What’s Behind Your Test Kit Results?

Adolfo Wurts
About Us – Our Background

• Developing field instrumentation for over 21 years
  • 20+ patents
  • 100+ products introduced for field technicians
  • Marines, Airforce, Navy, Army, NASA, Boeing, Dollywood and Cross Connection Control testers around the world.
About Us – And the Field Technician

• Labor shortage in trades
  • Increase the numbers of testers
    • Recruiting and formal training
  • Increased productivity of testers
    • Improving education and training
    • Better tools and equipment
What We’ll Cover

• Measurement and Cross Connection Control
• A Look Inside Your Test Kit
• Types of Error and How to Avoiding Them
Measurement and Cross Connection Control
How Does Measurement Apply to CCC?

• Why do you test? –
  • Protects the water supply, Its my Job, To pay the bills. ...
  • Check our Expectations against our Test Results

• How do you test? –
  • Following a test procedure, with a test kit ...
  • Combine Training, Experience, Problem solving skills, Test and Measurement Equipment
Importance of Measurements

• If you don’t measure, you don’t know.
• Worse than No information is Incorrect information
• Good Measurements allow you to learn and build up knowledge
A Few Good Measurements

• We want the truth!
• How do we get there?
  • Maintaining Traceability
  • Avoid Error
What Makes a Good Measurement?

• Accuracy & Precision
  • Accuracy = centered around real quantity
  • Precision = more repeatable

• Good measurements must be both accurate and precise!
Keeping your Kit in Compliance

• Certification
  • Meets applicable standard
    • 3rd party standard (UL, FCC, etc.)
      • USC FCCCHR Manual 10
        • Manufacturer’s standard

• Calibration
  • A comparison between a device under test and an established standard.

• Adjustment
  • Changing a device under test to meet calibration
Traceability

- Your Test Kit
- Field Calibration Labs
- Accredited Calibration Labs
- National and International Standards Labs (NIST)
A Look Inside Your Test Kit
Your Test Kit – A General Measurement System

Sensor Stage

Signal Conditioning Stage(s)

Readout Stage
Sensor Stage

- Senses Desired Input
  - In contact with what’s being measured
  - Excludes other inputs
  - Temperature compensation example
Signal Conditioning Stage in Your Test Kit

• Modifies sensor signal into form usable for readout stage
  • Analog test kit – From elastic element (bellow or diaphragm) displacement to dial
  • Digital test kit – Analog electrical signal to a digital display
Readout Stage

- Readout
  - Dial on a gauge
  - Digital readout of value
  - Rate of change graph
Recording Stage

- Recording
  - Follower needle
  - Chart recorder
  - Notepad
  - Capture button
  - Output via Bluetooth for report creation
Types of Error and How to Avoiding Them
Types of Errors Outside Test Kit pt. 1

• Testing error
  • Incorrect/ incomplete test method used
    • Test method or fault of tester
    • Example, not raising test kit to proper elevation or orientation of test kit
  • Improper testing conditions for the method
    • NYC example
Types Errors Outside Test Kit pt. 2

- **Perception error**
  - Incorrectly reading display (eyesight, darkness, etc.)
- **Parallax**
  - Position of needle in analog kits; mirrors
- **Transcription error**
  - Incorrect initial recoding
  - Incorrect data entry
Types of Errors Inside Test Kit in CCC

• **Drift**
  • Deviation from expected calibration over time due to temp, vibration etc
    • USC checks accuracy after other tests
    • Gets worse with test kit age

• **Mechanical friction** - Corrosion and foreign object build up

• **Loading error**
  • Measuring device influences measurement
How You Can Reduce Error in Your Testing pt. 1

• Send in your test kit to a qualified lab for calibration, certification and adjustment for that kit
  • Ask them for their current certificate for their standard
  • At least 4x as accurate
  • Make sure they’re on the manufacturer’s current list or website
How You Can Reduce Error in Your Testing pt. 2

• Protect your test equipment
  • Drain it from water and keep it out of freezing environments
    • Undrained water is a water column which acts on the sensor(s)
  • Clean and replace filters to keep foreign objects out
  • Connect the hoses in the same orientation every time
  • Extreme temperatures tend to cause faster drift
    • Off the dash of vehicle in heat
    • Inside the house at night
How You Can Reduce Error in Your Testing pt. 3

- Protect your test equipment continued
  - Vibration and impact protection (particularly for analog test kits)
  - Open valves slowly
- Follow current and approved test procedures
  - Learn about the “why” behind the test procedures
  - If you’re thinking about a variation from procedure, ask the makers of the test procedures
How You Can Reduce Error in Your Testing pt. 4

• Use the best measurement equipment for the job
  • Is it designed for the application?
  • Is it accurate, precise, rugged enough?
  • Is the performance verified by a 3rd party?

• Keep improving your judgement
  • More experience testing
  • Continue education
  • Ask and share, we all drink the same water
Thank You For Your Time

• Have any questions about the content of this presentation e-mail: support@arbiterbackflow.com

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