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A PRACTICAL APPROACH TO THE TRACEABILITY OF MOISTURE CONTENT IN WOOD

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The measurement of the moisture content in wood has important industrial issues related to the assessment of the quality of raw and processed materials. Wood exchanges moisture with air, where the amount and direction of the exchange depend on the relative humidity and temperature of the air and the current amount of water in the wood. This relationship has an important influence on wood performance, on its physical and mechanical properties (density, thermal expansion, tensile strength, etc.) and on its evaluation for engineering applications and trading purposes.

A widely used electrical wood moisture content (MC) measurement technique is the DC resistance/conductance method. An electrical conductivity moisture meters is essentially a MΩ-meters whose pin electrodes are driven into the specimen at given depths. The method is invasive because of the electrode design. The meter is generally supplied with an empirical calibration chart by the manufacturer to allow for the conversion from the primary measured quantity (conductance) to the moisture content for different wood species. Of course, traceability exists for the primary quantity, but the lack of a reliable traceability chain for MC can be a significant source of uncertainty in the measurement of wood properties.

At INRIM, a practical approach has been developed within an industrial collaborative project to cope with the above traceability issues. The method is based on the measurement of the sorption isotherms at ambient temperature (23 °C) of several wood specimens. The sorption isotherm function characterizes the storage of moisture within a material.

Wood specimens were placed in small ventilated chambers - whose relative humidity (RH) was controlled by means of saturated salt solutions - until equilibrium with ambient RH was established. The equilibrium relative humidity (ERH) in the chambers was measured by means of a calibrated RH probe traceable to INRIM humidity standards. The equilibrium moisture content (EMC) of small wood samples cut from each specimen was determined by thermo gravimetric analysis. The EMC was then correlated with the equilibrium relative humidity (ERH) for each specimen to get the sorption isotherm.

The paper discusses such investigations and gives examples of conductivity-based moisture meters calibration. A comparison of the results with the manufacturer calibration charts is also made and a suitable calibration procedure developed.