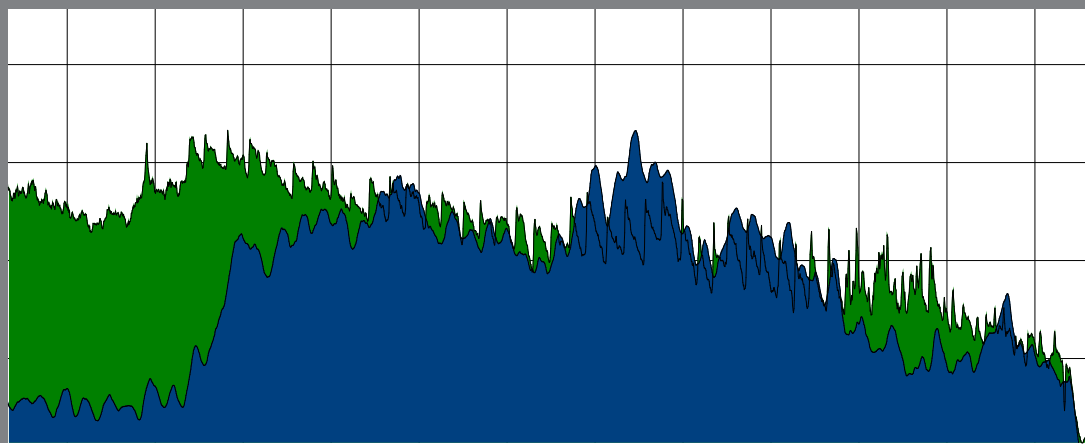
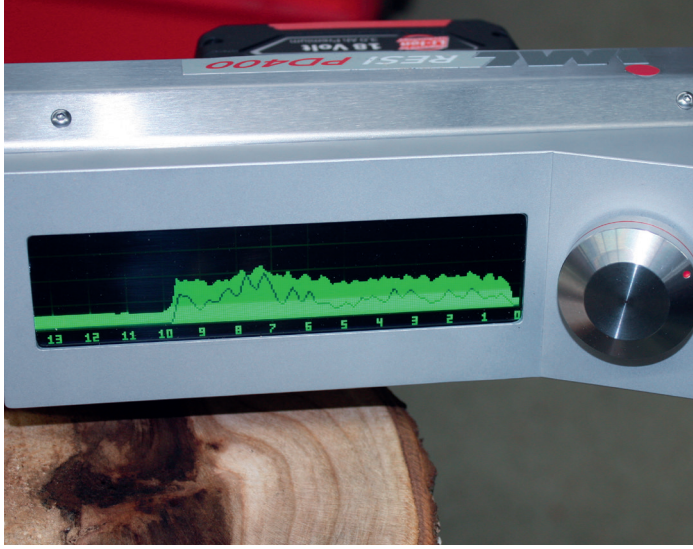


Measured Variables of the IML-RESI PowerDrill®

Drill Resistance and Feed Force Measurement



Measured Variables of the IML-RESI PowerDrill®

The great advantage of the IML-RESI PD-Series is not only the recording of the drill resistance but also the measurement of the feed force. Hence there are two measuring curves that are displayed in one graph. This enables the operator to have a much clearer picture and an easier identification of the various kinds and stages of wood decay.

Drill Resistance and Shaft Friction

While conducting a drill resistance measurement in wood, the drilling needle which is 3 mm wide at the tip and 1.5 mm at the shaft is clamped in the drilling channel by the wood shavings. The deeper the needle is drilled into the wood the more it is clamped. This creates more friction at the needle what we call ‚shaft-friction'. According to this the drill resistance is composed of the torsional force at the needle tip and the shaft-friction. Drilling hard wood (e.g. Oak, Beech, Robinia) affects the shaft-friction more distinctly than drilling soft wood (e.g. Cottonwood, Linden). A rising trend of the drill resistance curve with an increasing drilling depth is a proof for shaft-friction. When the needle exits the wood or hits a cavity the drill resistance graph does not drop to the amplitude level of the beginning of the measurement.

Measurement of the Feed Force

The IML-RESI PD-Series measures both the drill resistance and the feed force, which is the force that is needed to push the needle into the wood. Practical and scientific experiments have shown that the feed graph is only minimally affected by shaft-friction. This facilitates the identification of wood degradation, especially if it is toward an early state of wood degradation.

Specifications IML-RESI PD-Series

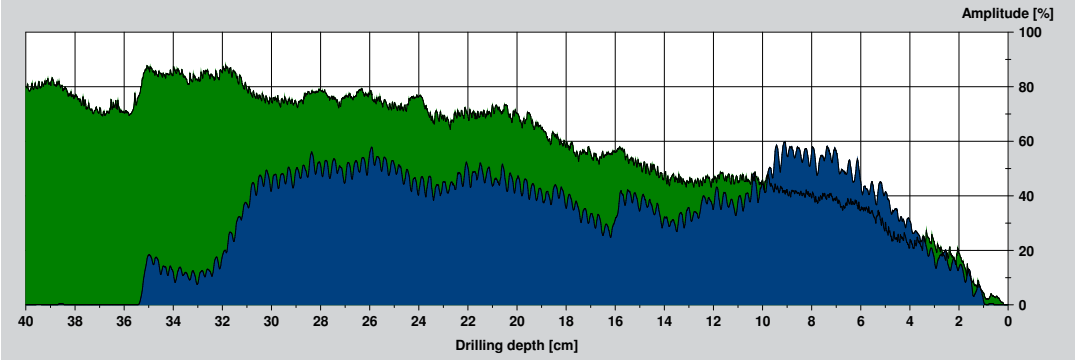
Drilling depths:	200 mm to 1000 mm
Energy source:	Lithium-Ion rechargeable battery
Results:	Electronic data storage, optional: Bluetooth printer
Resolution:	0,02 mm/300 mm
Feed stages:	5 feed stages, freely adjustable from 15 cm/min to 200 cm/min
Rotation speeds:	5 rotation speed levels, freely adjustable from a min. 1500 rpm to a max. 5000 rpm

Case Examples

The following case examples can help to clarify the eased identification of wood decay due to the synchronous recording of the drill resistance curve and the feed force curve in one graph.

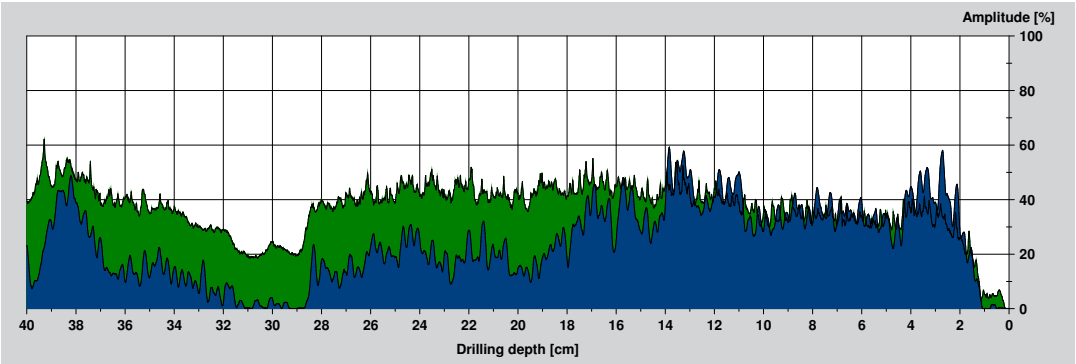
Example 1: Tropical Hardwood with Defect

The drill resistance curve (green) shows a steadily rising trend in amplitude with an increasing drill depth due to shaft-friction. At 35.5 cm drilling depth the drill resistance curve slightly decreases implying there is a wood defect. However, an interpretation is difficult based on the raised shaft-friction. The feed curve (blue) decreases already at 31 cm and does not show feed force after 35.5 cm anymore. This indicates by far a more advanced wood degradation. The drill resistance curve (green) remains on a higher amplitude (at approx. 80%) due to shaft-friction.



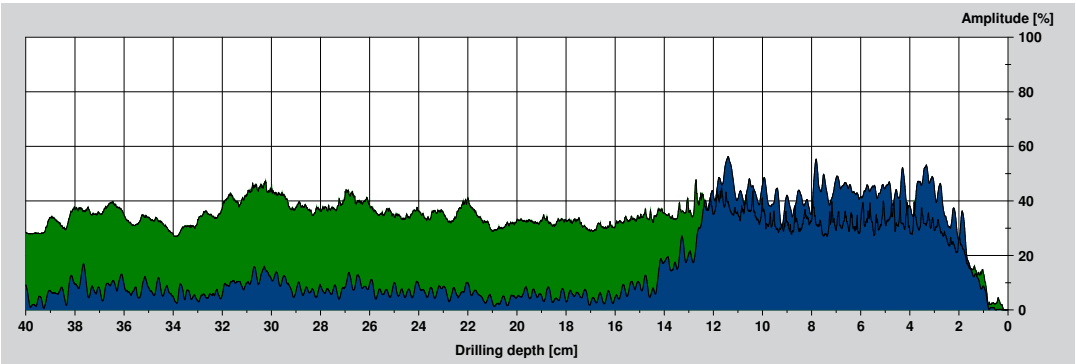
Example 2: Beech Tree with Brittle Cinder

The drill resistance curve (green) sinks not before 28.5 cm but shows a major defect after that drilling depth. However, the feed curve (blue) already drops down at 18 cm and indicates an early state of wood degradation till 28.5 cm. Then the wood decay increases significantly.



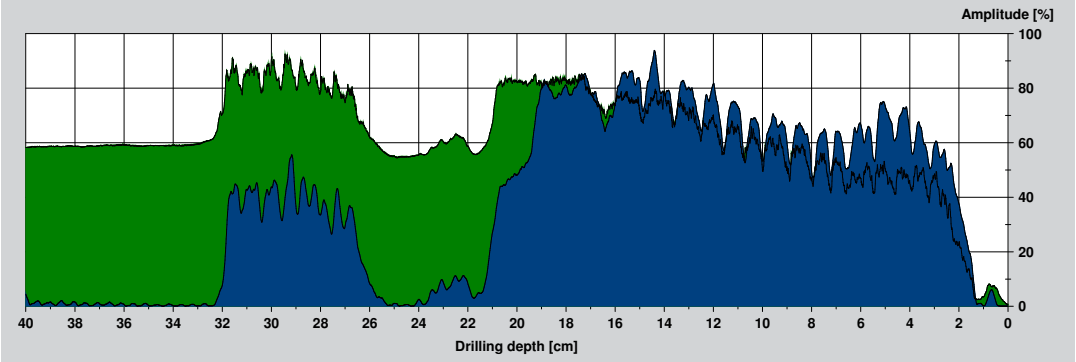
Example 3: Ash Tree with Brittle Cinder

The feed curve (blue) drops down considerably at 12.5 cm drilling depth, while the drill resistance curve (green) stays on almost the same level of amplitude. In addition the drill resistance amplitude does not show a further rising trend from 12 to 14 cm.



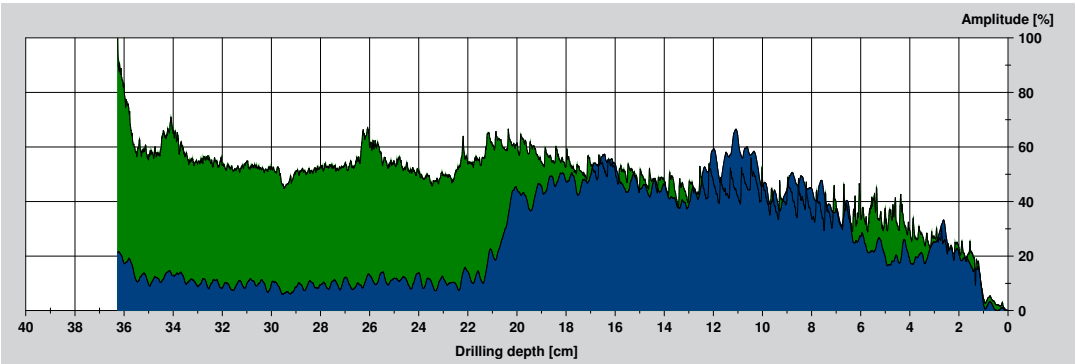
Example 4: Robinia with Significant Wood Defect

The feed curve (blue) decreases more clearly at 21.5 cm than the drill resistance curve (green). The drill resistance curve does not decrease below 60% amplitude. The areas that do not show any feed force (blue) imply a cavity or a very far advanced wood degradation in the trunk (e.g. brown rot). The difference between the amplitudes of the drill resistance curve (green) and the feed force curve (blue) results from the shaft-friction.



Example 5: Carob Tree (Alfarroba) with Wood Defect

The feed curve (blue) drops down significantly at 20.5 cm drilling depth while the drill resistance curve (green) only decreases slightly at 22 cm. The descent of the drill resistance curve is less distinct than of the feed curve due to shaft-friction. The feed curve indicates an advanced decay.



Conclusion

Practical and scientific experiments have shown that the feed force measurement is affected very little by shaft-friction. Measurements of hardwood with an early stage of decay prove the additional gain of information through the feed curve. Decreases of the feed curve are not overlain by the effects of shaft-friction, as it can be the case with the drill resistance curve. An interpretation of the drill resistance measurement result is significantly easier by the combination of the drill resistance and the the feed curve in one graph.

IML – Instrumenta Mechanik Labor System GmbH
Parkstraße 33
69168 Wiesloch
Germany

Phone: +49 6222 6797-0
Fax: +49 6222 6797-10
E-Mail: info@iml.de
Web: www.iml.de