PROTECTING CABLES FROM OIL DAMAGE

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Of all the chemical exposures that can affect the life and performance of electrical cables, oil is one of the most damaging. Used as a coolant and lubricant in many industrial and infrastructure settings, oil can inflict molecular damage on the polymers used for cable insulation and jacketing.

If ignored, oil damage to cables can be severe. It will ultimately result in cable failure, downtime and replacement costs.

Awareness of oil damage has been on the upswing in recent years, thanks to regulatory changes and the increased performance characteristics in renewable energy, automotive assembly and other advanced production facilities.

Fortunately, there are cables that have been designed from the ground up to resist the effects of cooling and lubricating oils. Here's a closer look at how oil degrades cables, how to diagnose oil exposure problems and how to select cables that can stand up to oils over the long haul:

DEGRADATION MECHANISM

Why does oil cause such excessive damage on some types of insulations and jackets, while others are more resistant? The main reason is that not all polymer compounds offer equivalent performance even if they have the same family name. This is true for many physical properties, including oil resistance.

For example, some PVC compounds have a higher degree of flame resistance, while others have better oil resistance. Still others demonstrate improved flexibility characteristics. PVC formulations vary greatly, depending on the desired properties and applications. These properties can be achieved by adjusting the formulations of a particular PVC compound. The modification or addition of flame-retardants (iodine), stabilizers, and fillers allow the compound to exhibit these types of enhanced characteristics. However, when certain PVC characteristics

Oil can cause polymers, such as those used for cable insulation and jacketing, to degrade and crack. Selecting an oil-resistant cable is the best way to avoid this failure mode.

are improved, the enhancement sometimes comes at a cost, the cost being that other performance traits are affected or completely lost.

With oil resistance in particular, all wire and cable insulations are not created equal. Electrical, environmental, mechanical, and chemical attributes will vary depending upon the individual compound formulations. Insulating compounds contain a specific amount of plasticizers in their individual formulations, which help promote flexibility and resistance to fatigue. When compounds are exposed to lubricating and coolant processing oils the material either absorbs the oil or the plasticizer will diffuse from the compound.

When oil is absorbed, it causes severe swelling and softening of the compound resulting in degradation of tensile properties. When the oil causes diffusion of the compound plasticizer, hardening will result and all flexibility and elongation properties are lost.

In short, oil attacks the insulating compound, where it will become virtually ineffective in its primary role as an effective insulator. This action can create a possibly very hazardous situation, not only to human life, but also to the overall function of the industrial machinery to which it is connected. This results in very expensive downtime, costly repair and in the worst-case scenario, entire replacement of the machine.