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## **3M COLD SHRINK CABLE JOINTS & CABLE TERMINATIONS 40 YEAR SERVICE RECORD, 1968-2008**

3M Cold shrink is used to achieve a tight fit around cables and connectors as part of cable joints and terminations and for bundling cables together for strain relief or for protection against environmental factors.

One alternate method of applying cable jointing accessories uses heat shrink technology, which requires a torch. To distinguish it from other methods, 3M gave the name 'Cold Shrink' to the new technology.

Specially formulated rubber tubes, stretched on a removable core, are used for electrical insulation, cable jointing and cable terminating. Using specially formulated rubber tubes, stretched on a removable core, 3M cold shrink tubing is easier to install than the previous heat shrink tubing, which requires special tools and special jointer training for fitting.

3M remains committed to continuously finding ways of improving many existing products and applications. We sought a simpler, better way to insulate in-line cable joints for electrical power cables and wanted to develop a technology that would improve upon the heat shrink concept. 3M Cold shrink was developed as a result, and its beneficial uses for electrical applications have proven to be manifold,' said Martin Parsons, 3M Marketing Manager Electro and Communications Business Middle East 3M.

A 3M cold shrink tube is an open ended rubber sleeve, made primarily from rubber elastomers with high-performance physical properties, that has been factory expanded or pre-stretched, and assembled onto a supporting removable plastic core. 3M cold shrink tubing shrinks upon removal of the supporting core during the installation process and the electrician slides the tube over the cable to be terminated and unwinds the core, causing the tube to collapse down, or contract, in place.

An EPDM (ethylene propylene diene monomer) rubber was needed that would easily stretch onto a core and when installed, would provide continuous radial pressure to maintain an environmental seal. 3M's engineers developed a new formulation of EPDM rubber that would provide a 'living seal.' With the silicone cold shrink assemblies inherently UV resistant, with an additive - EPDM also becomes UV resistant.

'Because both of the elements are water resistant and good performers in a broad range of temperatures, the 3M cold shrink technology is well suited to outdoor applications as well as to medium- and high-voltage cable joints and cable terminations,' Parsons explained.

Parsons added that upon installation, cold shrink tubes create a dynamic, compressive environmental seal and electrical interface without sealants and adhesives, which offer even greater protection.

'The tubes are always 'attempting' to return to original size - smaller than the conductor it is on - and so the constant inward pressure means the cable can be flexed and the seal will not be broken,' Parsons said.

'Furthermore, 3M cold shrink tubing is generally more flexible and pliable than heat shrink tubing, which allows the cold shrink product to move with the cable as it goes through thermal expansions and contractions, meaning a much lesser degree of tube erosion than traditional heat shrink technology,' he concluded.

The first application for the cold shrink insulation product (initially known as the Pre-Stretched Tube or PST) was for buried low-voltage secondary cable joints. Over the 40 years since 1968, 3M has used this technology as the basis for continued innovation:

- The first step in the evolution of 3M cold shrink technology was the 3M cable termination QTM for medium-voltage applications, 11kV-33kV.
- The 3M Cold Shrink Termination QT-II for medium-voltage terminations, consisting of a silicone insulator with integrated Hi-K stress relief, was introduced in the late 1970s.
- In 1993, the 3M Cold Shrink QS2000 was the first cold shrink medium-voltage cable joint introduced in Europe.
- A further development in 1996, the 3M Cold Shrink Termination QT-III, eliminated the need for grease, reduced the effective length of the termination and increased arc and track resistance. The QT-III insulator ended the need for sealing the top of the cable termination with tape, and provided improved hydrophobic recovery.
- In 1997, Cold Shrink Joints QS-III for medium-voltage cable were added to the line. This one-piece design incorporates an under-cut electrode to control electrical stress within the cable joint.
- Cold shrink branch cable joints for high voltage cables were added in 2001.
- 3M introduced cold shrink terminations for aerial and pad-mounted 69kV applications in 2005. The 3M Cold Shrink Termination Kit QT-III for 69/72,5kV replaces heavy porcelain products and heat shrink terminations. Users report that cold shrink terminations for high voltage applications are compact and easier to handle than traditional systems and are installed in substantially less time and with greater safety.
- Additional cold shrink products for low-, med- and high-voltage applications will be introduced in 2008.