EDITION 6
VOLUME 1

10 TOP ADVANTAGES OF HDPE

Written by: Dr. Yuhsin Hawig, VP of Applications Engineering and Erika Akins, Chief Applications Engineer

THERMAL STABILITY & THERMAL CONDUCTIVITY

High-density polyethylene (>0.940 to 0.960 g/cm³) provides superior thermal resistance over PVC due to its elevated melting point. It delivers extra protection for heavily loaded operations where the conductor is sustained at the maximum normal operation temperature or close to emergency overload conditions. A crosslinked HDPE (XL-HDPE) formulation can further boost the thermal stability of HDPE insulation and allows the cables to operate at 90°C. Polypropylene (PP) or PVC materials cannot be crosslinked. HDPE also has a lower thermal resistivity or higher thermal conductivity compared to PVC or other common jacketing material to facilitate heat dissipation of an energized conductor.

MECHANICAL DURABILITY & CRACK RESISTANCE

HDPE exhibits an improved flexural modulus, ultimate tensile strength and elongation, rigidity, and hardness compared to its LLDPE counterpart. HDPE also has a greater Environmental Stress Cracking (ESC) resistance due to its high molecular weight and high density.

DELAYED CHEMICAL ATTACK

HDPE offers better resistance to common chemicals compared to LLDPE due to its greater molecular weight and higher density. The highly crystalline structure improves its barrier property and delays the chemical attack. It takes a longer time for any liquid or vapor to be transmitted through a densely-packed crystalline material such as HDPE compared to LLDPE or MDPE.

INDUSTRY COMPLIANCE ON VERSATILE PRODUCTS

HDPE is governed by numerous industry standards including ICEA, NEMA, ASTM, UL, and CSA. Covered line wires, covered conductors, 600V UD, 600V Service Drop, MV, and HV/EHV cables can be produced with a standard LLDPE compound or upgraded using an abrasion-resistant HDPE material to defend against a more abusive installation or harsh environment.

ABRASION & WILDLIFE RESILIENCE

HDPE's excellent abrasion resistance helps to protect cables from an abusive environment. HDPE enables a compact design with a reduced thickness due to its hardness. HDPE minimizes damages during shipment, handling, and installation and prevents punctures and tearing during challenging long pulls. HDPE creates a great physical barrier to shield cables from wildlife, weather, and nearby construction.

HYDROPHOBICITY & MOISTURE REPELLENCY

HDPE is hydrophobic in nature and it repels water with a slower Moisture Vapor Transmission rate (MVT) when compared to hydrophilic materials such as PVC or CPE, which absorb water quickly. It is more difficult for liquid or vapor to diffuse through HDPE. For PVC or CPE, there will be more trapped moisture to lower the dielectric breakdown strength and to compromise the electrical, physical, thermal, and mechanical performance long-term.

PURITY, RECYCLABILITY, & SAFETY

HDPE, whether it is being used as a dielectric insulation, overall jacket, or an electrical conduit, contains a simple and pure formulation with a neat polyethylene-based raw material. HDPE can be recycled, re-grinded, and re-processed easily. HDPE does not contain lead and is naturally halogen-free with no risk of acid gas emission that might compromise field safety.

DIVERSE END USER APPROVALS

Cables reinforced with a HDPE material have been deployed by end users across the nation in diverse applications including Investor Owned Utilities (IOU), US Departments of Transportation (DOT) & of Energy (DOE), wind farms or renewable energy, infrastructure expansions, airports, wastewater treatment facilities, etc.

Southwire®

For more information, please contact cabletechsupport@southwire.com or visit **southwire.com**.

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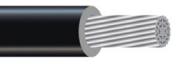
SUSTAINABLE SUPPLY CHAIN

With supply chain challenges for Polypropylene (PP), HDPE jacketing material has been successfully adopted by utility end users for PILC replacement projects where decade-old, paper-insulated lead cables were upgraded with EPR systems designed with an HDPE jacket. With the PVC supply chain interruptions, many end users have also transitioned from using the rigid PVC pipes to the flexible HDPE conduits for many commercial projects.

QUALITY SOURCING & MANUFACTURING

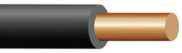
Premium grades of HDPE resins and other raw materials are sourced from quality vendors. Southwire utilizes continuous improvement of manufacturing processes to extrude ruggedized HDPE as an insulation, jacket, or electrical conduit with various wall thicknesses at multiple plant locations.

10 CABLE PRODUCTS REINFORCED BY HDPE



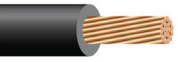
1: ALUMINUM COVERED LINE WIRE

Covered line wire is used primarily for overhead secondary distribution systems. It is installed on insulators and treated as a bare conductor in overhead applications. Covered line wires with either a Thermoplastic or Thermoset formulation can be designed with standard LLDPE or reinforced with HDPE per ICEA S-70-547. HDPE covered line wire minimizes damages as a result of vegetation or wildlife contact.



2: PROTECTED GROUND WIRE (PGW) OR RISER WIRES

Bare copper ground wire can be produced with a covering layer made of LLDPE or HDPE material at a thickness of 30, 45, or 110 mils per ICEA S-70-547. HDPE enhances its protection over bare copper ground wires compared to LLDPE due to its greater stiffness and exceptional puncture resistance.



3: CATHODIC PROTECTION CABLES (CP)

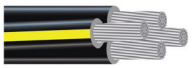
HDPE has been utilized in Cathodic Protection (CP) applications. Polyethylene-based resin offers low temperature flexibility and the high-density alternative compared to linear low-density yields greater physical ruggedness and mechanical durability to shield the bare copper conductors from the environment.

4: SERVICE DROP OR NEUTRAL SUPPORTED SECONDARY

600V Overhead multi-conductor assemblies, whether duplexed, triplexed, or quadruplexed, can be insulated with either LLDPE or HDPE per ICEA S-76-474. HDPE, a more robust dielectric material, is desired for areas where wildlife is abundant and tree contact occurs frequently.

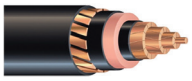
5: TRACK-RESISTANT MV TREE WIRE OR SPACER CABLES

Tree Wire is a covered overhead conductor used to replace spans where trees crowd the right-of-way, such as wooded residential areas. ACSR, AAAC, or other bare distribution conductors are co-extruded with an HDPE outer layer and an LLDPE inner layer per ICEA S-121-733. The black or gray crosslinked HDPE outer covering is UV- and Track-resistant and offers long-term thermal, physical, and mechanical durability.



6: SERVICE ENTRANCE 600V UD

Hi-Score ruggedized 600V cables are manufactured with a composite insulation of HDPE over LLDPE per ICEA S-81-570. The HDPE outer layer enables the material to sustain abusive mechanical forces as direct buried secondary cables. Sharp impact, blunt impact, abrasion, crush, puncture, and scoring are examples of extensive testing to qualify the HDPE/LLDPE coextruded cables compared to the single layer LLDPE design.



7: DENSFLEX® EPR MV WITH FLAT STRAPS

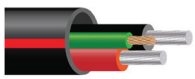
Southwire's DensFlex® cable is a MV primary cable with EPR insulation and flat strap concentric neutrals ideal for Paper-Insulated Lead Cable (PILC) replacement. The most robust design contains an encapsulating HDPE jacket as it provides physical reinforcement meeting ICEA S-94-649 with a sustainable and consistent supply chain. The abrasion-resistant HDPE jacket allows the 3-phase compact cable assembliy to be pulled into an existing steel pipe with lower risk of tearing or punctures.

8: TR-XLPE MV PRIMARY

Standard distribution cables or MV TR-XLPE insulated primary underground cables, rated 15, 25, 35, & 46kV, are typically designed with an LLDPE jacket. However, HDPE material is an excellent alternative to LLDPE if accidental dig-ins or termite, rodent, and other wildlife attacks are a major concern.

9: XLPE HV/EHV UNDERGROUND CABLES

Majority of transmission cables rated 69kV and above are extruded with a HDPE jacketing material to protect the critical HV/EHV cable cores with a dry design. Sustainable supply chains offer quality and consistent raw materials for utility operations and renewable applications, including wind farms.



10: EMPTY CONDUIT OR CABLE-IN-CONDUIT (CIC)

Southwire's SIM*pull* ® Electrical Polyethylene Conduit (EPEC) is made with HDPE, which protects cables during installation, repair, and upgrades. Southwire's HDPE Conduit complies with NEMA TC-7, ASTM B3485, and ASTM F2160. SIM*pull* ® Cable-In-Conduit (CIC), with pre-assembled cables installed at the factory prior to the jobsite, meet or exceed both UL 1990 and CSA C22.2 No 327-18.

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