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EEA - OH Line Designers Forum – Christchurch May 2026

Using Big Data and Predictive Analytics to Improve Overhead Line Asset Resilience.

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Why condition assessment over time matters:

- Single inspections give a **snapshot**; repeated measurements reveal **trends**
- Failure is usually preceded by **gradual degradation**, not sudden collapse
- Time-series data enables **early intervention**, not reactive replacement

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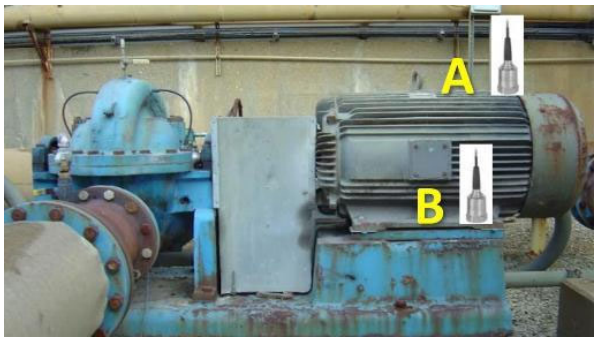
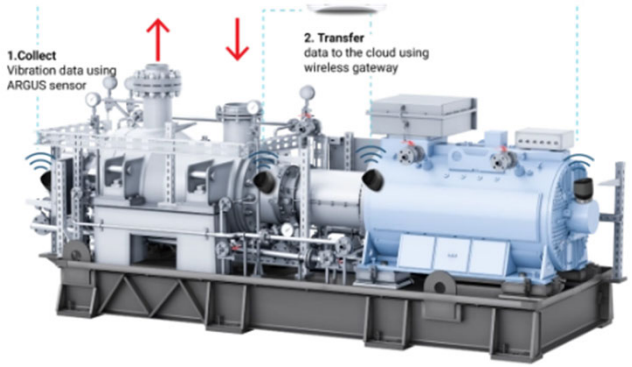
Use of Big Data and Predictive Analytics in other industries.

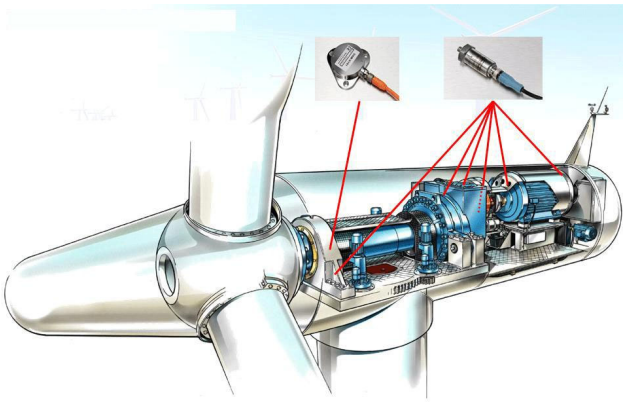
The use of predictive analytics has become the standard to monitor mission critical assets in many industries.

Constant monitoring of vibrations in moving parts is ubiquitous in many industries;

- Manufacturing
- Chemical processing
- Logistics
- Power generation







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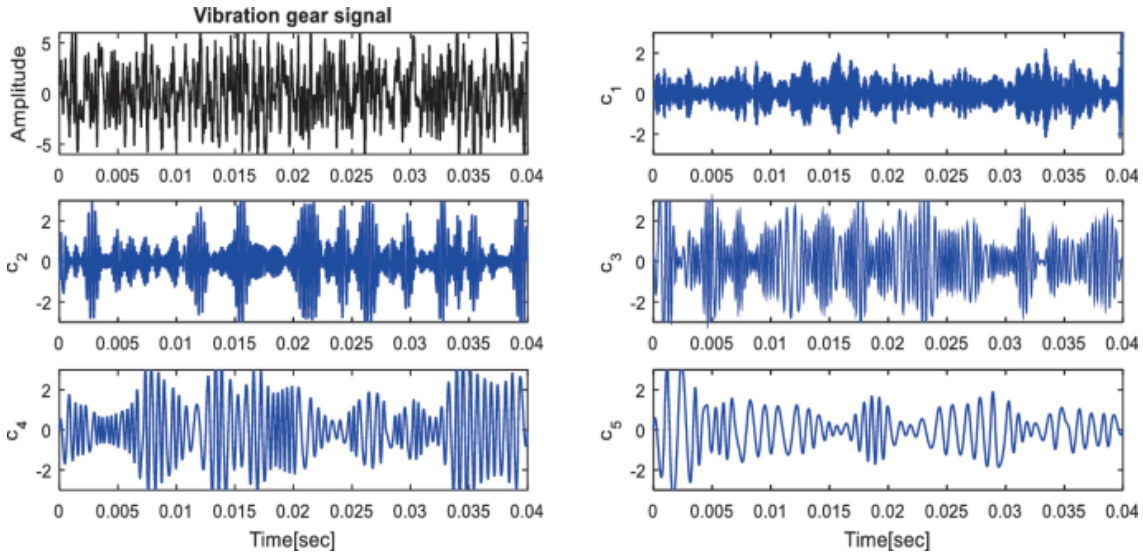
Vibration analysis on electric motors and gearboxes.

For electric motors and gearboxes this is relatively easy;

- Accelerometers constantly measure vibration
- Data is captured
- Algorithms look for changes in vibrations over time
- Operators are alerted when maintenance or replacement is automatically predicted.

In this case, steel is an isotropic material with predictable properties that are well understood and characterizable. Plenty of historic data to learn from…



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Time intervals - Constant monitoring vs Spot checks.

Monitoring a key property of a critical asset over time can predict failures before they happen.

The monitoring time interval effects how responsive and how effective predictions can be.

Monitoring interval	Analytic Comparison	Prediction Quality
Constant	Instant	Excellent
Regular	Incremental	Good
Ad-Hoc	No Analysis	No Prediction

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Health indicator – Data metric

To predict future asset condition, the key property measured and quality of the data needs to meet some criteria;

- Objective
- Indicative of asset condition – Health Index
- Comparable – measured in the same manner each time
- Recorded over time – more measurements the better
- Granular results – large buckets not useful
- Quick and easy to measure

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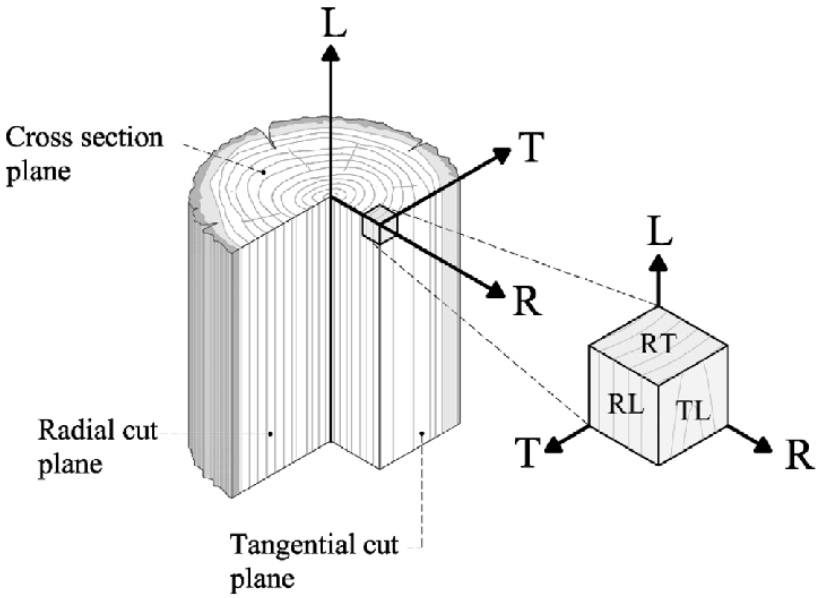
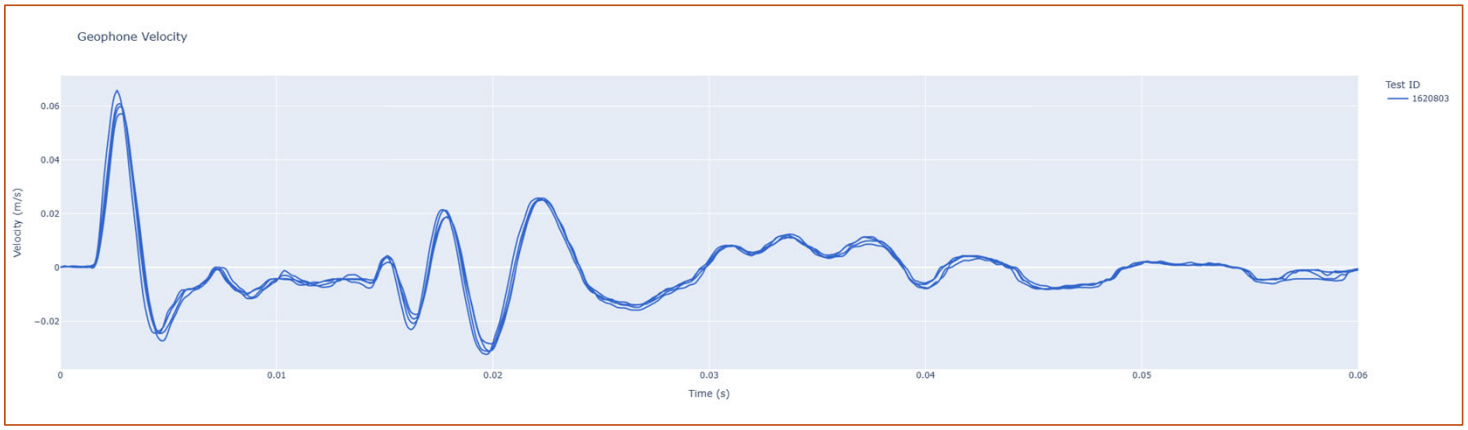
Limitations with Wood poles

For timber poles this is not quite as easy;

- Poles spread out
- Often in remote locations, no power or data
- Wood is an orthotropic material – different properties in different directions
- Wood can deteriorate on many and varied ways
- Wood initial strength can vary





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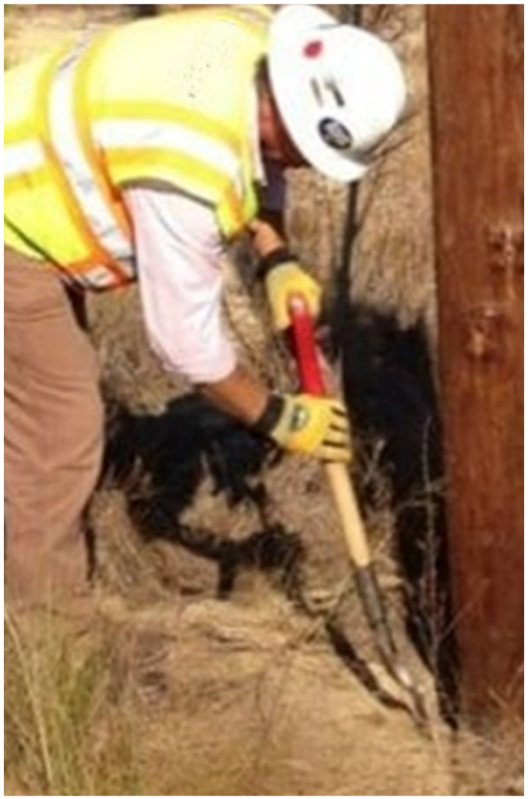
Limitations of traditional Pole inspection methods

Traditional methods of monitoring wood pole condition rely on subjectivity

- Sounding - using a hammer to listen for voids
- Probing - using a screwdriver to find soft pockets
- Drilling – measuring wall section assumes rot or decay is symmetrical each time
- Visual inspection…
- Digging
- Result scoring is coarse – lacks comparability and repeatability
- Time consuming
- Requires skilled inspectors for results to be reliable
- Manual recording of results



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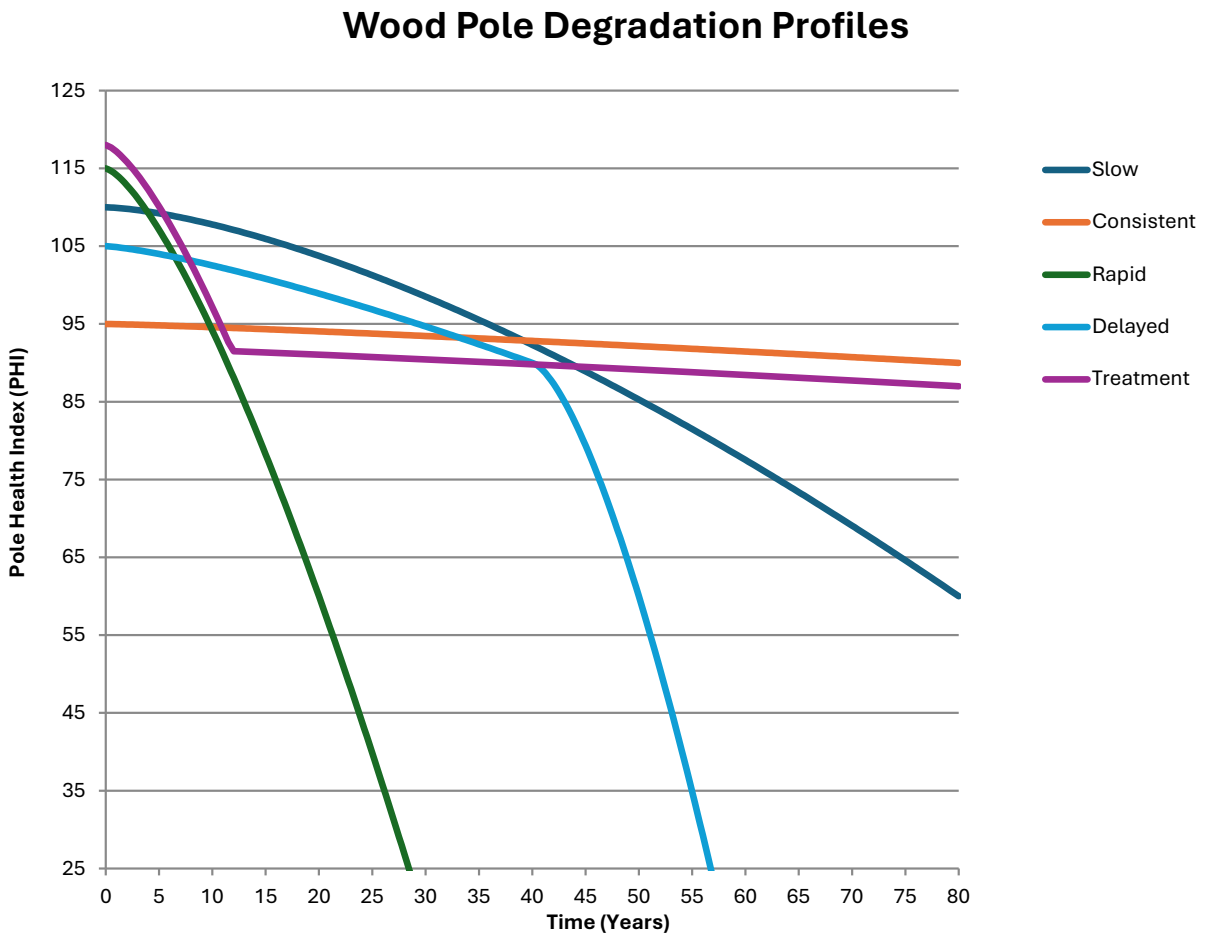
Predictive condition assessment

- Single inspections only give a snapshot in time
- Repeated inspections over time can reveal trends
- Unassisted pole failures are usually preceded by gradual degradation
- Natural material can degrade at different rates;
  - Some degrade slowly over decades
  - Some remain perfectly good for 80 years
  - Some can degrade rapidly in over 20 years
  - Some can be good for 20 years then degrade rapidly



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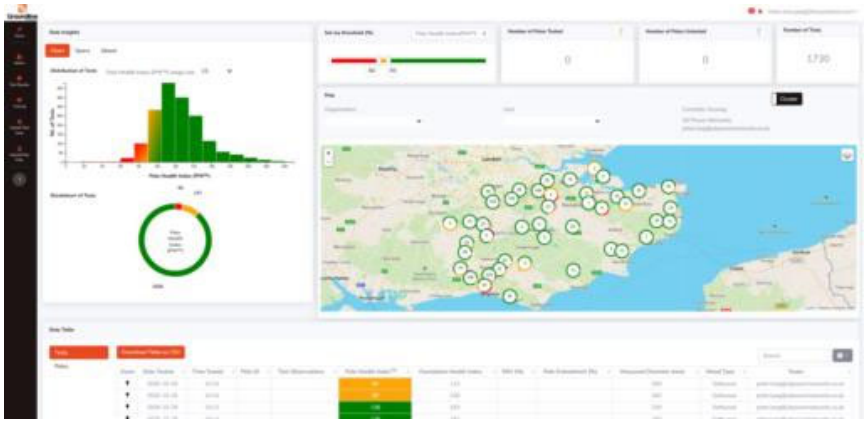
Opportunity - Use technology for pole inspections and test often...

Using technology to monitor a condition indicator of a wood pole regularly over time can predict failures before they happen.

The benefits include:

- Priorities replacements based on Risk - not age
- Defer replacement of stable assets
- Act early on fast degrading assets
- Plan maintenance / upgrades well ahead
- Plan budgets and staffing with accuracy supported with defensible data
- Audit trail for regulators and compliance requirements.



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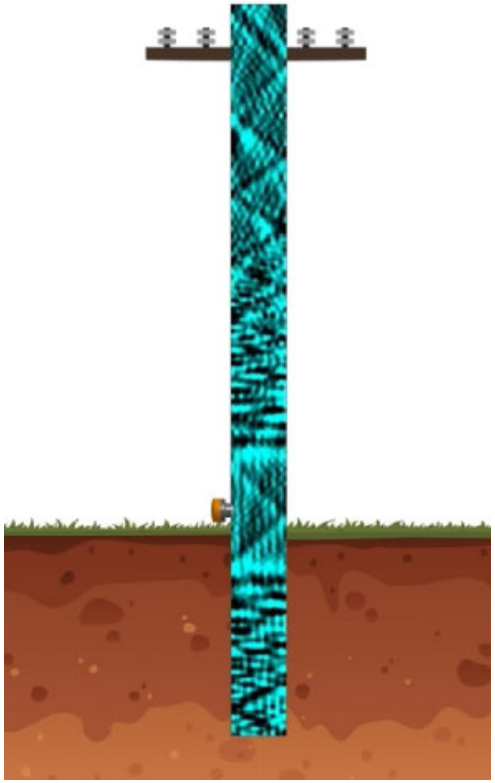
Stress Wave Mobility – POLE HEALTH INDEX (PHI)

Measuring a pole's stress wave mobility from a controlled impact at the base of the pole, allows for a health assessment of the entire pole.

Analyzing the stress Wave mobility over the length of the pole considers both fiber strength, as well as a cross-sectional area assessment.
This provides an estimate of a Pole's Bending Moment Capacity.

When this is compared to that of a nominal pole of same diameter and type with the mean fiber strength, you get the true index of Pole Health…

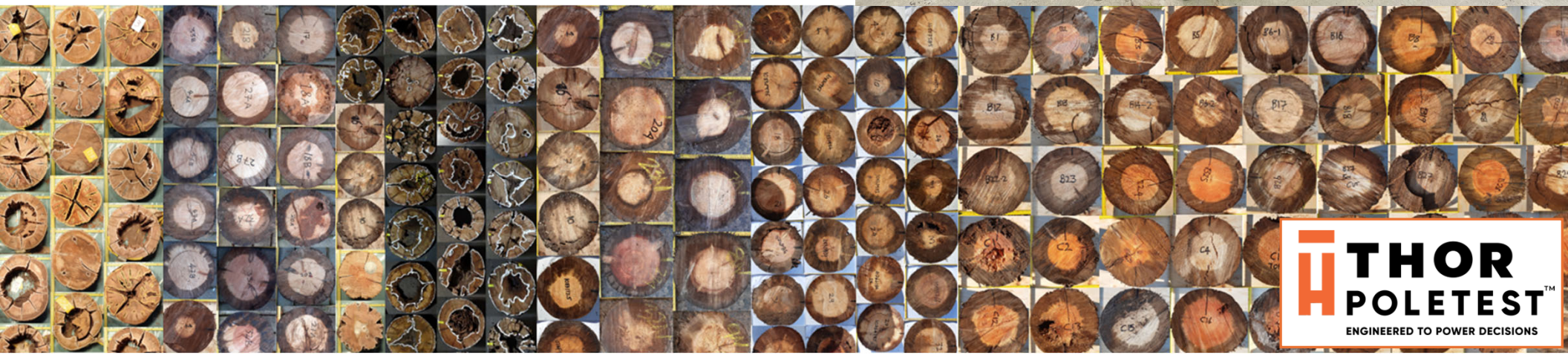


PHI™ Pole Health Index…

$$PHI = \frac{BMC(current)}{BMC(new)}$$

Historic data

THOR Poletest have been testing real poles for many years.
The Thor Poletest database includes poles from around the world. Capturing many different wood types and installation conditions. From sub-arctic to tropical jungles to arid deserts.
This has been performed over many years and given us a wealth of experience in understanding poles and how they behave over time.



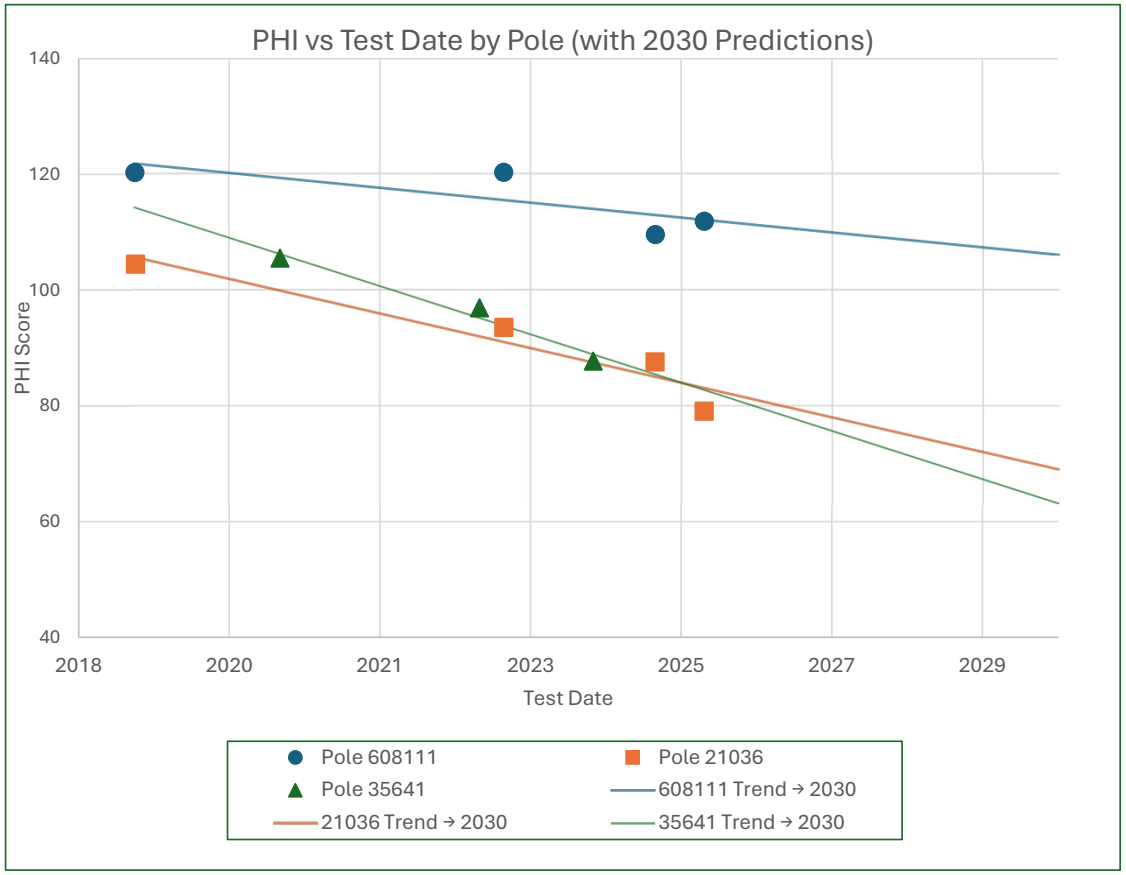
Predictive Analysis using THOR Poletest

Once a series of tests has been built up, trends can be seen.

Rates of decay becomes more important than a snapshot in time.

- Test new poles at time of installation for baseline condition
- Baseline entire network if possible
- Test regularly – every 2-5 years depending on condition and environment
- New pole install – test at install then after 5-10 years

Future use of AI to predict Network wide trends



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Summary

- Using large amounts of data recorded over time allows predictive condition assessment of critical infrastructure. This is already common in many industries.
- Time intervals and data quality need to be considered.
- Wooden poles are a unique challenge
- Some technologies already exist to enable pole condition assessment
- Utility companies should consider the benefits of predicting Pole condition
    - Identify weakness in network
    - Save on deferring replacement of good poles
    - Plan effectively

Interested in learning more about THOR Poletest?

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Questions?

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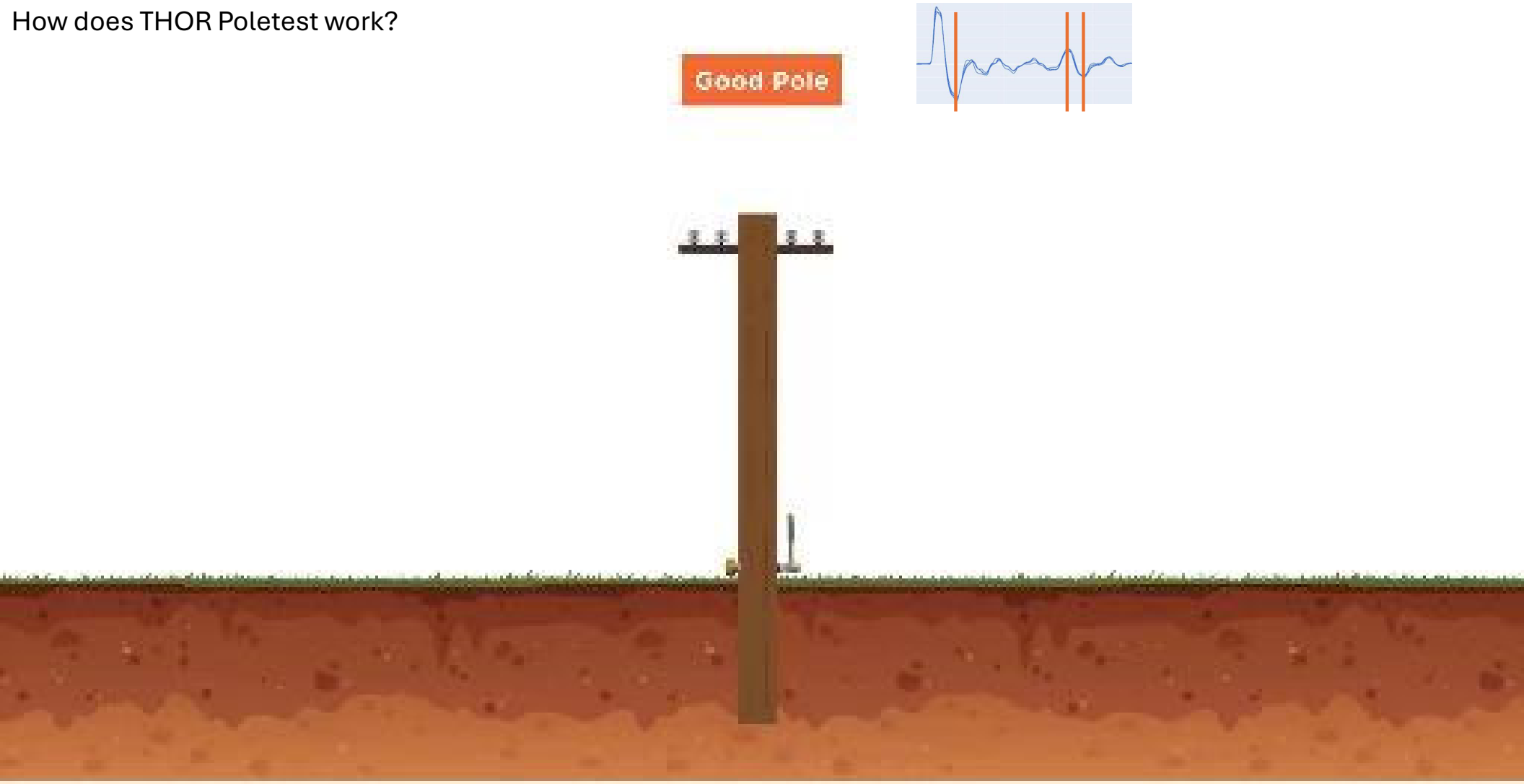
How does THOR Poletest work?



THOR Poletest – Asset Management:

The THOR Portal provides various tools for asset wide area management. Allows both fast overviews and in-depth pole by pole analysis

All THOR test data is automatically uploaded from the THOR Poletest App directly to our AWS cloud server. The Data is either Accessed through the THOR Portal or the THOR API to allow access directly into your own system.