

TDRI is a moisture profile meter developed by LVL and based on a new technique for quantitative, non-invasive and non-destructive imaging of the near-surface moisture content profile of composite materials. The technique was developed through FRST funding, with the research programme being prompted by a need expressed by the NZ timber industry and LVL's knowledge of soil moisture measurement needs identified through its extensive involvement in the global irrigation industry.

The TDRI concept relies on the alteration by a nearby composite material, of the propagation velocity of an electromagnetic pulse along a parallel transmission line, through distortion of the evanescent field. A set of measurements taken at different relative positions of the transmission line and composite material is, in conjunction with a forward model describing propagation velocity, inverted to provide the moisture content profile. The meter consists of three main components:

1. A transmission line, fast pulse generator and sampler to obtain a set of propagation times;
2. Software to translate the propagation times to a moisture profile
3. An output device to communicate the results to the operator

Critical to the meter's operation is a set of measurements of propagation velocity that provide pico-second propagation time accuracy, and are sufficiently linearly independent to enable discrimination of the permittivity of each layer of the composite material – typically, the moisture content of four layers within the material may be measured, with layers ranging from 5 to 50 mm depth, depending on the geometry of the transmission line assembly.

One possible embodiment of TDRI is shown in Fig 1.

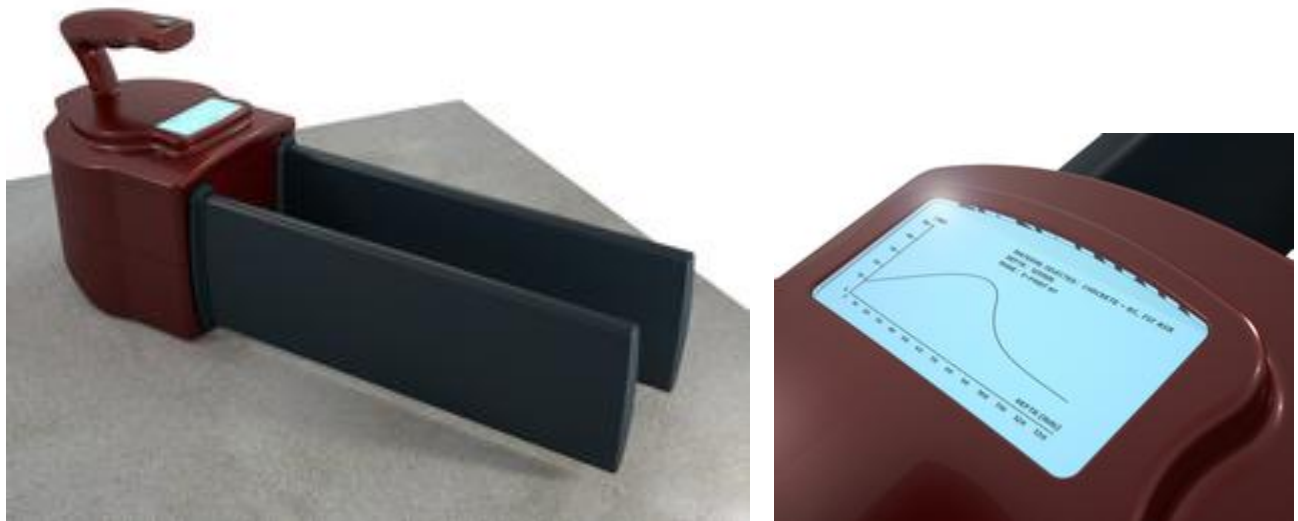


Figure 1: An artist's impression of a possible embodiment of the TDRI moisture profile meter with integral transmission line assembly, and a possible data display.