Explore. Connect. Learn.

Industry Insights

Bonus Track Presentations

IRRIGATION SHOW | Dec. 4-5, 2019
EDUCATION WEEK | Dec. 2-6, 2019
Las Vegas Convention Center
Las Vegas, Nevada

AGRICULTURE
LANDSCAPE
GOLF
NURSERY & FLORICULTURE
SPORTS TURF

Co-located with NGWA and ARCSA.
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LESSONS FROM THE GREEN INDUSTRY BENCHMARK REPORT
HELLO, MY NAME IS
CHAD
If I could improve one area of my business it would be?
#1

There’s a labor shortage in the green industry.
If I could improve one area of my business, it would be:

- Attracting/retaining employees: 34%
- Marketing to acquire new customers: 16%
- No free time/having to do much of the work myself: 15%
- Inefficient operations: 14%
- Low margins: 9%
- Difficulty getting capital/financing: 4%
- Other: 4%
- Regulatory compliance: 2%
- Retaining customers: 2%
How hard is it for you to find good employees?

- Very Easy - We don't have a problem finding employees. 2%
- Somewhat Easy - Most of the time, we find good employees. 6%
- Somewhat difficult - We sometimes find good employees 45%
- Very difficult - We have a very hard time finding good employees 47%
In 2019, my business expects our staff to:

- Decrease by 6-10%: 1%
- Decrease by 1-5%: 1%
- Decrease by 11-20%: 0%
- Grow by 6-10%: 24%
- Grow by 11-20%: 17%
- Grow by 1-5%: 19%
- Stay the same: 23%
Where do you find your best applicants?

- Word of Mouth (Employee Referrals, Customer Referrals, etc.) - 70%
- Online Job Postings (Monster, Indeed, etc.) - 14%
- Craigslist Ads - 4%
- Social Media Postings - 2%
- Local High Schools/Colleges/Universities - 2%
- Other - 6%
- Staffing Agency - 2%
You may have to pay more to attract and retain employees.

Don’t be afraid to experiment.

Focus on your culture.
Businesses are raising prices.
Do you plan to raise prices in 2019?

- No: 24%
- Yes: 76%
What is the primary reason you're raising prices?

- Rising Labor Costs (wages, health insurance, etc.): 41%
- Want to Improve Profitability: 17%
- Other (please specify): 14%
- Rising Vendor Costs: 11%
- Haven't Raised Prices in a Long Time: 8%
- Increasing Demand: 5%
- Rising Insurance Costs: 3%
- Rising Fuel Costs: 1%
Know your numbers.

Reiterate your value.

Offer reduced rates on long-term or pre-paid contracts.
You need branded trucks and a website. But if you want to grow faster, online advertising works.
I use the following marketing tactics (Select all that apply):

- I have a website
- My equipment is branded with my company logo/phone number
- I have a business page on at least one social media platform (Facebook, LinkedIn, Pinterest, Twitter, etc.)
- I use online advertising (banner ads, AdWords, Facebook ads, etc.)
- I have a search engine strategy, i.e. I target and monitor specific keywords on my website
- I use door hangers or other hand delivered print materials
- I have a referral program with incentives for referrals
- I send transactional emails (appointment confirmations, reminders, completion notifications, etc.)
- I send bulk email promotions
- I have an email newsletter
- I send bulk direct mail
- I have a blog
I use the following marketing tactics (Select all that apply):

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- I use online advertising (banner ads, AdWords, Facebook ads, etc.)
Define/Refine your sales process first.

Consider newer options like NextDoor.

Facebook/Google Ads can be effective for residential, LinkedIn for Commercial.
Service Specialization is Dying.

#4
I offer the following services (Select all that apply.):
How many of the nine services listed did the average respondent offer?
Average Green Industry Services Offered
Do some market research.

Partner vs. compete?

Cross-promote your services.
Economic Optimism is Waning.
In 2019, I expect the economy will:

- Stay the Same: 46%
- Moderately Improve: 31%
- Get Moderately Worse: 15%
- Greatly Improve: 6%
- Get Significantly Worse: 2%
Limit your debt.

Measure and improve customer loyalty.

Consider your wage structure.
Software makes businesses more efficient.
I use field service software:

- Yes: 50%
- No: 50%
I use field service software:

- 1-5: 70% Yes, 30% No
- 6-10: 60% Yes, 40% No
- 11-20: 50% Yes, 50% No
- 21-30: 40% Yes, 60% No
- 31-50: 30% Yes, 70% No
- 51-100: 20% Yes, 80% No
What's the biggest benefit to using field service software?

- More efficient operations: 37%
- Eliminate paperwork: 11%
- Enables me to deliver better customer service: 11%
- Easier billing/better cash flow: 10%
- Improved productivity: 8%
- Other (please specify): 8%
- Improved communication with my field crews: 6%
- Better visibility into my business: 5%
- Improved profitability: 4%
Know what issues you’re looking to solve.

Understand that introducing software is a process.

Look for a partner, not a software provider.
High growth businesses get a lot of leads, close business quickly and close a higher percentage of them.
Which of the following has the biggest impact on your growth?

- Getting more leads?
- Closing leads quickly?
- Closing a higher percentage of leads?
The biggest issue in my sales process is:

- Other (please specify)
- Poor close rates
- Tracking bid vs. actual reporting
- Commissioning my sales rep(s)
- Managing my sales rep(s)
- Sales reporting - I don't know where my sales opportunities stand
- Following-up on information requests - I don't have enough time
- Generating a bid
- Qualifying leads - I have too many leads
- Filling the funnel - I don't have enough leads
From lead to sale, the typical time it takes to close a sale is:
Determine your best lead source.

Analyze your sales touchpoints.

Learn what makes you unique.
Cast a wide net when researching products and equipment.
Which resources do you use to research parts/business equipment/software (Select all that apply.)

- Google/search engines
- Seller websites
- Distributor Representative
- Peers
- Print publications
- Educational/news websites (PLANET, Lawn and Landscape, etc.)
- Video/demos
- Social Media (Facebook, LinkedIn, Twitter, etc.)
- Message boards/Forums
- Webinars
- Blogs
- None
- Other: (please specify)
Develop a sounding board of non-competitive peers and advisors.

Leverage distributors and other sellers.

Take an active role in a local, regional or state association.
Goal-setting helps businesses grow.
Do you set goals for your business? (Select all that apply.)

- Yes, I set annual goals
- Yes, I set quarterly goals
- Yes, I set three year goals
- Yes, I set five year goals
- No
Do you set goals for your business?

- Yes, I set quarterly goals
- Yes, I set annual goals
- Yes, I set three year goals
- Yes, I set five year goals
- Yes, I set ten year goals
- No
Start with a long-term goal, then work backward to short-term goals.

Communicate your goals.

Give everyone a number.
Add your voice to the 2020 survey:

www.hindsitesoftware.com/survey
Topic:
Why a Certified Professional Beats Its Competitors

Jay Gray, Conserva Irrigation- Richmond Virginia

- Irrigation Certifications- CLWM, CID, CLIA, CIC, CIT
- ISA- Certified Arborist
- Cross Connection Control Specialist –USC
- Certified Pest Control VA- All Categories
- Certified Fertilizer Applicator- Virginia
- Backflow Prevention Tester – Virginia- Charlotte NC
- California Licensed Landscape Contractor – C-27
- Florida Licensed Irrigation Contractor
- North Carolina Licensed Irrigation Contractor
- Connecticut Licensed Irrigation Contractor
- Honored in 2018 for having been IA Certified for over 20 years
4 Reasons –
Why a Certified Professional Beats Its Competitors

- Certifications are required to be qualified to bid on projects
- Certifications in some cases qualify you for a license in a state automatically
- Certification gives credibility when water agencies are looking for Conservation partners to recommend for consultation to customers
- Certifications are an advantage if looking for a career- Immediate Recognition on a Resumé (a known level of knowledge and experience)
Leveraging Water Agency Incentives

Andrew Pirrone CLIA, CID
Town of Gilbert, AZ
Irrigation Association Conference 2019
Why are there rebates?

Water agency reasons:

• Landscape water use is often the highest use (by far!) of potable water in a service area.
• Technology that saves water. (How exactly?)
• **Elevate** and **inform** the landscape and irrigation industry *and its customers*
  • We have the same customers!
Why are there rebates?

How is water saved by technology exactly?

• Watering to ‘Budget’
• Smart Controllers can enhance by automatic seasonal adjustments
Why are there rebates?

How is water saved by technology exactly?

- Higher DU reduces SM requirements
- Leak avoidance (Proactive)
So What?

How this benefits YOU

• Contractors & Consultants
  • Opportunity for higher margin work
  • Strengthen retention & relationship with customer
  • Free promotion by the water agency

• Manufacturers
  • Case study for an entire region of similar characteristics
  • Water manager or irrigator buy-in for products that work
  • ‘Preferred’ products by water agency (list)
Which accounts?

Be SMART about selection

• Identify sites with potential for water savings
  • Will the customer see dollar savings from upgrades?

• Identify reasonable timeline
  • It’s true that water agencies work slower than private companies
  • Budget and paperwork limitations

• Avoid time wasters such as:
  • Sites with little to no water savings
  • Band-Aids (smart controller on site with low DU or leaks)
Know your contacts

Relationship with your Water Conservation office

• Why bother?
• We can build off your feedback
  • Rebate processes that work for you are most successful
• Proposed Product or upgrade strategy not incentivized? Find out why
• It could be made so if you have a strong case (with data!)
  • Remember the water agency goal- reliable water savings.
Gilbert AZ Commercial Incentive Program

- Gilbert Water Conservation purchases the equipment outright and gives to commercial customer to install (Business, HOA, Church, etc.)

- We assist in programming the controller after installation if needed.
- Monitor for optimal results, following up as necessary.

- Completed examples: Shopping plazas, fire stations, HOA’s, schools.
Product Selection Considerations

- Controllers that adjust for frequency

- Point source drip in clay soils renders duration adjustments ineffective, especially in cooler seasons.

- Short duration run times for turf do not permit full penetration of clay soil to appropriate root depths (6 - 10”)

Now still watering five days per week with .03” per irrigation. Sprinklers with 2”/hr precip now have a 1 minute run time.
Gilbert’s Motivation

Save water with FREE Smart Technology

After high water bills and inconsistent watering, this business took the guesswork out of irrigation by installing a Smart Controller in April 2016... and has been saving water and money ever since!

Gilbert believes in healthy landscapes that are irrigated efficiently.

We will pay for water efficient technology that meets the specific needs of your site, including smart irrigation controllers, multiple stream-rotating nozzles, pressure compensating drip irrigation emitters, and more!

Learn more at gilbertaz.gov/water
Results

Daycare Center
(Smart Controller)

~ 500,000 Gallons saved in first year
Results

Grocery Store Plazas (Smart Controllers)

Already about 800,000 gallons saved each
Results

Fire Stations
(Smart Controller)

Water savings may be small, but plant health is much improved
Results

Fire Stations
(Smart Controllers)
Results

HOA’s (Smart Controller)

Smart Controller Installed (Sep 2017)

~ 1,055,000 gallons saved about an 1 acre of turf and 2 acres of shrubs.
Results

HOA’s
(Smart Controller)

Sometimes there are little savings potential with a smart controller.
Potential for Smart Controller

Flat-lining irrigation schedules

Common with commercial or light industrial properties
Potential for Smart Controller

Compensating for ‘brown spots’- Project: Poor uniformity upgrade

Note: Water Budgets use higher end of standard DU to display best scenario water use.
Ensure your success

• Existing field hardware (nozzles, drip emitters, pressure issues) **must** be addressed for full effectiveness of smart controllers.

• Address serious leaks and deficiencies first
  • Commercial (Drip Irrigation leaks, valve leaks)
  • HOA & Large Landscapes (Improper turf head spacing, clogged drip emitters)
Challenges

• Our Differences:
  • Water agencies do not want turnkey projects
  • Expired communication subscriptions
  • Deferred maintenance from customer budget issues

• Agency MUST supply water to that property for life.
  • If project or contract goes sour, water still must flow
  • Water agencies must take the long view
  • Project evaluated on cost per gallon saved (agency) vs profit margin (business)
Future for Smart Controllers

- Smart Cities & Connectivity
  - Potential for irrigation manufacturers to line up with city-wide communication signals (e.g. SigFox, LORA, MB-IoT).

- Supporting reliable weather stations - is the data reliable? Maintained? Funded? (AZMET, CIMIS)

- Smart Water Management as a standard piece of landscape contractor package of services.
Takeaways

1) Use water use data to determine ‘best’ sites for upgrades
2) Recommend appropriate products in the right order
3) Have a relationship with your Water Conservation office
4) Follow-through to ensure success on your project
Value Chain

Supply → Manufacturing → Distribution → End User
Manufacturing Overview
Design and Innovation

Meet the HP-48, the First Paver Light from FX Luminaire

NewDark Slate Finish Complements a Range of Applications.

Latest and Greatest

IDEAS

modulating PWM for more steps or more colours

Basic modulate on top of the PWM signal going into the driver chip. For example, if you had to go from 10% to 20% and based on the micro capacity let's say it was able to do 10 PWM... Read more

George Thakat
Under Review
9/26/2019
Design and Innovation: Materials
Design and Innovation: Low Impact Design
Design and Innovation: End of Life
Tooling and Manufacturing
Tooling and Manufacturing: Efficacy
Tooling and Manufacturing: Efficacy
Tooling and Manufacturing: Efficacy
Tooling and Manufacturing: Waste
Resources
Resources: Consumption
Resources: Measure and Manage
Quality Control
Transportation

We proudly offer UPS carbon neutral shipments

ups.com/ carbonneutral
Green Infrastructure
Green Infrastructure: Community
Green Infrastructure: Heath and Well-being
Green Infrastructure: Environment
Green Infrastructure: Economy
These Cities Are Replacing The Worst Kind Of Infrastructure With The Best

R.I.P. parking lots.
Green Infrastructure: Irrigation
Green Infrastructure: Balance Inputs and Outputs
Resource Efficiency
Waste

Linear Economy

Take resources from the ground

Make into products which are used

Waste discarded when no longer needed or wanted

Circular Economy

Regenerate natural systems

Design out waste and pollution

Keep products and materials in use
Partnerships

Recycle Your IRRIGATION CONTROLLER

BlueStar Recyclers | Ewing Irrigation & Landscape Supply | Hunter
Focus on disAbilities
Inspiration & Investment

CJ Garcia

Tony & Mary Fagnant
Solve Two Problems...

**Wasted Talent:** Of the 50 million people in the U.S. with a disability, less than 20% are participating in the labor force.

**Wasted Resources:** Of the 20-50 million tons of e-waste produced globally each year, less than 13% is recycled.

*Bureau of Labor Statistics, 2014*
**US News & World Report, 2014**
With one solution...

Ethically recycle electronics to create local jobs for people with autism and other disabilities.
A New Approach

Financially self-sustainable nonprofit

No dependence on outside funding

Asset vs. deficit-based employment model

Reduces taxpayer burden

Transforms waste into community benefit

Produces triple-bottom line impact
Impact To Date

- Social: Permanent employment for 40 people with disAbilities
- Environmental: 20 million lbs. of e-waste recycled
- Economic: 2018: $2.5 million in SROI ($2.65 return on every $1.00)

*As of July 1 2017
Workforce Advantage

- Less than 20% annual employee turnover
- Zero absenteeism
- Zero lost-time accidents
- 98% on-the-clock task engagement

“If I did not have my work, I would not have my life.”
Temple Grandin
Workforce Development Partnership

Cherry Creek Schools - Aurora, CO
Vocational Training/Bridge to Employment Program established 2014
All school district e-waste is sent to program and ultimately recycled by BSR
Students acquire and demonstrate skills for permanent employment with Blue Star

Win-Win-Win:

- BSR gets a qualified and trained employee
- Student has opportunity for first real job
- School District and taxpayer costs reduced

Kian Phair Age 18 – 2014
Transitions Program Student

Kian Phair Age 22 – 2018
Recycling Tech/ BSR
Closing The Loop

Consumer

OEM

BlueStarRecyclers

Certified Downstream Processor

Hunter Industries

Built on Innovation
Enterprise & Certifications

• Certified electronics recycling
• Data Destruction
• Computer Refurbishing
• Fluorescent Bulb Recycling
• Recycling events management
Locations:

Current Recycling Operations:

- Colorado Springs
- Denver
- Boulder

2019 Expansion:

- Chicagoland, IL
- Roaring Fork Valley, CO
Thank you!

www.bluestarrecyclers.org
Value Chain

Supply → Manufacturing → Distribution → End User
Creating partnerships to find solutions
Sharing the story
Wi-Fi Controller Are Revolutionizing / Disrupting The Irrigation Business!

Presented by:
John Newland
Irrigation Association
Agenda

1. Trends
   • Irrigation Market North America
2. What’s WiFi
   • General Knowledge
3. Wifi and your Business Future
   • Change your model
   • Get to Started
   • Plan
4. What I’m doing
Trends
Irrigation Trends
- Where are we going?

• 2020 Different Customer / Different Business owner
  • Fewer installations.
  • Water is a resource.
  • Aging systems.
  • Aging owners.
  • Technology improvements.

• IA Best Management Practices / on IA web site under “Standards”
Google and Amazon Set the bar!

• Customers expect you to be like Google & Amazon
• Smart Homes
• Smart Devices
• Anticipating customer needs
• WiFi Controllers are the answer
• Smart Devices
• Anticipate customers needs
Fewer Installs / Rebuild Future

- 43,000,000 + 1” systems in NA
- WiFi Controllers (Just taking hold)
- Water conservation
- Market to existing customers Base
- Owners need to think REBUILD FIRST
- Change Business to Proactive VS Reactive
So, what do WiFi Controllers have to do with this?

- Old Controllers you're waiting for the phone to ring
- WiFi Controllers you knowing your customer has a problem before they do
- Office does the monitoring
- Office Service call $$$$ 
- Free Service tech for tougher jobs
- Communication and scheduling office work
- Future is being in the “Water Management “ Vs Irrigation Repair Business!
Understanding WiFi Controllers
Market and Contractor Acceptance

2.5% Innovators  13.5% Early Adopters  34% Early Majority  34% Late Majority  16% Laggards
What is out there for tech?

- Cloud based control systems.
What is out there for tech?

- Different types of communication.
  - Ethernet, radio, pager, cellular, WiFi and bridge type hybrid systems.
What is out there for tech?

• Flow sensing.
  • Water passes over flow sensor impeller
  • Each revolution generates a pulse
  • The pulses are transmitted to the controller or converter
  • The Controller converts those pulses into GPM or LPM
What is out there for tech?

• Check out this list of “Smartphone-Friendly Irrigation Controllers IA Web Site Under SWAT”
Stuff to consider with this accessible technology?

- Method of Connectivity
- Stability of Platform / Recurring Charges
- Accessibility for Multiple Users and Onsite
- Security
- Ability to Sense Flow / Normally Open MV?
  - Incorporating flow sensing into your business?
- Type of Smart Control
  - Deficit versus predictive weather based control
- Business Improvement Reasons
Service Delivery

• System monitoring and inspections.
  • Technician inspects site twice annually (start up and shutdown).
  • System monitoring (Office Staff) requires someone to check at least daily what is going on and log info.
  • Reports include system performance, water use, events, i.e. rain delay, run time adjustments due to temperature.
Business Reasons

- Everyone of your current customers
- Upgrade System / Water Manager
- Can install a WiFi Controller in Winter
  - Keep guys working in off season
  - New revenue in Winter
  - Recurring Revenue
  - Increase Business Value
  - Less weather dependent
Potential Challenges

• Different way of thinking, managing and pricing services to customers
• YOU ARE THE BIGGEST CHALLENGE
• Being left behind
• Using office staff for basic issues
• Field Staff for more technical issue
• Education of clients and associates
Potential Challenges

• Service alerts must be continually managed, “emergency” calls and alerts must be managed.
• Setting expectations that monitoring and repairs are two different charges.
• Customer communication must be primary concern – may be contrary to company culture (texting, Email and phone)
Business Future
A Worthwhile Question

“If you continue to do the same thing over and over and get the same results, why would you expect anything different in the future?”
What is needed to get to the “next level”?

Good luck is the result of good planning.
A fool with a plan can beat a genius with no plan.
- T Boone Pickens
What is needed to get to the “next level”?
Know your cost!

- What does it cost to go back and adjust controller?
- Opportunity Cost
  - you could be doing something that you can bill out
- What do you value your time as an owner
A Trend (monitoring)

• Home Security and HVAC
  • Prices & Packages
  • ATD
  • Brinks
  • Home Generators
  • Sump Pumps
  • Hot Water Heaters
• Why not Water Management?
Annual Fee

- This annual fee ($75.00) covers the cost of monitoring your irrigation system. "Providing Peace of Mind"
  - Smart Water Scheduling
    - “Keeping it Green”
  - Flow Monitoring
    - leak or no water
  - Detects faulty wiring
  - Allows remotely shutting system down.
Plan & Equipment

**Good**
- Controller/Rain Sensor
- Remote Scheduling
- Smart Watering
- Electrical issues detected

**Better**
- Plus Flow Meter
- Plus Flow Meter
- Total Water Usage

**Best**
- Plus Master Valve
- Shut water off

- All Three Prepaid $75.00 annual fee
- No plan: $40.00 per adjustment offsite, standard service call on site.
What WiFi Controller to Sell?

1. 26 different WiFi Controllers
2. What one helps me change my business
3. Who manages the alerts?
   • Owner, Service techs, office staff
4. Office Staff is the answer
   • Easier to find, hire & train
   • They schedule and communicate
   • Wifi alerts integration with office a must.
What I’m doing
Hunter’s Hydrawise Controller Sends Alert
Directly into my office’s HindSite Software
Office staff processes the Alert

• By texting customer

Your Hydrawise controller appears to be offline. Please reboot it at your convenience.
Or by scheduling a Tech to repair issues
Hunter Hydrawise & HindSite Software

1. Direct communication from customer controller into your HindSite Software base.

2. Office Staff does all the managing of the alerts.
   a. Office staff makes can automatically communicate with your customers
   b. Hydrawise marketing templates integrated with HindSite Connect to make marketing very easy to your customers.
   c. A number of contractors have sent 1 email and sold 50-75 Hydrawise controllers as off season upgrades
Summary

1. Get in with both FEET
2. Market as an upgrade to existing clients.
3. Wifi controllers can be installed in winter months
4. Don’t forget about Wifi controllers for new installs
5. Controller and office Software need to be integrated.
Protect the Heart of the Irrigation System - The Pump

C J PHENE II
PRESIDENT
EPIPHENE, INC
“What gets us into trouble is not what we don't know. It's what we know for sure that just ain't so.”

— Mark Twain
Outline

• Downhole Pumps - Sand Protection
• Self-Cleaning Suction Screens
• Strainers
• Flow Control Solutions
Car Analogy

- Fuel Filter
- Oil Filter
- Air Filter
- Fuel Injection Nozzles
Downhole Pumps – Why Sand Protection?

• Declining well water levels
• Decreased well production
• Silt and Sand intrusion
• Damage to bowls and impellers

MAIN BENEFITS
INCREASES LIFE OF PUMP UP TO FIVE TIMES
MAINTAINS FLOW AND HEAD FOR LONGER
Downhole Pumps – Solutions for Turbines
Downhole Pumps – Solutions for both Submersible and Turbine

• Important Factors to consider:
  • Casing Inside Diameter
  • Water Level
  • Pump level
  • Depth to bottom of well

• Typical Requirements to consider:
  • Correct Connections & Approach
  • Does the pump have minimum head requirement to operate the downhole separator?
  • Does it change during season?
  • Does it have minimum of 30 ft to bottom?
Why Self-Cleaning Suction Screens?

- Protect Centrifugal or Close Coupled Turbines from
  - debris,
  - aquatic beasties,
  - and algae
What Are Self-Cleaning Suction Screens?

• Centrifugal
• Close Coupled Turbines
• Video Example
Self-Cleaning Suction – Solutions for both Submersible and Turbine

• Important Factors:
  • Flow Rates
  • Debris Expected
  • Inlet Velocities
  • Protecting Screen Collapsing & Pump From Cavitating
  • Drive Type

• Typical Requirements:
  • Always Oversize
  • Algae, Fish & Frogs, other debris
  • Maximum Inlet velocity .4 fps
  • Vacuum Gauge with Switch
  • Diesel or Electric
Why Strainers?

• Protects the Pump
• But also protects downstream components
  • Check Valves
  • Control Valves
  • Filters
• Bottomline:
  • Safety Screen
• **Rather clean a strainer than chase down issues in downstream components**
Types of Strainers

Y STRAINERS

BASKET STRAINERS
Design Consideration

Y STRAINERS

• More Flexible Installation
• Flushable
• More turbulence
• Higher Friction Loss

BASKET STRAINERS

• Only installed one way
• Not Flushable
• Less turbulence
• Lower Friction Loss
Types of Strainers

Y STRAINER

Y STRAINER
Types of Strainers

BASKET STRAINER

BASKET STRAINER
Strainer - “Saving Energy”

Smaller screen has less surface, reducing flow. Less surface area means screen clogs more quickly.

Up to 30% larger screen has more surface area. Flow travels smoothly through more holes. Clogs less.

Conventional Old Y Strainer
Same design since 1908

New LPD Y Strainer
Designed 2016
Strainer - “Saving Energy”

Bridge wall restricts flow, increases velocity and increases pressure drop.

No bridge wall. Flow is smooth with very low pressure drop.

Conventional Old Y Strainer
Same design since 1908

New LPD Y Strainer
Designed 2016
Strainer - “Saving Energy”

Orange and red bubbles show increased velocity as flow is squeezed into cavity.

Flow is straighter. Velocity remains almost unchanged, pressure drop is low, maximizing NPSH.

Conventional Old Y Strainer
Same design since 1908

New LPD Y Strainer
Designed 2016
Strainer - “Saving Energy”

LPD Strainer
Low Pressure Differential "Y" Strainer

Flow Through Design – No Obstructions & Lower Pressure Loss

Flow Capacity often exceeds Basket Strainers of the same size – No need to Upsize

Differential Pressure Ports

Access Port for Injection Or Flow Sensor

Installation Option Vertical & Horizontal 4 to 8 O’Clock Allowed – Less Clearance than most Basket Strainer Sizes

More Open Area to Pipe – Less Clogging

Significantly Larger Screen – Less Clogging & More Storage

Detachable Bottom 4 Bolts – Easy Access

Manual or Automatic Flushing Port – Minimizes Service
Strainer – Design Flows

Flow vs. Pressure Drop

<table>
<thead>
<tr>
<th>Size</th>
<th>Cv</th>
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<tbody>
<tr>
<td>2</td>
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# Strainer – Design Flow Comparison

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</tbody>
</table>

Graph showing Cv Comparison LPD vs Basket Strainer.
Strainer – Design Flow Comparison

Area Comparison LPD vs Basket Strainer

NPS PIPE SIZE

0 250 500 750 1000 1250

INCHES

Basket Strainer Area (in2)  LPD Strainer Area (in2)

NPS PIPE SIZE

2 2.5 3 4 5 6 8 10 12

Epiphene, Inc - Copyright 2019
Price Comparison LPD vs Basket Strainer

NPS PIPE SIZE

Basket Strainer Cost
LPD Strainer Cost

Epiphene, Inc - Copyright 2019
Strainer - “Saving Energy”
Why Flow Control Solutions?

• Minimizes Turbulence
• Minimized Friction Loss
• Improves Asset Life
  • Pump
  • Motor
  • Control Valves
  • Check Valves
  • Pressure Sensors
  • Flow Meters
• Pump & Devices Operate at Design
Why Flexible Connector Solutions?

• Minimizes Vibration
• Mitigates Thermal Expansion Issues
• Easier Connections In the Field
• Strain Relief
• Offers some seismic protection
STRAINER & FLOW CONDITIONING
REMOVING TURBULENCE

• SUCTION DIFFUSER

• FLOW CONDITIONER

Stationary, curved fins rotate flow so it moves smoothly through the elbow.
Flow Conditioning
“Saving Energy & Assets”

BEFORE
- Balancing valve manufacturer requires length of pipe equal to 3 to 10 pipe diameters from pump to valve.
- Turbulence from pump can damage valve and make balancing impossible.
- Suction diffuser causes significant pressure drop as it converts turbulent flow prior to entering pump.
- Rarely cleaned, screen is not designed for debris collection. When cleaned, it requires complete system shutdown.

AFTER
- "Y" strainer with large screen designed for debris collection.
- Significantly smoother flow. Flow enters valve with even less turbulence than using long length of pipe. Balancing is easier and more accurate.
- Suction Diffuser Flex isolates vibration and "turns" flow to create a smooth entry and exit from elbow.
- Vane Flex isolates vibration and smooths turbulent flow in a fraction of the space.
BEFORE ELBOW FLOW CONDITIONING
REMOVING TURBULENCE

SUCTION DIFFUSER – 2” THRU 16”
Flow Conditioning

4.5% Flow Increase

7% HP Reduction

8.6% Discharge Head Increase

Epiphene, Inc - Copyright 2019
Flow Conditioning

Standard Suction Diffuser Flex Configurations

Long Radius Elbow
- Suction Diffuser Flex with 150# plate flanges for connecting to a long radius elbow
- Suction Diffuser Flex with 150# plate flange x groove end for connecting to a long radius elbow
- Suction Diffuser Flex with 150# plate flanges with concentric reducer for connecting to a long radius elbow

Short Radius Elbow
- Suction Diffuser Flex with 150# plate flanges for connecting to a short radius elbow
- Suction Diffuser Flex with 150# plate flange x groove end for connecting to a short radius elbow
- Suction Diffuser Flex with 150# plate flanges with short radius 90° elbow

90° Reducing Elbow
- Suction Diffuser Flex with 150# plate flange with 90° reducing elbow
- Suction Diffuser Flex with 150# plate flange x groove end with concentric reducer for connecting to a short radius elbow
Flow Conditioning

10 pipe diameters

Vane Flex
Flow Conditioning

Standard Vane Flex Configurations

- Vane Flex with 150# plate flanges
- Vane Flex with 150# plate flange x grooved
- Vane Flex with 150# plate flanges with concentric reducer
- Vane Flex with 150# plate flange x grooved with concentric reducer
- Vane Flex with 150# plate flanges with 90° reducing elbow
- Vane Flex with 150# plate flange x groove with 90° elbow
- Vane Flex with 150# plate flange x groove with 90° reducing elbow
- Vane Flex with 150# plate flange with 90° elbow
Flow Conditioning
Rigid Configurations

2” thru 12”
Summary

- Design of Pump Station Impacts System Performance
- Minimization of Turbulence
- Minimization of Friction Loss
- Increased Design Flexibility
- Increased Reliability
- Improved Asset Life
- New Tools exist to address issues
- Economically Viable with Quick Paybacks
Long-Term Value vs Short-Term Cost
Defining the terms...

Long-Term Value

• **Value**: is a complicated thing to measure because it means different things to different people at different times.

• **Long-Term Value**: is simply taking that undefined value and multiplying it over time.
What is the Value of this $100?

What can you buy with $100?
Clark County, in 2017, by the numbers:

• Casinos grossing more than $1 million in gaming revenue: 161

• Total casino gaming revenues in Clark County: $9,589,605,525

• Total casino gaming revenues on the Las Vegas Strip: $6,038,883,957

In 2016, the typical visitor spent an average $827 gambling.
So, what is the value **your** money?

How do you decide when and where to spend it?
In 1910 John Dewey, an American philosopher, introduced a five-stage consumer behavior model still used today.
**Problem Recognition – Perception of a Need**

**Need:** Financial needs are expenditures that are essential for you to be able to live and work.

- Housing
- Transportation
- Gas and Electricity
- Insurance
- Food

**Want:** Are expenses that help you live more comfortably. They’re the things you buy for fun or leisure. You could live without them, but you enjoy your life more when you have them.

- Travel
- Entertainment
  - Coffeehouse Drinks
  - Gym
  - Designer Clothes
Information Research – Seeking Value

This is the buyer’s effort to search internal and external business environments, in order to identify and evaluate information sources related to the central buying decision.

Your customer may rely on print, visual, online media or word of mouth for information.
Alternative Evaluation – Assessing Value

All the various points of information, collected from all the different sources, are used in evaluating alternatives and their attractiveness.

While evaluating goods and services, different consumers use different bases.

Generally, the consumers evaluate these alternatives based on the attributes of the product, the degree of importance, belief in the brand, satisfaction etc. to make their decision.
Purchase Decision – Buying Value

- **Where should I buy it?** Influenced by price, terms of sale, familiarity of the company, the return policy, urgency of need and availability etc.

- **When to buy it?** Influenced by the store or website atmosphere, timing of need (holiday or birthday), is it on sale, the overall shopping experience.

- **When not to buy it?** Alternatively, they may also decide that they want to make the purchase at some point in the future.
Customers will often compare their expectations to previous experiences and will be either ecstatic, satisfied or dissatisfied.

If your customer is ecstatic the result is total brand loyalty.

A satisfied customer will likely purchase again – but possibly could be lured away.

A dissatisfied customer will likely never purchase again.

This is a critical stage for retention of customers.
What else do really happy, or really unhappy, customers do?

87 percent of e-commerce shoppers believe social media plays a vital role in their shopping decisions. (Adweek, 2018)

78 percent of online shoppers value the availability of product reviews by other shoppers. (NPR/Marist, 2018)
The 5 Stage Process to Buying Decision

1. Problem recognition: Perceiving a need
2. Information search: Seeking value
3. Alternative evaluation: Assessing value
4. Purchase decision: Buying value
5. Postpurchase behavior: Value in consumption or use
Know your customer...

Where ever your place is in the irrigation industry - manufacturer, distributor, contractor, installer - understanding the buying decision process of your customer should help you make the process easier and more appealing to those customers.

Consumers: Are influenced by price but are also concerned about product quality and durability, suggesting their preference towards purchasing high quality products at an equitable price rather than searching for cheaper products.
Know your customer...

Present-day consumers make more informed purchasing decisions through their own research evaluating available alternative solutions rather than being overly reliant on the information provided by a sales representative.

For corporate end users: Product price is only a fraction of the overall cost involved. Most industry verticals would be willing to trade-off paying more for a solution that would avoid interruption of work at a critical delivery window. (Stax-Insights, 2016)
“The bitterness of poor quality remains long after the sweetness of low price is forgotten.”

Ben Franklin
Pump station retrofits
What, Why, and When
We’ll discuss…

- WHAT is a retrofit
- WHY might you want to consider retrofitting
- WHEN might a retrofit make sense… and when it doesn’t
What is a retrofit?

• Not one size fits all...
  • Updating existing equipment
  • Replacing broken or undersized components
  • Replacing the controls
  • Mostly new components
  • All new components built to align with existing plumbing and fixturing
What is a retrofit?

So, it could be…

Almost anything other than a brand new pump station that does not utilize existing plumbing
What is a retrofit?

- Things to consider
  - Age of the station
  - Condition of the station
  - Structural soundness
  - Mechanical soundness
  - Properly maintained
  - Is expansion needed now… or in the future
  - Could water or energy efficiency be improved?
  - Integration with irrigation management system
Why consider a retrofit?

• Use the existing infrastructure
  • Cost considerations
  • Avoid site damage
  • New approvals
  • Environmental considerations
Why consider a retrofit?

- **Cost considerations**
  - Changing the infrastructure can be cost prohibitive.
  - Engineering fees
  - New Buildings
  - Retrofitting allows savings on any components that can still be utilized
Why consider a retrofit?

• Avoid site damage
  • Changing the infrastructure can cause harm to established vegetation.
  • Removing old growth trees
  • Moving transformers
  • Extended heavy equipment use
  • Retrofits may mean less disruption
Why consider a retrofit?

- New approvals
  - Changing the infrastructure may require engineering approval
    - Engineered sump designs
    - Electrical designs
    - Civil Designs
  - Retrofits may not require new approvals
Why consider a retrofit?

• Environmental considerations
  • Retrofits may be environmentally friendly
  • We’re good stewards of resources when we reuse functional equipment – utilizing motors, controls, piping, etc.
  • Minimize scrap waste, motors, e-waist etc.
When might a retrofit make sense?

- Older pump stations may not utilize current technology.
  - VFDs and new pump product designs lead to higher efficiency.
  - US motor efficiency standards have changed and all new motors are required to meet the minimum DOE standards.
  - Pump efficiency rules have also changed and certain pump styles are now required to meet a minimum efficiency standards. (Horizontal centrifugal pumps).
When might a retrofit make sense?

- Older pump stations may not utilize current technology.
  - Energy companies may offer upgrade rebates for VFD’s and premium efficient motors.
  - Eliminating antiquated hydraulic control valves. Pressure sustaining, pressure reducing valves and solenoid valves.
When might a retrofit make sense?

- New sensing devices.
  - Flow meters with higher accuracy and lower flow range.
  - Pressure transducer's in place of pressure switches.
When might a retrofit make sense?

- Upgrading to PLC’s.
  - Ability to control the pump station with higher accuracy.
  - Reporting capabilities, flow, pressure trends.
  - Remote monitoring.
Example 1

Horizontal centrifugal station that is aging and has experienced loss of prime issues
When it makes sense...

Example 1

Consider retrofitting to vertical turbines
Example 2

Existing 5 hp pump station utilizing a pressure sustaining valve
When it makes sense...

Example 2
Consider retrofitting by adding a VFD
When it doesn’t make sense…

- New installation
- Structure failing or surrounding infrastructure not sound
- 3. New requirements for retrofit do not fit existing infrastructure.
Wrap up…

• WHAT is a retrofit

• WHY might you want to consider retrofitting

• WHEN might a retrofit make sense… and when it doesn’t
Water efficiency vs Energy efficiency
What’s the difference?

Water Efficiency
vs
Energy Efficiency

What’s the Difference?
Water efficiency vs Energy efficiency
What's the difference?

PROGRAM

• About the Presenter – career experiences
• WE vs EE – what’s the difference’?
• Applying energy efficiency in irrigation

By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water efficiency vs Energy efficiency
What’s the difference?

About the Presenter

• Mixed farm GULNARE, South Australia
• 1948 - 1958
• 2km creek for playground
• Did farm “apprenticeship”
• Innovation permeated farm life
• Made own toys etc
• Pedal car = prime mover
• Challenged status quo throughout life
Water efficiency vs Energy efficiency
What’s the difference?

South Australia

Driest State of the Driest Continent in the World

Murray/Darling catchment

2/3 size of Mississippi/Missouri

South Australia
- 95% area < 10” rainfall
- River Murray lifeline
- 1.5 x area of Texas

By Robert L Welke
Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water efficiency vs Energy efficiency

What’s the difference?

Note that USA almost all above 30\textsuperscript{th} Lat Nth. Australia almost all above 30\textsuperscript{th} Lat Sth.

Therefore, Australia much hotter/drier climate.
PUMP TESTING with SA Water for 20 years.

- Adelaide, 1.2 million
- Dry year, 90% water pumped from River Murray
- 1000’ lift, 3 or 4 stages
- 4 major pipeline systems
- Approx 130,000 kW (175,000 HP)
- $millions/annum pumping costs
- > 1000 pump tests over 20 yrs

Murray Bridge – Onkaparinga Pipeline and No 3 PS
3 x 5,600 kW pumps (7,500 HP each)
By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia

Water efficiency vs Energy efficiency
What’s the difference?

PIpine FrIction
Testing
with SA Water for 20 years

- From largest (1.8m) to smallest (80mm) pipeline, (Hazen & Williams “C” Values)
- Determine maintenance policy
- Pumping economics

Mannum – Adelaide Pipeline No 3 PS (1955)
3 x 1,600 kW pumps (2,500 HP each)

Murray Bridge – Onkaparinga Pipeline and No 3 PS (1973)
3 x 5,600 kW pumps (7,500 HP each)
Water efficiency vs Energy efficiency
What’s the difference?

Pump Design and Build
Hydrotech (Aust) 6 yrs
- 100 pumping systems
- Turf, Horticulture, Ag, Golf
- Design, Build, Commission
- Engineered Product

Defining moment

“There’s a wheel barrow in my Pipeline”
- 10 km of 450NB PVC
- Pumps reduced output
- Pipeline friction test, 2000
- Willunga Basin Water Co

By Robert L Welke
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Adelaide, South Australia
Water efficiency vs Energy efficiency
What’s the difference?

Tallelenco Pty Ltd 2003 to present
- Designed P.S. up to 3,000 l/s
- Bore draw-downs
- Field Evaluations – Irrigation (CIAL Certified)

System Evaluations
- Pumping systems
- Pipeline systems
- Irrigation systems
- Pumping Energy Efficiency audits

Pump Design 3 yrs
HydroPlan (Aust)
- Pumping systems
- Pipeline systems, Dams
- Irrigation systems (drip)
Water efficiency vs Energy efficiency
What’s the difference?

Tallemenco Pty Ltd 2003 to present, (16 yrs)

Pumping System Evaluations

- Pumping Energy Efficiency audits, identified > $630,000 annual elect savings
- More energy efficiency losses in pipes (hydraulics) than in pumps
- Case Study: Pumping energy efficiency audit, Windsor NSW turf farm (for DPI NSW 2014)
  - Efficient Lateral Move
  - 90% losses in pipes
  - 10% losses in pump  

Defining moment
Water efficiency vs Energy efficiency

What’s the difference?

How many “MPG” does your pump system do?

$$$/yr^* = 3.15 \times \text{feet head} \times \text{c/kWh} \times \text{Mg/yr} \times \text{motor } \eta \times \text{pump } \eta \times \text{drive } \eta$$

*Refer www.talle.biz/data.html

Elevation
Filter head loss
Main line head loss
Laterals head loss
Layflat hose head loss
Emitter head loss
Residual head

Pump less water
a) scheduling
b) Soil moisture monitoring

Motor efficiency fixed

Motor \eta \quad \text{MkW} \quad \text{Pump } \eta

Tariff – choice of
- peak
- Off-peak
- Week-end

Pump efficiency
- Worn
- off-BEP

EkW

WkW
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency

a) Water Requirement
b) Irrigation scheduling
c) Distribution Uniformity
d) Crop water use efficiency

V’s

Energy Efficiency

a) Head pumped
b) Pump effy
c) Motor effy
d) Tariff (c/kWh, $/litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency
What’s the difference?

Water Efficiency  V's  Energy Efficiency

Water Efficiency:

a) Water Requirement
b) Irrigation scheduling
c) Distribution Uniformity
d) Crop water use efficiency

e) ML pumped

Energy Efficiency:

a) Head pumped
b) Pump effy
c) Motor effy
d) Tariff (c/kWh, $/litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency
What’s the difference?

Water Required vs Pumped Volume

Soil Moisture Monitoring

Eg, Capacitance Probe

Less irrigation = less pumping costs.

Total water holding capacity of soil

Rain Rain 1 Week Rain Irrigation

By Robert L Welke
Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water Efficiency vs Energy Efficiency

What’s the difference?

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Water efficiency vs Energy efficiency
What’s the difference?

Irrigation Scheduling vs Pumped Head

Sanctuary Cove Resort, Gold Coast, QLD. 2010

Manual scheduling 1
70 acres landscaping site, 31 stand alone controllers
Pump system failing on low pressure

Concentration of scheduling resulted in high peak flow rates, high head losses in pipes

Charts: R Welke

By Robert L Welke
Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor Adelaide, South Australia
**Water efficiency vs Energy efficiency**

*What's the difference?*

By Robert L Welke

Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor

Adelaide, South Australia

---

**Irrigation Scheduling vs Pumped Head**

**Manual Scheduling 2**

28Ha landscaping site, 31 remote controllers

Rescheduling optimised pump duty required

---

Charts: R Welke

Rescheduling reduced peak flow by 35%, resulting in less friction losses.
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency  V’s  Energy Efficiency

a) Water Requirement
b) Irrigation scheduling
c) Distribution Uniformity
d) Crop water use efficiency

a) Head pumped
b) Pump effy
c) Motor effy
d) Tariff (c/kWh, $/litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency
What’s the difference?

Irrigation Scheduling vs Pump Effy/motor effy

Irrigating cabbages 57kW (75hp) diesel
Lindenow, VIC. 125x100-315
Mitchell River 2950rpm pump

Can affect energy efficiency if irrigation flows are reduced or increased.

By Robert L Welke
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Adelaide, South Australia
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency  V’s  Energy Efficiency

a) Water
   Requirement
b) Irrigation
   scheduling
c) Distribution
   Uniformity
d) Crop water
   use efficiency

a) Head pumped
b) Pump effy
c) Motor effy
d) Tariff (c/kWh, $/litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency

What’s the difference?

Irrigation Scheduling vs Pumped Volume

- Clay soil
- 6 water melon plants
- 8” x 8” soil (paver removed)
- Pulse irrigation (Hunter X-Core)
- 1 x Shrubblrer
- Pulse application
- 1 minute x 4 times/day
- 0.7 litre per application
- 360 litres (95 US gall) total
- 9 melons
- 86kg (190 lb) crop

Irrigation Scheduling – pulse irrigation
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency

a) Water Requirement
b) Irrigation scheduling
c) Distribution Uniformity
d) Crop water use efficiency

V’s

Energy Efficiency

a) Head pumped
b) Pump effy
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d) Tariff (c/kWh, $/Litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

Scheduling Co-efficient

- If CU/DU down
- SC up (Scheduling Coefficient)
- Eg, DU falls from 84% to 73%
- SC rises from 1.3 to 1.6
- That’s 23% more water required

Example:
Toro 640 @ 450 kPa
DU = 84%
SC = 1.3

Example:
Toro 640 @ 350 kPa
DU = 73%
SC = 1.6

Image: Space Pro by Hunter
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

Example: Toro 640 @ 350 kPa
DU = 73%
SC = 1.6

Restoring Pipeline efficiency – known as Pigging or Swabbing (removing the wheel barrows)

SC Restored
Toro 640 @ 450 kPa
DU = 84%
SC = 1.3

Image: Space Pro by Hunter

Pigging 6” PVC, Penrith NSW

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Water efficiency vs Energy efficiency
What’s the difference?

Pipeline friction

Combine “Hazen & Williams” and “Darcy Weisbach Friction factor”
Graph of “Pipe Wall Roughness” to “C” value

Reduction of 10% pipe efficiency (C=135) due to only 0.1mm (4 thou) of pipe wall roughness.
This level of roughness cannot be seen with naked eye.
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

Irrigation Trust, SA
2 x 270hp pumps
675 acres vines, almonds, citrus

- Founded 1968
- 15”, 12”, 10”, 8” Asbestos Cement pipes
- Audited 2015
- H&W C Value new = 140, now = 80 to 110
- Bryozoa - aquatic invertebrate animals (20 thou long)
- Overheads at end of farm < ½ irrigation radius
- DU’s 10 to 20%
- PIR reduced 40% to achieve required distribution efficiency

Long term solution: Replace pipes

River Murray, Mannum SA
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

Pump Corrosion (Pump efficiency and H-Q loss)

Materials Evaluation

Blue Lake PS, Mt Gambier, SA. 1971

Austenitic Cast Iron casings (Ni Resist)
- Resistance to sea water corrosion
- used on ships propellers
- Ni 20.0, Cr 2.5, C 3.0, Si 2.0, Mn 1.0 typ.

- Tested after 1 year for efficiency
- Down 10%
- Casings badly corroded
- Materials specific to water quality

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Associate Diploma, Mechanical Engineering,
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Adelaide, South Australia
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

Impeller Coatings Evaluation
Mannum Adelaide No. 1
Pumping Station. 1975
Cast Iron casings, Bronze impellers
- pump tested, efficiency recorded
- impeller coated - DULUX gloss enamel
- pump retested – 4% efficiency gain
- pump tested 1 yr, lost η% and paint

Conclusions
- smooth coating > increased η%
- conventional coatings not satisfactory
- search for hi-tech coatings
- adopted “Belzona”, 25% metallic content

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Adelaide, South Australia
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

**Impeller Coatings** *(pump corrosion)*

Eg, Irrigation and Water Supply Pumps, Riverland Region, SA, 1980’s

Eliminate Blulon (asbestos) gland packing
- move to mechanical seals
- rotating elements balanced
- pump casings coated (Belzona)
- impellers coated (Belzona – 25% metal)

Pumps tested less regularly
- Sustained efficiency
- High reliability

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Adelaide, South Australia
Water efficiency vs Energy efficiency
What’s the difference?

Distribution Uniformity vs Pumped Head

**As designed**
- 25 l/s flow
- 10m head loss

**Optimized pipe system**
- Extend 6” by 150m
- Shortened 4” by 50m
- Shortened 3” by 100m
- Gained 3.4m
- Saved $13,400 / 15 yrs

**Modified**
- Add 3 l/s end of pipe
- 8m extra head loss
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency

- a) Water Requirement
- b) Irrigation scheduling
- c) Distribution Uniformity
- d) Crop water use efficiency

Energy Efficiency

- a) Head pumped
- b) Pump effy
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- d) Tariff (c/kWh, $/Litre diesel)
- e) ML pumped
Water efficiency vs Energy efficiency

What's the difference?

Irrigation Trust, SA
2 x 270hp pumps
675 acres vines, almonds, citrus

- H&W C Value new = 140, now = 80 to 110
- Overheads at end of farm < ½ irrigation radius
- DU’s 10 to 20%
- PIR reduced 40% to achieve required distribution uniformity
- Overflow irrigation into higher day time tariff

By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
## Water Efficiency vs Energy Efficiency

### What's the difference?

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<td>d) Crop water use efficiency</td>
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<td></td>
<td>e) ML pumped</td>
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</table>
Water efficiency vs Energy efficiency

What's the difference?

Crop Yield vs Pumped Volume (+ Scheduling + Tariff)

Sugar cane crop, Nth QLD

**BEFORE**
- PIR 11mm/day (43 pts/day)
- CP/LM or Big Gun (SC 1.2/1.6)
- 11 ML/Ha (8.9 ac.ft)
- Evenly across crop life
- 95 t/Ha (38t/ac) ave
- $2600/Ha ($1040/ac) ave

**AFTER**
- PIR 14mm/day
- Sub Surface Drip (+30% CAPEX, -30% pumping head, -30% SC)
- 7 ML/Ha (5.7 ac.ft)
- (50% less kWh pumping)
- Growth based irrigation (flowering/fruiting)
- 137 t/Ha (55t/ac) ave, 238t/Ha max
- $4500/Ha ($1800/ac) ave

Example per Jim Phillips, ASIC's Aussie member – ph +61 435 187 486

ML x 0.81 = ac.ft
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency

a) Water Requirement
b) Irrigation scheduling
c) Distribution Uniformity
d) Crop water use efficiency

V’s

Energy Efficiency

a) Head pumped
b) Pump effy
c) Motor effy
d) Tariff (c/kWh, $/Litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency

What’s the difference?

Irrigation during day time
“crop water uptake”
= higher tariff costs

Crop Yield vs Tariff

Sugar cane crop, Nth QLD

Example per Jim Phillips, ASIC’s Aussie member – ph +61 435 187 486

BEFORE
- PIR 11mm/day (43 pts/day)
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ML x 0.81 = ac.ft

5.5m 18’

1.8m 6’
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency V’s Energy Efficiency

Summary

a) Water Requirement
b) Irrigation scheduling
c) Distribution Uniformity
d) Crop water use efficiency

a) Head pumped
b) Pump effy
c) Motor effy
d) Tariff (c/kWh, $/Litre diesel)
e) ML pumped
Water efficiency vs Energy efficiency

What’s the difference?

Water Efficiency V’s Energy Efficiency

- Where can energy be saved?
- How to design best practice energy efficiency irrigation systems
- Get more “MPG” from your pumping system!
Irrigation System Design approach - typical

Water efficiency vs Energy efficiency
What’s the difference?
Irrigation System Design approach - typical

Water efficiency vs Energy efficiency
What’s the difference?

By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water efficiency vs Energy efficiency

What’s the difference?

Irrigation System Design approach - Tallemenco

Irrigation design

Pumping/pipeline design

By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Pumping Energy Efficiency
More than just testing pumps....

By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water efficiency vs Energy efficiency

What's the difference?

Where can energy be saved?
Water efficiency vs Energy efficiency
What’s the difference?

Pump efficiency
Typically < 50%
Recoverable energy losses

Hydraulic efficiency
Excess Friction losses + excess residual
Typically > 50% recoverable energy losses

Where can energy be saved?

Excess residual head

Mains
Submains
Pipe ageing
Pump suction
Valves
Filters

Friction loss controllable by design and maintenance

Pump efficiency

Total Pumped Head

Emitters

Lift (fixed)
Water efficiency vs Energy efficiency
What’s the difference?

Conduct a pump efficiency audit

✓ Subtract adjacent pressure readings, flow
✓ Compare with manufacturer’s curve
✓ Assess potential energy improvement
Water efficiency vs Energy efficiency
What’s the difference?

Conduct a pumping system energy efficiency audit

- Subtract adjacent pressure readings, flow
- Compare with best practice
- Assess potential energy improvement

What is “best practice”?

By Robert L Welke
Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water efficiency vs Energy efficiency
What’s the difference?

TALLEMENCO – 2 Day Workshop Training

“Pumping System Master Class”
(Teaches how to design pumping energy efficiency principles into new irrigation systems)

- Re-defines “pumping energy efficiency for irrigation”
- Numerous software for energy efficiency design
- Comments:
  - “This training course has no equal...” Senior Irrigation Designer
  - “The course was excellent, it has definitely raised the bar for NZ irrigation pumping design”. PGG Consultant, New Zealand
  - “Rob, I learned sooooo much..” 51 yr veteran, water operations engineer, Lower Murray Water

“Limits of Operation”
Determined by Rob’s 5 decades of pumping & hydraulics experience

By Robert L Welke
Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia

By Robert L Welke
Associate Diploma, Mechanical Engineering, Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia
Water efficiency vs Energy efficiency

What's the difference?

Water Efficiency  V's  Energy Efficiency

Proudly presented
by

Rob Welke, Tallemenco

Thank you
WaterSense Update: Weather-Based Irrigation Controllers and Soil Moisture Sensors

Stephanie Tanner, EPA WaterSense
Julius Duncan, EPA WaterSense
Joanna Kind, ERG

December 5, 2019
Agenda

- Weather-based irrigation controllers: specification review
  - Review information gathered
  - Decision
- Soil moisture sensors: draft specification
  - Scope
  - Performance criteria
  - Supplemental capability requirements
  - Packing and labeling
  - Testing configuration and compatibility
  - Certification
- Next steps
What is WaterSense

WaterSense is a voluntary partnership program launched by EPA in 2006 that provides a simple way to identify water-efficient:

- Products
- Programs
- Practices
- Homes

Products are independently certified for water efficiency and performance

Photo: Judith Chaddock
The WaterSense Vision

- WaterSense offers people a simple way to use less water
- Our vision is that all Americans will understand the importance of water efficiency and take actions to reduce their water use – in their homes, outdoors, and at work

How will we achieve it?

- By transforming the marketplace for products and services that use water
- By promoting a nationwide ethic of water efficiency to conserve water resources for future generations and reduce water infrastructure costs
WaterSense Program Overview

Actions that can be taken to reduce water use – at home, outdoors, and at work

Practices

Products

People

Fixtures and technologies save water

Partners reach users to change behavior
WaterSense Product Evaluation Factors

WaterSense uses the following factors in determining which products to label. Products must:

- Offer equivalent or superior performance to conventional models
- Be about 20 percent more water-efficient than conventional models
- Realize water savings on a national level
- Provide measurable results
- Achieve water efficiency through several technology options
- Be effectively differentiated by the WaterSense label
- Be tested and independently certified
WaterSense Labeled Products

- **Lavatory Faucets**
  - Labeled since 2007
  - 18,000 labeled models

- **Tank-Type Toilets**
  - Labeled since 2007
  - 3,900 labeled models

- **Flushing Urinals**
  - Labeled since 2009
  - 700 labeled models

- **Showerheads**
  - Labeled since 2010
  - 9,100 labeled models

- **Weather-Based Irrigation Controllers**
  - Labeled since 2011
  - 800 labeled models

- **Flushometer-Valve Toilets**
  - Labeled since 2015
  - 1,500 labeled models

- **Pre-Rinse Spray Valves**
  - (Recently Sunset)
  - Labeled from 2013 to 2018
  - 30 previously labeled models

- **Spray Sprinkler Bodies**
  - Labeled since 2017
  - 200 labeled models

*Data as of September 2019*
Accomplishments

3.4 trillion gallons of water saved since 2006!

2007 – 2015
2016
2017
2018

725 billion gallons saved in 2018

Saving consumers $84.2 billion in water and energy bills
Weather-Based Irrigation Controllers
Specification Review
The America’s Water Infrastructure Act of 2018

- Formally authorized the WaterSense program
- Directed EPA to:
  - Enhance awareness of the label
  - Preserve the integrity of the WaterSense label
- Defined the scope of products and systems that could be included in the program
- Provided direction on the frequency and process for revision of product specifications
- Directed WaterSense to institute a comprehensive review of products specifications developed before 2012.
  - Specifically, not later than December 31, 2019 EPA shall, “consider for review and revise, if necessary, any WaterSense performance criteria adopted before January 1, 2012.”
## Specification Review Process

<table>
<thead>
<tr>
<th>Thru Mar 2019</th>
<th><strong>Internal Research</strong></th>
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<tbody>
<tr>
<td></td>
<td>• Update product information, analyze WaterSense product database, conduct industry research</td>
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<tr>
<td></td>
<td>• Issue <em>Notice of Specification Review</em> and hold first stakeholder meeting</td>
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<tr>
<th>Mar-Jun 2019</th>
<th><strong>Stakeholder Engagement</strong></th>
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<tr>
<td></td>
<td>• Hold meetings with individual partners, standards committees, industry experts, and utilities</td>
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<tr>
<td></td>
<td>• Review comments, conduct additional analysis based on in house data</td>
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<td></td>
<td>• Hold product type meetings with stakeholders to review information collection to date</td>
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<tr>
<th>Jun-Aug 2019</th>
<th><strong>Analysis</strong></th>
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<tbody>
<tr>
<td></td>
<td>• Compile additional comments received and post to website</td>
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<tr>
<td></td>
<td>• Review and analyze information collected</td>
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<td></td>
<td>• Continue engagement with standards committees and industry as necessary</td>
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<table>
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<tr>
<th>Aug-Dec 2019</th>
<th><strong>Develop Recommendations and Announce to Stakeholders by December 31, 2019</strong></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Develop recommendations and review with EPA Management</td>
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<tr>
<td></td>
<td>• By December, present recommendations, post material to website, host public meetings</td>
</tr>
</tbody>
</table>
Specification for Weather-Based Irrigation Controllers

- Released November 2011
- More than 30 manufacturer partners
- Approximately 800 labeled models
Soil Moisture Sensors
Draft Specification
Soil Moisture-Based Control Technologies

- Soil Moisture-Based Control Technologies
  - Conducted research and worked with manufacturers to identify test protocols from 2007 to 2013
  - Issued a Notice of Intent (NOI) in May 2013
  - Working with ASABE X633 committee on a test method
    - Method tests sensors in a box of soil with a known depletion
    - Two soil types, two salinities, three depletions
  - Performance testing at the University of Florida completed in the summer of 2019
  - EPA released a draft specification on November 7, 2019.

Image courtesy of Hunter Industries, Inc.
Next Steps

• Pertinent information and comments can still be submitted to watersense-products@erg.com

• Deadline to submit comments: January 10, 2020.

• WaterSense will summarize information collected and issue a comment compilation

• WaterSense will review all comments and work toward a final specification (anticipated in summer 2020).
Contact Us

General E-mail: watersense@epa.gov
Comment Submission E-mail: watersense-products@erg.com
Website: www.epa.gov/watersense
Helpline: (866) WTR-SENS (987-7367)
Regulatory Precipitation Rate Limits

Water Saver or Waster?

Ron Wolfarth

The Intelligent Use of Water™
Do You Like Chocolate?

- Tastes Great!
- Easy to Find
- Makes Me Happy
- Inexpensive
Chocolate For Every Meal?

- Doesn’t taste THAT great!
- Makes me sick now.
- Makes me fatter.
- I hate Chocolate!
What is Precipitation Rate?

- $PR = \frac{GPM \times 96.3}{\text{Head Spacing} \times \text{Row Spacing}}$

- Rate at which irrigation applies water to the landscape
Is Low PR Good or Bad?

- That is not the Question!
- Good Sometimes
- Not Good Others

Real Question:
All the Time
Or Not?
What Is ‘Good’ About It? (Regulator POV)

- More Closely Matches the Soak-In Rate
- Reduces Runoff
- Easier to Inspect/Plan Check
- Forces the “Right” Behavior
What Is Not Good? (Real World POV)

- University of Arizona
  - Wind Drift & Evaporation Losses

- California State Polytechnic University - Pomona
  - 2/3 of Total Losses
  - No Runoff With Cycle+Soak
Should Low Precipitation Rate be Required … At All Times?

- Some Regulators Want This!
- Believe It Saves Water!
- Don’t See the Potential Water Losses
Does It Save Water?

Show Me The Science!

- **California State Polytechnic University – Pomona**
  - 2/3 of Loss = Wind Drift & Evaporation;
  - No Run-off with Cycle+Soak Programming

- **Eugene Water and Electric Board**
  - No Savings

- **Inland Empire Utilities Agency**
  - 2% Greater Water Use

- **Municipal Water District of Orange County**
  - 10% Savings

- **Southern Nevada Water Authority**
  - No Savings

- **University of Arizona**
  - 12% More Wind Drift & Evaporation Loss With Low PR
Conclusions

- Reduces Some Runoff
- Can be Wasteful
- Does Not Reduce Water Use
- MSMT May Mitigate Some Losses
- Don’t Ban More Efficient Products
Conclusions

- Like Chocolate, Low PRs Are Good in Moderation
- Low PRs Should Not Be Required by Law
- Industry Should Oppose PR Limit Regulation
Water Hazard Ahead! Assessing An Aging Irrigation System

Phil Dyck, B.MGT.
Manager, Grounds and Motor Vehicles
University of Lethbridge, Alberta, Canada
Introduction and Outline

A. Strategies for assessing systems and risk
B. Budgeting
C. Communicating unexpected and future repairs.
A. Strategies for Assessing Systems and Risk

1. Know what is at risk in the event of a failure.
2. Know what components of the system are at risk for failure.
3. Know what to do immediately when a failure occurs to minimize further damage.
4. Make a plan to reduce the risks due to unplanned failures.
1. What is **at risk** in the event of a failure?

**Programming** – a break that interferes with the purpose of the institution/company.

**Reputation** - of institution, company, business, staff.

**Infrastructure** – wash out a green, undermine a road, flood a building.
1. What is **at risk** in the event of a failure?

- **Budget** - shortfalls from unbudgeted repairs could result in sacrificing budgeted expenditures

  \[ \textit{Rushed Repairs} = \textit{higher costs} \]

- Repairs on prepared schedule capitalize on:
  - off season rates
  - low irrigation times
  - high availability of staff
  - no effect on core functions of business.
Risks : Break Example
Multiple Risks: Convocation Example

- Programming
- Reputation
- Infrastructure
- Budget
1. What is **at risk** in the event of a failure?

• What if failure means no water?
2. What **components of the system** are at risk for failure?

- Document all failures to create a history.
  - what caused them?
  - how were they repaired?
  - what were the consequences of the failure?
  - could they have been predicted and prevented?
  - how old were the parts that failed and were replacement parts available?
  - do you have more components or installations that are like these ones?

- Ask your experienced techs for answers.
2. What components of the system are at risk for failure?

• Also consider:
  - Compromised systems due to surface construction.
  - Reliance on long term employee or contractor memory.
  - Obsolete equipment
  - Asbestos and silica concerns.

• Use history to predict future failures.
3. **What to do** immediately when a failure occurs to minimize further damage.

*Time is of the essence.*

- Enough **Knowledgeable** and **efficient** staff must be available to minimize damage.
4. Make a plan to reduce the physical and financial costs of unplanned failures.

The most compelling arguments for getting extra funding for upgrades in advance of failures are directly related to the relative value of the risks identified earlier.
The Plan

1. Know your system.
   - Talk to your techs and contractors.
   - Update your as-built drawings
   - Gather as much info as you can and document it.
   - Use a Work sheet.
SAMPLE IRRIGATION MAINLINE CONDITION ASSESSMENT WORKSHEET

Mainline Section: ____________________________________________________________

Size: ____________________________

Length: ____________________________

Age or year installed: ______________________

Material: _______________________________________

Repair History:

Date of repair and cost if known: _________________________________

Reason for the repair/describe failure: ________________________________________________________________

Potential or realized secondary **risks or damages** associated with this failure: ________________________________

Connection Points:

Type of connection: ________________________________________________________________

Location of this connection: __________________________________________________________

Sizes into and out of connection: IN__________ OUT____________

Is this connection encased in concrete? Y /N Year installed______________

Materials used in components of this connection _______________________________________________________

Identify potential secondary **risks or damages** that could occur if this connection failed __________________________
The Plan

2. **Share the knowledge** with staff.
   - Make the info easily accessible.
   - Train your crew on the entire system.
   - Practice operating startup and shutdown procedures, including opening and closing isolation valves as different valves feel differently and finding them can be tricky.

3. **Use the knowledge** to predict where failures are likely.
B. Budgeting

• Use the costs of past repairs as a budgeting tool.

• How to budget:
  • Compile and print one overall map of the irrigation system.
  • Highlight all the main lines.
  • Mark all isolation valves. Record as much as you know about the condition of the valves (1-3 scale).
  • Mark all lines and the size of each line.
  • Document the total number of isolation valves, each valve condition and the corresponding line size.
  • Review repair history of isolation valves to determine historical cost of those repairs. Use this information as an predictor of replacement costs.
University of Lethbridge Example

• 106 acres of campus, 50 years old system, drawing from an irrigation pond.
• 800 feet of 10” concrete/asbestos mainline.
• An irrigation control system running on an old computer because the programs are not compatible with newer operating systems.
• Limited access provided to the crew of the drawings.
All sections of the previous map enlarged so it is readable. This is what the techs have in a binder in their truck.
All lines that are pressurized when pump is on.

Three status codes for isolation valves.
Highlight sizes of all pressurized lines. All isolation valves will be identified on this map.
What do these maps tell us?

1. 48 isolation valves.
2. 6 are deemed to be at the end of their service life.
3. 12 are nearing the end of their service life.
4. Urgent repairs on failed valves have cost $5000 to $11000 per valve, depending on location.
5. We can expect to spend $30000 to $60000 in the near future, if we do nothing proactively, to repair 6 valves. This does not include the costs that could be added for some of the risks to Programming, Reputation, or surrounding Infrastructure.
6. Another $60000 to $120000 in repairs are coming in the medium term future to repair 12 valves.
C. Communicating for unexpected and future repairs

Communicate the risks associated with potential future failures:

• Programming
• Reputation
• Infrastructure
• Budget: Costs will be higher if you are not proactive and will create budget shortfalls from higher overall costs.

Communicate the costs of past failures to explain anticipated future costs.
C. Communicating for Unexpected and Future Repairs

Keep messages in line with the core business of your organization.

Communicate all the risks and potential costs associated with system failures to the Directors when seeking funding for irrigation upgrades.
Presentation Takeaway

*Fewer surprises=fewer losses.*

- Know the risks of system failure
- Know what components might be at risk of failure.
- Know what to do if failure occurs.
- Make a plan to reduce costs of failure.
- Document your system in an easy-to-understand and accessible format.
Presentation Takeaway

• Train enough staff about the main system operations to ensure coverage.

• Be proactive to reduce overall costs.

• Communicate the risks of failures and the impact to the core business with the directors to secure and maintain funding for repairs.
Contact info: phil.dyck@uleth.ca