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Laminate sheath power cable insulated with XLPE for flame retardant applications

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Flame retardant low and medium voltage power cables are often required in industrial, commercial, and generating plant applications. This paper discusses a new cable design that uses a laminate sheath consisting of a halogen free polyolefin (HFPO) and a coated 0.15 mm thick copper shield as a fire barrier for a crosslinked polyethylene (XLPE) insulated conductor. Vertical tray fire testing demonstrated that an unprotected XLPE insulated conductor failed the test in both flame spread and smoke generation. A laminate sheath over the same XLPE insulated conductor passed the test with only 1.2 m of flame spread and virtually no smoke generation. For these particular tests the overlap of the cable was not sealed indicating that the laminate sheath maintained its integrity and did not allow the flame to spread into the cable core. Mechanical tests were also conducted on the cable. The cable was subjected to cyclic bending for 15 cycles around a 12 times mandrel with no tearing or cracking of the shield. Additional bend tests were conducted at -30°C and +60°C without damage to the shield. Aging tests at 90°C indicated the cable sheath could retain its integrity at elevated temperatures. The development of this cable sheath technology has particular significance because it allows the use of XLPE insulated conductors in applications requiring flame retardancy. Thus industrial, commercial, and generating stations can take advantage of the electrical and mechanical properties of XLPE. Other potential benefits include the use of reduced wall thickness on the insulation for reduced cable diameters that are of particular benefit in the case of installation in trays. The bonded sheath associated with the use of coated copper provides corrosion protection for the copper shield in hostile environments. Protecting the shield from corrosion, in turn, allows the use of cable diagnostic methods over the lifetime of the cable. In addition costs can be reduced through the use of XLPE and cables with reduced diameters.