

CXI-PT5500 academic researches and reviews

June 2016

Cinetix/Vonaq worked together with different research teams in the University of Trento and Padova, to develop the CXI-PT5500 pole tester. Different topics have been investigated by several experts, mainly on the following research areas:

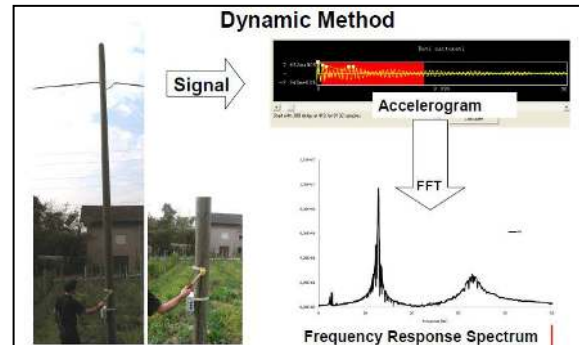
- *Wood properties and Mechanical Characterisation:* Prof. Maurizio Piazza, Prof. Luca Deseri, Ing Mariapaola Riggio, Ing. Andrea Polastri (University of Trento)
- *Soil properties and their effect on the wooden poles dynamic behaviour:* Prof. Gianpaolo Cortellazzo, Prof. Marco Favaretti (University of Padova)
- *Structural Engineering and FEM Modeling:* Prof. Ugo Galvanetto, Prof. Mirco Zaccariotto (University of Padova)
- *Signalling Processing:* Prof. Claudio Narduzzi, Prof. Matteo Bertocco (University of Padova)

All these researches produced different documents and academic publications, reported below.

- **Wood properties and Mechanical Characterisation:**

Piazza M., Deseri L. (2011), *Metodologia di indagine ND su pali in legno – Risultanze della ricerca triennale svolta dal Dipartimento di Ingegneria Meccanica Strutturale dell'Università degli Studi di Trento per la validazione dello strumento X-POLES – Trento*

This document reports the results of a 3 years research project carried out by the Department of Mechanical and Structural Engineering of the University of Trento. The research validated the pole's structural analysis made by the CXI-PT5500 pole tester.



Mariapaola Riggio, Maurizio Piazza, Andrea Polastri, *Dynamic testing of wood utility poles*, M.C. Forde (Eds.), Structural Faults + Repair-2010, Edimburgo, 15-17/06/2010, 2010, Vol.1, ISBN:0-947644-66-0

Mariapaola Riggio, Maurizio Piazza, Andrea Polastri, *Structural Assessment of Wood Utility Poles: A Research in the Telephonic Network in Italy*, H. Zhang, X. Wang (Eds.), 16th International Nondestructive Testing and Evaluation of Wood Symposium, Beijing, China, 12-14/10/2009, 2009, pages 97-104

These papers have been presented at the "Structural Faults + Repair" in Edimburgo (2010) and at the "16th International Nondestructive Testing and Evaluation of Wood Symposium", Beijing, China (2009), reporting different technical phases of the 3 years research project carried out by the Department of Mechanical and Structural Engineering of the University of Trento

- **Soil properties and their effect on the wooden poles dynamic behaviour:**

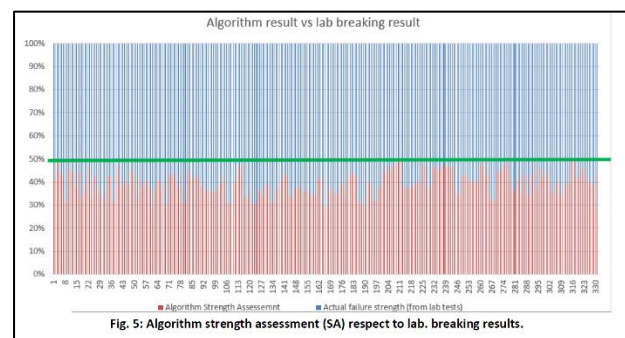
Cortellazzo G, Favaretti M. (2013), “*Studio degli effetti della rigidità del terreno sul comportamento dinamico di pali in legno, parzialmente infissi nel terreno, ai fini della verifica della loro integrità*”
University of Padova

This document reports the results of the research project carried out by the Department of Civil Engineering of the University of Padova, in order to analyse the effect of the different types of soil on the dynamic behaviour of a wooden pole planted into the ground.

- **Structural Engineering and FEM Modeling:**

Galvanetto U., Zaccariotto M. (2015), *Verification of the Strength Assessment computed by the CXI-PT5500 measurement device* – Padova.

This document reports the results of the numerical tests performed by Dr. Mirco Zaccariotto and Prof. Ugo Galvanetto to evaluate the performance of the CXI-PT5500 utility pole tester.



The objective has been to investigate whether the value of the wooden poles ultimate bending strength (UBS) computed by the software installed in the CXI-PT5500 correlates with the value measured by breaking the pole in laboratory

- **Signalling Processing:**

Bertocco M., Frigo G. (2015), *Cross-Correlation Methods for Enhanced Monitoring and Health Assessment of Wooden Poles* – EESMS 2015 Environmental, Energy, and Structural Monitoring System. Trento, Italy – July 9th-10th, 2015

This paper has been presented at the EESMS 2015 Environmental, Energy, and Structural Monitoring System in Trento (Italy), in July 2015. It presents the mathematical and scientific basis of the technology implemented in the CXI-PT5500 to reduce noise effects in the FFT analysis, like spectral leakage, with the goal to improve the wooden pole proper frequency detection. This technology is based on signaling processing techniques.

Benetazzo L., Bertocco M., Bovo U., Frigo G., Genovese M.P., Narduzzi C. (2016), *Characterisation of a wood pole tester* – 14th IMEKO TC19 Workshop Technical Diagnostics New Perspectives in Measurements, Tools and Techniques for system’s reliability, maintainability and safety. Milan, Italy - June 27-28th 2016.

This paper has been presented at the 14th IMEKO TC19 Workshop in Milan (Italy), in June 2016. It presents the metrological analysis of a vibration-based pole testing system, taking into account different contributions to uncertainty as well as the effects of natural variability of wood properties. The study allows to evidence the main features and intrinsic limits of the test approach and shows how performance bounds have been evaluated.