

CASE STUDY: CUSTOMIZED SOLUTIONS BERNMOBIL

Customized cable protection solutions

Working together with PMA, Bernmobil finds the correct solutions for repairing and protecting cable systems



Finding the right product together: PMA provides needs-oriented cable protection solutions and services from the most basic to the most challenging high-tech products

From experience gained over many years, PMA knows that rail operators often need entirely unique cable protection solutions – tailor-made to their fleets and to their technical requirements – so that they can operate safely 365 days a year. Solving important tasks like this together with their customers is thus one of the core areas of expertise which PMA is able to offer.

Responsible for public transport in Switzerland's capital

For over 125 years, Bernmobil has been responsible for public transport in Bern, Switzerland's capital city. Bernmobil's workforce of some 1,000 operates 48 trams and 163 buses every day and in all weather conditions, serving 336 stops. Thanks to electricity from renewable sources, more than 70 per cent of all passenger services in the city already operate in an environmentally-friendly manner. A survey has shown that 93 per cent of passengers are either satisfied or even very satisfied with the services provided.

PMA is a market leader in the field of cable protection for rail applications. PMA can offer its customers one or more tailor-made solutions for virtually any task. These solutions also benefit Bernmobil in Bern, Switzerland: The city's public transport operator, carries over 100 million passengers annually on its network of 5 tram routes, 3 trolley bus routes and 26 bus routes.

To be able to continue this high degree of reliable services, it is essential for Bernmobil's vehicle fleet to be in perfect working order. Maintenance and repair work has to be carried out quickly and thoroughly so that vehicle downtimes are kept to a minimum and Bernmobil's trams are available to convey passengers smoothly through the inner-city traffic without hold-ups.

Helping to provide this reliability is having the right repair solutions when it comes to cable protection. Many of the protection systems are mounted on tram roofs, vital cables and leads which are essential for keeping a tram running must be securely protected from external influences. Sun, rain, snow, frost, mechanical wear and tear and even sparks flying off the roof-mounted current collector all present major challenges for cable protection systems in rail applications. This need for protection is why Bernmobil, as a long-standing customer, contacted our cable protection experts so they could collaborate on the right cable repair solutions. Over time, the demands of operating for 365 days a year will leave its mark on any cable protection



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— Bernmobil's trams even run through the narrow streets of Bern's picturesque old quarter. The many tight curves they have to negotiate in these narrow streets and lanes subject the cable protection systems to particularly severe torsional stress.

system. Due to mechanical influences such as torsional stress and to sparks from the current collector, cracks and holes appear in the conduit as it ages which need to be repaired professionally with minimal interruption. For reasons of time and cost, it is frequently not possible to remove complete systems together with their complicated cabling and to replace the defective conduits in their entirety.

Cable protection systems subject to huge stresses in daily use

Effective and technologically sophisticated repair solutions are needed for accurately repairing just the damaged and aging parts of the cable protection system. Michael Aufdenblatten, Project Manager Trams at Bernmobil, teamed up with PMA to test a range of PMA products with a view to finding the best possible repair solution.

According to Michael Aufdenblatten: "We know PMA to be a supplier of high-quality cable protection solutions and we have already installed their products in our trams. We therefore seized the opportunity of getting our workshop team to discuss various tricky cable protection problems in detail right on the spot with PMA's cable protection experts."

Firdes Arikan, PMA's Area Sales Manager, presented Bernmobil with a range of potential solutions: "Fire prevention is extremely important in rail applications. Therefore, all the solutions we presented to Bernmobil satisfy the HL3 standard.

Meeting together in our workshop, we discussed various ways of meeting Bernmobil's requirements and tested them using design models."

The PACOF divisible cable system as a repair solution

Wherever there is a need to replace conduits without having to dismantle the whole cable system, we recommend using the PACOF conduit system; it can be fitted without the use of tools over the exact spot where there is a defect so as to restore protection.

This avoids having to disassemble and refit entire cable systems, a costly and time-consuming process. The divisible one-piece system is an optimum solution for repairs, retrofits or for pre-assembled applications. The most important features of this solution are that it is: divisible, one-

— The flexible, divisible PACOF conduit is ideal for repair tasks and to help provide trouble-free subsequent cable installations.





— The divisible PACOF conduit can be quickly and easily fitted over the damaged area, helping guarantee total protection

piece, provides IP54 protection, quick and easy to assemble, suitable for retrofitting and repair tasks, of a modern functional design, of high quality, and an excellent value for the price.

The PACOF conduit can be opened up lengthways and closed again at any time; it therefore offers great bendability and compression strength – properties which are hugely important for rail applications.

As a second step, the PMA team discussed with Bernmobil how to prevent cracks occurring in conduits in the first place. Until our discussions Bernmobil had been installing conduits and support systems provided by another manufacturer. Lack of conduit flexibility in the existing support systems was identified as a cause of cracking.. Due to the

constant torsional forces, the conduits suffer stress fatigue and eventually crack.

A new, flexible and modular support system for conduits and cables

This is precisely what PMA's new, highly flexible BGPM multiple support system can help prevent. The BGPM is a light, compact solution offering high impact-resistance. Thanks to its innovative design, the conduit is able to move within the support system, thus helping prevent cracking due to torsional stress.

— After several years, this conduit from a different manufacturer broke. The cable is exposed and there is a risk that it could be damaged. With PMA's PACOF divisible conduit, the defect can be quickly and safely repaired without dismantling the entire cabling.





Possible ways of using the new modular support system BGPM, are discussed with customer.

The BGPM is a light, compact solution offering high impact resistance. The external dimensions of this new design have been reduced to the minimum and the spacing between parallel conduits is very small. The system has been specially designed for use in the rail vehicle construction sector and for other applications where conduits and cables running in parallel need to be held in position.

“The BGPM modular support system boasts many highly-promising characteristics”

PMA's customer advisers, together with Bernmobil's workshop team, completed a trial installation in an initial modular cable support system to establish how BGPM performed in everyday use and while interacting with conduits. According to Michael

Aufdenblatten, Project Manager, Trams at Bernmobil: “The BGPM modular support system boasts many highly-promising characteristics. I feel certain that the system will pass our test with flying colours.”

As time goes by, cable protection systems have to be replaced. Whether because the cabling needs renewing or because a new technical installation is in order. This also presents a good opportunity to introduce cable protection systems which promise to deliver the latest technical developments plus improved characteristics impacting dynamics, fire-resistance, UV-protection, etc.

Wherever entire conduits have to be replaced, PMA recommends using the XPCSF multilayer conduit. The PMA multilayer technology allows materials possessing the best possible product characteristics for the rail sector to be combined in

01 The flexible MGPM modular support system offers many options for securing cables and conduits

02 The XPCSF multilayer conduit. The PMA multilayer technology allows materials possessing the best possible product characteristics for the rail sector to be combined in entirely new ways.



01



02



PMA presentation to customers about how the XPCSF multilayer conduit (example seen to the left on the carriage roof) could be installed in future by Bernmobil.

entirely new ways. A conduit composed of two layers made of different materials is produced using an innovative manufacturing process. By combining two specially modified polyamides with different material properties, this multilayer solution offers additional protection and safety. These new materials are thus able to help markedly improve the overall performance of the conduits.

A new, highly-flexible multi-layer conduit for the rail industry

The XPCSF multilayer conduit with its orange-coloured inner layer is particularly suited for use in all external applications on rail vehicles – such as Bernmobil's trams for example, and also for the couplings between carriages, for roof installations and, for applications beneath the train and in bogies. It complies with the EN45545-2 HL3 fire prevention standard in accordance with Requirement Set R23 and is thus suitable for use with trains of all types and all operating modes. Bernmobil's first step will be to test the XPCSF conduit to determine how the new multilayer technology behaves in daily operations.

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