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Measuring Dry Film Thickness (DFT) on Concrete Substrates

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DFT on Concrete Substrates

- Traditional measurement techniques
- Advances in NDT measurement technology
- Use of the Elcometer 500 Coatings on Concrete Gauge
- Things to look out for when measuring the coating thickness on concrete substrates
- How to more effectively manage the results

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Traditional Measurement Techniques

- Mechanical device – PIG Gauge
  - Destructive
  - Difficult to interpret results – scale range in the microscope

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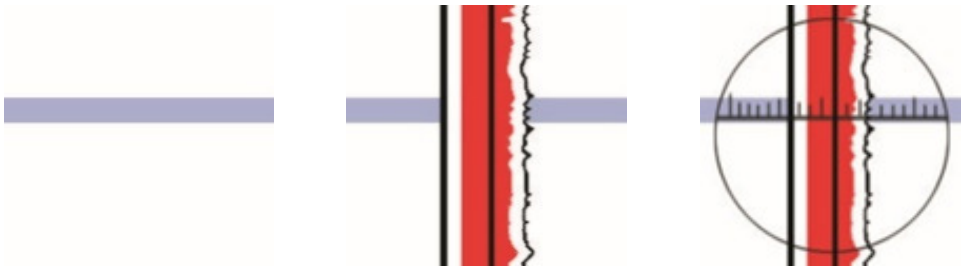
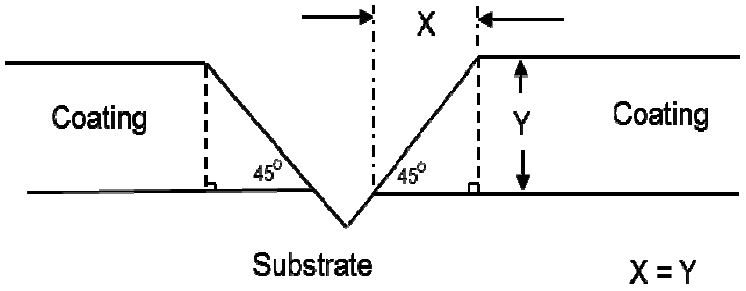
Paint Inspection Gauge (P.I.G.)





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Current Measurement Techniques

- Ultrasonic devices – Non Destructive

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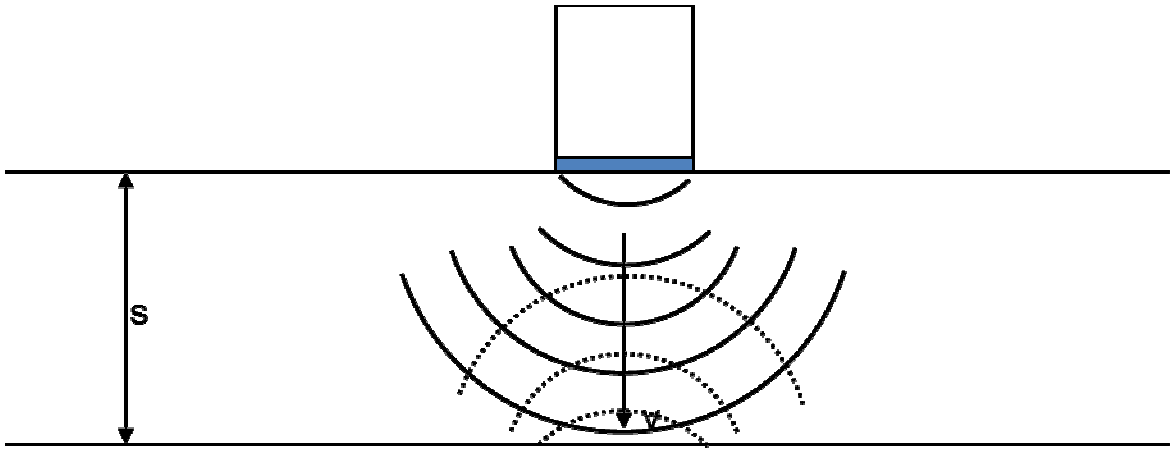
Ultrasonic Measurement



$$S = v \times \frac{t}{2}$$

Where s = substrate thickness
v = the velocity of sound in the substrate material
t = the measured round trip time (pulse to echo)

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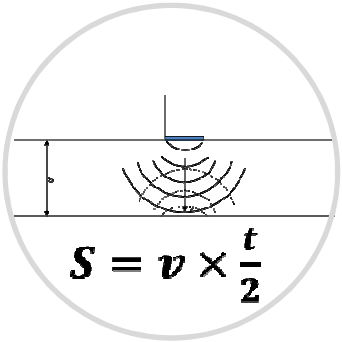
Ultrasonic Measurement



t is measured by the gauge

S is the calculated thickness

v (the velocity of the coating) is 'inputted' by the user

- so if you set up the gauge with the wrong speed of sound, the thickness will be wrong

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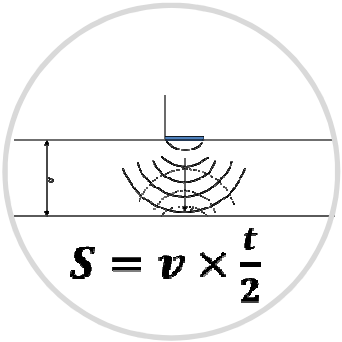
Ultrasonic Measurement



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- Different coatings (Epoxy, Acrylic, PVC, rubber, etc) each have a different speed of sound, so for an accurate reading, you cannot simply have a single speed of sound for all coatings

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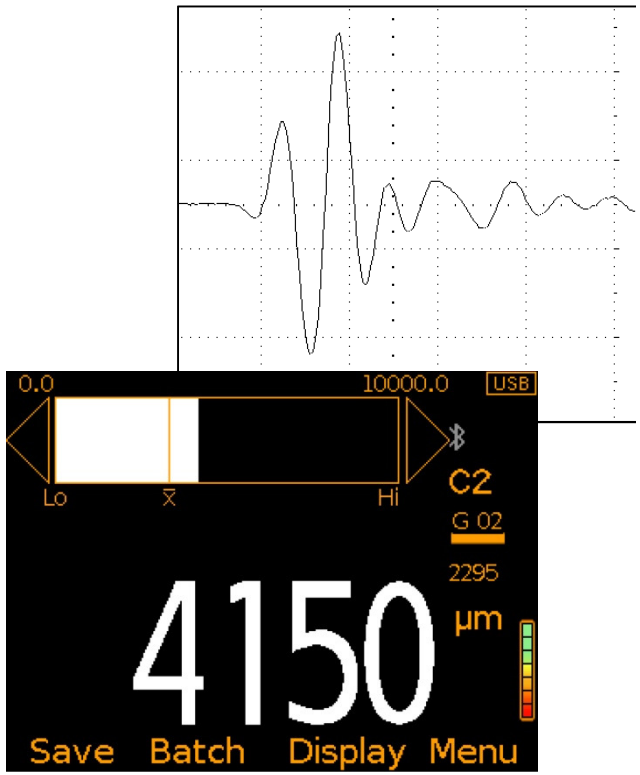
Ultrasonic Measurement

- Metal Substrate DFT measurement isn't daunting, so why should ultrasonic DFT be any different?

- It doesn't need to be. You shouldn't have to set up gates or thresholds, or worry about what gain or what sort of A-Scan graph you have, the gauge should do this for you automatically

- Calibrated correctly, the gauge should only give you the correct answer



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Ultrasonic Gauge Calibration

- There are 4 options for calibrating an ultrasonic gauge
  1. Use a generic value for all coatings (not recommended)
  2. Select the appropriate coating from a pre-defined material selection (generic speed from pick list)
  3. Input the known speed of sound of the coating
  4. Measure a sample of known thickness

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Ultrasonic Gauge Calibration

- But how do you know what the speed of sound is for the coating?
- Where do you get a sample of known thickness from?
- A Coating Calibration Mould answers both of these questions. The CCM is a metal mould allowing for the creation of a known thickness of coating

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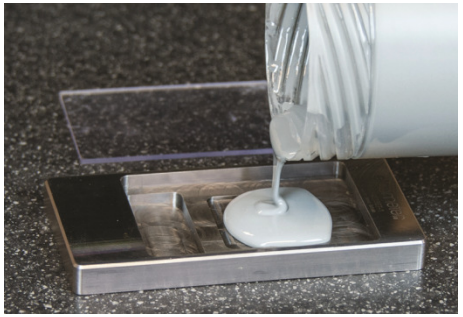
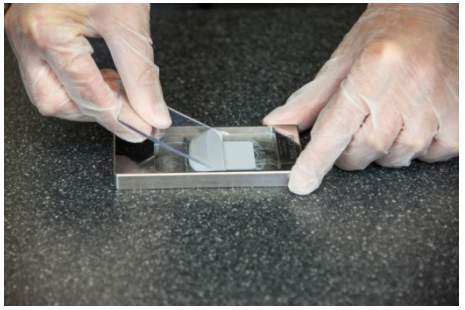
Ultrasonic Gauge Calibration

- The CCM mould is filled with the coating under test



- A scraper is used to level a predetermined wet film thickness of coating



- Once fully cured a DFT gauge is used to accurately measure the coating thickness and …

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Ultrasonic Gauge Calibration

- The ultrasonic gauge can now be calibrated accurately on a sample of known thickness

- And used to determine the coating's speed of sound, which can be stored in the gauge for later use, or used to calibrate other gauges

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Elcometer 500 Gauge Usage

- Calibrate by setting the material speed of sound
- Select the correct probe type (C1 or C2)
- Take and store readings recognising that
  - The gauge signal strength needs to be ‘in the green’
  - If no reading occurs then carefully move the probe over the substrate until a reading is obtained
  - Store the reading in the gauge memory
  - Download the data to ElcoMaster

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Elcometer 500 Gauge Advantages

- Fast
- Rugged, Reliable and Ergonomic gauge design
- Intelligent
  - New probe tip is field replaceable
- Ease of Use
  - Simple Menu and On Screen Instructions
- Powerful
  - Connects to ElcoMaster reporting software

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Result Reporting

- Ultrasonic measurement of coating thickness is covered by ASTM D6132-13 and SSPC-PA 9

- These standards define the method, the procedure and the reporting requirements

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Result reporting to SSPC-PA 9

- SSPC-PA 9 is a recommended procedure for measuring DFT using Ultrasonic Gauges

  - a minimum of three (3) gage readings shall be made for each spot measurement of the coating.
  - an area measurement is obtained by taking five (5) separate spot measurements each $10m^2$ up to $100m^2$
  - For areas between 30 and $100m^2$ select 3 random $10m^2$ areas
  - For areas greater than $100m^2$ measure as above for the first $100m^2$ and one $10m^2$ area per $100m^2$ thereafter

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Result reporting to ASTM D6132-13

- ASTM requires the following to be reported
  - Type of coating and substrate
  - Instrument used
    - manufacturer, model number, serial number and calibration date
  - Type of coating thickness or reference standard
    - Together with method of accuracy verification
  - Mean and standard deviation of readings
  - Operator I.D. and inspection date

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Result Reporting

- Modern digital inspection gauges enable the operator to
  - Save the readings in the gauge
  - Transfer the readings from the gauge to the PC/Phone
  - Analyse the data carrying out any calculations or statistical analysis required by the Standard
  - Produce and email a report instantly

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Result Reporting

- All the data required by the customer can be automatically transferred by the gauge to the software and directly onto your report… all at the click of a button

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Conclusion

- You don’t need to panic at the mention of Ultrasonic DFT gauges as they don’t have to be complicated!
- Measuring coatings on concrete has been made significantly easier, faster and more accurate with the introduction of new ultrasonic gauges and through the use of coating calibration moulds
- Ultrasonic DFT results on concrete no longer need to be viewed with scepticism

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Now for a short demonstration…..