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SUBJECT: Re-Issue of P-03-13-Trailing Cable Overheating On Equipment Cable Reels

Who needs this information?

This Program Information Bulletin (PIB) applies to operators of underground coal or gassy metal and nonmetal mines, manufacturers of mining machinery, Mine Safety and Health Administration's (MSHA) enforcement personnel, miners' representatives, and other interested parties.

Why is MSHA issuing this bulletin?

To inform the mining industry of possible solutions to heating and damage problems incurred by trailing cables layered on equipment cable reels of permissible mining machinery.

What is the hazard of storing excess cable on the cable reel?

Electrical current flowing through the conductors of a trailing cable generates heat. When more heat is generated in the conductor than can be dissipated to the surrounding environment, namely the conductor insulation, cable outer jacket and the surrounding air or other solid material of the cable reel, the temperature of the conductor increases as well as the other components parts of the trailing cable. As the conductor temperature increases and exceeds the normal operating temperature rating of the insulation, 90°C for most modern trailing cables, the insulating properties of the insulation begin to degrade.

After withstanding repeated exposure to temperatures exceeding the normal operating

temperature rating of the insulation, breakdown or deterioration of the conductor's insulation will result. Degraded cable insulation can result in a short circuit that may cause a fire or explosive release of energy.

What should be done to minimize cable heating?

Effective techniques to minimize cable heating on MSHA approved equipment currently in use include:

1. Increasing the equipment's trailing cable size to the largest size covered by the equipment's approval documentation.
2. Modifying the equipment to utilize a higher operating voltage such that equal or greater power can be achieved at a lower electrical current flowing through the existing trailing cable size.
3. Removing all but the last layer of the unwound cable from the reel and tying it off near the cable's anchor point. With the excess cable tied off the reel, the entire length of cable should have the opportunity to cool.
4. Implementing the Insulated Cable Engineers Association (ICEA) ampacity derating factors for cables layered on cable reels.

Using a trailing cable of the proper size to preclude the generation of excessive conductor temperatures is the ideal method to eliminate cable overheating. Selecting the proper trailing cable size is dependent on the current drawn by the mining equipment during operation. The current drawn by the equipment during operation is known as the "average duty cycle ampacity." The average duty cycle ampacity is often provided by the equipment manufacturer when the equipment is evaluated for MSHA approval. The average duty cycle ampacity is compared by MSHA against the Insulated Cable Engineers Association (ICEA) ampacity tables for mine trailing cables.

Ampacity derating factors are included in the ICEA tables for cables layered on a cable reel. These derating factors are not used by MSHA when evaluating the cable ampacity. MSHA evaluates the average duty cycle ampacity, as if the cable was not wound on the reel. In evaluating these cables, MSHA assumes that layers of cable will periodically be removed from the reel to allow the entire length of cable time to cool. The ICEA ampacity table derating factors are based on continuous current flow through the cable, not the ON/OFF duty cycle of typical mining equipment using a cable reel. Therefore, standard ICEA ampacity tables show an ampacity derating of 85, 65, 45, and 35 percent for 1, 2, 3, and 4 layers on a cable reel, respectively. This magnitude of ampacity derating would require, for example, that a 1/0 AWG trailing cable be replaced with a 500 MCM size cable when 4 layers are used on the reel.

What should be done when trailing cable damage is found on reeled equipment?

When a section of cable jacket is found to be melted or cracked due to excessive heating, the entire length of cable should be replaced and the techniques to minimize cable

heating should be considered.

What causes heating and damage to cables on reels?

Cable heating can occur when a cable is layered on a permissible mining machine's cable reel and stays wound on the reel for extended periods of time. This heating is most noticeable when three to four layers of cable are left on the cable reel for extended periods and are only removed from the reel when the mining equipment is used at the farthest working places from the cable's anchor point. This may cause internal heating and cable jacket melting and cracking. This condition may be detected by odors emitted from the over heated cable.

The increased demands on cable reeled equipment, caused by higher duty cycles necessitated by longer runs from the face area to the dump point, increases the duration of peak electrical current through the equipment's trailing cable. The longer duration of peak current generates additional heat in the layers of cable on the cable reel. This additional heat generation contributes to the increasing occurrences of trailing cable deterioration on the cable reel.

Who are the contact persons for this bulletin?

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What is the authority for this bulletin?

30 CFR 18.35, 75.513, 75.606, 57.12004

Who will receive this bulletin?

MSHA Program Policy Manual Holders

Underground Mine Operators

Miners' Representatives

Equipment Manufacturers

Special Interest Groups

Repair and Rebuild Facilities