TYPE TEST ON EPR 66 KV AT 105°C

Massimo **TAWFILAS**, Simone **GIANNINI**, Luca **Perotto**, Alessandro **TROLLI** Prysmian Group, (Italy),
massimo.tawfilas@prysmiangroup.com, simone.giannini@prysmiangroup.com, alessandro.trolli@prysmiangroup.com

ABSTRACT

Ethylene Propylene Rubber (EPR) is a saturated rubber formed by copolymerization of ethylene, propylene, and a small number of diene monomers. Thanks to its mechanical properties and a wide thermal range, typically in the region of -60°C to 150°C, it represents a good candidate for new applications. Nevertheless, it is a reliable and processable material if properly formulated. EPR cables are known to have a maximum working temperature of 90°C. The subject of this study is a Submarine AC Power Cable 3 x 630 mm² Cu, 38/66 (72.5 kV) that successfully passed a Type Test at maximum operating temperature of 105°C extending the range of working temperature. In order to assess the status of the polymeric insulating material, two cores have been selected and compared and a list of analytical techniques are shared and discussed.

KEYWORDS

EPDMEPDM, HV cables; Type test, high operating temperature.

INTRODUCTION

Offshore wind energy is a crucial component of renewable energy sources and has become increasingly cost-competitive in recent years. Despite this, wind farm developers are always exploring ways to lower the Levelized Cost of Energy (LCE). Among the advancements in technology that help reduce LCE, several studies have shown that using 66 kV array cables instead of 33 kV offers considerable benefits for typical offshore wind farm systems. The main cost-saving drivers of using 66 kV over 33 kV while maintaining the same overall power output are: two times more power can be transmitted through a single array cable, reducing the length of cable needed and, therefore, the investment in cables and installation [1][2]. Fewer cables enter the offshore substation, leading to a reduction in the number of J-tubes, transformers, switches, and the space they occupy. The larger turbine unit power reduces the number of turbines and associated array cables. For offshore wind applications, high-reliability cables with easy installation and competitive costs are required. EPDM cables are covered by IEC standards and many national standards worldwide. Its good and reliable properties allow it to be used at higher operating temperatures, enabling more power to be transmitted with the same cable design. This paper aims to present the status of a 3 x 630 mm² Cu Submarine AC Power Cable, 38/66 (72.5 kV), that has successfully passed a type test at a maximum operating temperature of 105°C, extending the range of operating temperatures for EPDM cables.

EXPERIMENTALEXPERIMENTAL

SamplesSamples

The subject of this study is a Submarine AC Power Cable 3 x 630 mm² Cu, 38/66 (72.5 kV), subjected to Type Test protocol according to TB623 [3] for mechanical preconditioning and IEC 60840 [4] for electrical testing, at maximum conductor temperature set at 105°C.). Two cores have been selected and compared, a "*virgin*" samples that was not subjected to the Type Test protocoltest and the core that successfully withstood the Type Test protocol.type test. A list of analytical techniques are shared and discussed.

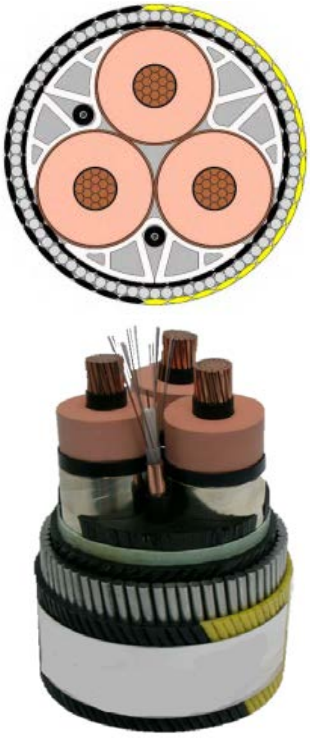

Figure 1: Indicative section and 3D drawing and sample of 3-cores inter array cable

Attenuated total reflection Fourier transform infra-red spectroscopy (ATR-FTIR)

FTIR gives information about the chemical structure of a components. It is a spectroscopy that can distinguish chemical bonds and it helps to define a molecular structure.and it is exploited to observe and if any degradation occurs. Method: Parameter Range: from 4000 to 700 cm-1, resolution: 4 cm^{-1}, Scan Numbers: 4, Scan speed: 0,2 cm-1/s, ATR crystal: ZnSe