Since 1983, enough to lay an underground cable 80 times around the world.

Dow Endurance™ HFDB-4202 MV. The long-buried secret of reliable power delivery and reduced system costs.
Over a quarter century of success

Distinctively renamed DOW ENDURANCE™ HFDB-4202 MV in 2009, the global power industry has used enough of this heritage tree retardant crosslinkable polyethylene (TR-XLPE) since 1983 to insulate the equivalent of over 3 million kms of underground (UG) medium (MV) cables. Enough to circle the earth 80 times.

In 2008, we celebrated the fact that DOW ENDURANCE HFDB-4202 MV insulation is helping UG power distribution cable systems withstand the test of time. This insulation has exhibited excellent field experience for UG residential and commercial distribution and feeder applications. Samples pulled out of the ground after many years show little wear and high reliability – more than 25 years of proven performance to fulfill utility and consumer needs for a dependable power supply.

Dow Wire & Cable utilises a proprietary technology for its TR-XLPE insulation that reduces electrical degradation such as water treeing in underground (wet) conditions. In fact, since Dow Wire & Cable introduced DOW ENDURANCE HFDB-4202 MV in 1983, TR-XLPE has rapidly replaced conventional XLPE to become the predominant MV insulation for primary UG distribution cables in the U.S. and Canada. In addition, DOW ENDURANCE HFDB-4202 MV is currently used in several other countries across the globe including Australia, New Zealand, Philippines, Germany, Hong Kong, China, India, Chile and Mexico. Furthermore, TR-XLPE insulation is gaining wider acceptance as a technology proven to lower total cable life-cycle costs by enhancing MV cable life while allowing simplified cable constructions that handle the most challenging wet or dry environments.

DOW ENDURANCE™ HFDB-4202 MV performance advantages

— Assured by more than 25 years of effective service in simpler, “wet” design and excellent balance of cost and performance
— Improved distribution system reliability and very low life-cycle costs
— Longer cable life, less replacement, low dielectric losses
— Higher retained “wet” aged electrical strength than conventional XLPE
— Consistent performance across a multitude of accelerated “wet aging” tests
— Clean, dependable compound and technology
— Cable manufacture, installation, operation and diagnostics same as conventional XLPE

Now, especially in growing markets like Russia, India, the Middle East, Brazil, Mexico and China, Dow Wire & Cable is working with cable manufacturers, utilities, testing institutes and other industry experts to gain recognition and global standardization of this important technology that has ensured peace of mind among utilities in North America and many other regions.

Milestones and achievements in the field

During the past 25 years, advances in cable materials, cable design, manufacturing and testing, combined with better utility installation and operation practices have improved the performance of MV UG distribution cables. In addition, the qualification test created by the Association of Edison Illuminating Companies, Insulated Cable Engineers Association (ICEA), and cable makers in the mid 1980s, has been refined and is now recognized as the U.S. national standard ANSI / ICEA S-94-649-2004 (2).
Several evaluations of field-aged cables demonstrate and confirm the long-life attributes of TR-XLPE made by Dow Wire & Cable. In almost all cases, these evaluations have been sponsored by various electric utilities and cable manufacturers. Most of the data presented has been published by independent laboratories associated with organizations such as the Cable Testing Laboratory, Electric Power Research Institute (EPRI), National Rural Electric Cooperative Association, National Electric Energy Testing Research and Applications Center (NEETRAC) and Wuhan High Voltage Research Institute (China). All reports provide convincing evidence of the benefits of DOW ENDURANCE™ HFDB-4202 MV TR-XLPE technology.

A sampling of testimonies follows.
“Based on research results and field data, it appears that the service life of …. TR-XLPE will be greater than 40 years when incorporated into a cable when all of the suggestions in this digest are followed.”

– EPRI 2000 Cable Research Digest

“Since 1963, we’ve installed 2,405 miles of 15 kV underground residential distribution (URD) cable and 3,185 miles of 35 kV URD cable...we’ve learned that 98 percent of the dielectric failures that occur annually are on cable installed prior to 1981 and the remaining two percent of the dielectric failures are on cable installed prior to 1986. We started using TR-XLPE in 1987 and there are no documented dielectric failures on cable installed after 1987. As a result of the reliability of CenterPoint Energy’s current URD cable construction, we have returned to direct burying our cable.”

– Mike Walker (2004), CenterPoint Energy, USA

“Dow 4202 has been an excellent performer for us since 1984.”

– Tim Robeson, Progress Energy, USA

“Overall, the study concludes that MV UG distribution cables insulated with Dow 4202 EC have lower initial cable cost, lower operating cost (due to low dielectric loss) and long service life, thus providing electric utilities the lowest total cable life-cycle cost system and the highest value.”

– Study comparing the performance of TR-XLPE and ethylene propylene rubber (EPR) cables installed in 1985 at the Galleria Mall in Alabama conducted by the Southern Company / Alabama Power, NEETRAC and Dow Wire & Cable.

“Since 1985, Wisconsin Public Service Corporation has used Dow Wire & Cable’s patented TR-XLPE insulation. Our cable testing found the insulation to be very consistent, even though several different manufacturers have supplied cable over the years with the Dow 4202 insulation technology. Cable installation and termination is performed under a wide range of ambient temperature conditions. In-service cable testing has found little water tree growth, even for cables over 20 years old. The reliability has been excellent and should remain exceptionally high for many more years to come.”

– Greg Stano, Wisconsin Public Service Corporation, USA

“We have been very pleased with the performance of Dow 4202 on our underground system. In the 20-plus years of use, we have had no failures of our cable attributable to insulation or compound failure.”

– Blaine M. Strampe, Federated REA, USA

“Duke Energy has been using Dow Wire & Cable’s tree retardant MV cable insulation products for 25 years. During that period of time, we are not aware of any cable failures that have occurred as a result of an insulation breakdown on the cables made with these products. This record of performance has given us confidence in the quality and consistency of these products.”

– Chris Fletcher, Duke Energy, USA

“Dominion Virginia Power has been using Dow Wire & Cable’s patented tree retardant insulation products for 17 years. We’ve found the technology in Dow 4202 to be reliable in providing long service life with low dielectric losses. The products are easy to use on cables and provide consistent quality.”

– Phil George, Dominion Virginia Power, USA

“We have been very pleased with the performance of Dow 4202 on our underground system. In the 20-plus years of use, we have had no failures of our cable attributable to insulation or compound failure.”

– Blaine M. Strampe, Federated REA, USA
Based on promising laboratory trials and successful field installations in 1998, BC Hydro (Canada) adopted a TR-XLPE cable design as a PILC (paper-insulated lead-covered) replacement, wherever feasible. Benefits include: lower initial costs and losses than EPR cables; installation cost savings up to 46 percent; deferred cable replacement; and the ability to use larger conductor sizes, which increases cable run ampacity, leading to additional savings.

– Solutions Vol. 1, No.1, April 2003, “BC Hydro employs Dow’s TR-XLPE insulation for PILC cable replacement”

Proven performance has led the Canadian utilities to standardize the use of TR-XLPE insulation in their MV UG cable systems, via Canadian Electricity Association specifications.

China recently introduced a higher-performance utility industry specification (DLT/1070-2007) for UG distribution cables to reflect the performance of TR-XLPE. The new specification has been in effect since December 1, 2007.

After Beijing and Shanghai, the two major metropolitan areas in China, both secured grants for hosting internationally recognized events – the 2008 Summer Olympics and the 2010...
World’s Fair respectively – the government and utilities started to consider the importance of electrical supply reliability. Their target is 99.99%, or an annual power outage time of less than one hour for each city. Further motivated by the incidents of power blackouts in the U.S., Canada and Russia, and the continuous improvement of living standards throughout the country, utilities in China are now very focused on improving service reliability. Therefore, China’s cable manufacturing industry and cable research engineers are recognizing the value of high-performance products and technology in MV distribution power cable systems.

Recently updated Rural Utilities Service (U.S. Department of Agriculture) specifications for primary UG power cable (Bulletin 1728F-U1) state “plain XLPE has been removed as acceptable insulation and TR-XLPE insulation has replaced it due to the significantly improved reliability.”

A tribute to testing

A reliable cable system must perform well across regional protocols to enhance value for utilities globally. DOW ENDURANCE™ HFDB-4202 MV and other TR-XLPE products from Dow Wire & Cable have passed a wide variety of independent accelerated material and cable aging tests conducted under a full range of operating conditions. Some examples are illustrated below.

Two-year CENELEC Tests (VDE 0276 Part 620/A3)

DOW ENDURANCE HFDB-4202 MV meets requirements of the Committee for Electrotechnical Standardisation (CENELEC), including the more stringent German conditions. The typically consistent performance of TR-XLPE, evident in all six cable samples, illustrates improved system reliability.

Proven Field Performance

Dow Wire & Cable TR-XLPE additives help performance of 35 kV cables over time. Analysis of a 2002 study of cables removed after 17 years of active service in wet conditions confirmed additive content was uniform across insulation at original levels and retained electrical strength was excellent. No circuit failures since then, during 23 years of operation.

Comparison of Field-aged Cables

Failure data for three generations of MV cables installed at TXU Energy (now Oncor) are shown in the standard Crow AMSAA [16] format with the x axis (experience) using the cumulative product of the amount of cable installed and the number of years during which that cable was in service. (Long-life XLPE-insulated Power Cables handbook, 2006)

Wuhan Test Results – ACBD (AC Breakdown Strength)

Material type and quality play key roles. Short-term (factory) dry performance does not guarantee long-term quality. Wet aging tests are critical.
Continued commitment

With UG systems gaining momentum worldwide due to the aesthetic, right-of-way and weather issues affecting overhead cable construction, Dow Wire & Cable will continue to be a leader and a strategic supplier of cable materials that meet or exceed baseline requirements to the global power delivery industry. In fact, with the introduction of our new Dow Inside program, we are working with select cable makers around the world to create a network of licensees to manufacture consistently high-quality cables made with exceptional materials. These cables perform at levels specifically designated by Dow Wire & Cable for DOW ENDURANCE™ materials to exceed all existing stringent global standards that cover UG distribution cables.

We are committed long term to developing solutions that provide excellent quality, sustainability and high performance that the industry can count on to withstand the test of time. Utilities should settle for nothing less, to make sure their investments in UG cable pay off. Minimizing life-cycle cost is critical, as repair and reinstallation and commensurate costs such as loss of service become more burdensome.

We look forward to working closely with cable manufacturers, utilities, industry associations and testing facilities to develop solutions for aging power delivery systems in mature markets, as well as the new UG installation trend for infrastructures in developed and emerging markets.

Contact your Dow Wire & Cable sales representative to request a copy of the book “Long-life XLPE-insulated Cable,” edited by: Harry Orton, Orton Consulting Engineers International, Vancouver, Canada, and Rick Hartlein, NEETRAC Georgia Institute of Technology, Atlanta, Georgia, USA.

Experience the Power of Dow Inside
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c. use as a critical component in medical devices that support or sustain human life; or
d. use specifically by pregnant women or in applications designed specifically to promote or interfere with human reproduction.

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