Sheave Wheel Friction

Rope Sheaves generally have a service life of many years. However all bearing ultimately fail for one reason or another. The design of a Vertical Sheave Wheel is different from a Horizontal Sheave Wheel due to the lubrication requirements. The incorrect orientation of a Sheave Wheel will result in early failure.

A Sheave Wheel with bearings is considered by many to be completely free of friction. This is not so; a friction level of 1½ % is recommended to be assumed as average; for this reason minimising the number of Sheave Wheels is very important. There is absolutely no place whatever for bushed Sheave Wheels in any C onveyor Tension Take-Up System. Note that Gravity/Counterbalance Tensioning Systems generally have at least twice as many Sheave Wheels as Winch Tensioning Systems and are actually more prone to Sheave Wheel Failure due to their constant movement. Measurement and detection of Sheave Wheel Friction is a 'next-to-impossible' task.

Sheave Wheels do eventually fail and cause unbelievably dramatic and confusing symptoms in all Conveyor Tension Control.

The simplest way to illustrate this is to study the effect of a totally seized Sheave Wheel.

In an experiment carried out by Iptron Technology on an ungrooved solid steel disk, the difference between tensions on either side of the 'Wheel' had a ratio of 3:1. In other words, if a Take-Up Trolley has a total force of 40kN on the Trolley (20kN Belt tension) the Take-Up Winch will be pulling 30kN while the Tension Transducer the other side will sense only 10 kN.

To describe this very confusing behaviour:-

With the sensed tension below the target level of e.g. 20kN, the winch would have to pull 60kN for the Load Cell to read 20kN. The resultant belt tension will be (20 + 60)/2 = 40kN The actual Belt Tension will be 200% of target. Likewise when decreasing tension from a higher level to a target level of 20kN the Winch will have to drop to 6.6kN at which point the actual Belt Tension will be (6.6+20) /2 = 13.3kN. Thus the adjusted tension will vary from 66% to 200% of the target tension. Note that this is for a single Trolley Pulley. Trolleys with 4m of 6 falls of rope have even more dramatic behaviour.

To personnel attempting to set the tension manually, he will observe that when attempting to increase tension, the sensed tension will initially decrease be for increasing. This has led many conveyor service electricians to conclude that the motor direction is incorrect.