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New XLPE insulation for HV and EHV cables

P.J. Caronia, J.M. Cogen and J. Kjellqvist
Dow Chemical 1 Riverview Drive, Somerset, NJ USA 08873
Dow Europe GmbH Bachtobelstrasse 3 8810 Horgen Switzerland

Because of its excellent electrical insulating properties, superb mechanical properties, environmental compatibility, and low cost, crosslinked polyethylene is the material of choice for insulating high voltage transmission cables. Material suppliers, equipment suppliers, and cable manufacturers are continuously searching for methods to improve the manufacturing process for high voltage and extra high voltage crosslinked polyethylene cables. A new crosslinkable polyethylene insulation material has been developed, which provides significant advantages for cable manufacturing operations and cable quality while maintaining the excellent dielectric properties expected from XLPE. The performance of this new insulation material in properties important to the cable manufacturer and the cable user will be presented.

Current industry leading crosslinkable polyethylene (XLPE) insulation compounds for medium and high voltage power cable contain additives that migrate out of the polymer (sweat out), leading to a variety of production problems for cable manufacturers. In addition, buildup in extruder backpressure and/or imperfections in the insulation, both of which result from premature crosslinking (scorch), often limit the duration of cable production campaigns. Therefore, there is a need for power cable insulation compounds having reduced susceptibility to additive sweat out and scorch. The chemistry of scorch retardance and the requirements needed of an improved XLPE insulation will be discussed. The laboratory characterization of scorch retardance via small and intermediate scale accelerated tests will then be reviewed. Additionally, an accelerated additive sweatout test designed to model the long term storage capabilities of various XLPE insulation materials will be discussed.

Because the excellent dielectric performance of XLPE is a key factor in its being used to insulate high voltage and extra high voltage cables, it is critically important that any new XLPE material maintain this high electrical performance. Cable and lab electrical testing designed to simulate high voltage operating conditions and evaluate performance of the new XLPE material will be discussed.

In summary, a novel improved insulation compound for insulating high voltage and extra high voltage power cables has been developed. The novel compound incorporates new formulation technology that provides a high level of scorch retardance and improves issues related to additive sweatout, while maintaining the excellent electrical properties of polyethylene. This new combination of properties provides improved cable manufacturing productivity and cable quality.