AmerCable INCORPORATED

Tiger Tips

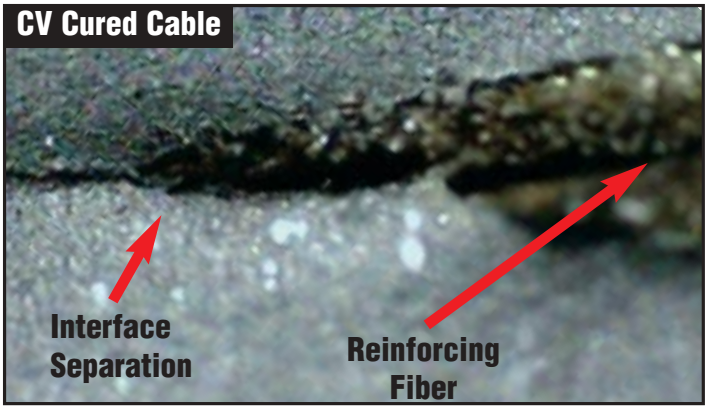
Mold-cured Rubber Jackets versus Continuous Vulcanized Jackets for Mining Applications

"Under the microscope – a closer look!"

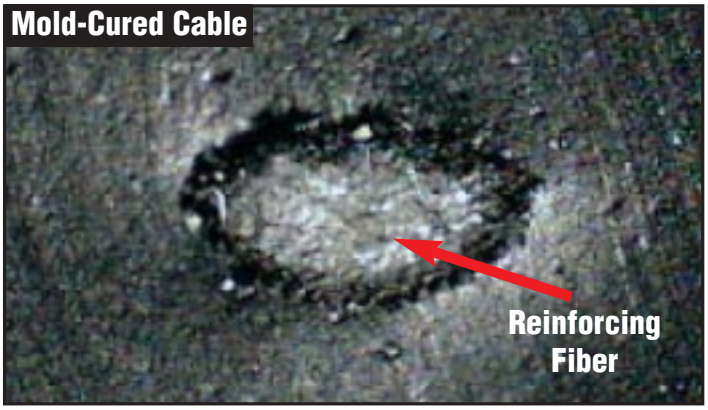
There has been a strong push in recent months to bring Continuous Vulcanized (CV) cured jackets into the mining marketplace. Field trials of the CV-cured product show that it is no match for the lead/mold-cured jacket in mining applications. Continuous Vulcanized jackets are soft and contain a large number of micro-voids in the jacket's outer surface. These are a result of direct contact between the uncured rubber of the jacket and high temperature steam which is used as the heat transfer and curing medium.

The argument has been made that the method of cure does not affect the physical properties of the jacket. This, however, has not been shown in the laboratory (see table on back). Previous field trials of CV cured products have resulted in disastrous results. Between the weak jacket and ground check wire problems, downtime went up drastically.

AmerCable jackets are extruded in two layers with reinforcing fiber between the two layers. A lead mold or sleeve, is extruded over the uncured rubber. Once a length of cable is completed, the entire mass is placed into a large autoclave and elevated to a moderate temperature that crosslinks the rubber. In the mold curing process the lead sleeve protects the uncured rubber and provides an excellent heat transfer medium. The lead extrusion tightly squeezes the jacket material during the vulcanization process as the uncured rubber expands. This pushes the rubber even tighter against the lead mold, creating a smooth, dense surface that is extremely resistant to abrasion. It has excellent tensile strength and tear resistance.



Cross section close-up of a typical CV cured jacket at the interface between the inner and outer jacket. The reinforcing fiber can be seen in the upper right and a small separation can be seen at the interface. Separations or cracks like this can often be seen in jackets when a low pressure CV, or steam process, is used to vulcanize the jacket. These voids can cause premature jacket separation. Photo magnification: 40X



Cross section close up of a typical Tiger® Brand Mold-cured jacket at the interface between the inner and outer jacket. The interface between the inner and outer jacket runs through the oblong axis of the reinforcing fiber. The high pressure of the mold-cure results in a smooth, homogeneous, tightly bonded interface. Photo magnification: 40X

Tiger® Brand Mining Cables

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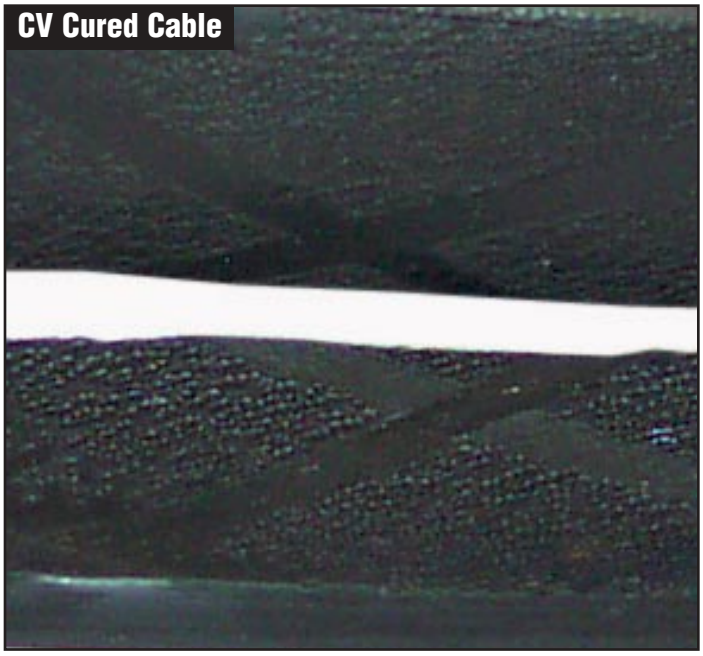
Continuous Vulcanized (CV) jackets are extruded onto the cable core. This assembly is then pulled through a long steam tube. With direct exposure to steam, plus high heat, crosslinking occurs in a short length of time. Steam permeates the raw rubber, with the degree of penetration affecting the jacket's abrasion resistance, tensile strength, tear resistance, and abrasion resistance.

Constructions of trailing cables vary with the type of jacket cure used. Internal components of Tiger® brand cables include: flexible stranding, a strand separator, Ethylene Propylene Rubber insulation, copper/nylon braid shielding (on Type SHD-GC), two grounds, and one yellow polypropylene insulated ground check wire. In the case of the braid shield, nylon has the highest strength and moisture resistance of available textiles. Polypropylene Ground Check insulation is also the material of choice for trailing cables. AmerCable utilizes only the best materials in trailing cables. These materials are not typically used in CV cured cables. The high temperature during jacket curing can deform or possibly melt polypropylene and nylon.



This photo shows the facing contact surfaces between the inner and outer jackets of a typical CV cured cable. The low pressure of the CV cure process is often not sufficient to cause a tearing-bond between jacket layers. Flexing or bending during service can cause these layers to separate, causing premature cable failure. These two layers were easily separated by hand.

Physical Properties

Tiger Brand mold-cured Chlorinated Polyethylene rubber jackets meet or exceed the physical properties below. Data from a typical CV cured jacket is shown for comparison:

Property	AmerCable Mold-cure	Typical CV cure
Tensile (psi)	2800	1980
Elongation (%)	525	488
Tensile strength @ 200% elong.(psi)	1035	600
Tear (lb./in.)	55	41
Abrasion resistance, volume lost (cc)*	0.339	0.691

*Abrasion testing was performed per ISO 4649 using 10 Newtons force. Results are in volume loss.