

CABLE TENSION MONITORING



WHAT WEARS OUT/DESTROYS CABLE

× Fatigue

- + Tight-loose-tight-loose ie tension cycles
- + Bending around sheaves - forth and back
- + Vibration

× Abrasion

- + On the ground
- + On and off the drum
- + Recoil on the drum

WHAT WEARS OUT/DESTROYS CABLE

- ✘ Burning it
 - + On the ground/rocks
 - + Over logs
 - + Line wrap
- ✘ Abuse
 - + Kinks
 - + Grapples
 - + Neglect

WHAT WEARS OUT/DESTROYS CABLE

- ✘ But out of all the ways that we can damage
- ✘ or destroy a piece of wire rope, what is the
- ✘ most common cause of the destruction of
- ✘ wire rope in logging?

TENSION

- ✘ We shorten the life of and destroy more cables and especially skylines by over
- ✘ loading or over tensioning them.



HOW DOES A CABLE REACT TO TENSION



- × SWL = Safe Working Load (Design Load)
- × EL = Elastic Load (Damage Starts)
- × CBS = Catalog Breaking Strength

CUMULATIVE DAMAGE

- ✘ Every time you go over the Elastic Limit of a cable you do damage, you weaken it and reduce it's strength.
- ✘ It will now break at something less than the original breaking strength.

HOW DO WE MONITOR TENSION

× Historically

- + By the seat of the pants (pucker factor)
- + By Design (Calculate payloads, engineering)
- + By Visual indicators (belly in the line, vibration)
- + By Audible Indicators (hear the cable talking)
- + Mechanical.... Brake settings
- + By Breaking cable

SEAT OF THE PANTS

- ✘ When does it kick in?
- ✘ What is it telling us?
 - + “If I pull any harder, something is going to break”
- ✘ Where are we in the strength profile of the cable when this occurs?
- ✘ Probably somewhere between the elastic limit and the breaking tension.

BY DESIGN/ENGINEERING

- ✘ How many do payload analysis during planning?
- ✘ How many give this to the logger?
- ✘ How many loggers/rigging slingers can tell you what the weight of a turn is?
- ✘ Great planning tool
- ✘ Difficult to implement on the ground

VISUAL INDICATORS

- ✘ Belly in the cable/deflection
 - + Hard to visualize on the ground
- ✘ Vibration
 - + Frequency of vibration is a function of length, weight (lbs/ft) , and tension
 - + Good for **comparing** tension in guylines
 - + Not very useful in determining absolute tension

AUDIBLE

- ✘ When does the cable start talking to us?

Just before it breaks, so we are in the red zone between the elastic limit and breaking.

Already doing damage

MECHANICAL

- ✘ We can set the brakes to slip.
- ✘ How do we know where to set them?
- ✘ Some machines have a chart that helps to determine the air pressure setting.
- ✘ These are based on an engineering calculation, not actual measurements.
- ✘ Based on the original brake lining and ideal conditions of humidity and temp.

ELECTRONICALLY

System are available to monitor cable tension through the use of load cells and digital read outs.



TENSION MONITORING SYSTEMS

- ✘ How do they work?
- ✘ Replace the pin in the sheave of the line you want to monitor.



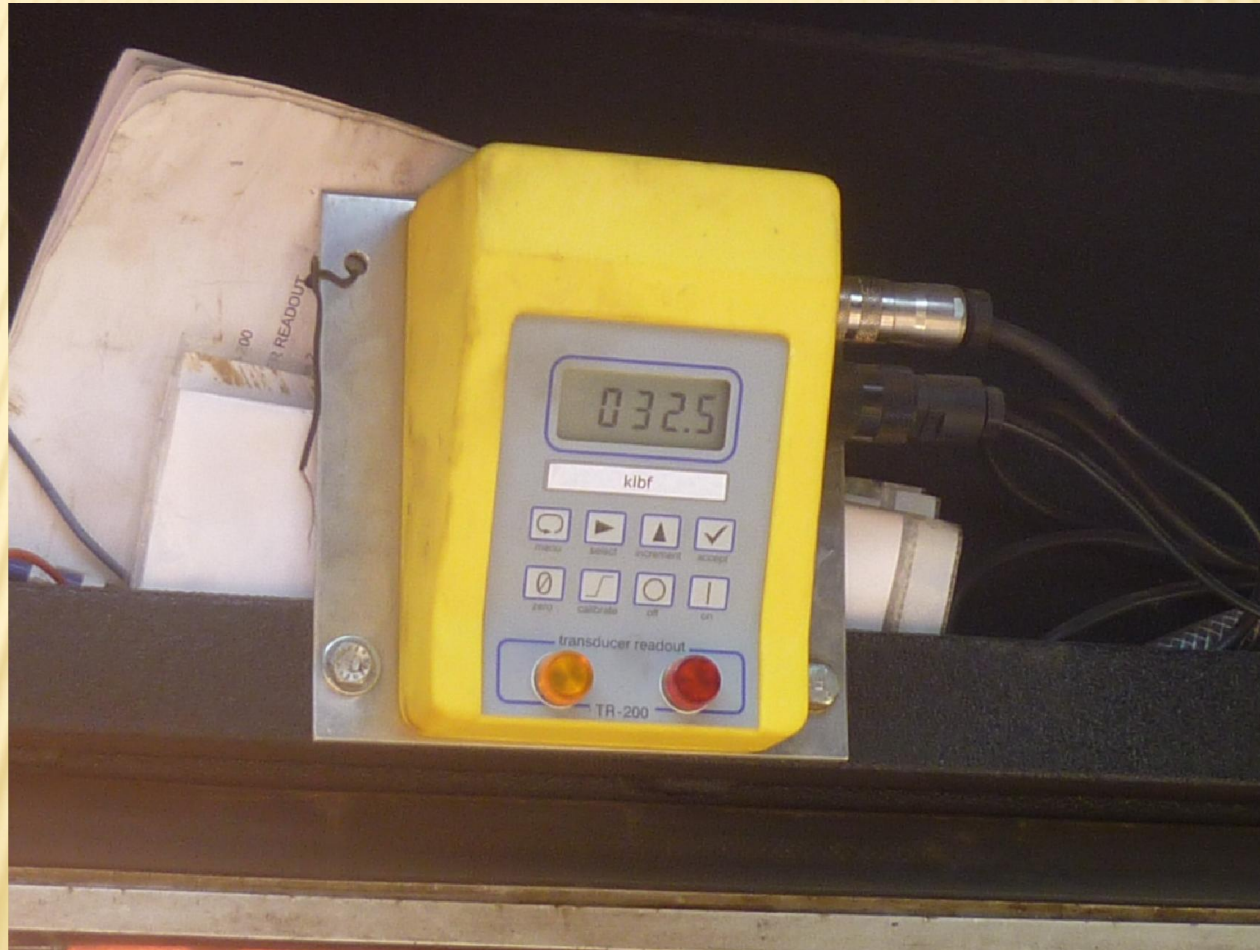
TENSION MONITORING SYSTEM

- ✘ This system puts the tension of the skyline in front of the operator at all times.
- ✘ Can give the crew feedback as to what is going on.
- ✘ Avoids overloading the system and breakingstuff.
- ✘ Avoids underloading the system and losing productivity.

TENSION MONITORING SYSTEMS

- ✘ Two “Warning” lights and a buzzer.
- ✘ Amber light is set, usually at SWL or 1/3 of CBS
- ✘ Red Light is set at 50% of CBS
- ✘ Buzzer goes off when red light comes on.

TENSION MONITORING SYSTEMS



TENSION MONITORING SYSTEM

- ✘ Most yarders require a pin with two load cells set at 90 degrees to each other because the angle of the skyline over the pin is constantly changing. (Dual axis pin)
- ✘ There are a few yarders (071, 171, 172 Madills) that have a deflector sheave where the angle of the cable over the pin doesn't change and those only require one load cell. (single axis pin)

TENSION MONITORING SYSTEM

- ✘ Crew gets immediate feed back concerning under and over loading.
- ✘ They quickly get a sense of what is a “good” turn.
- ✘ The yarder operator can set the skyline brake to slip at a tension that is less than what will damage the skyline.

TENSION MONITORING SYSTEM

- ✘ Encourages crew to chase deflection.
- ✘ Give real data, as opposed to a “feel”
- ✘ Protects your investment in time, cable, carriages, yarder.
- ✘ At one time there was an insurer who was willing to give a discount.
- ✘ Eliminates the need for “fuse links” in over spec'd skylines.

FUSE LINKS

- ✘ Yarder is designed for the breaking strength of the skyline, mainline, and haulback that it is plated for.
- ✘ As long as your system stays under this load it is legal and safe.
- ✘ 50% of 1-1/8th PowerPac/double swaged is approximately 83% of 1-1/8th EIPS.

TENSION MONITORING SYSTEM

- ✘ Cost of tension monitoring system. \$7000
- ✘ Cost of skyline ??
- ✘ Cost of carriage ??
- ✘ Cost of down time??
- ✘ Cost of lost production from under loading??

TENSION MONITORING SYSTEMS

- ✘ Load sensing shackles are available for monitoring guylines.



TENSION MONITORING SYSTEMS

- ✘ These load sensing pins are being integrated into tethering machines to control operations



??QUESTIONS??

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