

FASTTRACER NEWS

New free Excel reporting tool for the tension estimation of cables



The tension monitoring of cables/metallic ropes is fundamental both in civil engineering, in particular about tie-beams, ropes and chains, and in lifting operations, as elevators and cranes. The monitoring constantly allows controlling the health of the system under analysis, by means of a non-invasive measurement.

In order to estimate the tension, Sequoia IT developed a simple tool in Excel to be used together with FastTracer, which allows identifying the different natural frequencies of the cable under examination.

REPORT FUNCTIONALITIES

TEST ON THE CABLE

A single test on the cable must be realized with a suitable excitation, usually a hammer blow in a certain point of the cable, so that as many frequencies as possible are present in the spectrum. It is not necessary to acquire the data for a long time period, but few seconds (about ten) are sufficient per each acquisition.

The spectrum is obtained from the free oscillations of the cable, caused by the hammer blow.



TENSION CALCULATION

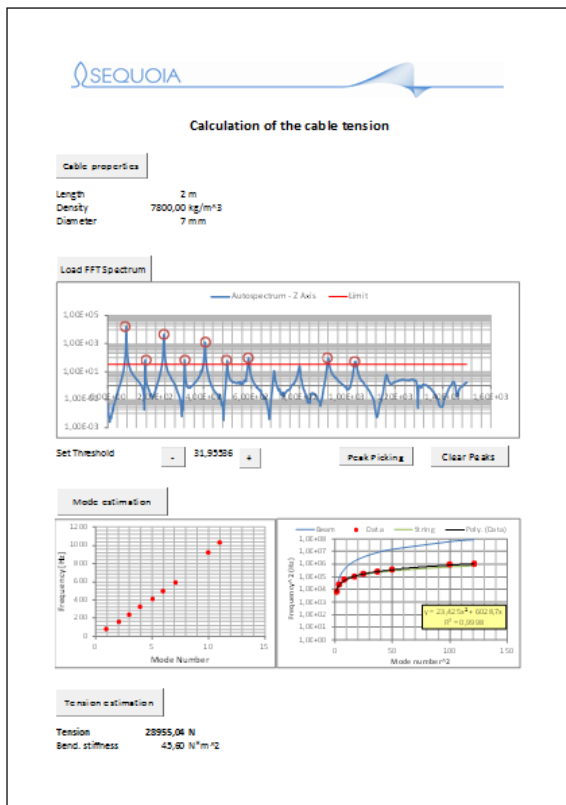
The cable tension (and parallel the bending stiffness) is estimated through a mathematical relationship connecting the tension to the natural frequencies of the cable:

$$\left(\frac{f_r}{r}\right)^2 = \frac{1}{4\mu L^2}T + \frac{r^2\pi^2}{4\mu L^4}EI$$

where r is the mode number referred to the frequency f_r , L is the cable length, T is the cable tension, EI is the bending stiffness, μ is the mass per unit length. For the tension estimation, it is important to estimate as many frequencies as possible, usually up to 20. The string model, where the contribution of the bending stiffness is neglected, is not suitable for this purpose.

RESULTS

The report, once the user has inserted the cable data (length, density and diameter) and has loaded the FFT saved from the FTAnalyzer (the software correlated to FastTracer), provides both the tension and the bending stiffness of the cable.



Microsoft Excel

Length of the cable (m)

OK Cancel

Microsoft Excel

Density of the cable (kg/m³)

OK Cancel

Microsoft Excel

Diameter of the cable (mm)

OK Cancel

ADVANTAGES OF THE METHOD

The method proposed for the tensional study of cables is:

- *non-invasive*, because it is an indirect method and it does not execute any invasive action on the cable under analysis
- *non-bulky*, because a unique sensor of small dimensions is adopted, with no impacts on the cable and on its dynamics (negligible mass)
- *of simple use*, because a quick single test must be done, with hammer blows, and the rest is automated
- *cost-effective* compared to other technologies, as the direct methods (devices placed on the cable measuring directly the tension)