

8. CONTINUOUS WORK STRAIN MEASUREMENT IN CABLE YARDER RIGGING

Morten Nitteberg^{1*}, Bruce Talbot¹, Karl Stampfer², Daniel Kindernay³

¹Norwegian Forest and Landscape Institute, *nim@skogoglandskap.no

²University of Natural Resources and Life Sciences, Vienna

³Technical University Zvolen, Slovakia

This paper presents the measuring equipment, techniques and results of a study monitoring the heart strain experienced by cable logging crew while drawing out a light weight 4.0 mm synthetic strawline (11g m^{-1}) as against the conventional 3.5 mm steel wire (39g m^{-1}). Setting up the skyline is not a frequent work process in steep terrain logging, but is regarded as one of the most strenuous tasks, and likely one of the major factors regulating recruitment into the sector. Two subjects were selected from a steep terrain logging crew. Each subject was made to alternately drag out the synthetic strawline, steel wire strawline, or walk with no load up a demarcated trail, with an outward length of 300 m. The sequence of doing this was fully randomised, with three replications of each treatment. The trail profile was divided into 12 segments, each of which were used as individual units of observation (fig. 1 left).

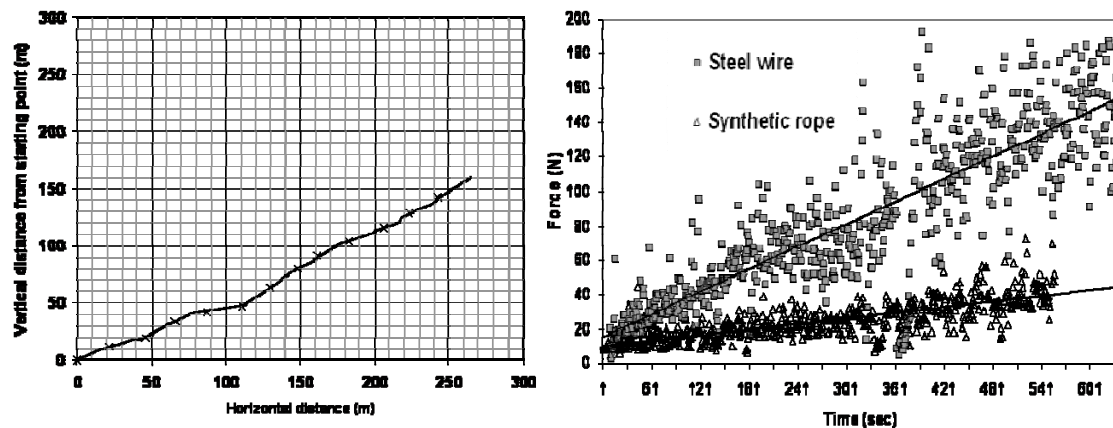


Figure 1 (left) the terrain profile with a 65% overall slope, and (right) an example of the tensile forces acting on the subject as he walks up the profile

The rope was attached to the subject with a 3.5 kN load cell (accuracy 0.1 %), fitted with a wireless transmitter which allowed for continuous logging of the tensile force in the rope. Heart rate was measured as a proxy for work strain using a Polar RS400 pulse monitor with continuous data logging and storage. Heart rate data was superimposed over the continuous tension measurements and the digital terrain model. Results showed a significant difference in force required in pulling out the two rope types. Differences in heart rates were also significant and indicated an extreme work load when pulling out the steel wire, where the recovery time was also significantly longer. The cumulative work load (Joules) increased exponentially toward the end of the 300m corridor for the steel rope, and suggested that this was approaching the maximum range for a single person to pull, while the synthetic rope could be handled more easily over longer distances.

Keywords: rigging, yarding, work strain, synthetic rope,