"Haggie Hints"

by George Delorme

Issue 4. 2002

Haggie North America - Meeting your hoisting needs!

GEORGE DELORME
Ph: 514-453-1283; Fax: 514-453-0631; Email: georgedelorme@sympatico.ca ;
Toll Free: 1-888-HAGGIE-9 (424-4439)

The Effects of a Tight Groove in a Headsheave
(Including Plastic Inserts)

This is a subject that has been discussed and written about many times, but with the use of synthetic groove inserts becoming more common, it is worth discussing again.

PROBLEM:

Simply put, an old rope that has been in service for its normal life tends to wear the headsheave groove to its own diameter and that can be as much as 6% - 8% less than the nominal rope diameter. On the other hand, a new rope is normally 2% - 3% larger than the nominal diameter. It is obvious then, that there can be a 10% interference between a new rope diameter and a used sheave liner.

Under these circumstances, the tight groove of the headsheave will "Milk" or displace the strands over the core. This milking action can occur in both hoisting directions, although it is much more common for the action to take place as the conveyance is descending.

The reason for this problem to show itself within weeks of installation can be explained by the fact that a new rope has not yet "bedded down". When new, the rope has its full oversize diameter because wire bedding and stand bedding into the core has not yet taken place. This bedding action during the first few months causes the rope to reduce to its nominal diameter and also accounts for most of the permanent stretch.

As the new rope enters the sheave groove as the conveyance descends (and it normally does so with no payload and thus the rope is in a relaxed condition), it is very easy for the un-bedded rope to have the strands displaced over the core. To further complicate the issue, for at least some of the time, the rope is entering the sheave at the maximum fleet angle that makes the groove appear even smaller. This stand displacement will continue until the descending conveyance stops; usually at the load position. The following sketches (Fig. 1,2 & 3) show where this accumulation gathers and the resultant upset is usually described as a "Wave" or "corkscrew".

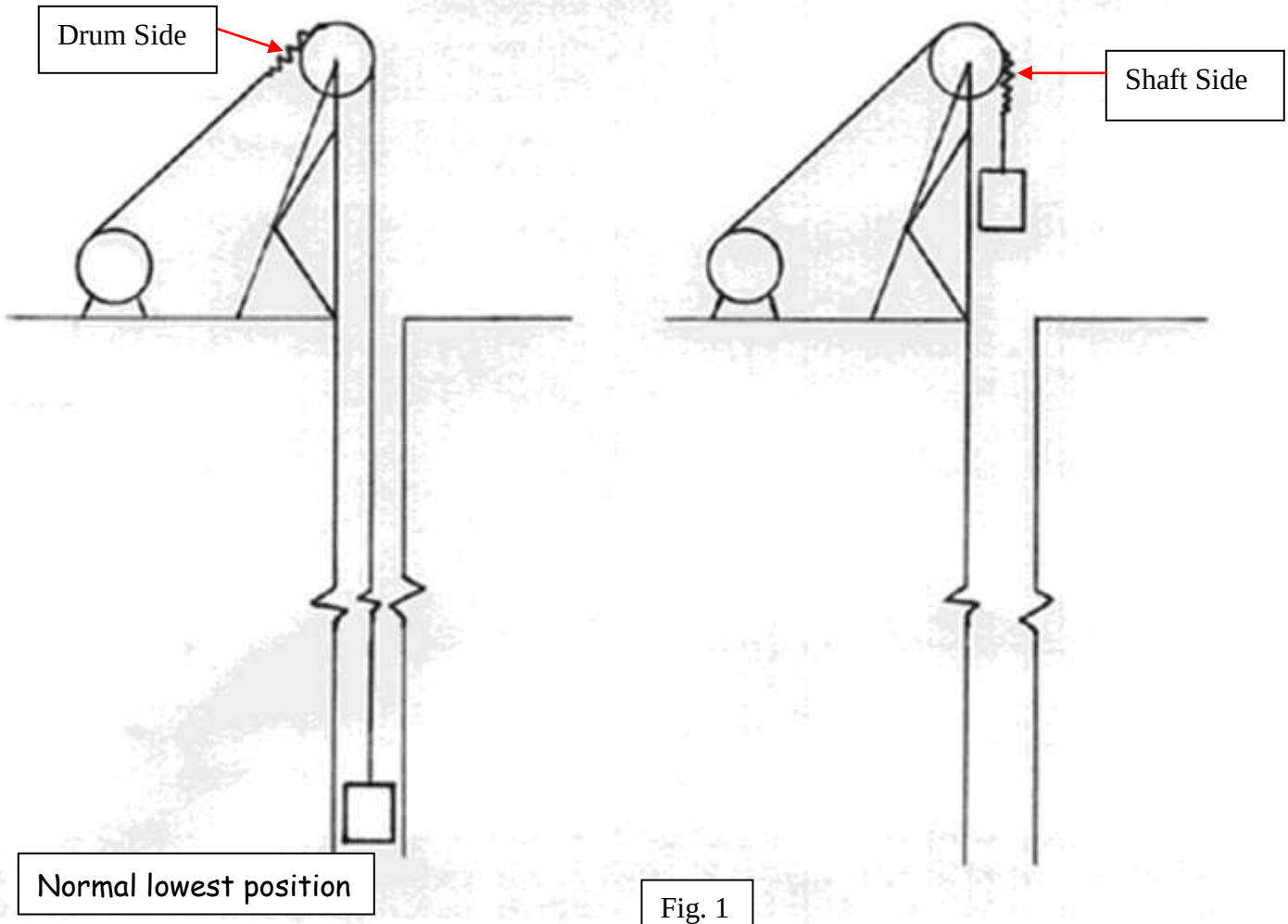

Fig. 1

In the ascending direction, the milking is less likely to displace the strands to an extent that an upset will be caused because the rope is most often loaded and enters the groove vertically with no angle. We are finding however, that with the high coefficient of friction of most plastic inserts, there may be slight stand movement that results in abnormal amounts of rope torque at the conveyance end. The torque may also be augmented if the rope is hitting the side of the plastic insert and is forced to roll into position.

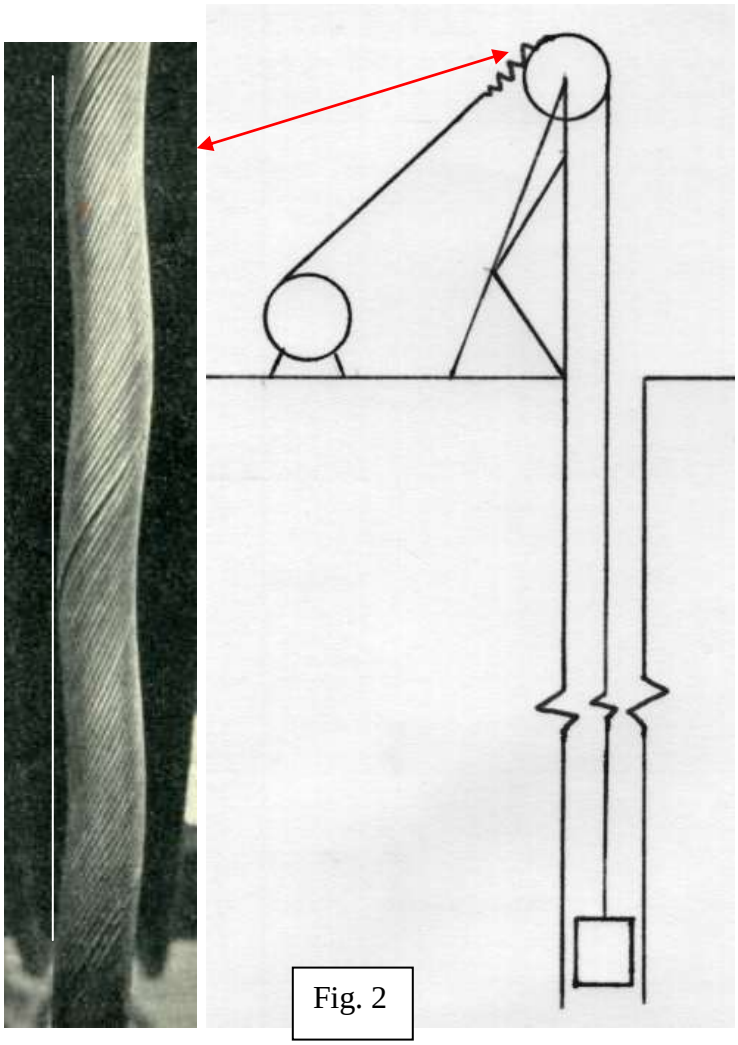

Fig. 2

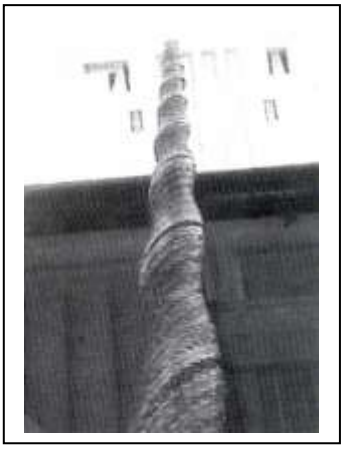

Fig. 3 - Another example of a "wave" positioned at and viewed from the hoistroom

When plastic liners were first introduced, it was thought that perhaps a new rope would simply machine out it's own larger groove and that the necessity to cut a new groove before the new rope was installed would be unnecessary. **This has been proven to be completely wrong!**

Since the plastics used for headsheave liners generally have high coefficients of friction and good resilience, a tight groove in a plastic liner will cause more milking than a steel liner. To illustrate the point, the following photo (Fig. 4) shows how even the wires in the strands have been milked or displaced by a tight plastic groove.

Fig. 4 - This photo was taken of a wave positioned on the drum and although it is of poor quality, it does show that the tight plastic liner not only displaced the strands over the core causing a wave, but also displaced the wires in the strand.

To prevent this problem, it is essential that **before** a new rope is installed, the groove is either machined to offer a 10% clearance over nominal rope diameter or new liners with the proper clearances are installed. This is just as important, if not more so, if plastic liners are used.

In Addition to the 10% diameter clearance, the sides of the grooves must also allow the rope to enter without contact. The following sketch (Fig. 5) shows the path the rope takes when entering a headsheave when the sheave to rope ratio is 80:1 and the fleet angle is 1^0 20' and in order to avoid contact, a 36^0 included angle must be available. If the sheave to rope ratio is 100:1, then the angle must be increased to 45^0.

It is also recommended that the sheaves at least be aligned towards the middle of the drum or more accurately towards the middle of the active rope wraps to ensure that unnecessary contact is minimized between the rope and the side of the sheave liners.

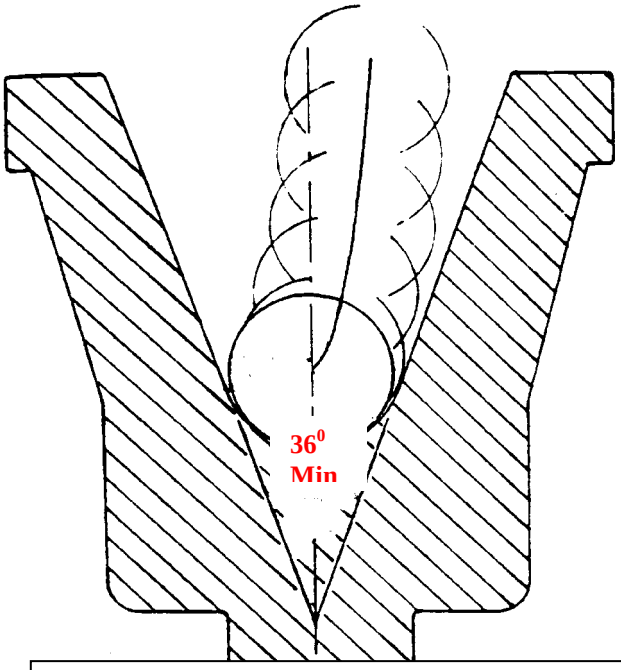

Fig. 5 - Rope path entering a groove @ $1^0 20'$ and sheave to rope ratio of 80:1

Since most sheave wheels in Canada offer an 80:1 ratio, "Arrow head" sheave gauges (see Fig. 6) that incorporate the 10% diameter clearance and a 36^0 intersecting angle are available from most rope manufactures that serve the mining industry.

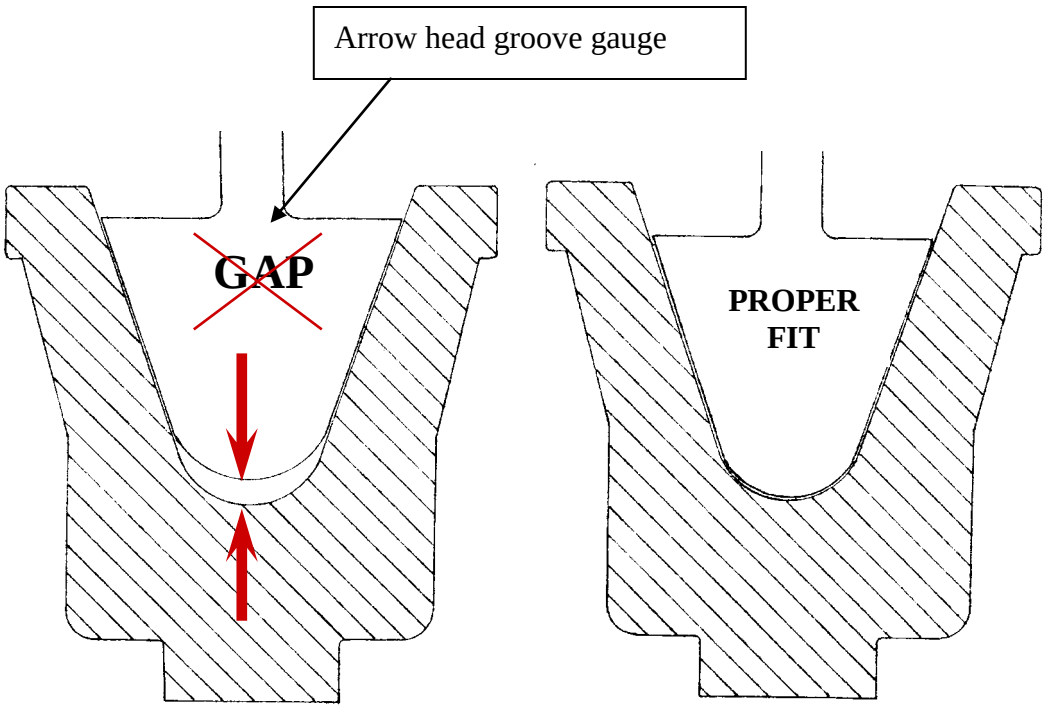

Fig. 6

REMEDY:

While it is virtually impossible to completely eliminate a wave once is has been formed, if it is noticed early, it can be diminished. The first step is to open the headsheave liners to the correct clearance ASAP. Light oil should be saturated in the area and beyond in both directions (this will help in allowing the strands to re-position themselves). It is always a good idea to measure the length over which the wave extends and record the amplitude at the worse spot. It is expected that the wave will lengthen but the amplitude will reduce. Performing a conveyance end cut will also force the rope to contact the sheave and this may help in dissipating the wave. NOTE: the rope must be examined throughout its life in this location because wear will occur in this area despite the apparent success of reducing the effect of the wave.

CONCLUSION:

With tight headsheave grooves being the most common problem causing premature rope removal on drum winders, it is essential that either new liners be installed or the old ones be machined to offer the correct clearance before a new rope is installed.