

Application Information

Wind Loading Effects from Deforestation on Forest Canopies

The effect wind can have on both natural and managed forest areas can range from foliage loss to complete uprooting of trees. A university in North America wanted to study the stress on tree trunks from wind before and after partial deforestation. The test was set up on an untouched section of forest where a base line could be established over a period of time. The following season a second test was performed on the area after 30% of the trees were removed to compare the results.

To acquire measurements of the stress caused by the wind, strain gauges were fixed to multiple trees in the area. The researchers had to ensure that the strain gauges were initially calibrated as well as obtain an understanding of their output prior to taking live data. In order to develop a response correlation of the strain gauges corresponding to tree movement caused by the wind effects, varying forces on the tree trunks had to be simulated. This was accomplished with a simple winch and pulley system. To determine the forces being applied by the winch and pulley apparatus, the university team chose the Nidec-Shimpo FG-7000L-S20 with S-Beam style external load sensor and $\pm 0.2\%$ full scale accuracy. The S-Beam load cell was installed on the winch's wire to measure the tension force applied to the trees' bases and compare to the output of the trunk-attached strain gauges.

The FG-7000L-S20 with its external load cell was easy to integrate with the cable of their winch and pulley apparatus, enabling minimal set-up time each season. The initial simulation procedure allowed the team to properly calculate the complete range of strain gauge output over the season and compile accurate test results.

As anticipated, the deforestation test showed a significant impact of strain on the trees versus the baseline forest test without tree removal. The university team was able to make further insights into the effects of deforestation from their work and will continue on further with their research.

Equipment Used

- *FG-7000L-S-20 Digital Force Gauge with external load cell, 4500 lb (20 kN) capacity*
- *EDMS Data-Logging Software*

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