2017 ASIC NATIONAL CONFERENCE

Motif Hotel
Seattle, Washington
Ewan Parker
Root Zone Visualization via Multi Sensor Soil Moisture Probes

OUR STAMP ON THE FUTURE
Through Technology, Best Practices and Awareness

Ewan Parker, Director of Business Development, Tucor Inc
Root Zone Visualization via Multi Sensor Soil Moisture Probes

Imagine an X-Ray for Your Soil Profile
Identify and Manage Your Root Zone
Add a Whole Other Dimension to Your Irrigation Management

See the Unseen via multi sensor soil moisture probes
Relative Soil Moisture Data

Relative Soil Moisture Data allows you to see root zone activity via Day/Night Stepping.

Day/Night Stepping is demonstrated by a decline in volumetric soil moisture via the active removal of moisture by the plant material for use in photosynthesis during the day light hours.

At night soil moisture removal stops due to no photosynthesis and the graphing levels off.

Day/Night stepping identifies active root zone extents and allows us to irrigate to them.
• Optimized Soil Moisture

• Blue Zone = Small steps with minimal extraction due to poor moisture/air mix

• Green Zone = Larger steps with optimal extraction due to good air/water mix

• Red Zone = Return to small steps due to reduced water availability
• Equipment

• Multi Sensor Soil Moisture Probes
  
  • Multi sensor probes with capacitance sensors every 8’s that measure and collect volumetric soil moisture data
  • Most accurate soil moisture sensors available second only to Neutron Probe
  • Probe collects volumetric soil moisture data points every 15mins vs snapshot of data every 30 days with Neutron Probe
  • Multi Sensor probes come in 8”, 12”, 20”, 40” and 60” lengths with sensors every 8”s.
• Installation

• Data quality is directly related to installation technique

• Less disruptive install = More representative data

• More representative data = Better results
**Installation Technique and Mechanics**

- The Probe has a diameter of 1.25” Installation Auger has diameter of 1.27”
- Installed with auger that’s only 2 mm wider than the probe itself
- Sensors scan 2”s from probe wall through the auger cut and into native surrounding soil profile
- Sensor has doughnut type sphere of influence and averages volumetric soil moisture from surrounding soil
Installation

- Auger allows for minimal disruption of native soil profile
- Less disruption of native soil stratification equals more representative data for surrounding zone
- In non sandy soil the use of a slurry based on removed soil is recommended to remove air gaps
- In sandy soil a watering technique is recommended.
• Telemetry

• Wired or Wireless

• Up to five Multi Sensor Probes can daisy chained together to a wireless battery operated node for transmission back to a cellular/ethernet/WiFi gateway and on up to the web for graphing and visualization

• Alternatively each individual multi sensor probe can be hardwired directly to a gateway or 1:1 wireless node
• Questions?

• For More info come
• by our table top
Larry Workman
Surge vs. Water Hammer & Installation

Larry Workman
Expert4PVC Consulting
What is Water Hammer?

Water Hammer vs Surge

- **Water hammer** is a pressure surge caused when a fluid is forced to stop or change direction suddenly.
- It is a unique form of surge that has an extremely high amplitude and short duration.
What is Water Hammer?
Valve “SLAMS shut!”
Calculating Hydraulic Shock

\[ S = \left[ \frac{E - E'}{(p/g) \times [E + (E' \times d)/t]} \right]^{1/2} \]

Where:

- \( E \) = Bulk Modulus of pipe \((\text{lbs/ft}^2)\)
- \( E' \) = Bulk modulus of fluid \((\text{lbs/ft}^2)\)
- \( d \) = Inside diameter of pipe \((\text{feet})\)
- \( p \) = Density of fluid \((\text{lbs/ft}^3)\)
- \( g \) = Acceleration of gravity \((32.2 \text{ ft./sec.})\)
- \( t \) = Pipe wall thickness \((\text{feet})\)

Things That Control The Magnitude

- Flow Velocity Change
  - True time to vary flow rate
    - Valve closing time
    - Air slugs

- Flow velocity
  - Momentum of fluid in motion

- Pipe Material
  - Strength of pipe material
    - Steel = Short valve closing, High surge
    - PVC = Medium valve closing, Medium surge
    - Poly = Long valve closing, Lower surge
• First surge is largest.

• Travels approximately 1440 ft./sec.

• Passes a ¼ NPT port in 14.4 microseconds
  • (0.000 0144 seconds)
Delay due to inertia of mechanism.
Peak is not recorded because of wave velocity.

Rule of thumb:
Gauge may indicate 30-60% of true surge
• Delay due to inertia of mechanism.
• Peak is not recorded because of wave velocity.

• NEVER USE OIL FILLED A GUAGE!
Cyclic Failure

- PVC Fittings
  - Bliesner, FHA and Soil Conservation Services
    - Suggests using 60% pipe pressure rating.
    - Keep PEAK surge below pipe pressure rating.
      - 125% of pipe pressure rating, will fail at about 140,000 surges
    - Lower surges will extend life of fittings.
      - 75% of pressure rating, fatigue occurs at about 2.2 million surges.
Fatigue Failure

- **Characteristics**
  - Straight line
  - Follows fluid flow
  - “Erosion” around hole
  - “Stretch Marks”
Cyclic Failures
Cyclic fatigue starts on the interior and works outward!
Cyclic Failures

Crack Origin

Crack Propagation

Beach Marks

Origin
Common Causes

- Opening and closing of valves
- Starting and stopping of pumps
- Changes in pressure
- Entrapped air
Water is 2% air by volume

1000 foot long pipe can contain 20 feet of air

Added sources of air in the system:
• System drain down
• Maintenance
• Pump Cavitation
• System leaks
  • Component failure
  • Seals
Air Vents

- Do NOT eliminate!
- Use manufacturers recommended sizing
- Place in system high points
- Pump outlets
Air Slugs

- Can form at high points
- Filling a system
- Drain down of a system
At the End...

- Velocity drops at end of “Air Slug”
  - System velocity = 4 ft./sec.  OK!
  - Velocity during Air Slug = 20 ft./sec.  Oh-oh!
  - End of “Air Slug” velocity change

\[ 20 - 4 = 16 \text{ ft./sec.} \]
Good Practices

• Air relief valves
• Variable speed pumps
• Slow closing valves
• Low flow velocity
Thank You!
Michael Derewenko
A Lesson in Landscape Photography

Michael Derewenko
JAIN Irrigation
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Basics of Photography
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- Aperture
- Shutter Speed
- ISO or Film Speed
Basics of Photography

- **Aperture**
  - Size of hole that allows light to enter cameras film plane or digital sensor plane
  - Depth of Field – is the amount of your shot that will be in focus:
    - A large depth of field means that most of your image will be in focus whether its close to you or far away.
Basics of Photography

- Shutter Speed
  - Speed the leaves move to close
  - Higher the speed, the more action you are freezing
Basics of Photography

- ISO or Film Speed
  - Film – Digital Planes are a sponge, how much light can your sponge absorb?
  - Higher the ISO the less quality and more grain
When to use an SLR?
- Printing
  - Posters
  - Magazine Ad
  - Wall print
  - Medium larger than 5 x 7

When to use an iPhone?
- Blog posts
- Websites
- Low res pdf
File Management:

- Events
  - FIS Golf Tournament 4/2/17
- Projects in Progress
  - Kingman Residence 2/17
- Finished Projects
  - Kingman Residence 3/17
  - Hearst Castle
- Product Photos
  - JAIN Irrigation
    - Octa-Bubbler
    - Saddles
      - Saddles Installed
  - Hunter Industries
    - MP Rotator
      - MP Rotator Installed
- Personal Photos
  - Rapunzel’s Halloween
Software

- Apple Photos
  - File management with simple correction options
- Aperture
  - File management with simple to advanced image correction
- Adobe LightRoom
  - File management with image correction
- Adobe Photoshop
  - Image enhancement and correction
  - Layering
- Adobe InDesign
  - Marketing material design
- Adobe Illustrator
  - Charts, graphics and designs from scratch

* Moving source files will make management software go crazy.
Lighting
• Try not to force a shot.
• Control light when possible.
• Reflective light can be easy.
• Shoot early and late in the day.
Natural Light

- Shoot water when backlit to highlight spray pattern
- Avoid shooting in cloudy weather unless you are shooting people
- Utilize natural polarized light
Natural Light

- Know the weather
- Southern clouds build up in midday to produce good late day filtered light
- Be careful of wind
Natural Light

- Reflective light - Use a reflector in place of a flash when shooting tighter shots during the day
- Filter light when possible with a scrim
Natural Light

- Tricks of the trade
  - Reflectors, scrims and neckwear
Artificial Light
Artificial Light
Tips
Easy Framing and Lighting Tips:

- Look for lines
- Use frame corners
- Avoid foreground dark spots
- Try to match light intensity from sources
- Try not to split the frame in fours

with subject matter
Too Much Sky

Not Enough Sky
Long Exposures:
  • A good tripod is key!

*Note how the tree line on the right draws your attention to the house.
• Avoid Hot Spots
  • White and light colored surfaces
Bend your knees!
Thank You!