

Prediction of Maximum Tension and the Sag Location in Track Rope of Ropeway System using Numerical Method

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Abstract:

This paper presents a numerical approach for accurately predicting the maximum tension and location of maximum sag in the track rope of a ropeway system. Accurate and efficient calculation of these parameters is critical for ensuring the structural safety, operational reliability and optimal design of ropeway installations, especially those which cover challenging terrains with long span and varying load.

The rope is modelled as a flexible catenary, incorporating the effects of distributed self-weight, external body (e.g. dead and live weight) and supporting reaction. A numerical iterative scheme, Newton-Raphson method is employed to solve the non-linear equation governing the cable profile. This approach allows us to determine the horizontal tension component, which is then used to calculate the maximum tensions occurring at the upper supporting points and the lowest point of sag (the maximum sag location).

Results obtained from the numerical procedure are compared with analytical results to validate the accuracy. A material carrying ropeway system has been considered to conduct a case study.

The proposed approach provides an effective computational tool for engineers in design and analysis of track rope, sag clearance verification for a ropeway system. Also, this approach offers a significant improvement in accuracy compared to traditional methods.