Extension of Qualification applied on a MV extruded submarine cable in France.

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ABSTRACT

The project called "BELLE ILE 4" consists in implementing a new MV submarine power link to feed a French island after partly removing the previous one. The length of the link is around 14.5 km with 30 m maximum depth. The study introduces the newest technology based on the development of coilable hybrid 3x150 mm² copper 20 kV cable, XLPE insulated with 48 optical fibers.
The authors will introduce a new "Extended Prequalification sequence" based on the recommendation of CIGRE TB 303 and the standard IEC 60840 that was applied on the MV submarine cable.

KEYWORDS

XLPE, Submarine Cables, CIGRE TB 303.

INTRODUCTION

Belle Ile is an island in the Atlantic Ocean of the Brittany coast in the western part of France, fed by 3 MV submarine cable systems connecting Belle Ile to the mainland. The link "BELLE ILE 2" is out of service and it was decided to replace it. The project called "BELLE ILE 4" consists in implementing in the same corridor a new MV submarine power link after partly removing the previous one. This choice was validated by the fishermen who prefer to keep the same cable laying zone than to enlarge it.

To guarantee the quality of supply in the island in the absence of "Belle Ile 2", generating sets were displayed, showing the need to quickly replace the missing cable. The length of the link is around 14.5 km and the maximum depth is 30 m. To minimize the cost, it was decided to lay the cable with fixed table vessel and to maximize the reliability, on board joints were forbidden and factory joints limited to one per phase. In addition, the regional representatives of the Ministry of Environment forbade the use of lead on this project. Therefore, a welded copper screen was specified.

Simultaneously, the local authorities were thinking to lay an optical fiber cable to provide high speed internet to the island. As a result, the DSO, ERDF, and the Conseil Général, the local Authority, agreed to build a common cable called hybrid providing at the same time electricity and telecommunications.

This hybrid cable should cope with the HN 33-S-26 [1] a company specification for MV submarine cables derived from the French standard NF C 33-226 [2] dealing with MV land cables and the UIT G 652 for the optical part.
This paper introduces the newest technology based on the development of coilable hybrid Cable design with copper laminated screen longitudinally applied and bonded to the outer sheath which demonstrates high reliability for currently envisioned Subsea systems.

The focus of the paper is to assess the reliability of XLPE insulation cable system subjected to extensive qualification program. This paper describes the development process of MV XLPE Cable systems and the results of the type tests qualification process.

Indeed, the cable system has been submitted to mechanical and electrical type tests qualifications mainly focus on, Coiling Tests, Traction Tests, Tensile and Bending Tests followed by Electrical Type Tests. The non-Electrical Type tests have been performed as well. Several European laboratories have been involved along the process of the qualification.

Even though successfully passed type tests need not to be repeated, the frequency of supply of distribution submarine cable is smaller than the rhythm of changes in cable design or manufacturing process which may lead to different performance characteristics and therefore recurring type testing.

CIGRE Technical Brochure 303 [3] led the way by introducing a guide for a functional analysis approach in the extension of validity of test of HV cables. The modification proposed by a supplier could be studied in order to detect which performance characteristics were affected and to select the tests that need to be repeated. The same methodology was applied for this MV submarine cable qualification.

The authors will introduce in the paper a new "Extended Prequalification sequence" based on the recommendation of CIGRE TB 303 and the standard CEI 60840 Ed 2004 that was applied on the MV submarine cable. Such a specific protocol adapted for the project was a pioneer methodology in the cable manufacturing industry for MV cable system.