faido and the south portal at Bodio will start on schedule in December 2013, making it a further important milestone on the way to the world's longest railway tunnel becoming operational in 2016.

With strong progress being made across all areas of the project, Ceriani has a very clear view of what he expects it to bring Switzerland in terms of economic and social benefits. "Goods traffic on the north-south axis is constantly increasing and it is the goal for much of this traffic to be transferred from road to rail to protect the sensitive Alpine environment that we hold so dear. What the newly constructed Gotthard route will do is make rail travel competitive with road and air travel. This will benefit more than 20 million people in the catchment area between southern Germany and northern Italy." BE

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