Frequently asked Questions

What is the correct procedure to allow gas to migrate out of the insulation surrounding the conductor?

A customer recently had a line gas up on a dry gas / H2S environment. They let the line air out overnight and had no issues the next day.The customer indicated that they are using a process of "notching" the insulation (exposing a small portion of the conductor) above the sealed portion of the tear drop sub, and indicated this as a best practice to allow the gas to migrate out of the conductor.

Could it be problematic if the grease in the cablehead is forced out due to pressure as it would expose the conductor directly to the H2S. Secondly, should the insulation allow gas to pass through?

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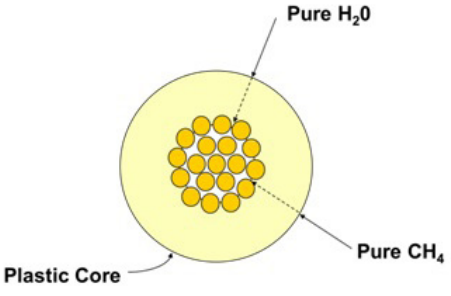
When a wireline cable is exposed to very high temperature and pressures for a period of time, there will be a migration of water (pure H20) and methane gas (CH4) through the plastic insulation. This is true of any thermo-plastic to varying degrees. The plastic acts as a molecular sieve and allows only the smallest of molecules, H20 and CH4, to pass. This water and gas collects in the microscopic voids in the conductor stranding. Even though, during manufacturing, all possible steps are taken to minimize these voids, by filling the spaces between copper strands with blocking materials.

There are, invariably, some unfilled microscopic voids for the gas and water to fill. When the cable is removed from the well and returned to atmospheric pressure and surface temperatures, the gas trapped in the conductor voids will try to expand, forcing the water out the end of the conductor. When this occurs, it can cause a leakage path at the bottom hole connector on the cable in the cable "Head." If the connectors are cut off the cable after an extended exposure to very high temperature and pressure, water can sometimes be observed oozing out of the strands of copper. Sometimes in high gas content wells the water will "spit" out of the conductor under the pressure of the gas. Normally this condition will exist for only several hours, but in extreme cases, as long as a week. It is very important to remember that this gas and water have penetrated through the permeable plastic jacket and it is not a result of pin holes in the insulation.



This statement is easily proven by making a high voltage test of the insulation. With the cable completely disconnected at both ends (collector and head connectors removed) a high voltage test of the conductor to armor insulation will show there is no electrical leakage even while water is dripping out of the ends of the conductors. The explanation for this phenomenon is that pure water is an excellent insulator and dielectric and therefore does not degrade the electrical properties of the plastic as it passes through. Once the water reaches the conductor, it is contaminated by the copper, copper stranding lubricants, and water blocking materials; therefore the water oozing out the end of the conductor will be contaminated and conductive.

The microscopic collection of moisture in the copper conductors does not, in any way, deteriorate the performance of the cable. It will, however, discolor the copper, and cause temporary termination problems. There are several operating "tricks" that can be used to minimize these problems in many applications but these problems have to be considered individually. Great progress has been made, er the past 30 years, since this problem was first encountered, but in the case of extreme temperature and pressures, there is no way of completely eliminating the problem without sacrificing other desirable operating characteristics of the cable.

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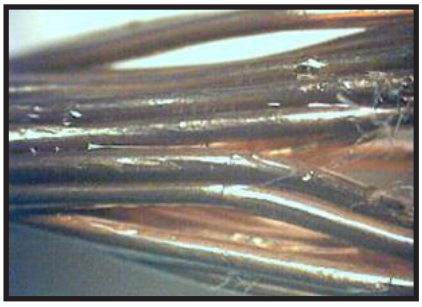
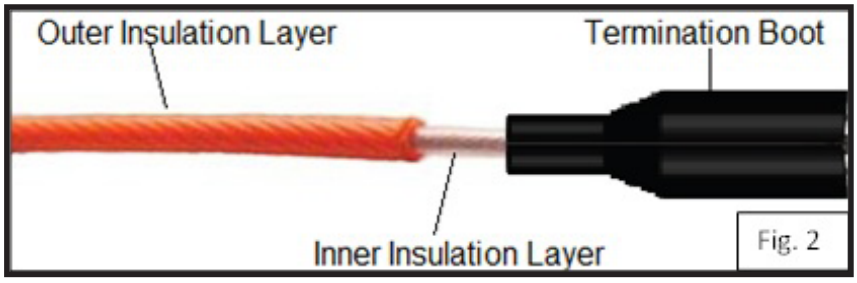
Techniques for addressing gas migration in the field:
During some well logging applications, gas and/or water will escape from the end of the conductor inside the rope socket. This may cause an electrical leak or short that is significant enough to affect the logging tools. During manufacturing as part of the plastic extrusion process a water blocking agent is applied to the stranded copper conductor. This agent reduces the migration of gas and water. In some wells migration will occur even in the presence of the water blocking material. The gas and water are not entering the line at the head but entering along the entire length of the line and then traveling down the conductor to exit at the head. As they travel down the conductor the gas and water are contaminated by the cooper and create a short as they exit at the end of the conductor.

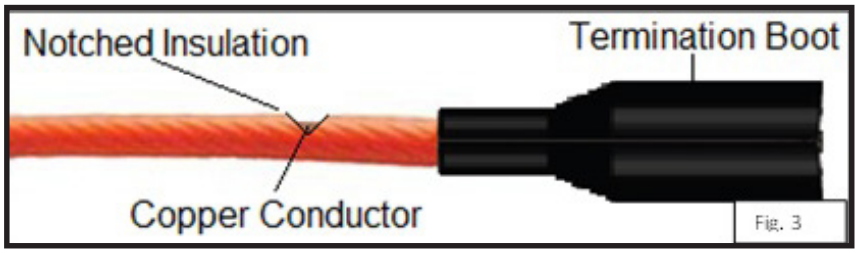
One possible solution to this problem is to check the conductor during the re-heading procedure to make sure the water blocking material is present. In Camesa cables, the water block is a clear filmy looking material that is visible for a short time after the removal of the insulation (Fig. 1). If the water block is not visible, then cut back a few feet and try again. Once you have reached a section where the water block is visible re-head as normal.



In a conductor where two layers of insulation are present, as in Camesa's "PTZ" insulation package, the migration may occur between the insulation layers. In this case, creating a path for gas and water to exit before reaching the termination boot can sometimes remedy the problem. While removing the insulation during re-heading, strip off a section of the outer layer of insulation so that the boot or tape job terminates on the inner insulation only (Fig. 2). This will allow the gas and water to escape prior to reaching the termination point.



If the migration isn't occurring between the layers of insulation then it is likely traveling down the conductor. In this case a release path can be made by making a small "V" cut in both layers of insulation all the way to the copper conductor just above the boot and lightly wrap with a few layers of electrical tape. This will allow gas and water to migrate out of the conductor before reaching the termination point. The v notch is a stop gap measure if nothing else works (Fig. 3).



It is important to remember that gas penetrates the conductor on all jobs and in all wirelines when exposed to pressure and temperature. In the majority of oil and gas wells the water blocking agent prevents migration but there are some well environments where gas will migrate. If problems continue with tools shorting due to gas migration after implementing these techniques, contact your local Camesa representative for assistance.

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