Subsea and EHV cables require a challenging purity degree of XLPE-material

Harry **PRUNK**, Executive Board, SIKORA AG, Germany, www.sikora.net, Ph.: +49 421 48900 0

ABSTRACT

This paper outlines the reason for the need of a high purity degree of XLPE material to be used for the insulation of subsea and EHV cables. Furthermore, there will be technological solutions introduced for purity assurance of XLPE pellets that are integrated at specific production stages.

KEYWORDS

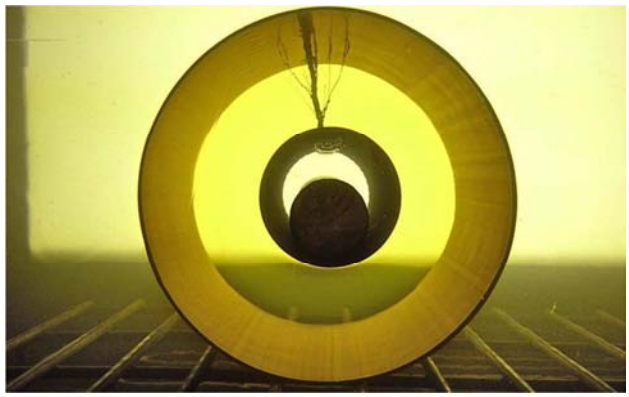
Purity of XLPE, inspection and sorting, X-ray, optics, Subsea and EHV cables, melt temperature, melt cleanliness

Necessity of clean XLPE compound for subsea and EHV cables

The purity of the XLPE compound that is used for the insulation of subsea and EHV cables plays a critical role. The purer the compound (Picture 1), the lower is the risk for a breakdown.

Picture 1: High quality insulation compound

Impurities of 50µm may already cause damage to the end product with high follow up costs. The repair of a defective subsea cable for example, which has been damaged by contamination, can lead to weeks of downtime. Furthermore, impure XLPE compound respectively defective cables and consequential crashes already affect the industry during the manufacturing process. As part of the production of EHV cables, they are tested in plant with a test voltage 2.5 times of the nominal voltage. Approximately, five to six breakdowns (Picture 2) a year are detected this way. Those breakdowns cause costs of 30,000 € minimum per crash even before the cable can be delivered to its dedicated position. In addition, valuable time is lost, making permitted delivery dates not accomplishable. Often, not agreed joints have to be used, damaging the quality image of the manufacturer consequently and may lead to contractual penalties. It is for these reasons that the Chinese Standard for high voltage cables, for example, demands the exclusion of contamination from 75µm in the processed materials[1]. Moreover, there are guidelines from the AEIC (Association of Edison Illuminating Companies), which state that cables have to be designed in such a way that they are usable for at least 40 years. Accordingly, it is necessary to inspect the material for purity to 100% before it enters the end product. Sample tests are not sufficient to exclude all contamination reliably.



Picture 2: Cross section of an EHV cable with breakdown

Today cable manufacturers use screens to catch impurities in the XLPE melt before they get into the cable. The screens are positioned directly in the melt flow after the extruder, before the crosshead. However, these screens can get clogged by scorches, or excessive amount of contaminants after certain run time. Then the melt pressure in the extruder may increase significantly. Finally, the production has to be stopped in order to change the screens, which in turn means that later a joint is required at that position. Joints, were the cables are welded together are manually made and always critical, in particular with regard to subsea cables for offshore-applications. That is why cable manufacturers aim at delivering large cable lengths with only a minimum number of joints as they contain a potential risk for breakdowns. One of the aspects to achieve long lengths is using highly pure raw material. As the integration of screens reduces the productivity of the line, an approach

1 Chinese standard IEC 62067 (for 150 – 500 kV) in J. Kjellqvist, K.P. Pang, S. Miao, Dow Europe GMBH, Horgen, Switzerland, Dow Chemical (China) Co. Ltd., Shanghai, China, Performance Requirements to Assure Reliable HV and EHV Cables, China International Conference on Electricity Distribution (CICED 2010) Nanjing (20-23 Sep. 2010)