Discussing the Value of Sustainability in the Irrigation Industry

Bryce Carnehl – Corporate Social Responsibility Manager, Hunter Industries
Warren Gorowitz – Vice President of Sustainability, Ewing Irrigation & Landscape Supply
Sustainability… Being Green
We’re part of the "Original" Green Industry!

Landscape Contractors
Interiorscape Contractors
Irrigation Consultants
Landscape Architects
Golf Course Superintendents
Growers & Nurseries
Sports Turf Managers
Manufacturers & Distributors
Urban Agriculture

WE ARE THE ORIGINAL GREEN INDUSTRY

Once upon a time...
Irrigation is a necessity to sustain most green spaces in the urban environment.
But, most of the time nobody actually gets to see our work...
Shift from Landscape Aesthetics to Performance
Eco-System Services provided by Green Infrastructure

These Cities Are Replacing The Worst Kind Of Infrastructure With The Best

R.I.P. parking lots.

3/7 [Image: courtesy SWA]
Economic Value and Benefits of Irrigated Green Spaces
Environmental Benefits of Irrigated Green Spaces
The Social Benefit of Green Spaces
Health and Well-Being Value of Irrigated Green Spaces
Polarized View of Green Spaces
Polarized View of Green Spaces

Irrigation often takes the blame…
Polarized View of Green Spaces

Irrigation often takes the blame...
Polarized View of Green Spaces
Context plays a role as well…
Polarized View of Green Spaces

As does landscape planning...
Polarized View of Green Spaces

The reactions we have in times of crisis...
Polarized View of Green Spaces

...May cause more harm than good
Polarized View of Green Spaces

…May cause more harm than good
Polarized View of Green Spaces

How does anyone make the right choice?
Polarized View of Green Spaces

More and more, the value of green spaces is being recognized.

Trees

Trees are integral to meeting San Diego’s commitment to climate change, carbon sequestration, storm water runoff reduction, and water conservation. As part of our urban forest, trees are found on both public and private property and help make our communities more sustainable and livable.
Polarized View of Green Spaces

More and more, the value of green spaces in being recognized.
Polarized View of Green Spaces
More and more, the value of green spaces in being recognized

Urban Wood Reuse

With more trees removed from urban areas than National Forests, urban wood reuse industrial clusters have emerged that include powering cities, art sculptures and nanotechnologies. They create jobs, protect natural forests and reduce environmental impact.
Responsibilities of Irrigation Consultants
Responsibility of Irrigation Consultants
Best Practices for Design, Management and Maintenance
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Responsibility of Irrigation Consultants

WHEN YOU RECYCLE
YOU CREATE JOBS FOR PEOPLE WITH DISABILITIES

HUNTER HAS TEAMED UP WITH EWING AND BLUE STAR RECYCLERS TO RECYCLE OLD IRRIGATION CONTROLLERS. Blue Star Recyclers’ mission is to recycle electronics ethically to help create jobs for people with autism and other disabilities.

Bring an old irrigation controller to any Ewing Irrigation store and drop it off in the designated container.
Responsibility of Irrigation Consultants

Innovate Water Supply Sourcing
Responsibility of Irrigation Consultants
Share your stories
Responsibility of Irrigation Consultants
Share your stories

Benefits of Urban Trees
Research has linked the presence of urban trees to...

- **PROTECTING BIODIVERSITY**
  - including habitat for migrating birds and pollinators

- **REDUCING OBESITY LEVELS**
  - by increasing physical activity including walking and cycling

- **REDUCING RATES**
  - of cardiac disease, strokes, and asthma due to improved air quality

- **COOLING**
  - city streets by 2-4°F, reducing deaths from heat and cutting energy use

- **FILTERING**
  - up to a third of fine particle pollutants within 300 yards of a tree

- **MANAGING STORMWATER,**
  - keeping pollutants out of waterways, and reducing urban flooding

- **INCREASING**
  - neighborhood property values

- **REDUCING STRESS**
  - by helping interrupt thought patterns that lead to anxiety and depression
Responsibility of Irrigation Consultants
Liquid Expectations – A Guide to Harvested Water Quality

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Product Manager  
Watertronics  
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Rick Clelan  
Regional Manager  
Ewing Irrigation  
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LEARNING OBJECTIVES

• Components of Rainwater Systems
• Tank Pre-filtration and sizing
• Common types of disinfection systems available
• Filtration integration into rainwater systems and for which water treatment purpose
• How to operate and size UV disinfection systems
• How a chlorine disinfection system works, and what to avoid in irrigation use
• What site circumstances will negatively affect water quality
• Common installation pitfalls
WATER HARVESTING

Major Components

- Catchment
- Pre-Filtration
- Post Filtration
- Controls
- Storage
- Pumping water
3 Main Components
COMPONENTS – Pre-filter

• The best way to filter the water is at the source. The sooner we incorporate filtration, the better the rest of the system operates.

• Primarily particle filtration (TSS – total suspended solids)

• Oil/Water separation (Stormwater only – Hydro-Dynamic Separator)
DESIGN OF COMPONENTS - Pre-filtration

- All Gravity type rainwater filters work on an efficiency principle
  - 200gpm @ 90% eff. = 180gpm to storage tank
- Sizes from 32 GPM to about 4,000gpm
- Some can be flushed with pressurized water
- Approx. 350 micron screens (.013”)
- Exception: Hydro-Dynamic separators 80% /100 micron

Image courtesy of Graf
DESIGN OF COMPONENTS - Pre-filtration

Why Pre-Filtration?

Image courtesy of ITS Jim D.
Tank Pre-filtration

Commercial Installation Examples

Images courtesy of Watertronics
COMPONENTS - Storage

- Storage could be any vessel that can hold or retain water
- Tanks or Ponds
- Separate containment, or built into building foundation
- Below or Above ground
Storage & Water Quality

Below ground tanks - limit sunlight, steady temperature
Above ground tanks – should be opaque (limit algae growth)
Water movement – recirculation systems

Keep organic items from decomposing in tanks (pre-filters)
COMPONENTS - Pumping/Controls

- The heart of the water harvesting system
- Submersible or above grade pumps
- Controls all peripheral components (level, flow, pressure, filters, treatment)
- Make a water manager out of the end user
- Quantify ROI and contain data about system

Images courtesy of Watertronics
TYPES OF PUMPS

Horizontal Centrifugal

Water well submersible turbine, installed Vertically or Horizontal

Submersible pump in Flow Inducer tube.

Images courtesy of Watertronics

MAIN RAINWATER TANK

Images courtesy of Goulds

Image courtesy of Watertronics
Automatic and Self protecting
Water Quality Specific Alarms (in addition to normal hydraulic pump station alarms)
Automatic Screen Filtration
- Reverses flow across the screen
- Internal self cleaning mechanism
- Note min. filter operating pressure and the extra demand it creates on the pump station
- Note screen area when sizing (water quality, UV, GPM/area)

UV Pre-Treatment = 5-25 micron
Drip Irrigation = 100 micron
Spray Irrigation = 200-500 micron

Image courtesy of VAF

Image courtesy of Rainharvest
Irr demand = 30gpm @ 60 psi
Irr + Filter flush = 55-60gpm @ min filter operating psi (50psi)
Actual filter pressure when irrigation is at max and filter is flushing is less than filter operating pressure required to clean the screen.
DISCHARGE FILTRATION

The Filtration Spectrum

Relative Size of Common Materials

Process For Separation

Note: 1 Micron (1x10^-6 Meters) = 4x10^-8 Inches (0.0004 Inches)
1 Angstrom Unit = 10^-10 Meters = 10^-8 Micrometers (Microns)
Ultra Violet Disinfection Basics

-254nm wave length UV light is used to render organisms inactive or unable to reproduce

-Water is in contact with light for a period of time. Energy is transmitted to the water (mj/cm²)

-Pick a dose (30mj/cm²) organisms require a certain amount of energy to be deactivated

-Pick a flow rate with a given UVT% (actual UVT of water not known without water sample.)
Water Quality Requirements for UV

Dose: Light Energy delivered into the water “mj/cm²” (see also destruction chart)

Ultra-Violet Transmittance %: Light’s Ability to Penetrate the Water

Flow Rate: Maximum GPM able to be disinfect at criteria above.

General Requirements
• 7 grains or less of Hardness (rainwater is soft water)
• .3 ppm of iron (limits quartz sleeve fouling)
• UVT% must be per the mfg. performance curve
• Must manage heat build up

If the UVT% of the water through the UV unit is different than what you sized the UV for, the dose is NOT DELIVERED!
What surface the water is collected from has a drastic affect on water quality

The surface of collection is the main driver in whether or not UV can be used on a given job site.

Avoid Green Roofs or other roofs with organic material

*TDS vs. TSS !*

TDS can not be filtered out with screen filtration. Its dissolved.
Ultra Violet Light Disinfection

#1 MKE canal
#2 Green Roof (AFTER 5 MICRON)
#3 Parking lot
#4 Metal Roof
#5 EPDM Roof Black
#6 EPDM Roof white

Image courtesy of Watertronics
# Ultra Violet Light Disinfection

<table>
<thead>
<tr>
<th>Bottle Label:</th>
<th>Watertronics Sample #1 UVT Testing</th>
<th>Bottle Label:</th>
<th>Watertronics Sample #4 UVT Testing</th>
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<tbody>
<tr>
<td>UVT (1cm, 254nm):</td>
<td>78%</td>
<td>UVT (1cm, 254nm):</td>
<td>96%</td>
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<tr>
<td>Bottle Label:</td>
<td>Watertronics Sample #2 UVT Testing</td>
<td>Bottle Label:</td>
<td>Watertronics Sample #5 UVT Testing</td>
</tr>
<tr>
<td>UVT (1cm, 254nm):</td>
<td>8%</td>
<td>UVT (1cm, 254nm):</td>
<td>97%</td>
</tr>
<tr>
<td>Bottle Label:</td>
<td>Watertronics Sample #3 UVT Testing</td>
<td>Bottle Label:</td>
<td>Watertronics Sample #6 UVT Testing</td>
</tr>
<tr>
<td>UVT (1cm, 254nm):</td>
<td>89%</td>
<td>UVT (1cm, 254nm):</td>
<td>90%</td>
</tr>
</tbody>
</table>

#1 MKE canal      #2 Green Roof      #3 Parking lot
#4 Metal Roof     #5 EPDM Roof Black  #6 EPDM Roof white

Image courtesy of Watertronics
Chlorine Injection Disinfection/Color

Chlorine Recirculation System on Day Tank (maintains 2-3ppm residual chlorine level)
- Uses separate pump in Day Tank Start/Stop via timer
- Water sent through CHL Analyzer (PH & CHL sensor)
- Dosing pump injects to maintain set point of CHL in PPM
- 30gal holding tank (uses household bleach/pool shock)

• Chlorine will also effect color of water. It changes the way molecules reflect visible light to the naked eye.
• Like a stain removal on white T-Shirt.

Images courtesy of Watertronics
Types of Systems and Applications

Direct Style System
The water in the main storage tank is pumped directly to the given application at the desired pressure. All components on the discharge side of the pump(s) are sized for max flow rate (capacity) and psi.

Day Tank Style System
Complete rainwater system includes (2) storage tanks and (2) pump stations. Also known as “batch processing” where a smaller transfer pump is used to treat water from main rainwater storage tank at a lower flow rate to the “day tank”, while another pump station to deliver that water at required flow and psi for the application.
3 Main Components of Direct style system
Types of Systems and Applications

Deciding Factors to use Direct or Day Tank Style Systems

1. Pressure required for application (150 psi max rating / 125psi safety factor)
   1. Filters and UV units have rating restrictions
2. FLOW or GPM required to application: For Financial Savings $$$
   1. IF the application requires 80GPM, a day tank system that transfer water at 30gpm offers little or no cost savings
3. Footprint or Available Space
   1. A direct system may be chosen even though GPM (over 150gpm) is high due to space constraints
4. Application or Usage Profile (ie..Irrigation vs. Toilet Flushing)
Types of Systems and Applications

IRRIGATION CYCLE PROFILE

TIME

GALLONS PER MINUTE (GPM)

3 - 6 HOURS
Types of Systems and Applications
CITY OF OCEAN SPRINGS - Splash Pad

- 3k Below ground storage tank
- Submersible pump in tank
- Control skid with filtration (outdoors)
- Back up water will fill tank
- Fully flooded excavation installation
- Harvested splash pad water for irrigation

Images courtesy of Watertronics
RADIO FLYER

Irrigation

- 40k above ground storage tank
- Flooded suction pump w/ 100 micron filter
- Back up water will fill tank
- Cold weather environment

Images courtesy of Watertronics
Mitchell Park Domes
Irrigation / Indoor

- 80k storage tanks
- Submersible pump 80gpm
- Filtration and UV
- City water back up direct
- Year round operation

Images courtesy of Watertronics
Thank you

Questions?
Making Sense of Flow Meters
A Measured Discussion of Types and Technologies

Moderated by: Brent Mecham
Panelists: Norm Bartlett, Ronald Purdy, Jim Peterson
Agenda

- Discussion about SWAT testing protocol – Brent
- Historical perspective of flow management in irrigation – Norm
- Types of technology available for flow management – Ron
- Future of flow management – Jim
- Q & A – audience questions will be considered

- Note: This is not about product promotion, but rather understanding how to better use the technology.
SWAT Draft Testing Protocol

- Scope: standardized performance evaluation of flow sensors used in landscape irrigation up to 4-inch size.
- Accuracy of flow signal
- Repeatability of flow signal
- Range of flow
- Pressure loss through the sensor
- Pressure rating
- Durability
- Wet environment test
Terms:

• **4.1 Flow sensor**
  A term commonly used in the irrigation industry referring to a device that detects flow and that generates a signal that is compatible with a controller or receiving device.

• **4.2 Flow meter**
  Combination of a flow sensor and scaling device often integrated into a single device which displays and or transmits actual flow rates or volumes in standard units of measure.
# Flow Rate Test

<table>
<thead>
<tr>
<th>Sensor SN_____________</th>
<th>Sensor size_____________</th>
<th>Test flow rate</th>
<th>Reference Meter Flow Rate gpm</th>
<th>Sensor Flow Rate gpm</th>
<th>Inlet Pressure psi</th>
<th>Delta Pressure change psi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum flow rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>80% of maximum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>60% of maximum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>40% of maximum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>20% of maximum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Minimum flow rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Durability Tests

<table>
<thead>
<tr>
<th></th>
<th>PRESSURE</th>
<th>WATER TEMP</th>
<th>FLOW RATE</th>
<th>OPERATING PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continuous test</strong></td>
<td>70 psi</td>
<td>72 °F</td>
<td>Q (80% of maximum)</td>
<td>10 hours</td>
</tr>
<tr>
<td><strong>Cyclic test</strong></td>
<td>70 psi</td>
<td>72 °F</td>
<td>Q (80% of maximum)</td>
<td>2,500 cycles</td>
</tr>
<tr>
<td>(on 30 sec. off 30 sec.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Why Testing?

• Flow sensing is being written into codes and regulations.
• Industry being proactive to validate the performance characteristics.
• Establish expectations of regulators.
• Should flow sensing be used to measure actual water usage?
• Improve consumer confidence.
Norm Bartlett
Creative Sensor Technology
Beginnings......
1986
Change

- Irrigation Controllers accept flow input directly from sensors
- Central Control Systems expand to incorporate flow
- 2-Wire Decoder control systems incorporate flow
- Controller inputs expand
Y2K

2019 NATIONAL CONFERENCE
Flow Measurement
For now
For the Future

presented to ASIC May 23, 2000
by Norman Bartlett

OTHER TECHNOLOGIES
SONIC
SHEDDING
MAGNETIC

2019 NATIONAL CONFERENCE
Is it a Flow sensor or a Flow meter?

- A sensor usually implies that it senses and tracks a physical property and produces a scalable output signal.
- A meter usually implies that it has a register or display.
- Some devices can be both.
- In the irrigation industry the terms are used interchangeably.
Pick the Right tool for the job
Balance your Requirements carefully

- Range of Measurement
- Friction Loss
- Pressure Rating
- Accuracy
- Repeatability
- Suitability for service

- Ease of installation
- Serviceability
- Reliability
- Support
- Cost
- Warranty
Is change a change for the better or just change?

- Materials of construction
- Electronics
- Detection principles
The Future?

Will ultimately be decided by:

Customer Demand

Water Availability

Regulatory Requirements
Ronald Purdy
Badger Meter
Common Technologies

• Impeller
• Electro-Magnetic
• Ultrasonic
• Disc
• Turbine
• Differential Pressure
• Vortex
Impeller Meters

Operation:
Force of moving water turns a multi-bladed wheel whose axis of rotation is perpendicular to the flow. Rotation is proportional to flow, mid-range; but, does follow the non-linear “S” curve common to all Turbine Type meters; At the extreme low limits due to bearing friction, and at the upper limits due to cavitation. Rotation can be detected by Magnetic, RF, Proximity, Mechanical or optical means.

Characteristics:  Pipe Sizes ½-36+  Range 0.3 – 30 FPS   Accuracy 1-3% ( 1 FPS+)

Advantages
• Rugged, Simple, Low Cost Design, with years of field experience
• Tolerates Particles in Flow Stream
• Low Head Loss
• Simple Two Wire Device, Compatible with most irrigation controllers

Disadvantages
• Limited Low Flow performance, sometimes requiring a meter run of smaller size pipe.

Best suited for
• Main and lateral lines connected to Irrigation Controllers
• Flow input to Flow Monitoring, Control and Metering Devices.
Electro-Magnetic Meter

Operation
Electric current pulsed to a coil produces a strong Magnetic field. Movement of Water generates a voltage proportional to flow. Sophisticated, micro-processor circuitry converts the voltage impulse to flow rate and total. Inline types are most common; but, some manufactures offer insertion types.

Characteristics:
- Pipe Sizes ¼ -36+  
- Range 0.1 – 40 FPS  
- Accuracy 0.25% - 0.5%

Advantages
- No Moving Parts and unaffected by sand and other debris
- Very Low Head Loss - Reduced Straight Pipe requirements
- High Accuracy with wide turn-down ratio, and good low flow performance.

Disadvantages
- Sensitive to Grounding, EMI, and Vibration
- Cost – Weight – Power Consumption.
- Not generally recommended for below grade locations.

Best suited for
- Pump Stations.
- Lower cost alternative to Compound meters where a wide range of flows is expected
Ultra-Sonic Flow Meters

Operation:
Two basic types (Transit Time and Doppler Shift)

**Doppler Shift** measures the change in frequency of an acoustic pulse, as it reflects off particles moving in the flow stream. (Think sound of Train Whistle) Not usually used in the Irrigation Market.

**Transit Time** measures change in time it takes for acoustic pulse to travel from one transducer to the other. The path may traverse the flow in a “W”, “V”, “Z” pattern, or be in-line, parallel to the flow.
The time shift is extremely small and requires very precise timing, signal gain, and software algorithms to deal with all the subtle acoustical properties of the piping, fluid, and transducers.

**Characteristics:** Pipe Sizes ½” - 36+” Range 0.1 – 40 FPS Accuracy 1 % - 3%

**Advantages/Disadvantages:**
With so many types available, it is hard to make a general statement.

As a general rule, inline types are best with small pipes below grade, while external mounts are best used in larger pipes in protected areas. They can susceptible to EMI, and acoustical vibration, such as found in pump stations; but, generally have good low flow performance in most environments.

**Best Suited for**
Locations with wide ranging, or low flow rates. Selection Application Specific.
Disc Series Meters

Operation:
• Positive Displacement Disc is driven around a tight tolerance chamber.

Characteristics:  Pipe Sizes ½” - 2”  Range 0.2 – 15 FPS  Accuracy 1.5%

Advantages
• Low Cost
• Simple Design
• Positive Displacement Accuracy and Low Flow Performance

Disadvantages
• Small Pipe sizes only
• Clean Water Only
• Limited Signal Options
• Higher Head Loss

Best suited for
• Metering clean incoming City Water
• Small line sizes 2” and under, with low flows where accuracy in important
Turbine Meters

Operation:
Water turns a multi-bladed wheel whose axis of rotation is parallel with the flow. Rotation is proportional to flow, mid-range, but, does follow the non-linear “S” curve, common to all Turbine Type meters, at the extreme lower flow limits due to bearing friction, and at the upper flow limits due to cavitation. Rotation can be detected by Magnetic, RF, Proximity, Mechanical, or optical means.

Characteristics:  Pipe Sizes 1.5” - 12”  Range 0.25 – 30 FPS  Accuracy 1.5% (above 0.4 FPS)

Advantages
• Wide Flow Range
• Good Accuracy
• Reduced Straight Pipe

Disadvantages
• Clean Water Only – Requires inline filters
• Cost and Weight
• Limited Interface Options

Best Suited for
• Clean incoming city water where good accuracy is required with mid-range flows
Differential Pressure Flow Meters

Operation:
Three basic types (Pitot Tube; Orifice Plate, Venturi)

**Pitot Tube:** A small protrusion into the flow stream.
**Orifice Plate:** Precise symmetrical constriction of the flow.
**Venturi:** Precise narrowing of the flow tube

The basic principle the same for all.
Non-linear pressure drop is induced, requiring square-root extraction to create a signal proportional to Flow.

**Characteristics:**
- Pipe Sizes ¼” - 36+”
- Range 0.1 – 40 FPS
- Accuracy 0.5% - 1%

**Advantages/Disadvantages:**
- Limited Turn-down ratio
- Cost – Probes inexpensive; however, Signal Conditioners tend to be expensive

**Best Suited for**
- Sometimes still used for flow verification, but portable Ultra-Sonic meters more common today.
- Not often used in the Irrigation markets.
Vortex

Operation:
Although the shapes vary, a strut sometimes referred to as Bluff or Shredder Bar splits the flow stream causing vortexes to form. The frequency of these pressure waves are proportional to flow, detected as they pass transducers located close downstream. Although the principle is simple, these meters tend to be quite expensive due the sophisticated circuitry and micro-processor design required to separate signal from noise and deal with the differences' in flow mediums.

Characteristics:  Pipe Sizes 1/4” – 24+”  Range 1.3 – 30+ FPS  Accuracy 0.5 - 1%

Advantages
• Low Head Loss
• No Moving Parts

Disadvantages
• Poor low flow performance and for Clean Water Only
• Cost
• Limited Interface Options

Best Suited for
• Not usually used in the Irrigation Markets
### Summary & Questions

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Impeller</th>
<th>Electro-Magnetic</th>
<th>Ultrasonic</th>
<th>Disc</th>
<th>Turbine</th>
<th>Differential Pressure</th>
<th>Vortex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Size</td>
<td>1/2&quot; - 36+&quot;</td>
<td>1/4&quot; - 36+&quot;</td>
<td>1/2&quot; - 36+&quot;</td>
<td>½&quot; - 2&quot;</td>
<td>1.5&quot; - 12&quot;</td>
<td>½&quot; - 36+&quot;</td>
<td>1/4&quot; – 24+&quot;</td>
</tr>
<tr>
<td>Range</td>
<td>0.3 - 30 FPS</td>
<td>0.1 - 40 FPS</td>
<td>0.1 - 40 FPS</td>
<td>0.2 – 15 FPS</td>
<td>0.25 – 30 FPS</td>
<td>0.1 – 40 FPS</td>
<td>1.3 – 30+ FPS</td>
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<td>Accuracy</td>
<td>1 - 3% (Above 1 FPS)</td>
<td>0.25% - 0.50%</td>
<td>1 - 3% (Design Dependent)</td>
<td>1.50%</td>
<td>1.5% (above 0.4 FPS)</td>
<td>0.5% - 1%</td>
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<td>Technology</td>
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<td>Simple</td>
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<td>Usually</td>
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<td>Suspended Solids</td>
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<td>Tolerant</td>
<td>Tolerant</td>
<td>Internal Screen</td>
<td>Requires Screen</td>
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<td>No</td>
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<td>Wet - Below Grade</td>
<td>Yes</td>
<td>Usually Not Recommended</td>
<td>Inline OK Clamp-On Not Recommended</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Cost</td>
<td>Low</td>
<td>High</td>
<td>Mixed</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Mixed</td>
</tr>
<tr>
<td>Power Requirement</td>
<td>From Controller</td>
<td>Line or Battery</td>
<td>Line or Battery</td>
<td>Mixed</td>
<td>Mixed</td>
<td>Mixed</td>
<td>Line</td>
</tr>
<tr>
<td>Weight</td>
<td>Light</td>
<td>Inline Heavy</td>
<td>Light</td>
<td>Medium</td>
<td>Heavy</td>
<td>Mixed</td>
<td>Mixed</td>
</tr>
</tbody>
</table>

### Where used

<table>
<thead>
<tr>
<th>City Water</th>
<th>Irrigation</th>
<th>Potable/Irrigation</th>
<th>Varies with Materials &amp; Design</th>
<th>Potable/Irrigation</th>
<th>Potable/Irrigation</th>
<th>Varies with Materials &amp; Design</th>
<th>Varies with Materials &amp; Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Stations</td>
<td>Yes</td>
<td>Check for Grounding and EMI</td>
<td>Check for Acoustic &amp; EMI</td>
<td>Small Pump Ok But Usually Not</td>
<td>Could be But Usually Not</td>
<td>Could be But Usually Not</td>
<td>Could be But Usually Not</td>
</tr>
<tr>
<td>Irrigation Controllers</td>
<td>Yes</td>
<td>Usually Not</td>
<td>Varies with Design</td>
<td>Yes</td>
<td>Usually Not</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Flow Monitoring</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Flow Totalizing</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Jim Peterson
Great Plains Industries
How do we know what the future holds?

• No way to know exactly

• Ask your customers what they are looking for
  • OEMs
  • Distributors
  • Consultants
  • Irrigation Managers
What did they tell us?

• Easier Installation
• Eliminate the wire-path
• Lower the cost of the device
• More robust hardware
• Better Accuracy
Easier Installation

- Device that doesn’t require cutting into the pipe
- Reduced installation labor
- Clamp on Ultrasonic
- retrofit applications
Eliminate the wire-path

• Continued advancement of wireless data transmission to the controller

• Affordably priced

• Reliable and Repeatable

• Retrofit applications
Lower the device cost

- This allows for more systems to add flow measurement
- Smaller commercial systems
- Residential system
Better Accuracy

• Flow sensor could also be a deduct meter

• Baseline to accurately measure the effects of water conservation measures

• Ability to tie into data analytics systems like IBM Watson

  • Allows for predicative anticipation of system problems
Questions & Discussion
The Future of Revit® in Irrigation

Moderated by: Lance Sweeney
BIM (Building Information Modeling)

- 3D model based design process
- Revit® - Autodesk BIM software
- Very Useful for Architects, MEP Engineers, etc.
- Data stored in “families” is very useful
- Not intended for landscape and irrigation design
Revit® Challenges

- Revit - $2,079 / year license (based on 3 year subscription)
- Difficult program to master compared to AutoCAD
- Irrigation is not designed in 3D (complicated and unnecessary)
- Irrigation piping and most equipment is diagrammatic
- Level of detail can be much higher than necessary or practical
- Installation of system likely will vary from plans
- Use of AutoCAD from Revit based files has challenges
- Development of equipment “families”
Revit Experiences

• Consultants who design in Revit

• Consultants who design in AutoCAD from Revit exported files

• Consultants who have used Revit consultants to convert 2D drawings into Revit

• Pressure from Landscape Architects to adopt Revit
Future of Revit in Irrigation

• Consultants looking to learn Revit?

• Should use of Revit be limited to within building shell?

• Should Revit use for irrigation be limited to piping or internal building installed equipment?

• What are irrigation manufacturers doing to assist?
ASIC Response to Revit

• Develop reasonable guidelines for use?

• Work with ASLA to define and mitigate Revit issues?

• Approach AutoDesk about future LIM (Landscape Information Modeling) development?

• Assist in sourcing irrigation specific training for members?
Thank you!