



# Shrink Polymer Systems

Cable Installation Materials – 24 volts to 36 kV

## First Steps to Reliability

### XLPE Cable Preparation

Controlling the initial installation costs of any power system is critical to operating companies and contractors alike. System maintenance and repair are also substantial factors in overall cost. It is important that installations are not only completed efficiently and quickly, but also done correctly.

No matter how well a cable accessory is designed, it will fail if the cable is not properly prepared before installation. Here are some of the more common causes of failure due to poor workmanship.

### Damage to the insulation during semi-conductive screen removal

This is probably the number one cause of all joint and termination failures. Care must be taken when removing the semi-conductive screen, any damage or nick to the insulation at this stage will result in creating an unscreened air void. Since the dielectric strength of air is less than that of the XLPE insulation, the concentration of electrical stress in this area will exceed the dielectric strength of air. The air will ionize causing corona discharge to occur. These discharges bombard the surrounding insulation 100 times a second, and will result in cutting through the insulation and ultimate failure.

### Damage to the conductor during insulation removal

By not taking care or using incorrect methods, conductors can, quite often, be nicked, this, particularly in the case of aluminium conductors, can result in individual strands breaking free, leading to a resistive “hot spot” around the connector area, causing thermal runaway and eventual failure.

### Contamination of the insulation surface

It is important that the cable insulation be free from all moisture and contamination. Common contaminants include, mud on the outside surfaces and semi-conductive particles, left on the surface of the insulation, after the conductive screen has been removed. If these contaminants remain on the insulation surfaces being jointed or terminated, a conductive path can exist, and

the difference in potential, between the energised conductor and earth screen will cause current to flow through the contamination, resulting in erosion and ultimately breakdown. To avoid this happening, all care must be taken to ensure the installer keeps his hands, as well as his tools clean and dry. Further to this, the insulation surfaces should be cleaned prior to the installation of the accessory and protected from further contamination until the installation is complete.

## **Accessory Installation**

### **Incorrect choice of accessory**

This may sound strange, but do you know the difference between an indoor and outdoor termination? Just because the termination is to be outside doesn't mean you need an outdoor type. Indoor kits are for terminating cables that will not be constantly exposed with direct UV light or directly exposed to the elements. A sealed take off chamber on the side of a transformer requires an indoor termination, despite the transformer being outside.

Unfortunately, it is not unusual for an operating company or contractor, to be a little unsure of the actual cable specification prior to arrival or exposure on site. Care must be taken before and during installation to ensure the accessory provided, suits both the application range and cable type.

The majority of accessories are range taking making one of the choices easier, but there is normally a difference relating to cable insulation, number of cores and system voltage etc. The use of a kit designed for 11kV, XLPE insulated cable, will not normally work effectively on an 11kV paper insulated cable.

### **Incorrect installation dimensions or procedures**

Unfortunately, this one usually comes down to male ego, the installer not wanting to appear unfamiliar with, or unsure of how the accessory is assembled. He goes blindly on without reading the installation instructions, doing what he thinks is the right thing. We've all been there, how many times do we start to assemble that new Swedish cabinet, only to find we should have fitted those shelves before fixing the top and doors.

All reputable manufactures will include an installation sheet within the kit, this is not because they want to contribute to the demise of the rainforests, it is the only way they have of telling the installer the kit, may not be exactly the same as a similar kit from a rival manufacturer or even the same kit from a few years ago.

Incorrect dimension or procedures could lead to misplaced or even omitted components, resulting in potential breakdown.

### **Incorrect connector / lug application**

Each connector manufacturer will recommend a connector and the correct die set, for a particular size and format of conductor, mixing the tooling and connector manufacturers can in some circumstances cause problems. With the variations in physical size of the modern conductors, it is sometimes difficult to ensure compression connectors are installed correctly. The increase use of "torque shear" connectors goes some way to alleviating this problem, but at a cost. Most mechanical connectors are larger in diameter than the compression equivalent. Care

should be taken when sizing the accessory, to ensure they fit within the accessory manufacturers recommended parameters.

### **Site Cleanliness**

Without exception all accessories are type tested in nice warm and clean laboratories, unfortunately, a cold and muddy building site plays no part in the type approval process. Any contamination within the assembly could have a detrimental effect on its efficiency and longevity.

Dirt or grease on the hands is easily transferred to any tapes or components applied, mud is one of those things that no amount of degreasing solvent will remove. A common misconception when using heat shrinkable accessories is any water present will disappear when the tubes are shrunk in place. Unfortunately, we live in a time when the rain contains more than just pure water, and on a building site, the rain can carry with it things like cement dust or carbon particles from that annoying dump truck that keeps driving by. It is true the moisture will evaporate once heated, but it will leave behind all of the pollutants.

Keeping the joint area free from clutter can prevent accidental and even un-noticed contamination of the assembly, this can only be a good thing, but more importantly, you'll probably lose fewer tools.

### **Finally**

Most accessories from reputable manufacturers will meet and surpass normal operating requirements. However, good preparation will help a lower quality accessory, and poor preparation will hinder a better product. Take care when installing any accessory, remember the cost of a termination or joint is a fraction of the worth of the total installation. Any system is only as good as the weakest link, a joint or termination failure could bring down the whole system, with all the costs that entails. A few extra minutes spent in the preparation and installation of any accessory could save thousands in the long term.