ON-SITE TESTING WITH COMPACT AC TEST-SYSTEM AT THE FIRST 500 KV XLPE CABLE PROJECT IN SOUTH AMERICA

Andreas **WEINLEIN**, Gero **SCHRÖDER**, Sebastian **EBERT**, Südkabel GmbH, Mannheim (Germany),
andreas.weinlein@suedkabel.com, gero.schroeder@suedkabel.com, sebastian.ebert@suedkabel.com,
Harald **GEYER**, agea kull ag, Derendingen (Switzerland), h.geyer@agea-kull.ch

ABSTRACT

The first 500 kV XLPE cable project in South America was delivered, installed and commissioned in Colombia as turnkey project. Due to the given local logistical and technical requirements a new compact on-site AC high voltage resonant test system was designed.

The test-set consists of 4 pieces cylinder reactors all placed transport locked in a 20 ft container suitable for a fast and reliable erection of the test system on-site. The compact test-set is rated for 540 kV.

The on-site test was carried out successfully in September 2010 including both, high voltage and PD tests.

KEYWORDS

500 kV XLPE cable system, compact on-site AC HV resonant test system, PD measurement on-site, compact plug-in sealing end, mobile spare phase

INTRODUCTION

The first 500 kV XLPE cable project in South America was delivered, installed and commissioned in Colombia in September 2010.

The entire job was handled as turnkey project. Due to the given local logistical and technical requirements a compact on-site AC HV resonant test system was designed to carry out the AC HV commissioning tests.

The XLPE cable connection consists of two systems (additionally one spare phase) rated 500 kV with individual cable length between 750 – 855 m. The conductor cross section is 800 mm^2 aluminium. Both circuits are laid in flat formation in a vertical saddle arrangement inside the cavern of the Porce III Hydro Power plant. Total 7 pieces of factory pre-tested compact plug-in SF_6 sealing ends and 7 pieces of factory pre-tested and pre-assembled compact plug-in outdoor sealing ends were installed.

The test-set consists of 4 pieces cylinder resonant reactors (3 t each) all locked for transport in a 20 ft container with removable roof suitable for a fast and reliable erection of the test-system on-site. The step-up transformer and frequency converter including control unit for voltage and PD measurement are placed in a 10 ft container.
The entire transport weight of the test-system is less than 24 t. Extension up to 6 resonant reactors is considered and easy to implement. Because of the module-like set-up the handling procedure on-site is optimized.
The test-set is rated for 540 kV, 11.6 A, max.170 nF cable capacitance (set-up resonant reactors: 2 serial, 2 parallel) or for 280 kV, 23.2 A, max. 680 nF cable capacitance (set-up resonant reactors: 4 parallel).

A full scale commissioning test of the test-set was carried out in the cable manufacturer's factory under full load conditions with 530 kV for the duration of 2 hours at a cable drum of a capacitance of 170 nF. Additionally, a PD measurement at both plug-in test cable sealing ends of test set-up was carried out. The test frequency for this set-up was 20 Hz, representing the minimum allowable frequency for AC voltage tests after installation acc. to IEC 62067 [11].

The on-site after installation test with 493 kV / 1 h was carried out successfully at all cables including the spare phase in September 2010 comprising both, AC HV tests and PD measurements.

The testing of the spare phase was carried out by phase-plugging of the regular cable phase inside the GIB cable enclosure which was performed in less than one day. This was possible because of both, the modular set-up of the test-set and the advantages of the compact plug-in sealing end system.

PROJECT DETAILS / REQUIREMENTS

A turnkey project with 5.4 km 500 kV XLPE cable of type A2XS(FL)2Y 1x800 RM/150 290/500 kV was planned, manufactured, delivered, installed and commissioned for the hydropower project Porce III near Medellín / Colombia (Empresas Públicas de Medellín E.S.P.).

The road distance to the next Atlantic sea port is more than 600 km with very frequent unpaved road quality in very high mountain regions.

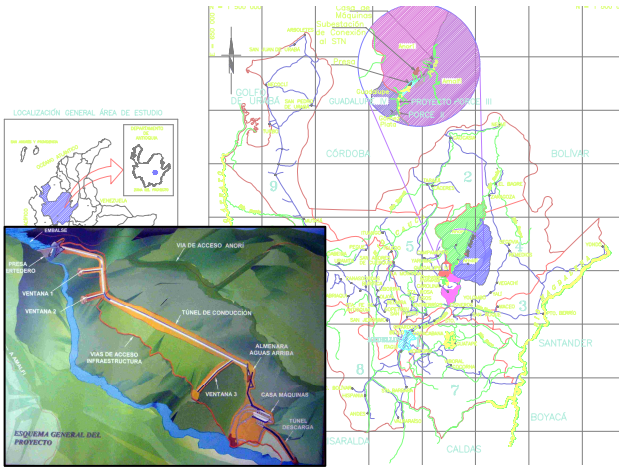

Fig. 1: map of region Porce III in Colombia

The project consists of 2 systems with an approximate phase length of 760 m. Additionally one spare phase of 855 m length was supplied and installed. In total 7 pieces of factory pre-tested 500 kV compact plug-in SF_6 sealing ends and 7 pieces of factory pre-tested and pre-assembled 500 kV compact plug-in outdoor sealing ends were installed: