# Dragline Rope Maintenance

Wire rope is one of the highest equipment expenses for a mine. It is therefore in the mine's best interest to improve and maximize the service life of wire rope used on draglines. A wire rope maintenance program appears to be costly in terms of labor and machine downtime. When performed during the machine's regular preventative maintenance, however, the mine is able to take advantage of a scheduled shutdown. Incorporating a wire rope maintenance program into the schedule results in reducing the overall cost of wire rope expenditures by increasing the service life of the wire rope. Increased service life maximizes the value of wire rope purchases.

## Cut-Off and End-For-End Program

One important program to improve service life is a properly designed rope cut-off and end-for-end program. Though these programs differ for hoist and drag rope applications, the general theory applies to both – to distribute critical wear areas along the rope length.

For drag ropes, and in some cases hoist ropes, an end-for-end program should be initiated at 40% of average or expected service life. End-for-ending allows relatively unworn rope sections to be positioned in critical wear zones, such as at drum pick-up points and fairlead sheaves. This process generally puts the severely worn rope on the drum, thus reducing the wear on a particular section of rope.

Because machines and digging conditions differ from mine to mine, this program must be carefully analyzed. In some cases, end-for-ending may place the heavily worn sections of the rope back into critical wear areas, such as at the boom point sheaves. This type of program for hoist ropes is unfortunately not worthwhile in some situations since the wear and fatigue area is usually central at the boom point sheaves and end-for-ending only results in the wear areas being returned to their original positions. On some machines, hoist ropes will benefit only from a cut-off program, or removing as much rope as possible when resocketing at approximately 50% of expected life.

A practice of periodic rope shortenings (cut-offs) is desirable for both hoist and drag rope applications where rope length and depth of pit conditions allow for this practice. Shorten the ropes at intervals of 15% to 20% of average or expected service life.

The timing of a cut-off program must be carefully reviewed to take full advantage of any scheduled downtime, thus eliminating additional costs associated with the end-for-end and cut-off processes.

Except for obvious deterioration of ropes, a visual inspection should not dictate when cut-off and end-for-end programs are to be applied. Regardless of an apparent good rope condition, the programs should be applied at the designated time periods. There are situations, however, that may require a modification of cut-off and end-for-end programs, such as excessive chop digging, spoil side digging, tight lining to dump loads due to area limitations, and the like. These situations may dictate an earlier than scheduled cut-off or end-for-ending.

## Inspect the Wedge Socket

Inspect the wedge socket when performing cut-off programs. These fittings have a direct relationship to wire rope performance and there are several areas that are critical in order to maximize rope performance.

When a wedge socket is used, pressure from the rope strands tends to imprint corrugations on the inside walls of the socket. These ridges have a tendency to hold one or more strands tighter than others when the rope is under load, which may result in unbalanced loading causing a high strand and ultimately failure. Therefore, replace socket components when this condition exists. Other concerns include:

- Proper socket size
- Proper wedge size for the specific socket
- Proper bowl sizes and grooves
- Sharpness of radii on the socket and wedge

Never mix wedges from one socket manufacturer with another nor substitute a wedge designed for another socket size as shown in Figure 1. A proper wedge-to-socket fit is very critical to provide the

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proper holding power. Mismatched wedges may distort the wire rope or create unique stress points. In addition, the wedge in many cases has a special live side contour that only fits into the socket in one direction. Reversing the wedge or putting it in upside down will cause improper seating of the rope and wedge, and may result in a socket pull-off or broken wires at the socket nose. Wedge sockets do wear, and when resocketing it is very important to inspect the general wear and fit of both the socket and the wedge. Figure 2 clearly shows a wedge and socket which should have been retired long before it reached this condition. Note the number of broken wires in the wire rope.

Figure 1: Mismatched Wedge

The wedge should not protrude more than designed, nor have cross-beads welded in the groove to provide additional holding power. All of these practices introduce wear and stress points that will produce broken wires and cause the rope to fatigue early.

A common complaint is rope slippage in the wedge sockets. Reasons for slippage include:

- Improper wedge and/or socket size
- Worn sockets
- Improper rope size
- Mismatched wedges
- Short rope tail before seating the wedge
- Banging of sockets during severe or unusual digging conditions, i.e., bucket rigging contact with sockets

For a temporary slippage fix, wrap a rag around the rope at the top of the wedge before the rope loop

Figure 2: Severely Deteriorated Wedge

is closed and the wedge seated. This creates additional friction and may assist in holding the rope in place. Please note that although Figure 1 shows the use of chain to prevent the rope from slipping through the socket, the use of a chain is never recommended and in fact would not be necessary in this instance if the wedge were properly matched with the correct socket.

If these practices are followed and adjusted to digging and operating conditions, rope life performance will be maximized and operations will reduce the costs of wire rope.

## Break-in Procedure

Always perform a break-in procedure for both hoist and drag ropes to achieve maximum service life. Run the new rope through its operating cycle a few times under a light load (10% of the working load) at a reduced speed. This allows the rope to adjust gradually to working conditions, enables the wires and strands to become properly seated, and allows for slight stretching and diameter reduction to occur.



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