

Nothing else

measures up

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The Importance of Moisture Measurement for the Coffee Market

SCAE Gothenburg June 2015

Jason Webb

About us

- ▶ Sinar Technology is a UK based manufacturer of moisture measurement devices
- ▶ Established for over 35 years
- ▶ High quality, high performance instruments

About me

- ▶ Jason Webb BSc (Hons)
- ▶ Founding Director of Sinar Technology
- ▶ Studied and developed moisture measurement techniques for more than 20 years
- ▶ Passionate about moisture

Why Measure Coffee Bean Moisture?

- ▶ Water cheaper than coffee

Caveat emptor

- ▶ To ensure safe transport and storage
- ▶ Coffee that is too high or too low in moisture will not maintain its quality
- ▶ To ensure consistent roasting protocols

Measuring Bean Moisture Content

- ▶ Oven testing, International Standard
 - ▶ Loss On Drying
- ▶ Karl-Fischer Titration
- ▶ Electronic Meters
- ▶ Water Activity measurement

Oven Test – ISO6673

- ▶ 16 Hours drying at 105°C

$$\frac{\text{Wet mass} - \text{dry mass}}{\text{Wet mass}} \times 100\%$$

- ▶ Oven Specification

- ▶ Controllable to 1°C
- ▶ Electrically heated
- ▶ Forced ventilation

- ▶ Analytical balance and lab desiccator

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Loss On Drying



LOD pros & cons

- ▶ Takes time to set up properly
- ▶ Sample preparation
- ▶ Different settings for green, roast etc
- ▶ 20mins per reading

- ▶ Mirrors the oven
- ▶ Once set up good precision

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Karl Fischer Titration



Difficulties with KF

▶ Pros

- ▶ Accurate & precise
- ▶ Measurement to ppm

▶ Cons

- ▶ Wet chemistry technique
- ▶ Sample preparation
- ▶ Laboratory training required

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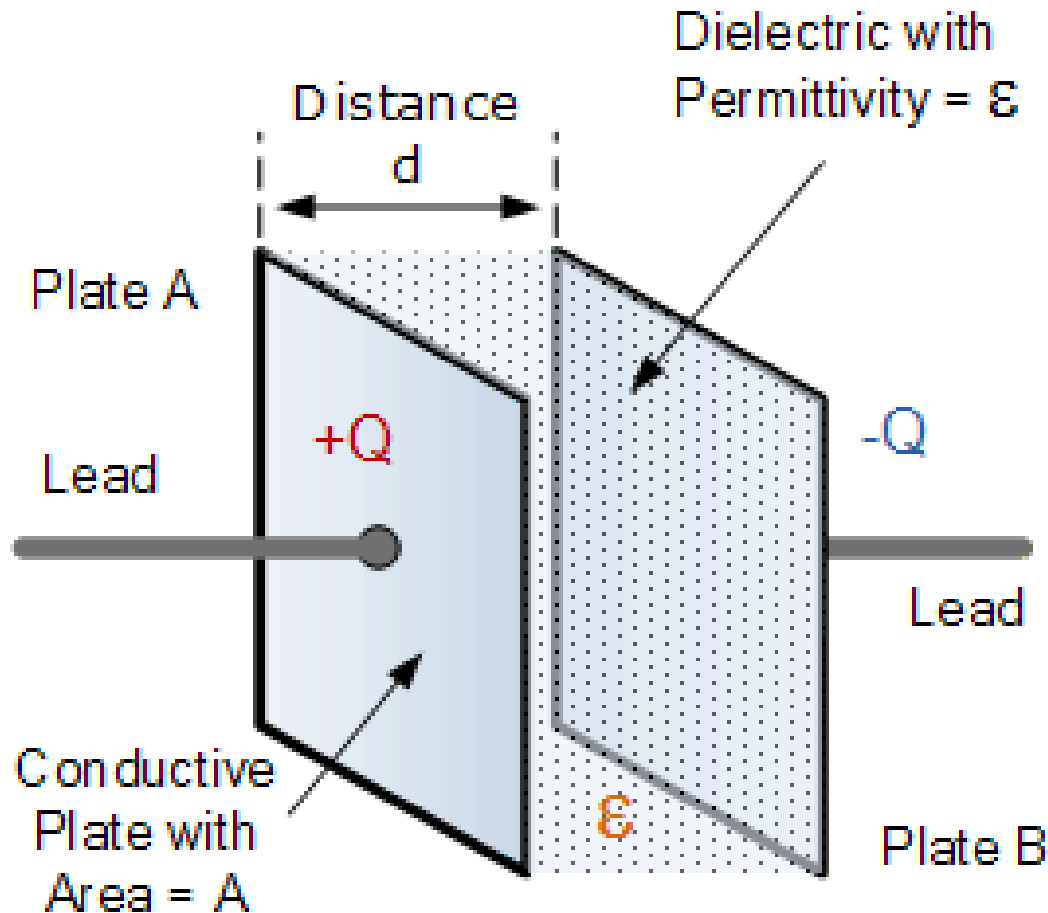
Electronic Meters



Two Main Principles

- ▶ Resistance
 - ▶ Cheap to manufacture
 - ▶ Requires careful sample preparation
 - ▶ Limited moisture range
- ▶ Capacitance (Sinar BeanPro)
 - ▶ Whole bean analysis
 - ▶ Quick, accurate measurement
 - ▶ Can measure Green, Parchment & Roast

Capacitance explained



Increasing Capacitance Accuracy

- ▶ Temperature measurement
 - ▶ Capacitance is temperature dependant
- ▶ Bulk Density measurement of sample between plates
 - ▶ Amount of stored energy is dependant on sample packing

Calibrating a Moisture Meter

- ▶ Lots of samples from across the moisture range to be measured
- ▶ Lots of reference measurements – oven tests
- ▶ The more results the better
- ▶ Keep adding more results as available often over many seasons

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BeanPro

- ▶ Measurement of moisture, density and temperature
- ▶ Good accuracy
- ▶ Extremely easy to use
- ▶ Can be easily checked and recalibrated as necessary



➤ Next

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AgriPro

- ▶ Portable instrument for fast testing in the field
- ▶ Very Robust
- ▶ Easy to use



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Water Activity, a_w



What is water activity?

- the measure of the energy status of the water in a system

$$\text{ERH} = a_w \times 100\%$$

ERH = Equilibrium Relative Humidity

Uses of a_w

- ▶ Distilled water has $a_w = 1.00$
- ▶ Water migrates from areas of high a_w to areas of low a_w
- ▶ Higher a_w substances tend to support more microorganisms
 - ▶ Bacteria typically need 0.91
 - ▶ Fungi at least 0.70

Difficulties with a_w

- ▶ Temperature specific
- ▶ Time, vapour/liquid equilibrium required
- ▶ Relatively expensive

Summing up

- ▶ 11% moisture in coffee is ideal
 - ▶ Coffee moisture above 12.5% impacts on cost of goods – paying more for less coffee by % mass
 - ▶ 8% moisture and below can lead to rapid roast completion - more difficult to manage
- ▶ Over drying can cause loss of aroma, acidity and freshness

Accurate measurement is therefore critical

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Thank you for your interest in
moisture in Gothenburg!



jasonw@sinar.co.uk