

CAPACITANCE

How does capacitance work?^{1,2}

Frequency Domain Reflectometry (capacitance) measures the dielectric constant of the soil. That is, the soil's capacity to transmit electromagnetic waves or pulses. The dielectric increases with higher water content of the soil.

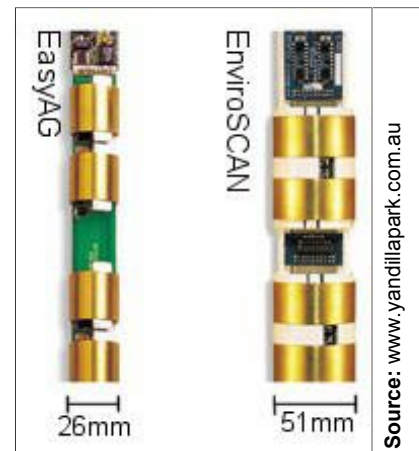
In effect the soil is placed between two electrical plates and when voltage is applied to these plates a frequency is measured. This is then converted using a calibration equation into mm of soil moisture per meter.

Permanent systems

The distinguishing feature of these systems, compared to portable systems, is that they are able continuously log readings at close time intervals. Examples of these systems include EnviroSCANTM and C-ProbeTM, which are well-suited to permanent plantings such as tree crops and vines and the EasyAG[®], designed for fast growing, shallow root-zone crops.

The readings can either be downloaded via telemetry, by phone, or by visiting each site to download them manually. The EnviroSCANTM system has specialised software for Windows (which the portable Diviner 2000TM probe also uses) enabling the user to view the readings on the computer.

Different systems support a different number of sites and depth intervals, so it is best to check with the distributor as to the features and specifications of a certain system, to ensure that it will meet your requirements.



Advantages:²

- Components are modulated enabling a custom designed system
- Minimal soil disturbance during installation
- Multiple and customised sensor depths (0.5 – 5.0m)
- Software available
- No labour input for readings
- Minimal maintenance required
- Remote telemetry available
- Integration with other products

Disadvantages:²

- More expensive than many other systems
- Small sphere of influence of around 10cm radius¹
- Installation in rocky/sandy/shallow soil can be difficult
- Access tubes need to be installed by qualified technicians

The products and companies mentioned on this fact sheet are examples only and are not endorsed in any way. Other tools with similar functions may also be available. Irrigators are advised to speak to an Irrigation consultant or the companies who sell the equipment, for more information on the best system to suit their requirements.

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Portable systems³

Portable capacitance probes (e.g. Diviner 2000™, Gopher™) measure soil in much the same way as previously described. The main difference between this and a permanent system is that readings must be taken manually, using the probe which has just one sensor on the end.

The probe is swiped down the profile (via an access tube) and takes readings at 10 cm intervals. The information collected can be displayed as chart giving a graphic display of the soil moisture content at different depths down the profile.

Depending on the system you choose, the data can either be viewed in the field on the display unit or downloaded to a computer.



Source: www.yandillapark.com.au

Advantages:²

- Minimal soil disturbance during installation
- Software available
- Minimal maintenance required
- Can service a large number of sites
- Readings taken quickly with one 'swipe'

Disadvantages:²

- Requires frequent labour for readings
- Manual downloading of readings is required
- Small sphere of influence of around 10cm radius¹
- Installation into rocky/sandy/shallow soil can be difficult
- Access tubes need to be installed by qualified technicians

Further information

AgriExchange (formerly Yandilla Park Pty Ltd)
http://www.yandillapark.com.au/Growers/enviroscan_main.htm

Soil Water Content Sensors and Measurement (Sowacs)
<http://www.sowacs.com/sensors/capacitance.html>

C-Probe
<http://www.aquaspy.com/default.cfm?id=175>
<http://www.sowacs.com/feature/adcon/index.html>

References:

1. **Charlesworth P** (2000) *Irrigation Insights - Soil Water Monitoring*, National Program for Irrigation Research and Development
2. **Improving Irrigation Efficiency Project** Irrigation Management Course, Irrigation Scheduling Equipment workshop presentation
3. Irrigation Scheduling with Capacitance Probes Course Manual; [http://www.dpiw.tas.gov.au/inter.nsf/Attachments/JCOK-63Q4QQ/\\$FILE/6a_irrigation_scheduling_capprobes.pdf](http://www.dpiw.tas.gov.au/inter.nsf/Attachments/JCOK-63Q4QQ/$FILE/6a_irrigation_scheduling_capprobes.pdf)