Case study
Cable fault location in the pump-fed power station

Fault finding in the interior of a mountain

Robert L'Eplattenier, test engineer and CEO of Gasenzer AG, often travels "in the field" and is even more often in the Swiss mountains. In February 2015, one job took him literally into the mountains: In the underground pump-fed power station Grimsel II of Oberhasli AG Power Works, a medium-voltage cable in the power derivation of a 100 MVA generator was faulty. The re-pair had to be preceded by a ca-ble fault location. Winter made the drive through the Bern Alps difficult: It had been snowing at the time of the damage, and the more than 2000 m high mountain passes were blocked. In the subsequent days, an avalanche and two avalanche warnings made the journey more difficult. It was only one week after the fault occurred that L'Eplattenier was able to reach the destination with his cable test van. He drove to the goods ropeway in Handeck via the mountain pass. It brought him to the entrance of the 2.5 km long tunnel that connected the outside world with the power station. His work on site was accomplished quickly: The SIM/MIM methods supported by the BAUR Syscompact 3000 fault location system (see box) guide you quickly to the high-resistive faults, as well as to any earth fault in a phase.

Gasenzer AG Prüf- und Messtechnik

Gasenzer AG, based in Hinwil in Switzerland, specialises in measurement technology and measurement services relating to fault location, testing and condition evaluation of cable systems. The company, which has been ope-rat-ing as a joint stock company (AG) since 1991, has more than half a century of experience. In 1961, electrical en-gineer Hans Gasenzer established a private company that focused on cable tests and on selling specialist measuring devices. Gasenzer established a close relationship with BAUR right from the beginning and is the exclusive trade partner for BAUR devices in Switzerland.

The SIM/MIM method

High-resistive faults are made visible with the SIM / MIM method (Secondary Impulse Method / Multiple Impulse Method). Here, the high-resistive fault is „ignited" by a high voltage impulse and thus is temporarily low-resis-tive. This helps determine the distance to the fault. This is evaluated and displayed by the device software, e.g. by the Syscompact 2000 or Syscompact 3000 software. The SIM and MIM methods have proven to be particularly advantageous because they help pre-locate faults in up to 98 % of all cases.

↗ Graphic: Power Works Oberhasli AG

Fault location system Syscompact 3000

The Syscompact 3000 from BAUR Prüf- und Messtechnik is a compact, fully enclosed fault location system for pre-location and pinpointing of high-resistive, low-resistive and intermittent faults in low and medium-voltage cables. Easy operation and the use of the latest fault location methods enable fast and safe fault location. The system can be equipped with different surge voltage generators SSG 1100, 1500 or 2100. Optionally, SSG 500 is also available.

The Syscompact 3000 is easy to transport due to its compact design. It is likewise suitable for installation in a small utility van. A Syscompact is part of a typical setup in the BAUR cable test vans.

Fault location methods:

- Time Domain Reflectometry (3 phases)
- Secondary Impulse Method (SIM and SIM DC)
- Multiple Impulse Method (MIM) (advanced SIM)
- Differential Secondary Impulse Method
- Impulse current method

The most important features at a glance:

- Location of low-resistive, high-resistive and intermittent cable faults
- Efficient cable fault pre-location meth-ods
- Pinpointing according to the noise loca-tion method or acoustic propagation time measurement (with Universal Locator and ground microphone)
- Sheath fault location according to the step voltage method (with Universal Locator and two measurement probes)
- Easy to handle
- Modular system, easily expandable for cable testing and diagnostics

Technical data:

Time domain reflectometer IRG 3000	
Output voltage (transmitting pulse)	20...160V
Pulse width (transmitting pulse)	20ns – 1.3 ms
Electric strength Echometer	400 V AC
Output impedance	12 - 2000 Ohm
Measurement ranges (at v/2=80m/µs)	10 - 1000 km
Sampling rate	200 MHz (5ns)
Resolution (at v/2=80m/µs)	0.1 m
Propagation time factor v/2	20-150 m/µs
Input signal Amplification	-10 dB ... +60 dB
Integrated surge voltage generator	
Output voltage	0-8kV / 0-16kV / 0-32 kV
Surge energy	1100, 1500, 2100 J
Pulse frequency	single, 10, 20 or 30 pul/min
DC voltage	0-32kV
Max. output current in DC mode	850 mA
General system data	
Power supply	110-240V (50/60 Hz)
Dimensions	ca. 1000 x 1160 x 800
Weight	195 – 295 kg
Operating temperature	-20 ... +50 °C
Storage temperature	-40 ... +60 °C

You can find data sheets and further details on these products on our website:
www.baur.eu/cablefaultlocation.

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www.baur.eu/cases