Installation of Crane Ropes

General Procedures

The reel of new rope should be mounted on an axle between two stands. In order to provide the necessary back tension - which should be at least half of, but preferably equal to, the working rope tension - a suitable braking system is essential.

A winch with water cooled brakes will provide the required back tension. In the case of multi-layer coiling on the drum, the first layer must be back tensioned, as this section of rope is not able to stretch with the'"operating section due to friction between rope and drum.

The result is that as overlying layers of rope cause the dead turns to bed down, the wires lose tension and become slack. Continuous movement of these wires by the overlying layers causes them to fatigue and break. In Non-spin ropes this action becomes even more noticeable, causing whole outer strands to fail in fatigue.

While coiling the new rope on to the drum it is as well to stop from time to time and reverse the drum fractionally to cause a slight degree of slackness in the section of rope between drum and reel.

It can then be seen whether there is any tendency for the rope to kink. A tendency to kinking at this stage indicates that there is torque present in the rope. When the rope is to be used on applications such as cranes, machinery, winches, etc, where rope tension sometimes reduces to zero, the residual torque in the rope must be removed during installation.

To remove rope torque while both ends are attached, one end to the drum and the other to the reel, feed turns of rope in the form of loops over either the left hand or right hand reel flange depending on the direction in which the torque is being produced. This necessitates passing the rope loop between axle and support, and requires the use of a crane or jack. Care must be taken to ensure that additional torque is not induced into the rope during installation. This can happen if the rope to be removed is used to reeve the new rope through the system. The old rope may contain a degree of torque which, if the two ropes are welded, brazed or clamped together, will be invariably transmitted into the new rope, or vice versa.

Should an old rope be used to reeve a new rope through, it is recommended that the 2 ropes be connected by a manilla or similar soft fibre rope in such a way that the respective rope ends are at least 1 m apart from each other.

A further check may be made to ensure that no torque is induced into the new rope during the installation. A match stuck between the strands or lacquer-spray applied on to the rope should remain in the same plane at all times.

If such a marker moves out or disappears behind the rope, torque is present in the rope; either residual manufacturing torque or torque induced by the system. e.g. misaligned sheaves. The cause of the torque as well as the torque itself must be removed.

There are a large variety of cranes made by various manufacturers. The following installation procedures therefore highlight the most important aspects of the installation of steel wire ropes.

The personnel of the Technical Services Department are always available to discuss and assist with any difficulties experienced in the field.

Mobile or Overhead Cranes

General Procedures

a. Assuming that the mobile crane has a rope which requires removal before the new rope can be installed, the hook block must be positioned underneath the overhead sheaves in such a way that:

• The block is in an upright position and not lying on its side.

• The sheaves of both the mobile crane and the hook block are in the same plane.

Whilst it is appreciated that not all operators will have the equipment to support a block in the vertical position, this aspect is of great importance, as failure to observe this feature will probably result in kinks or torque being introduced into the rope during the installation process.

b. The reel with the new rope should be positioned in such a way that the hook block sheave points at the centre of the reel barrel (between the flanges) and the reel barrel is square to such a line.

Note: All ropes, and especially non-spin ropes, (because of their inherent complexity), should be ordered on wooden reels rather than in coils. This, apart from assisting in the installation process, limits the possibility of kinks being introduced into the rope, or turn being lost or gained during installation.

c. The old rope may be used to pull the new one through the system. Care should be taken to ensure that the crane drum has sufficient capacity to cope with the full length of the old rope plus approximately 3 turns of the new rope.

Care must be taken to ensure that any turns which are present in the old rope do not permeate to the new rope.

d. Upon removing the old rope, (which should always be re-coiled onto a wooden drum or figure-of eighted on the ground), the new rope should be fixed to the drum.

The installation personnel must ensure that either the wedge or rope clamps, (or the means by which the rope is fixed), is properly secured.

Note: The seizing wires fitted by Elephant Lifting Equipment. Limited to cut lengths of rope, should not be removed either during or after the installation process, unless the design of the crane requires this.

The seizing wires ensure that the rope does not **unlay** or, in the case of a Non-spin rope, that the balance between the inner and outer rope is not disturbed. If seizing wires must be removed, a rope with tapered and brazed ends should be ordered.

e. The remainder of the new rope is now installed. However, particular note must be made of the following:

• The coiling of the new rope onto the hoist drum of the crane must be checked to ensure that there is no cross-coiling.

• It is important that the rope be installed under as high a tension as can reasonably be applied. Therefore some form of brake should be fitted to the reel containing the new rope. However, care must be taken to ensure that the braking action is not applied to the rope itself as this will cause damage. The reason for applying this braking action is twofold. Firstly, the incidence of kinks and other damage to the rope is reduced. Secondly, the tension has a direct bearing on the effectiveness of the coiling on the drum.

This is particularly true in the case of the multi-layer coiling on drums as poor coiling on the first layer will result in subsequent poor coiling in the following layers.

f. Periodically during the process of transferring the new rope from the manufacturer's reel onto the crane, installation personnel should stop and check to see whether or not there is any inherent turn or liveliness in the new rope. This is done by releasing the tension on the reel and allowing the new rope to become slightly slack. Inherent turn should then manifest itself by the rope realigning itself in a position 2 or 3 waps away from the position which it occupied when coming off the reel i.e. it will realign itself either to the right or left, 2 or 3 waps away from the position from which it was coming off the reel. The rope behaviour should be observed from a position in which the reel is between the crane and the observer.

i. Should the rope move 2 or 3 waps across to the **right** for a **right** hand lay rope, this would indicate that there is **"turn-in"** in the rope. This turn can be removed. by taking one or two waps off the **left** hand side of the reel, as one faces the reel. It is less likely that there will be **"turn-out"** in the rope but in this case for a **right** hand lay rope, the rope would move 2 or 3 waps to the **left** of its coiling position. This "turn-out" can be removed by then wapping off on the **right** hand side of the reel but care should be taken in this eventuality as the possibility will exist that a protruding inner rope can result from too many turns being induced into the rope itself.

• Should it be noted that the rope is extremely lively, this procedure of stopping and examining for liveliness or turn in the rope should be repeated frequently.

g. The rope end connection is now made. Again, care must be taken to ensure that the rope is not kinked when making the termination or that turns are neither lost or gained.

h. The jib is now raised and/or extended and the rope gradually paid out. Should it be found that the hook-block is cabling up, or showing a tendency to cable up, remedial action is necessary. In such a case it is recommended that the Technical Services Department of Haggie Rand Limited be contacted.

Tower Cranes

The essential difference regarding the hoist ropes of tower, mobile and overhead cranes is that the tower crane will usually have a non-spin construction rope operating on two or more falls, the mobile crane has either a non-spin or ordinary lay round strand rope, whilst the overhead crane will invariably have an ordinary lay round strand rope. Therefore the installation of a tower crane rope will follow the pattern of rope installation for a mobile crane, with one or two variations.

The following method has proved generally successful in practice, but particular installations may require slightly different methods, and· our Technical Services Department can advise in these cases.

a. The new reel to be installed must be positioned under the jib of the Tower Crane about midway along its length.

b. The new reel should be supported by a bar through its centre holes standing on a simple 'A' frame support.

c. The hook block ot the tower crane is tied to jib.

d. The end termination at the jib is loosened and the free end allowed to run to the ground. Care must be taken to ensure that the position where the block is secured to the jib will allow a long enough length of rope to reach the building when this operation is performed.

e. The old ropes' end connection is then severed, and the old rope joined to the new rope as indicated for mobile cranes. (See General Procedures, pages 19 & 20).

f. The new rope is now pulled through the system by the old rope and approximately 3 turns are put around the hoist drum before preparing to remove the old rope. The new rope is then clamped to a convenient place on the crane frame and the old rope l may be removed.

g. Whilst pulling the new rope through the system, it is also important to check for turn or liveliness in the rope as has been indicated in the section concerning installation of ropes on mobile cranes. Thus, the installation engineer must be prepared to remove the tensioning device from the reel and check for turn periodically. Should turn or liveliness be found in the new rope the method of removing such turn is the same as for ropes used on mobile cranes. (i.e. by wapping off the side of the reel).

h. The jib end connection is now made by lowering a fibre or other light rope to lift the end connection (e.g. thimble) to its required position.

i. The slack is now taken up, the block is released from the jib and is run without load over the total height available. Should turn be evident, remedial action in the form of inducing or removing turn at the jib end connection will have to be made. However, this can result in irreparable damage if not carried out correctly. We therefore recommend that the Technical Services Department be consulted, if problems arise.

Optimising Crane Rope Life

Ensure that -
1. all sheaves are:
a. correctly aligned
b. free to rotate
c. correctly profiled

2. the rope does not catch or snag on any part of the crane or building.

3. the coiling on the drum is good. Check also that the drum is not indented or badly marked.

4. in the case of hoist drums which are mounted on the tower itself, that the crane operator does not consistently operate the crane in either a clockwise or anticlockwise direction, as this will result in turn being either lost or gained in the rope.

5. The driver avoids side pulling and lifts vertically at all times. It is obvious that in most instances the crane driver plays an important part in the life expectancy of a crane hoist rope, and therefore his assistance in obtaining maximum rope life is of the greatest importance. Additionally, bad operating procedures can create high stresses on the crane and buildings, with attendant high risks.

Sheave alignment: All sheaves should be in proper alignment. The main sheave should line up with the centre of the hoisting drum. If the sheaves are not perfectly aligned both the rope and sheave flanges will be subjected to severe wear and rapid deterioration will occur. A ready indication of poor alignment is rapid wear of only one of the flanges on any given sheave.

Poor alignment of the main sheave may also result in poor winding on the drum.