Tunnel control and monitoring with PROFIBUS.

When the 24 km of the A1 motorway between Payerne and Yverdon was finished the last gap in the 350 km long link between Lake Constance and Lake Geneva in Switzerland was closed. 8 bridges and 3 tunnels had to be built in the cleared terrain which was the reason the costs were so high at almost CHF 60,000,000 per km (approx. 40.6 million Euro). In March 2001 this section was opened for traffic.

The company Omni Ray AG was responsible of all technical contact. They were also in charge of the product delivery for the whole project.

Local switch cabinet under an SOS recess.
Project details

The tunnels are called „Pomy“ and „Arrissoules“ and are 2.8 and 3 km long respectively. Under the carriageway in both of them there is an accessible 2.2 m high auxiliary tunnel which accommodates part of the control system and all the cables. The projects for the two tunnels are practically the same.

JEANFAVRE & FILS SA was commissioned to design all the backup control systems for the two tunnels. Based on good experiences they had had in previous projects they opted for SAIA-Burgess Electronics’ SAIA®PCD control system.

Project parameters

Of the 600 digital and analog signals to the „Pomy“ tunnel approximately 350 are processed directly by the two head ends. The remaining 250 signals are distributed in the tunnel mainly as so-called technical signals from the 42 SOS recesses.

Requirements

- Communication network of up to 3 km long
  - „Pomy“ tunnel = 2.8 km long
  - „Arrissoules“ tunnel = 3 km long
- Very short reaction time and therefore high transmission speed necessary
- Maximum safety standard

Solution

To solve this problem JEANFAVRE used an SAIA®PCD6 on both the east and the west side of the tunnel shafts. These process the remote signals from the SOS recesses with remote I/Os that are linked by the PROFIBUS DP network.

- The two PCD6’s at the tunnel entrances are also linked with a circular LWL connection through the two shafts.
- In order to achieve the short 1 second reaction time from the control system, a transmission speed of 1.5 or 0.5 Mbps is used.
- Hirschmann™’s OZD Profi were selected as LWL PROFIBUS converters. These had proved to be very efficient in other installations.

Why Hirschmann™?

The Hirschmann™ LWL network ring structure guarantees high communication security from the SOS recesses to the PCD6 head ends and between the head ends themselves.

PROFIBUS DP was chosen because it is a proven industry standard that is also easy to install and put into operation. By using fiber optic cables distances of up to 3 km could be easily overcome at the higher transmission speed. In addition this therefore gave good protection against electromagnetic fields that occurred in the auxiliary tunnel as a result of various high voltage cables.