Explore. Connect. Learn.

Irrigation Show 2019 Education Week

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.**

Irrigation Association® | NGWA The Groundwater Association | ARCSA American Rainwater Catchment Systems Association

Bonus Track – Table of Contents

Business Tracks

Pumps & Pump Stations

Special Topics


LESSONS FROM THE GREEN
INDUSTRY BENCHMARK REPORT


HELLO, MY NAME IS
CHAD

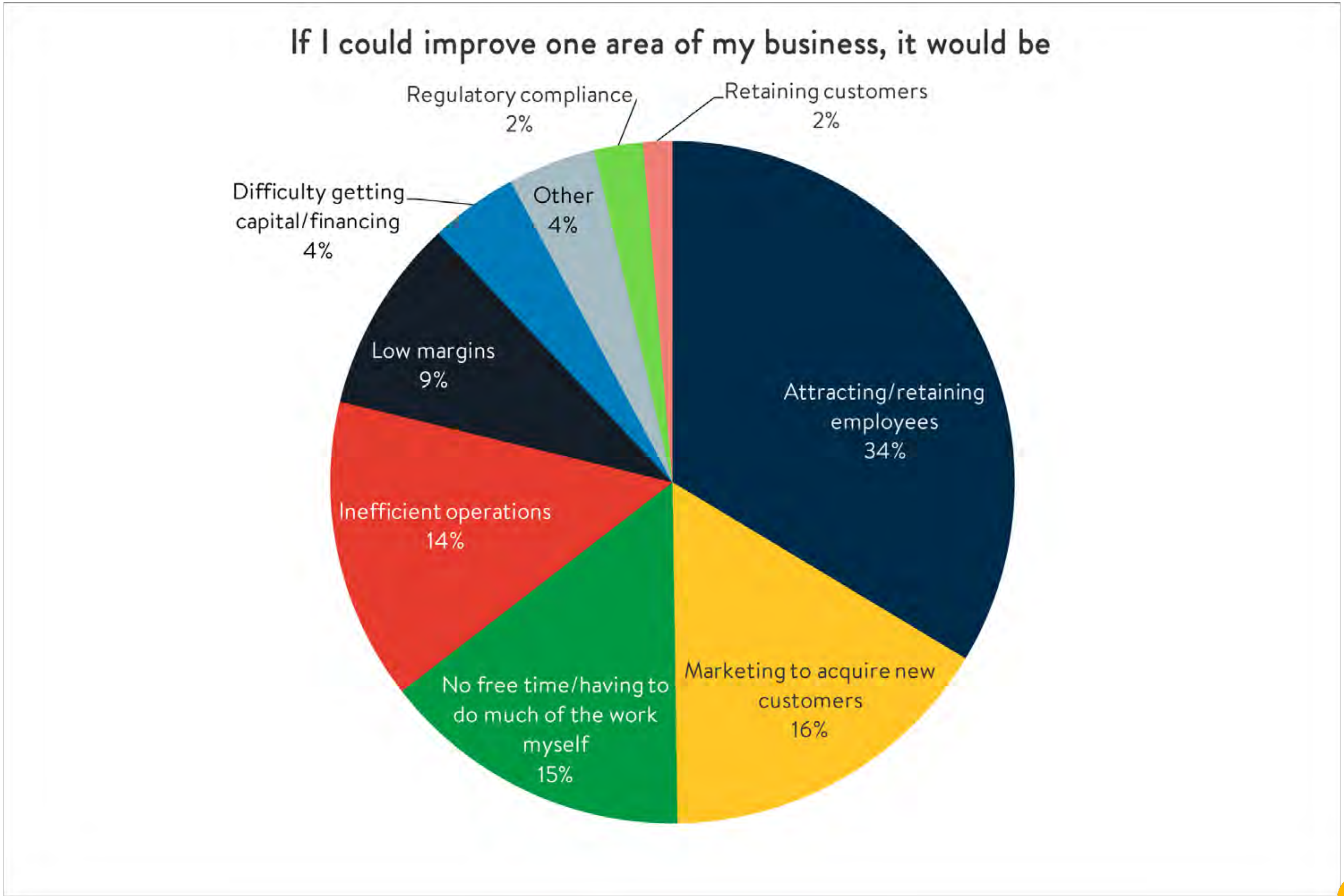
HindSite
SOFTWARE

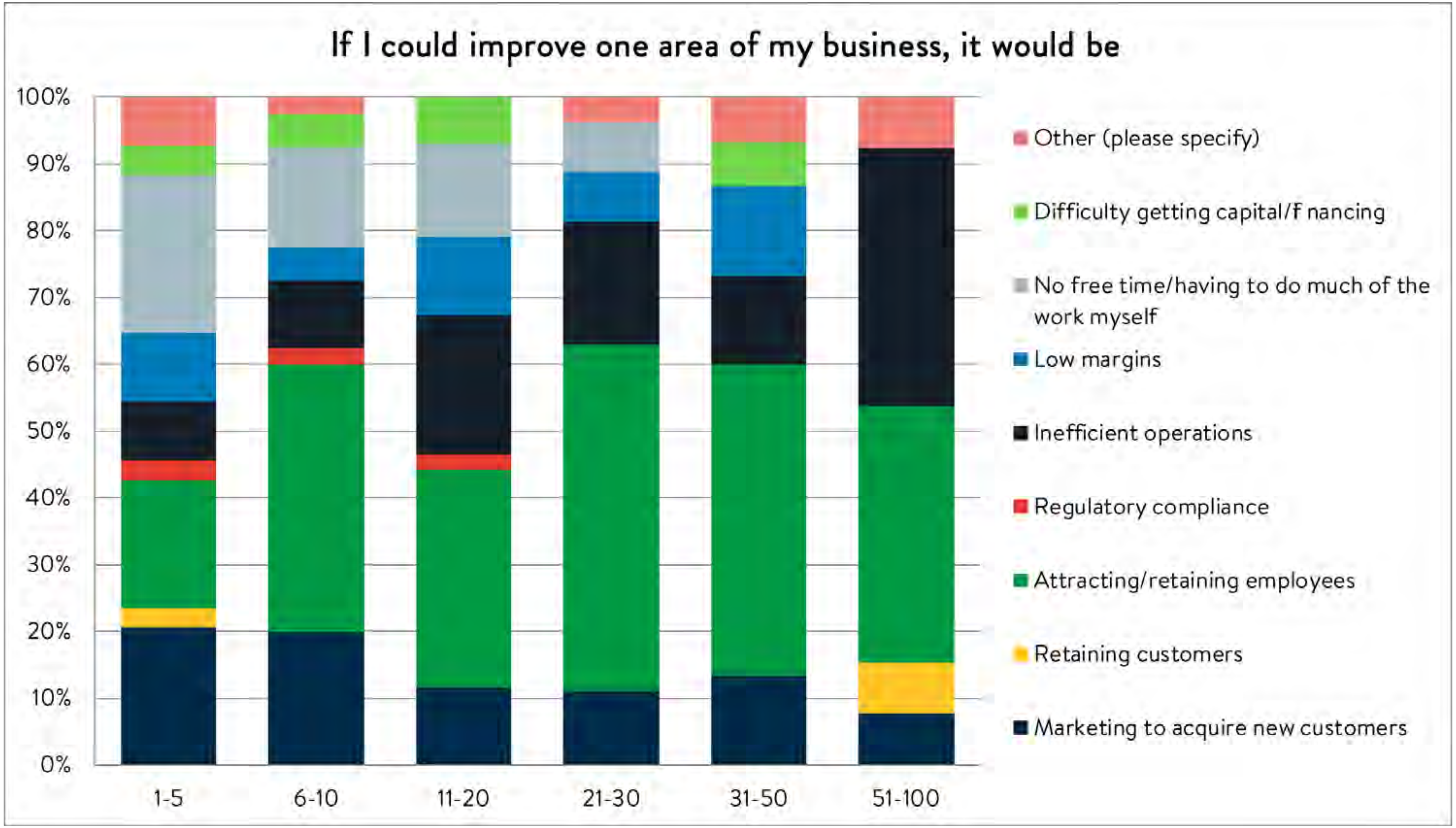
If I could improve one area of my business it would be?

#1

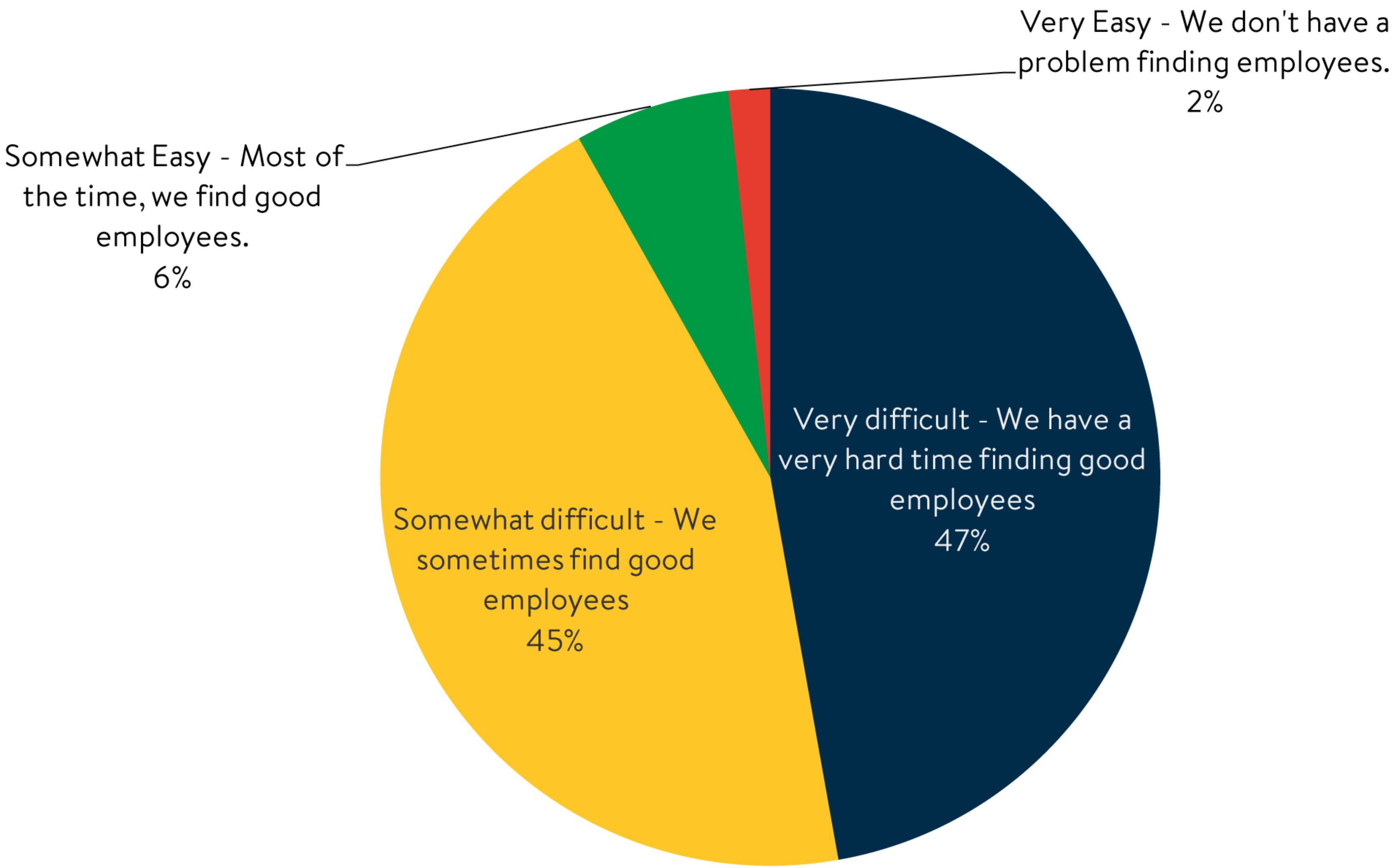
There's a labor shortage in the green industry.

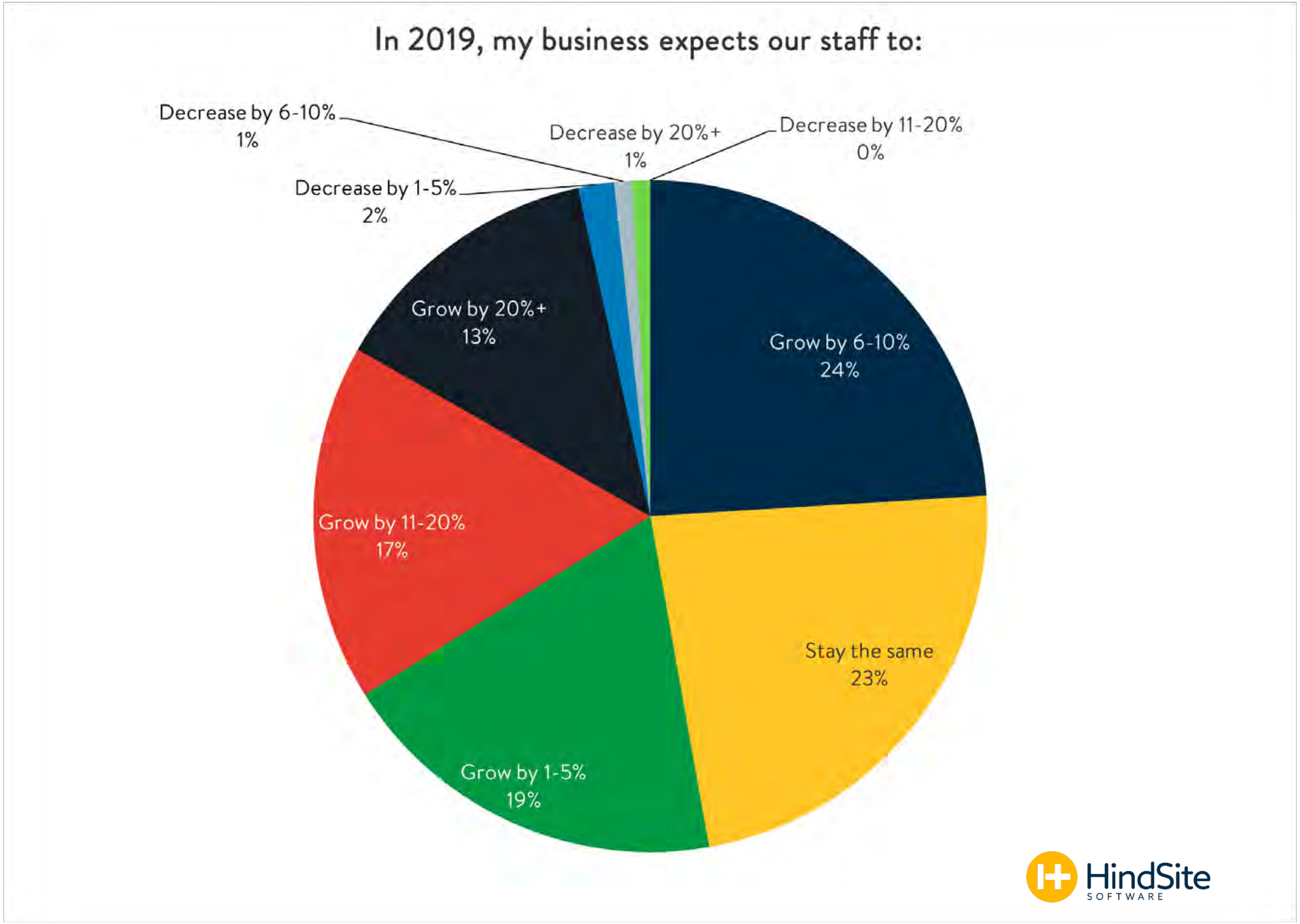
HindSite SOFTWARE


If I could improve one area of my business, it would be
Regulatory compliance 2%
Retaining customers 2%
Difficulty getting capital/financing 4%
Other 4%
Low margins 9%
Attracting/retaining employees 34%
Inefficient operations 14%
No free time/having to do much of the work myself 15%
Marketing to acquire new customers 16%

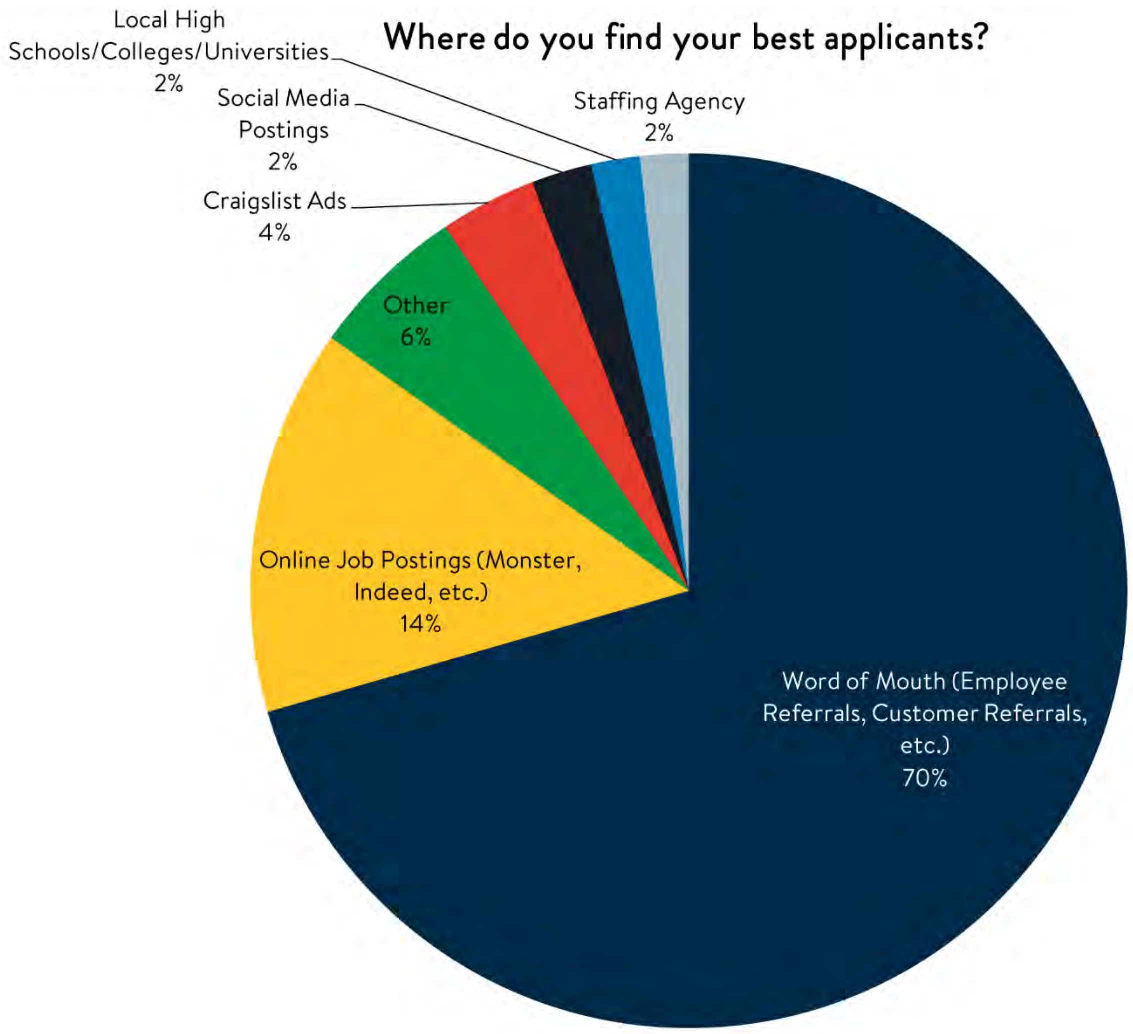

If I could improve one area of my business, it would be
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1-5
6-10
11-20
21-30
31-50
51-100
Other (please specify)
Difficulty getting capital/f nancing
No free time/having to do much of the work myself
Low margins
Inefficient operations
Regulatory compliance
Attracting/retaining employees
Retaining customers
Marketing to acquire new customers

How hard is it for you to find good employees?





In 2019, my business expects our staff to:
Decrease by 6-10% 1%
Decrease by 20%+ 1%
Decrease by 11-20% 0%
Decrease by 1-5% 2%
Grow by 20%+ 13%
Grow by 6-10% 24%
Grow by 11-20% 17%
Stay the same 23%
Grow by 1-5% 19%
HindSite SOFTWARE



HindSite SOFTWARE

You may have to pay more to attract and retain employees.

Don’t be afraid to experiment.

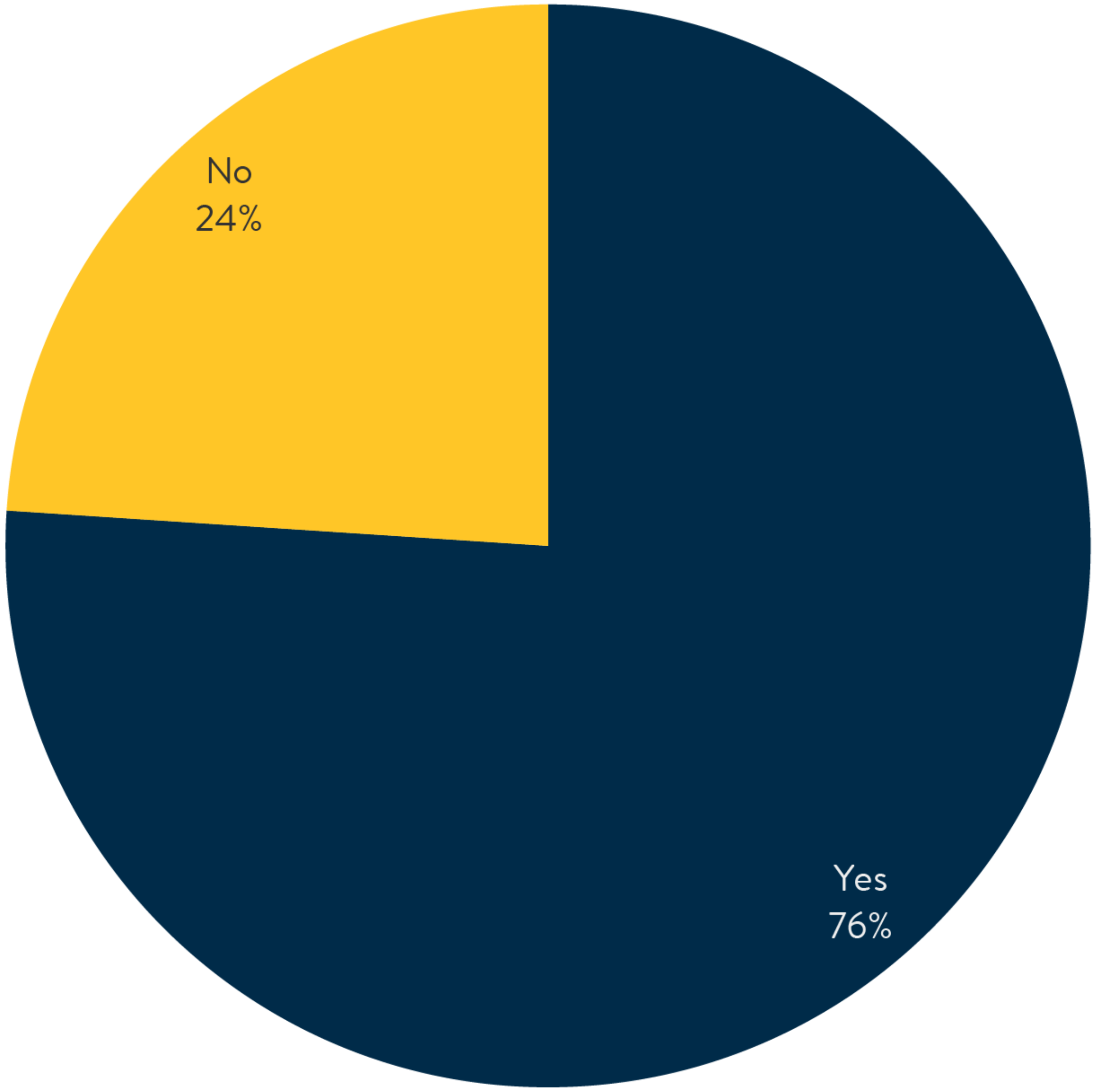
Focus on your culture.

HindSite SOFTWARE

#2

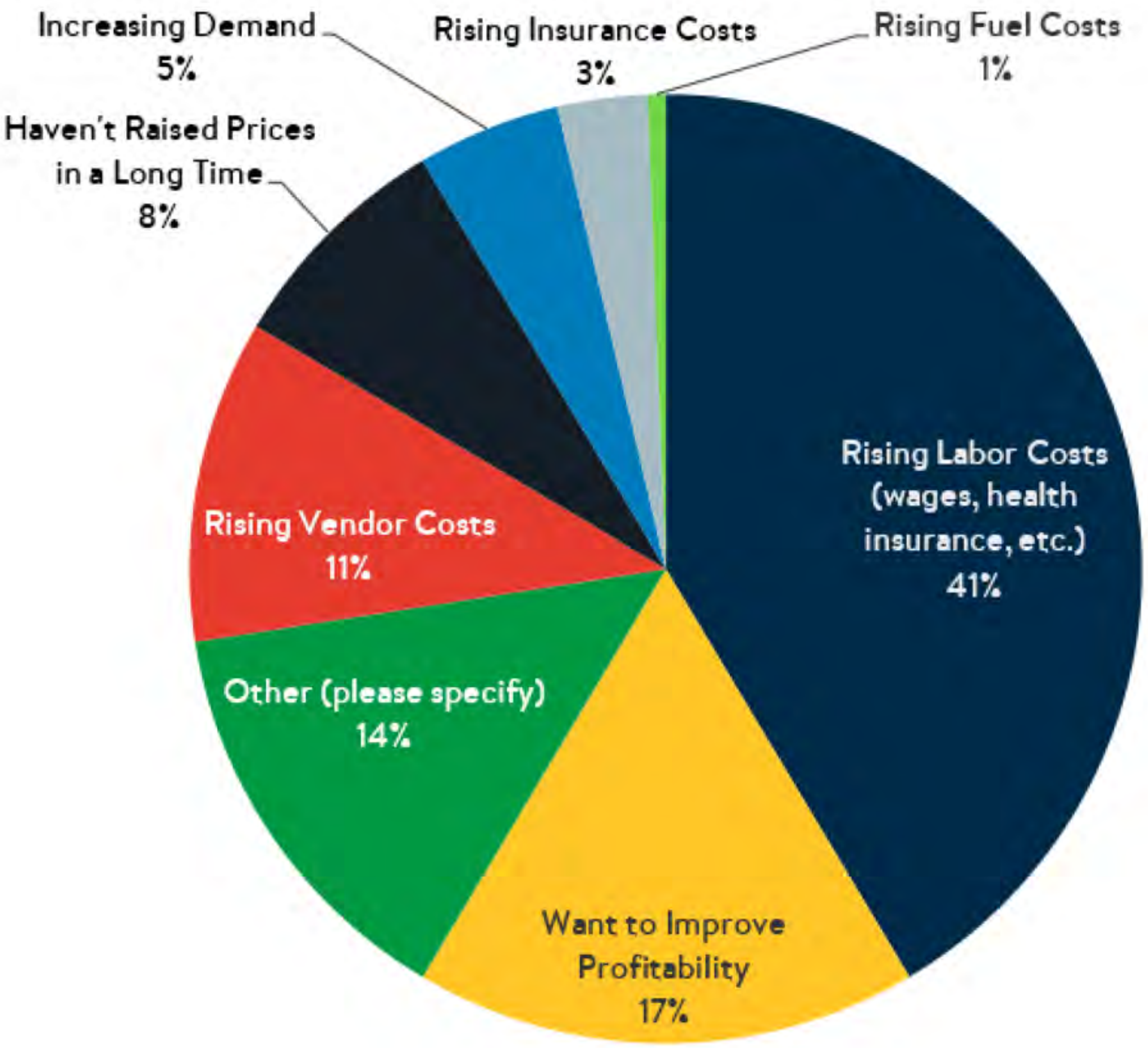
Businesses are raising prices.

Do you plan to raise prices in 2019?



HindSite SOFTWARE

What is the primary reason you're raising prices?



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0101
1001

Know your numbers.

Reiterate your value.

Offer reduced rates on long-term or pre-paid contracts.

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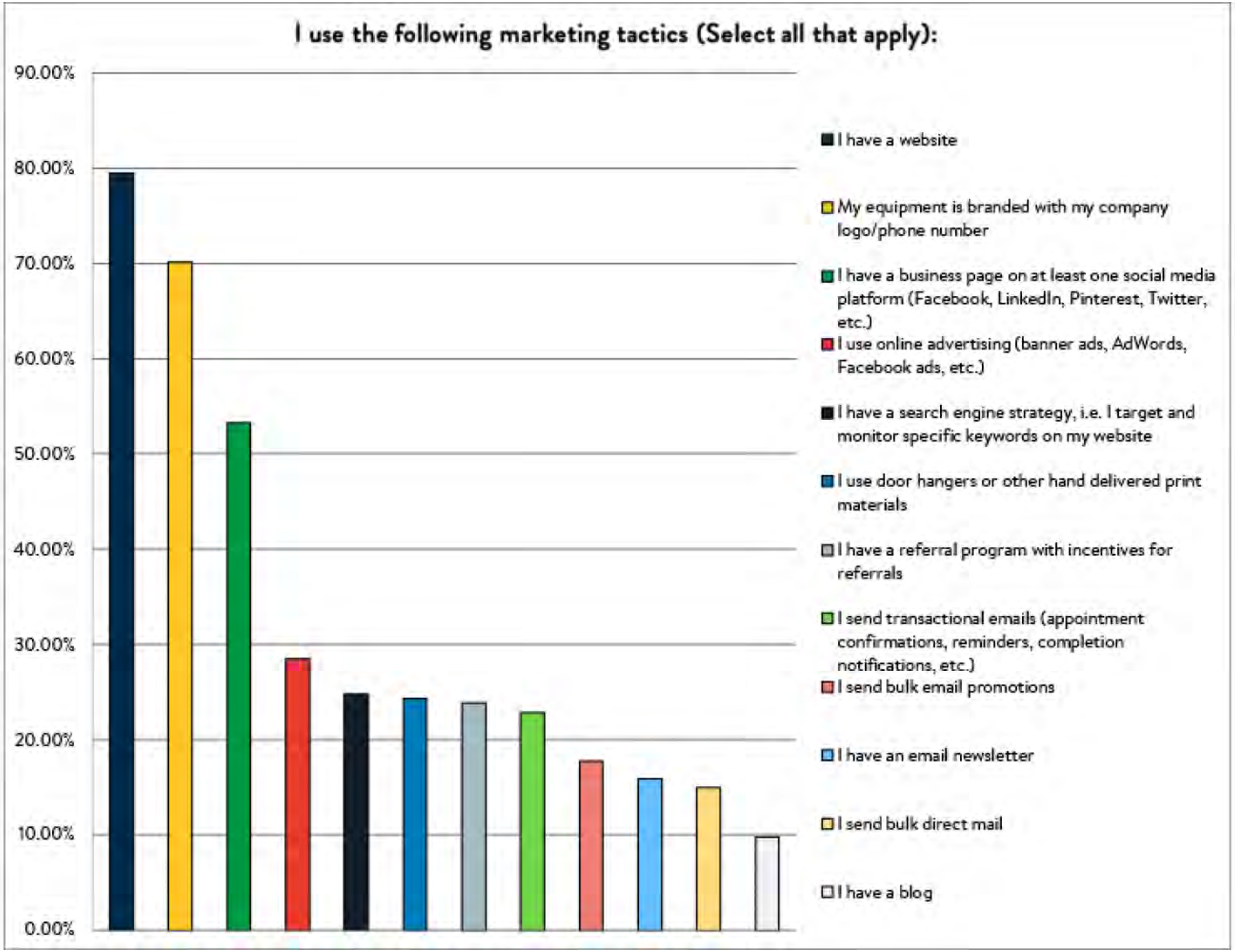
SOFTWARE

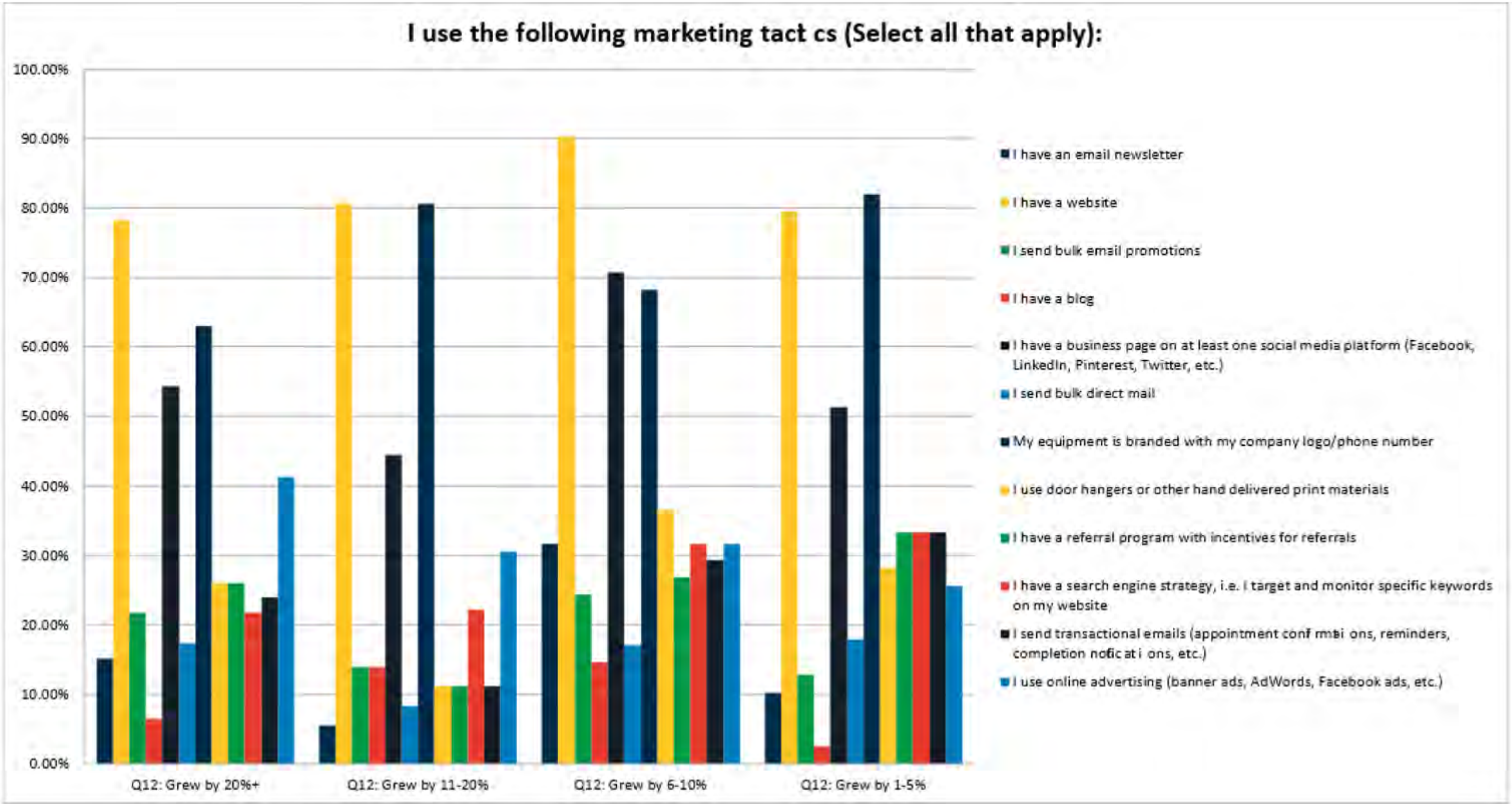
Online Advertising

#3

You need branded trucks and a website. But if you want to grow faster, online advertising works.



HindSite SOFTWARE

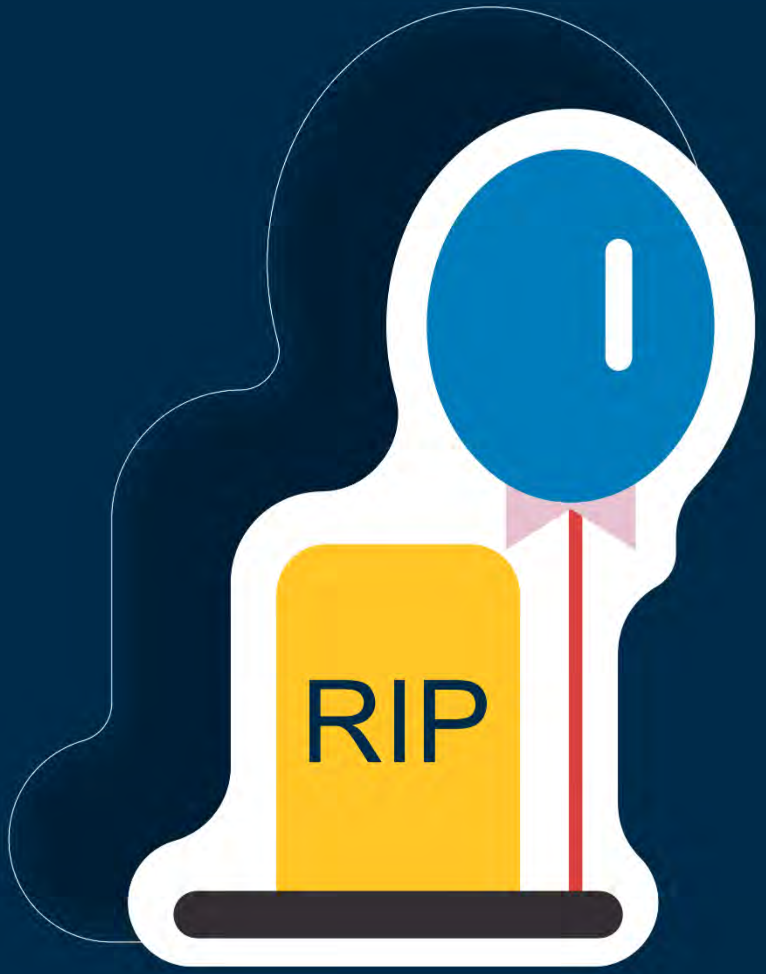


HindSite SOFTWARE

Define/Refine your sales process first.

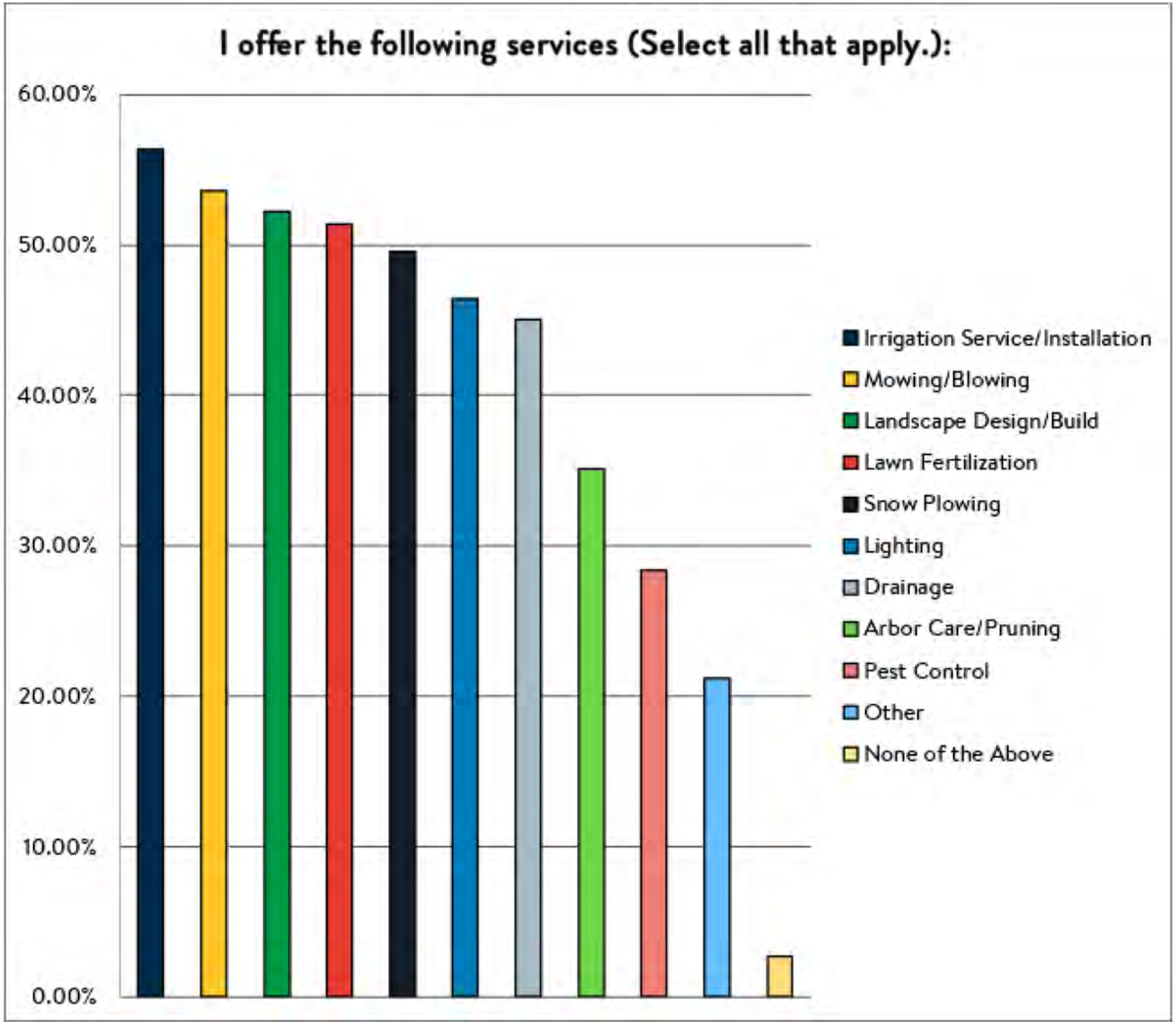
Consider newer options like NextDoor.

Facebook/Google Ads can be effective for residential, LinkedIn for Commercial.



#4

Service Specialization is Dying.



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How many of the nine services listed did the average respondent offer?

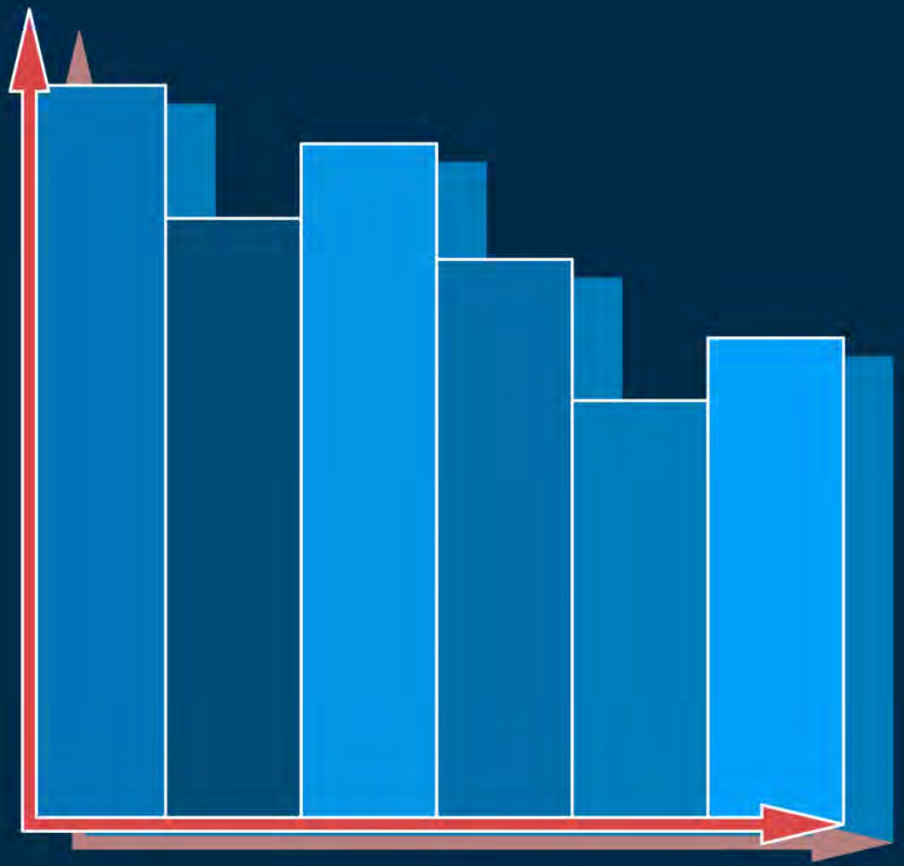
4

Average Green Industry Services Offered

Do some market research.

Partner vs. compete?

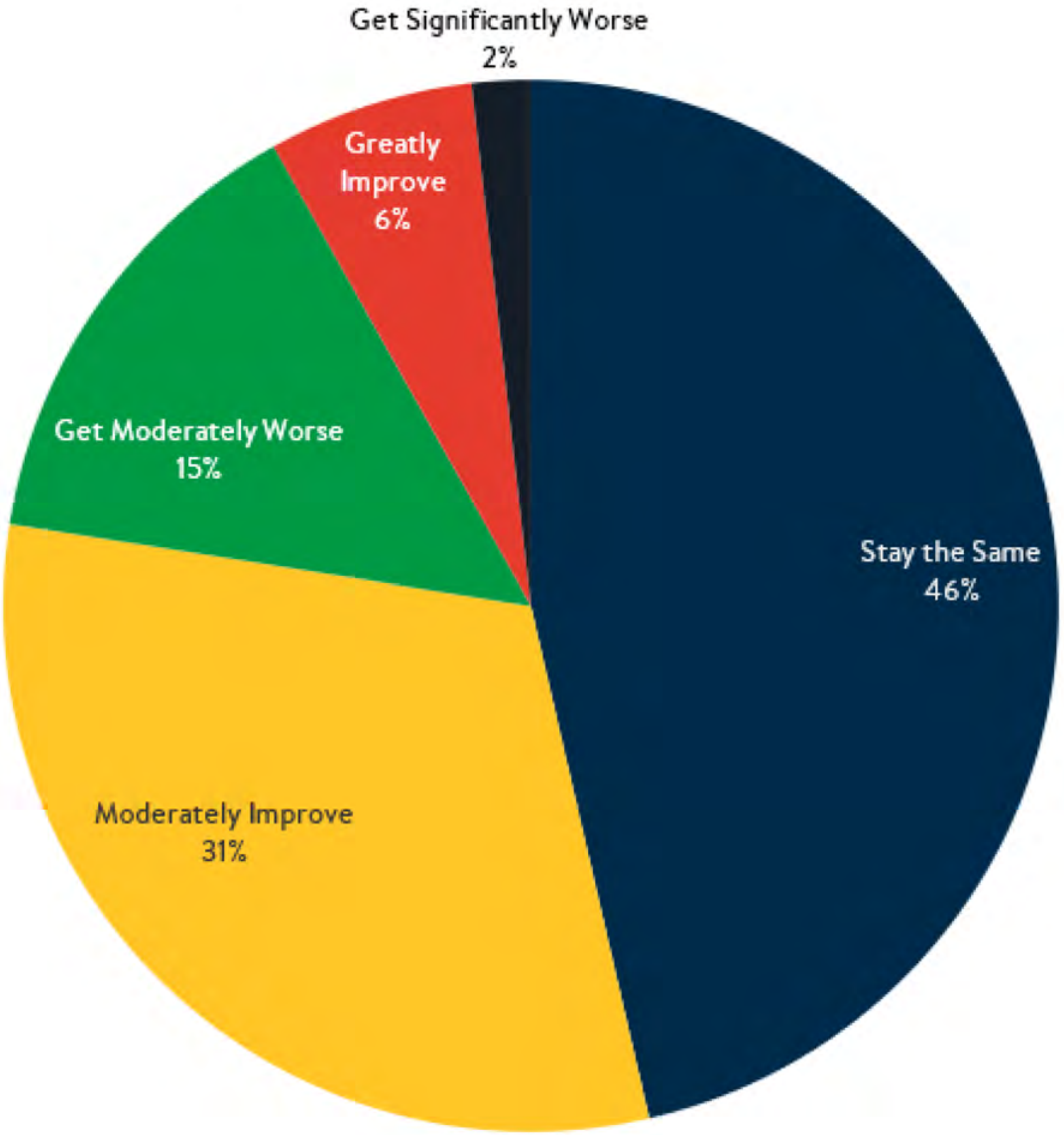
Cross-promote your services.



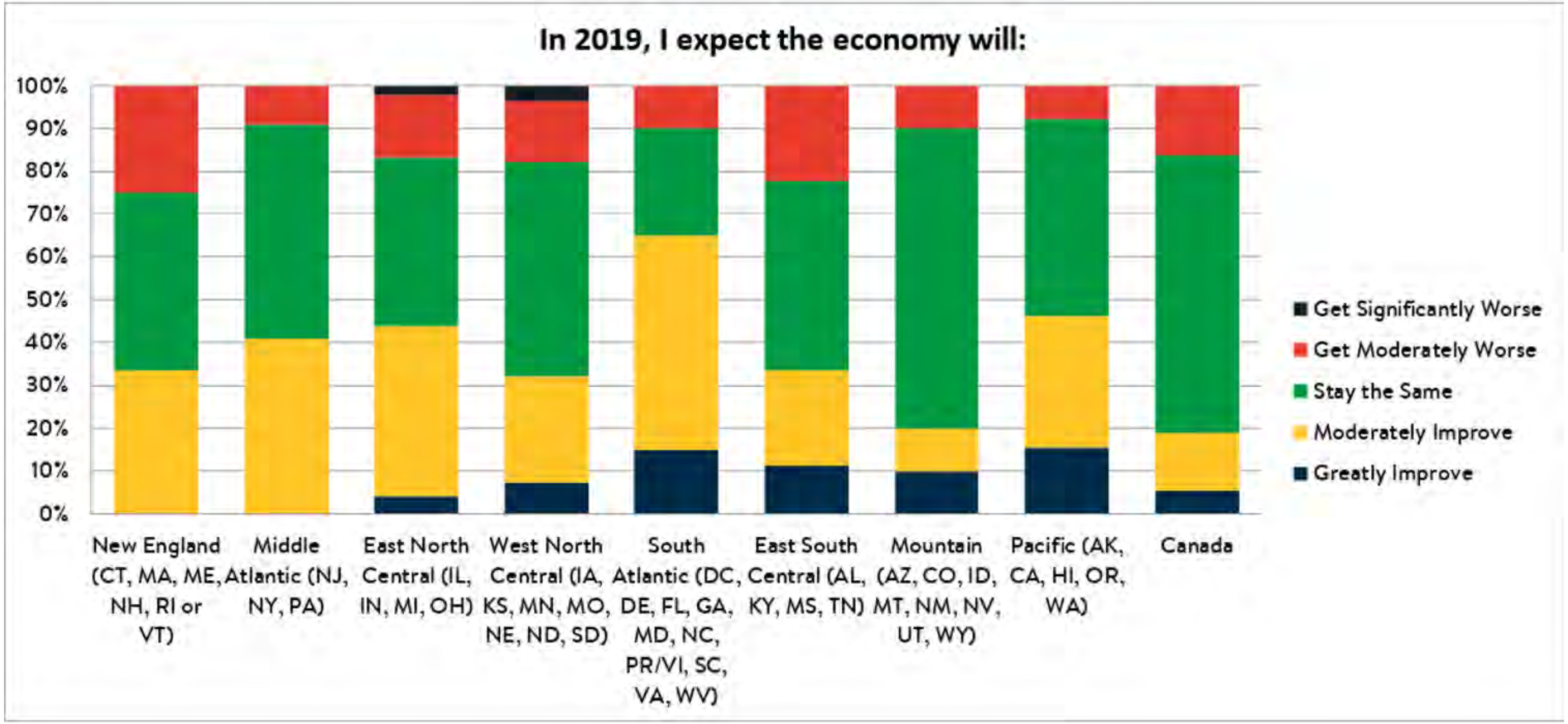
#5

Economic Optimism is Waning.

In 2019, I expect the economy will:



HindSite SOFTWARE


In 2019, I expect the economy will:
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
New England (CT, MA, ME, NH, RI or VT)
Middle Atlantic (NJ, NY, PA)
East North Central (IL, IN, MI, OH)
West North Central (IA, KS, MN, MO, NE, ND, SD)
South Atlantic (DC, DE, FL, GA, MD, NC, PR/VI, SC, VA, WV)
East South Central (AL, KY, MS, TN)
Mountain (AZ, CO, ID, MT, NM, NV, UT, WY)
Pacific (AK, CA, HI, OR, WA)
Canada
Get Significantly Worse
Get Moderately Worse
Stay the Same
Moderately Improve
Greatly Improve

Limit your debt.

Measure and improve customer loyalty.

Consider your wage structure.

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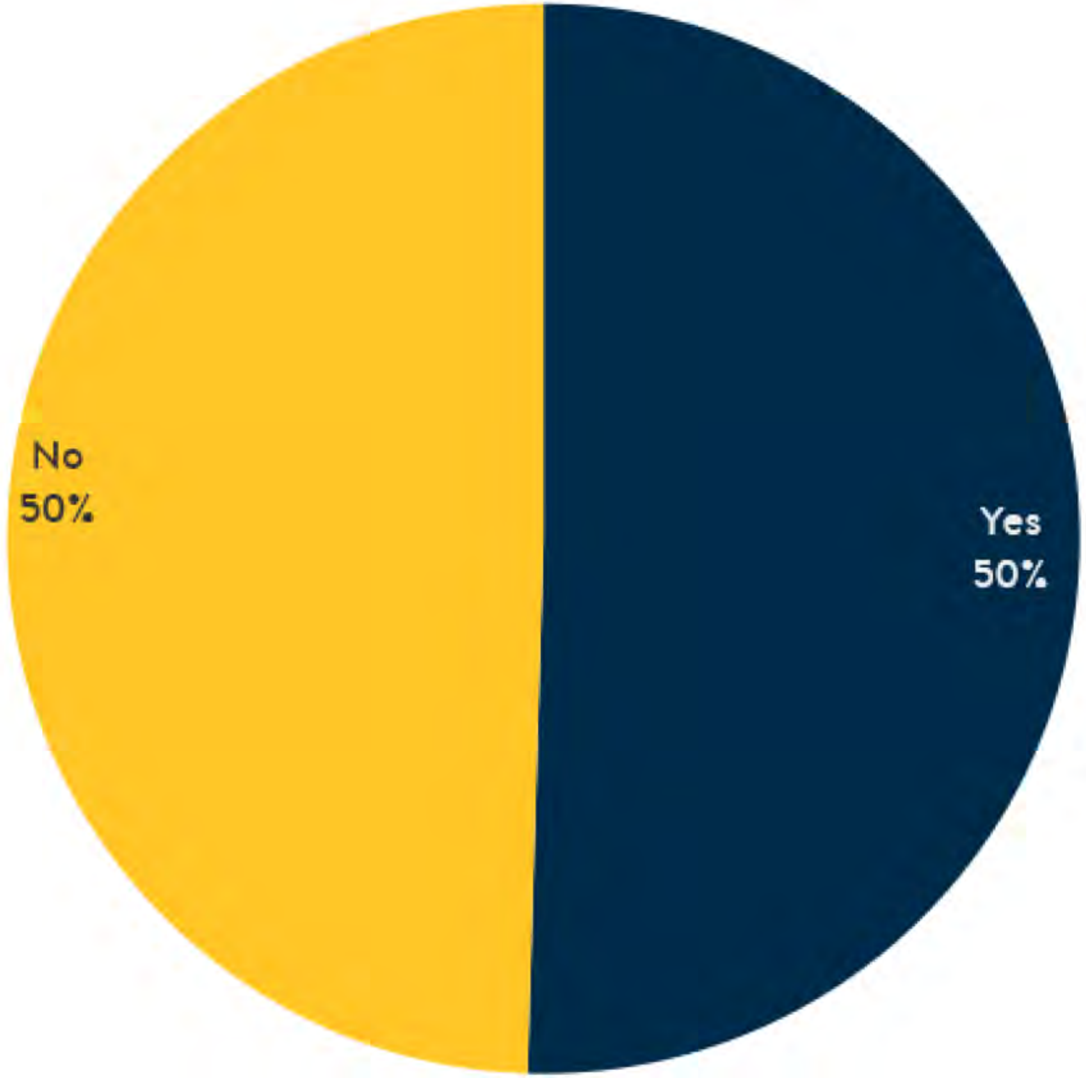
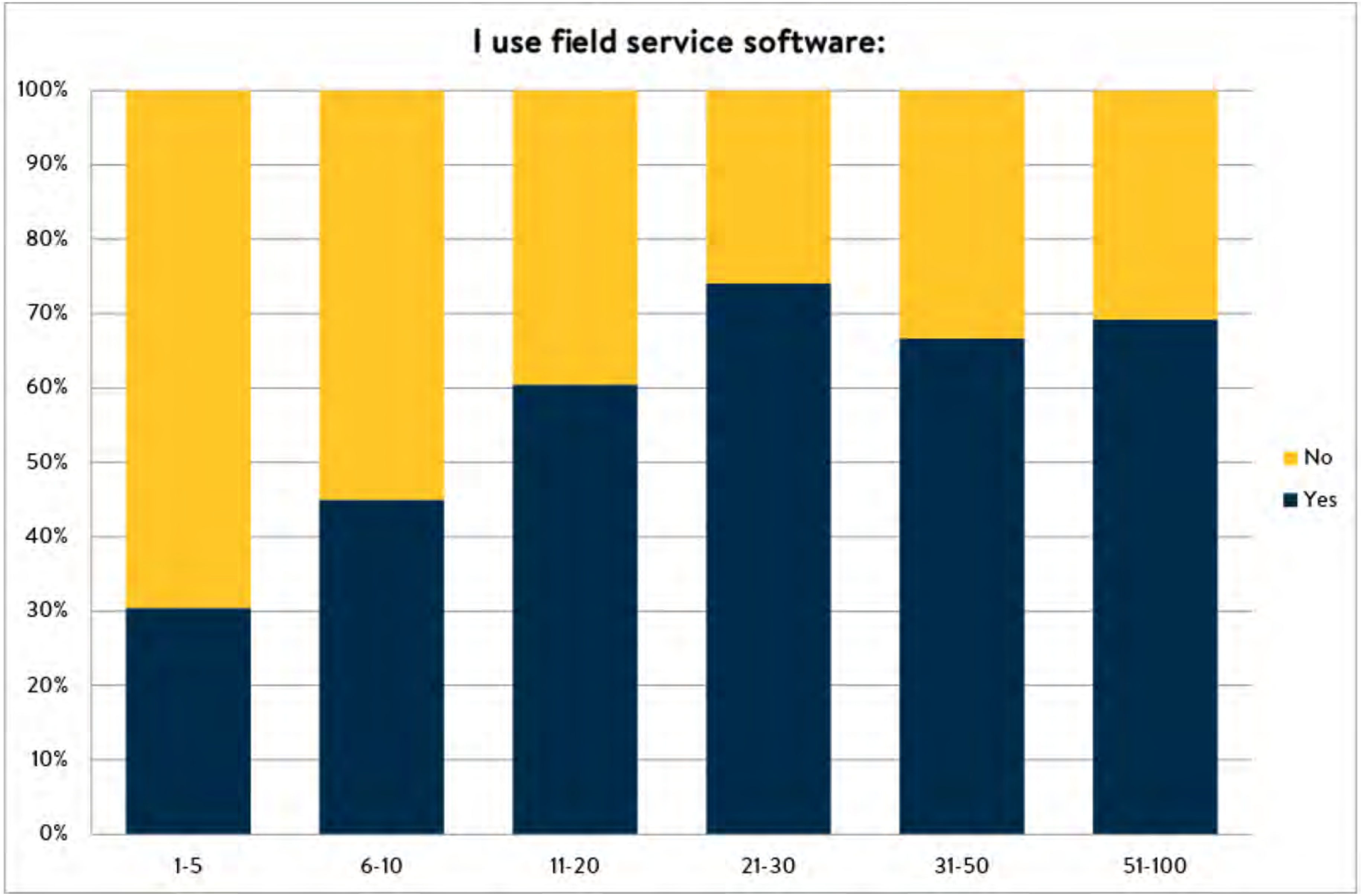
#6

Software makes businesses more efficient.

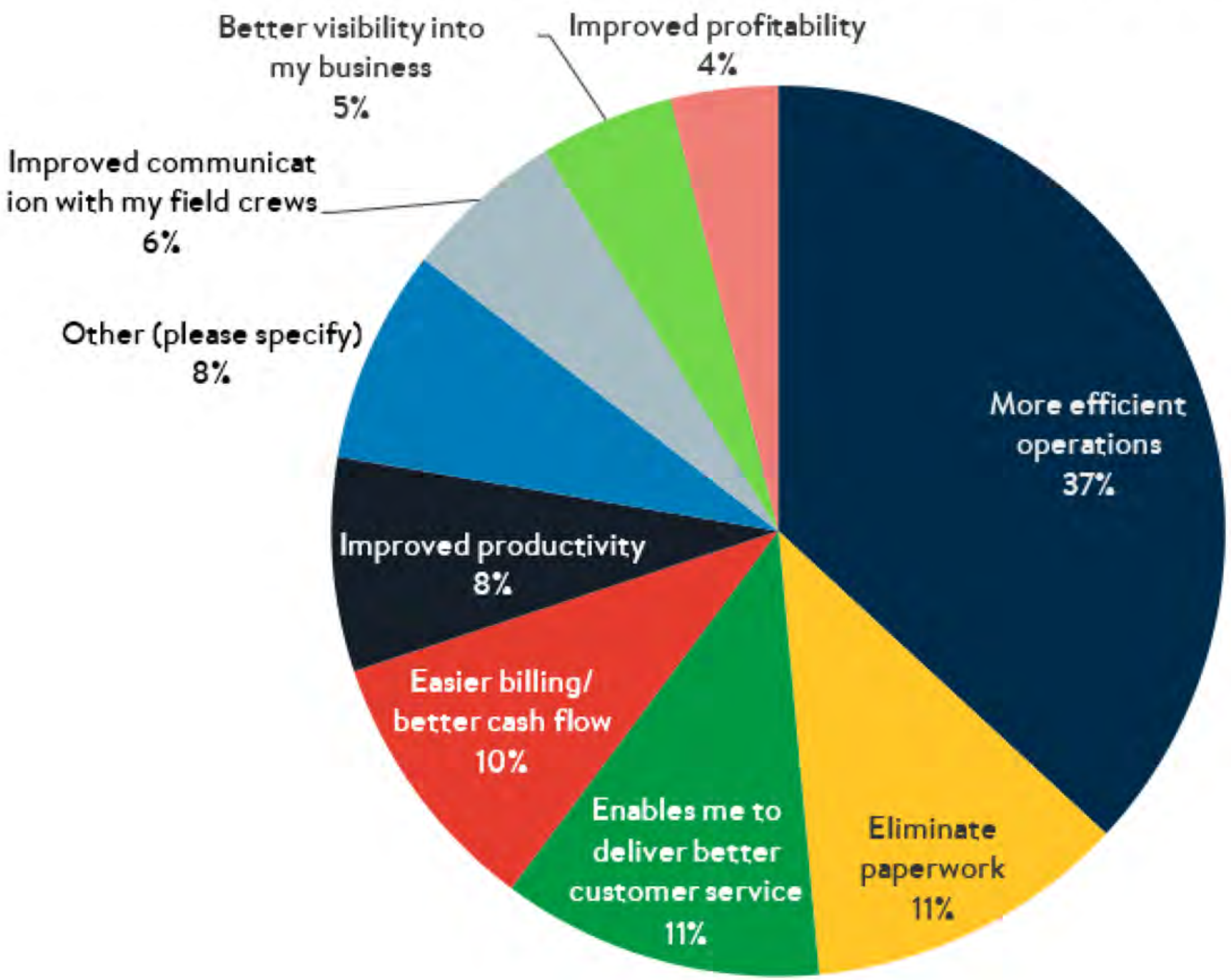
HindSite SOFTWARE

I use field service software:




I use field service software:
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1-5
6-10
11-20
21-30
31-50
51-100
No
Yes

What's the biggest benefit to using f eld service software?



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Know what issues you’re looking to solve.

Understand that introducing software is a process.

Look for a partner, not a software provider.

HindSite SOFTWARE

#7

High growth businesses get a lot of leads, close business quickly and close a higher percentage of them.

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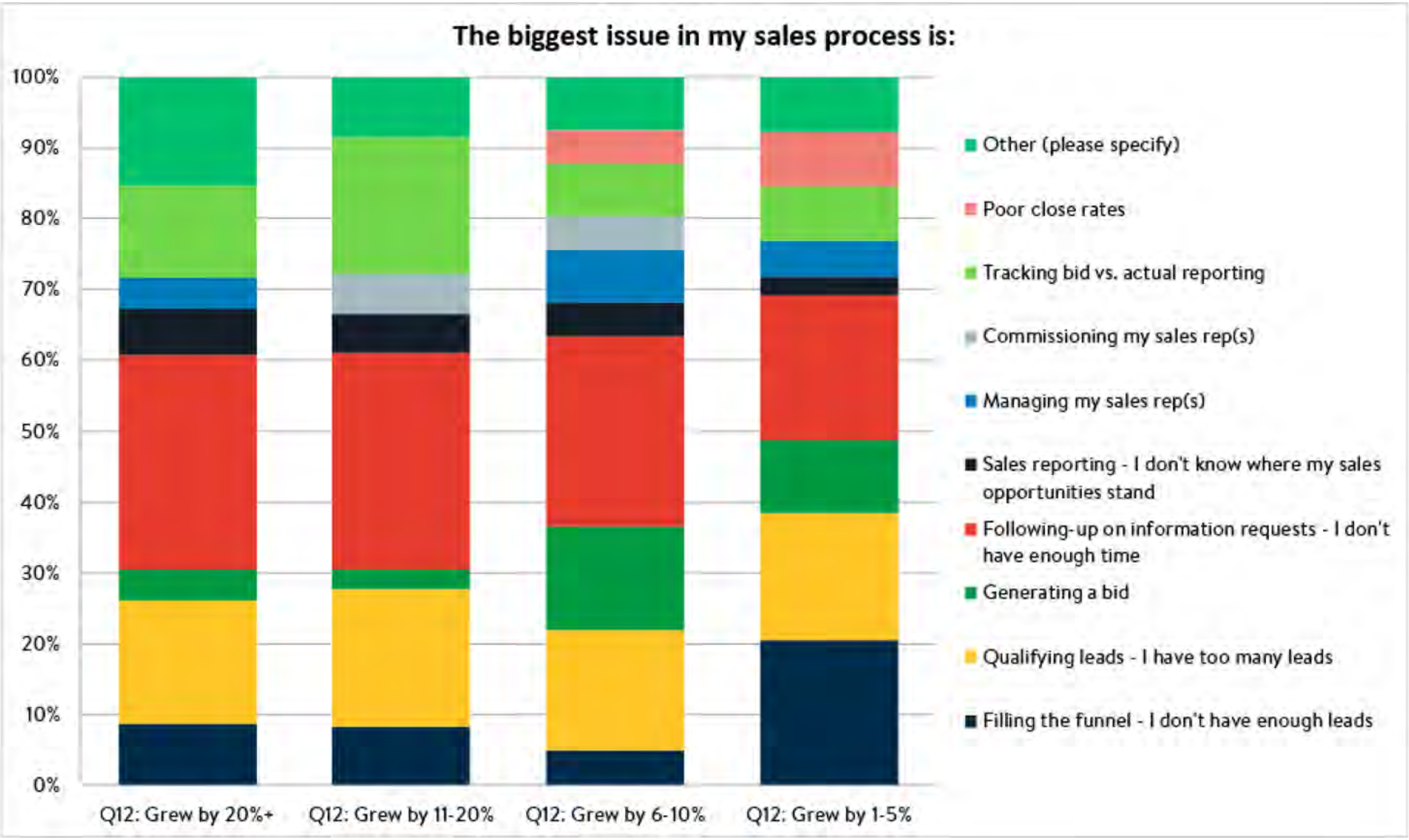
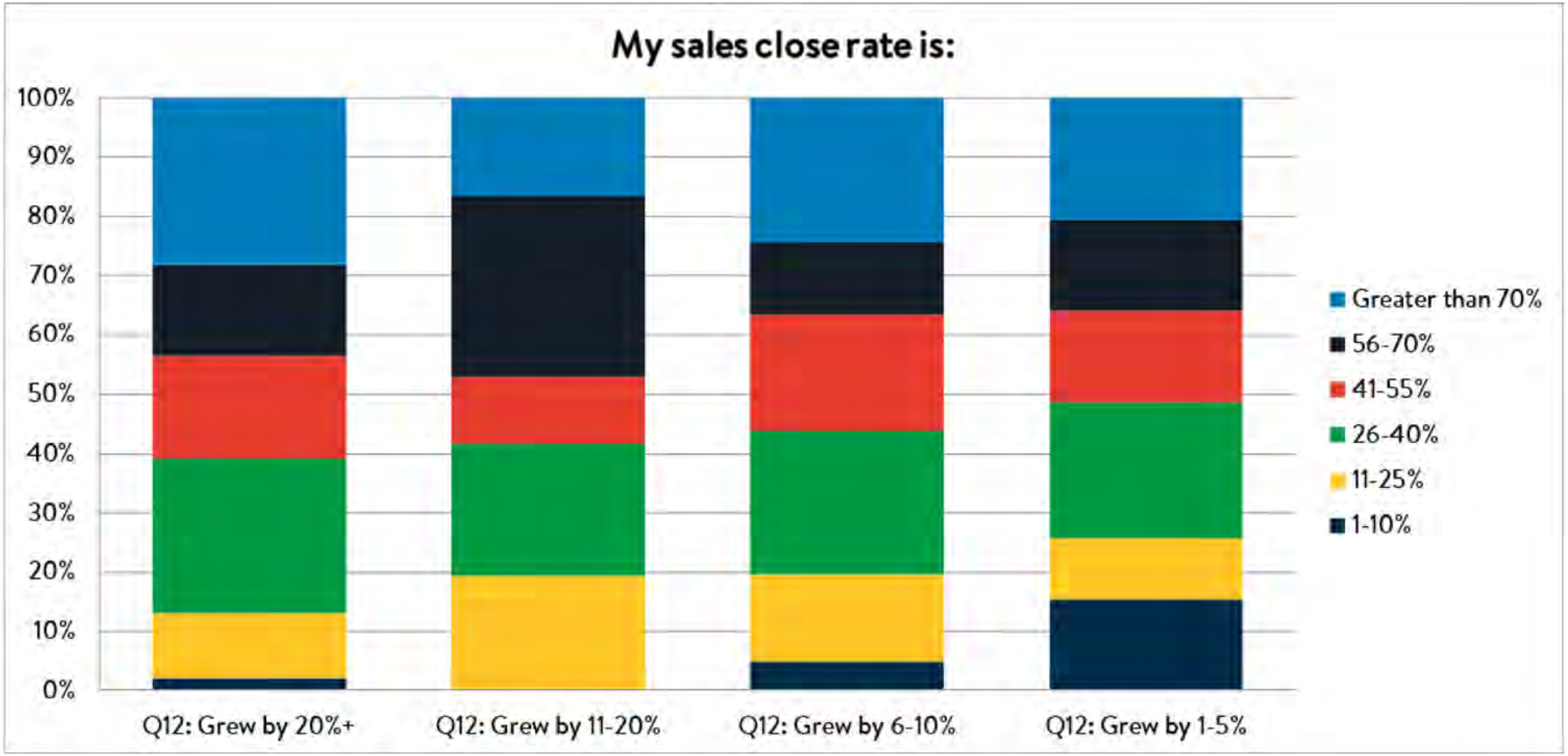
Which of the following has the biggest impact on your growth?

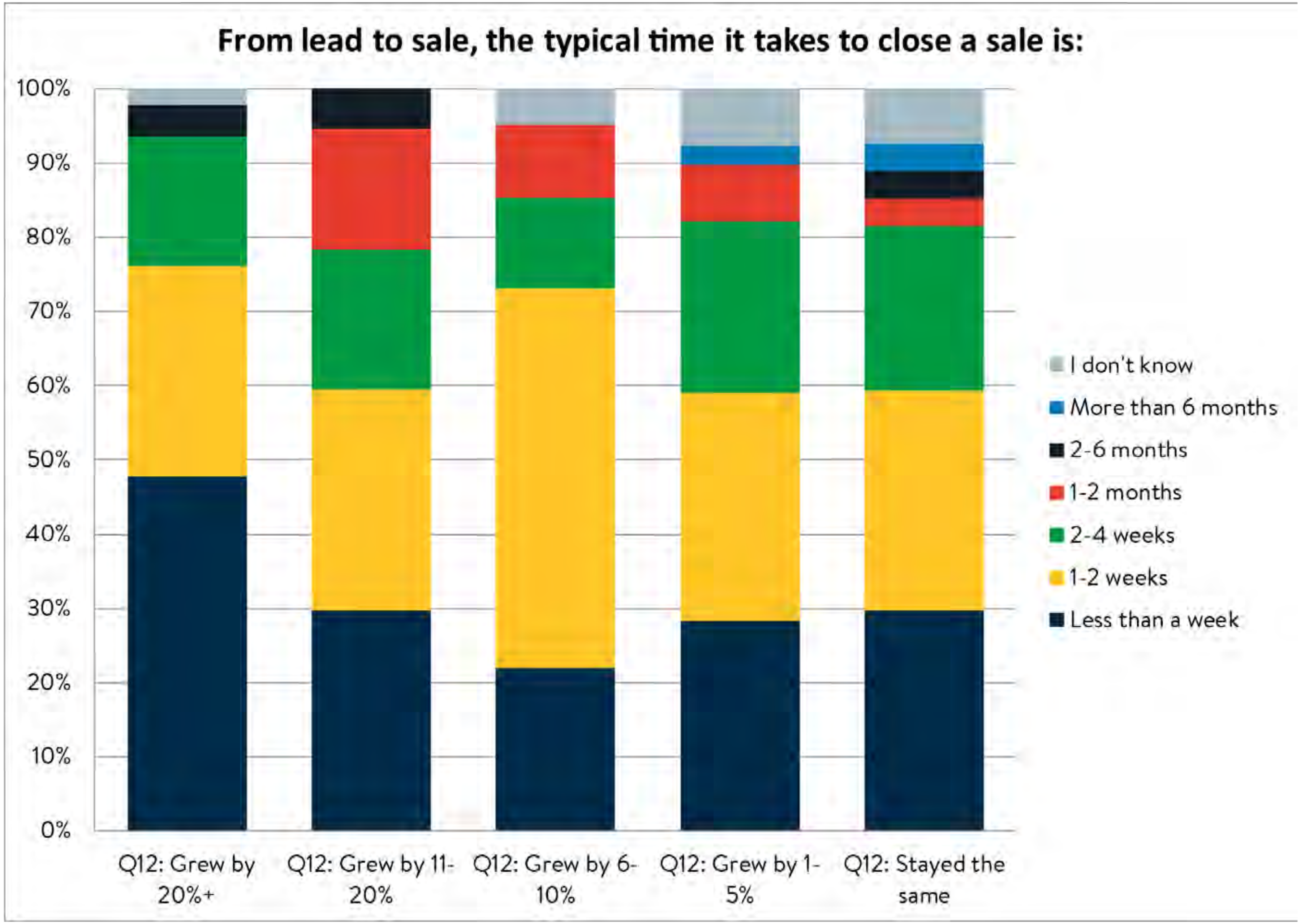
- Getting more leads?
- Closing leads quickly?
- Closing a higher percentage of leads?



HindSite SOFTWARE



HindSite SOFTWARE


From lead to sale, the typical time it takes to close a sale is:
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Q12: Grew by 20%+
Q12: Grew by 11-20%
Q12: Grew by 6-10%
Q12: Grew by 1-5%
Q12: Stayed the same
I don't know
More than 6 months
2-6 months
1-2 months
2-4 weeks
1-2 weeks
Less than a week

Determine your best lead source.

Analyze your sales touchpoints.

Learn what makes you unique.

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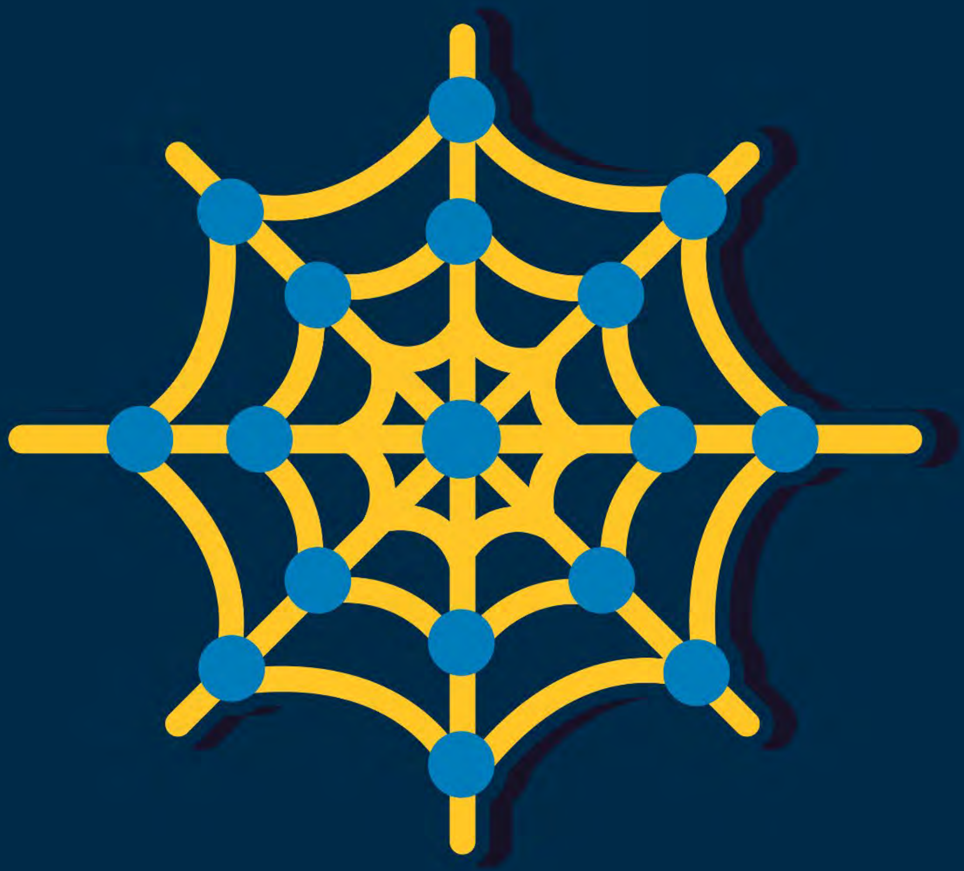
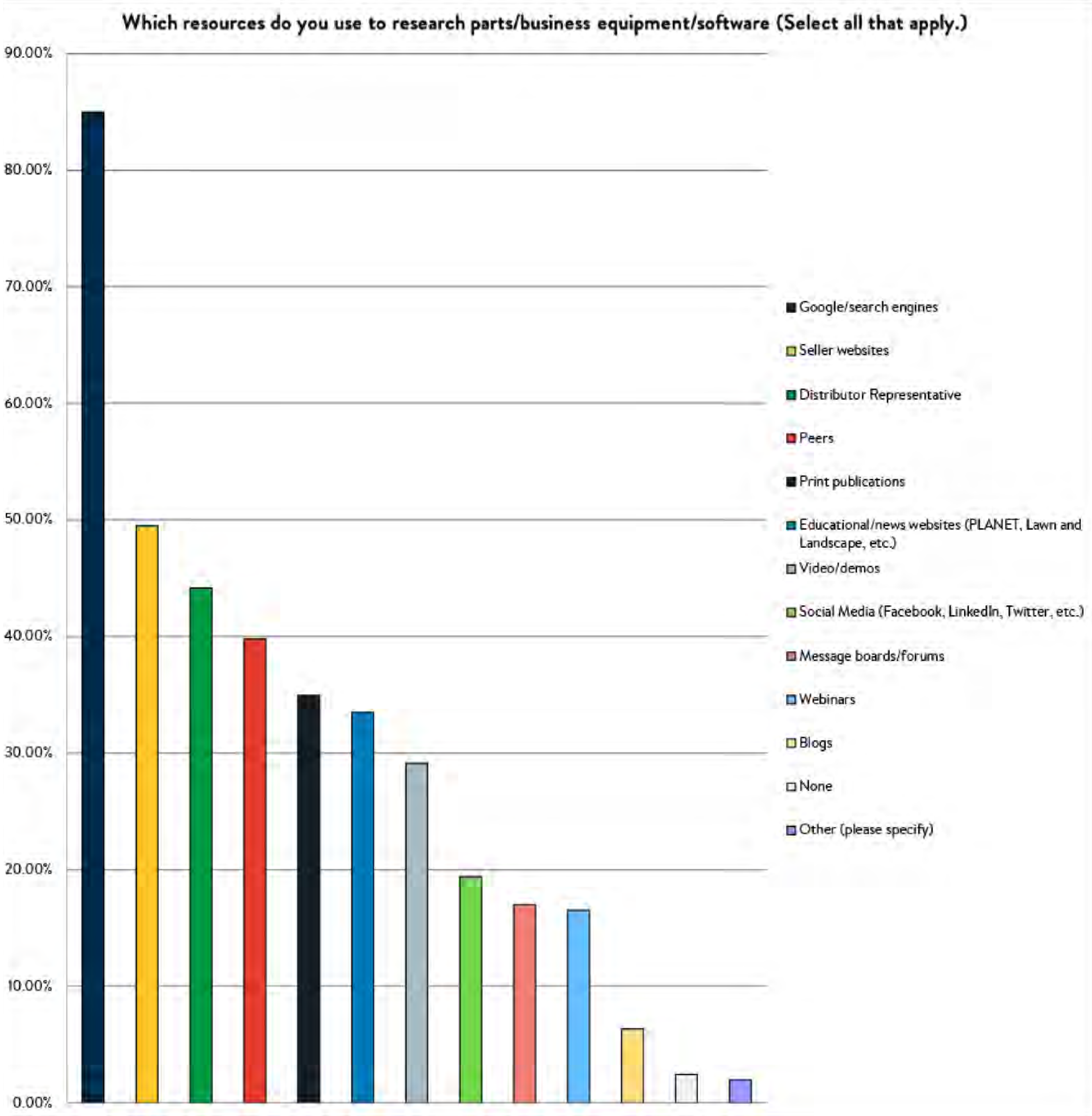


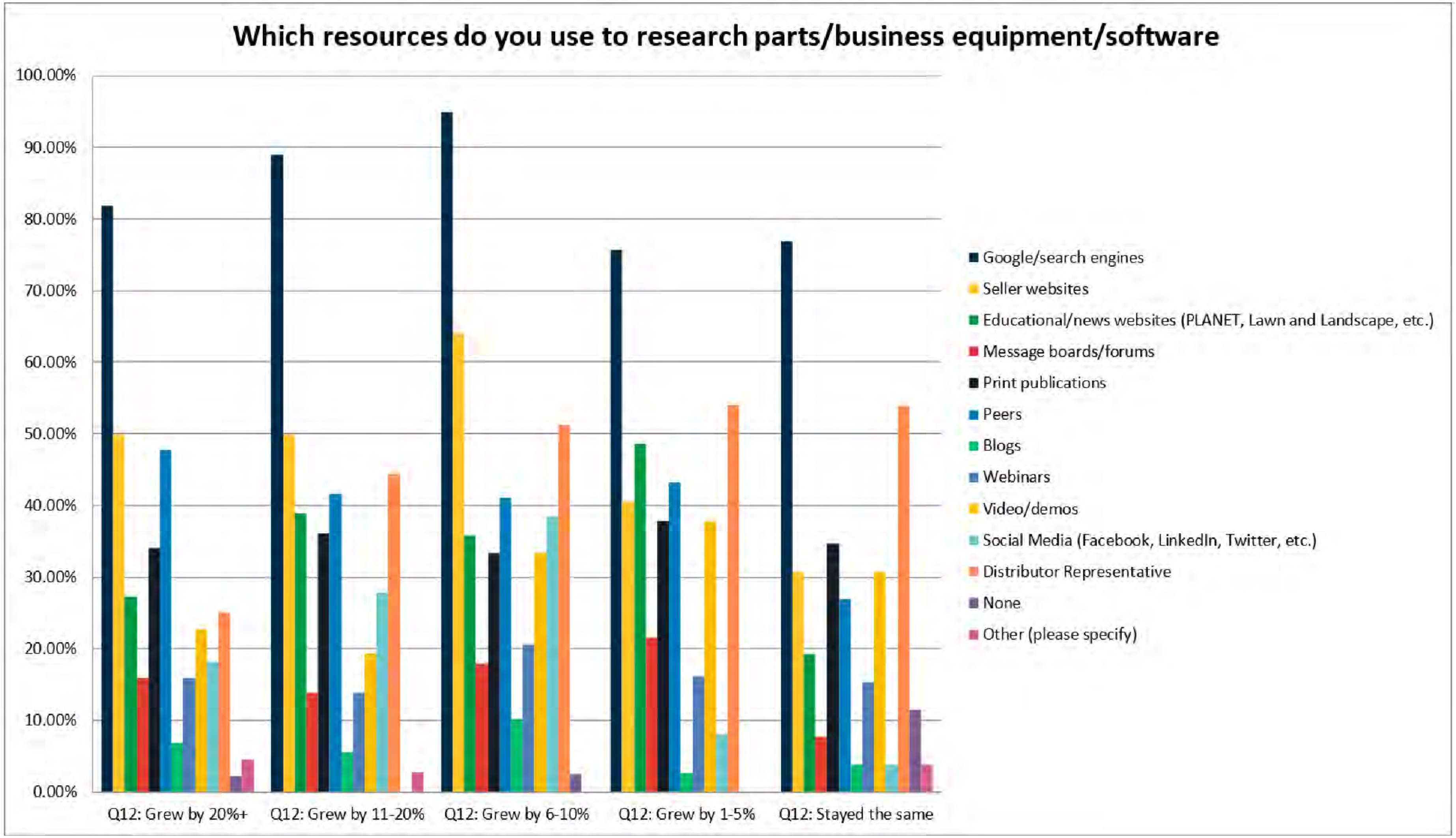
#8

Cast a wide net when researching products and equipment.

HindSite SOFTWARE



HindSite SOFTWARE


Which resources do you use to research parts/business equipment/software
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Q12: Grew by 20%+
Q12: Grew by 11-20%
Q12: Grew by 6-10%
Q12: Grew by 1-5%
Q12: Stayed the same
Google/search engines
Seller websites
Educational/news websites (PLANET, Lawn and Landscape, etc.)
Message boards/forums
Print publications
Peers
Blogs
Webinars
Video/demos
Social Media (Facebook, LinkedIn, Twitter, etc.)
Distributor Representative
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.

#9

Goal-setting helps businesses grow.

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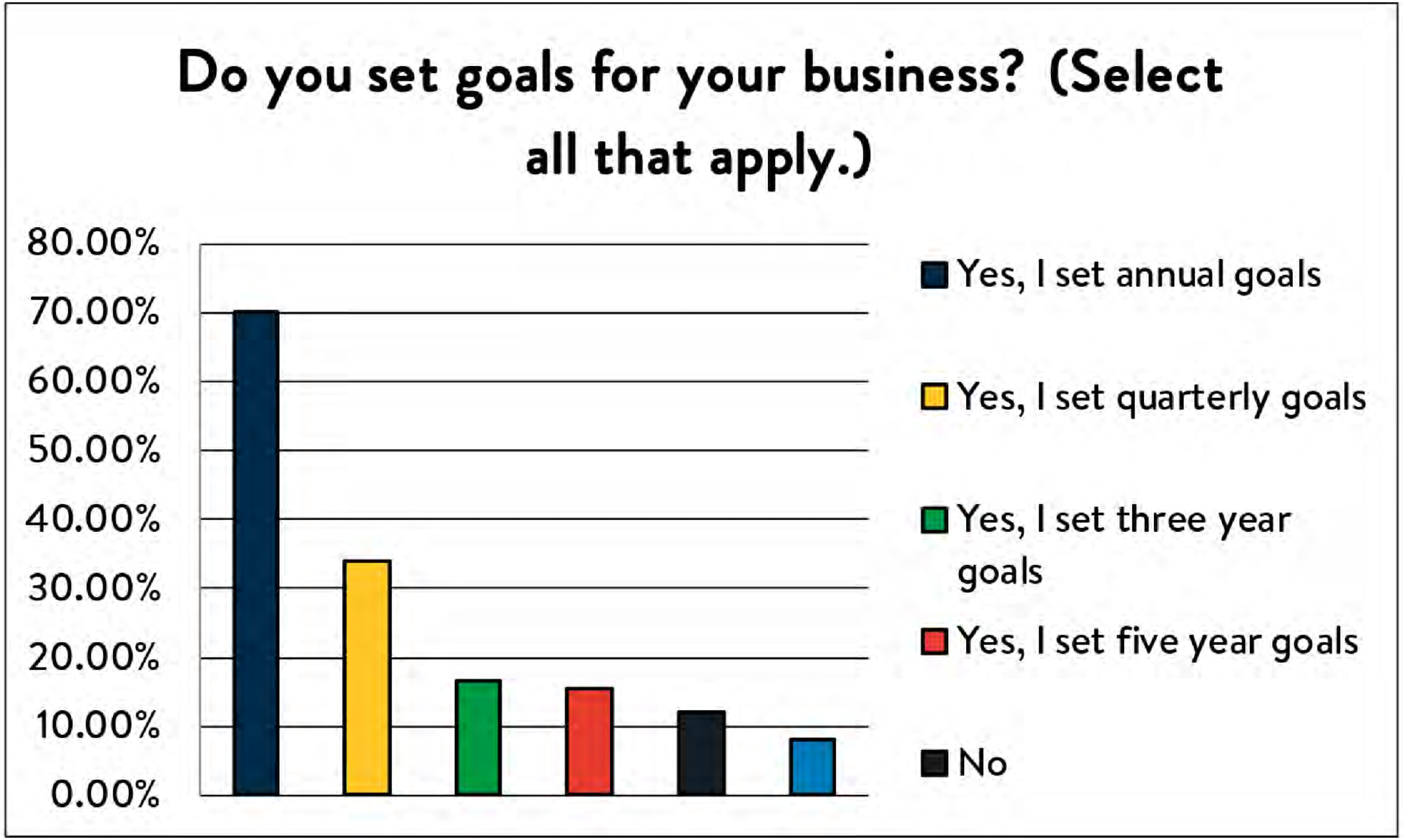
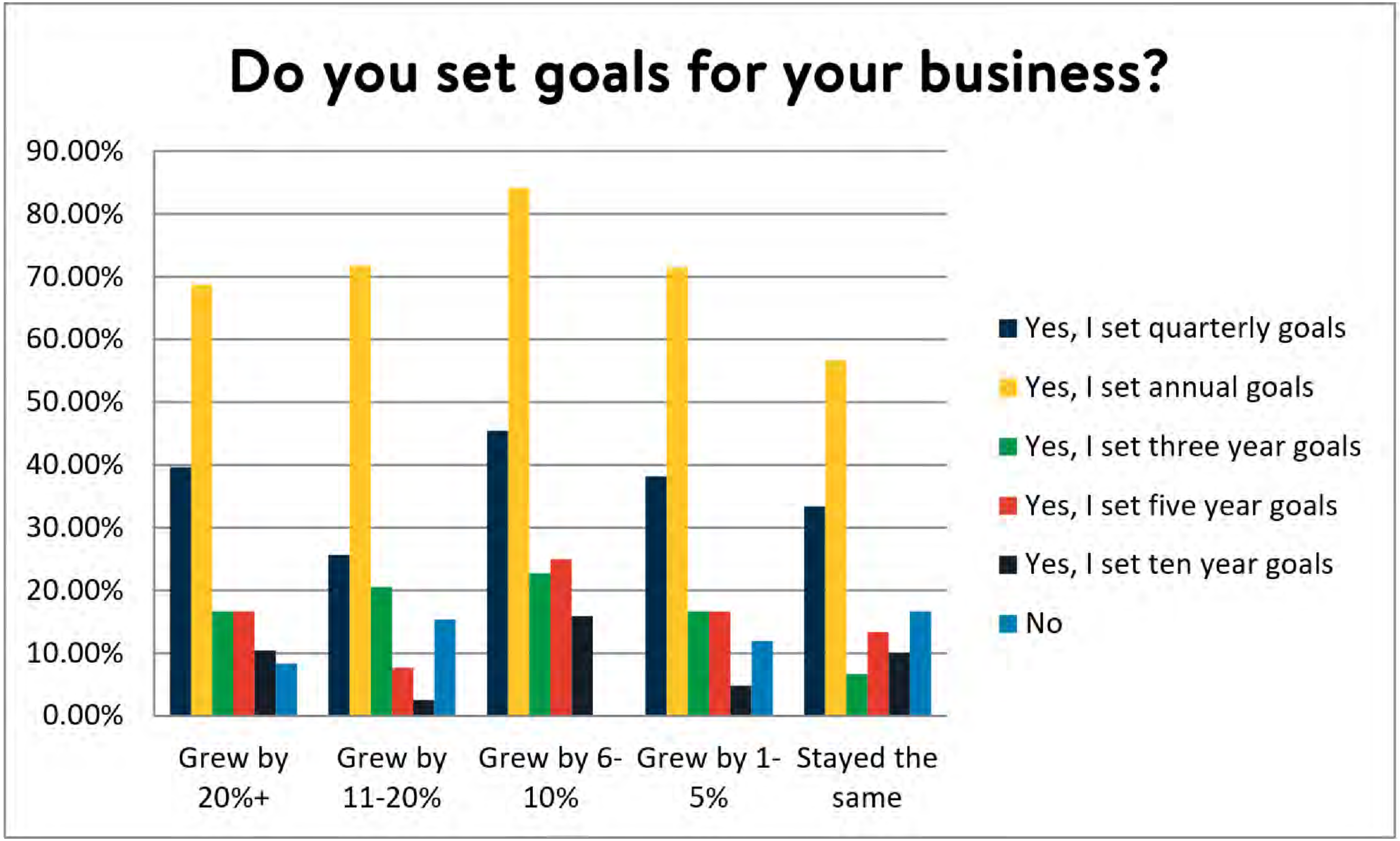


HindSite SOFTWARE



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Start with a long-term goal, then work backward to short-term goals.

Communicate your goals.

Give everyone a number.

HindSite SOFTWARE

Add your voice to the 2020 survey:

www.hindsitesoftware.com/survey

conserva irrigation®

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

2019

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?

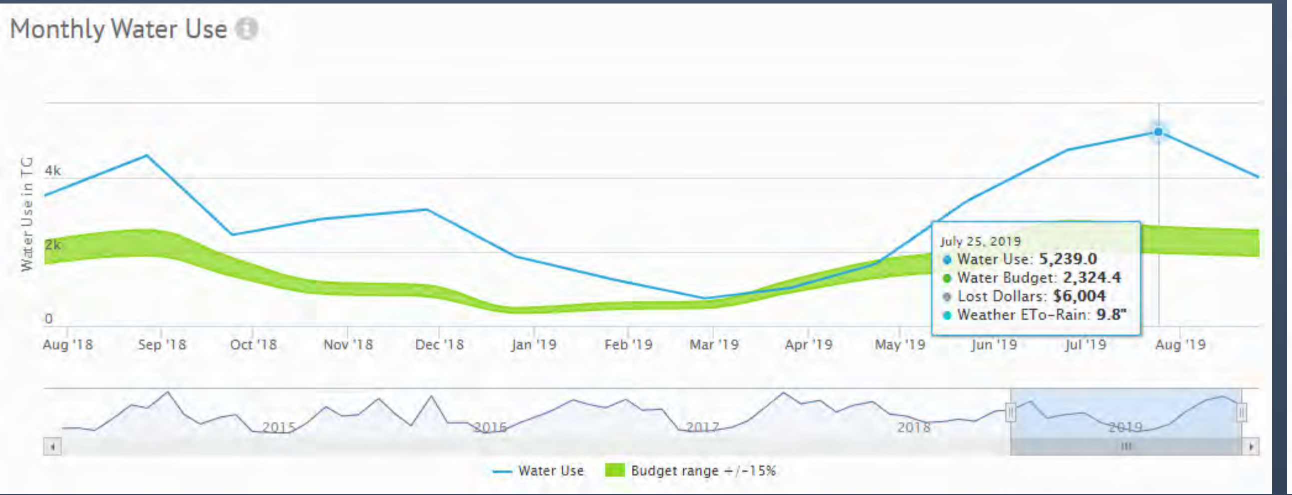
Water agency reasons:

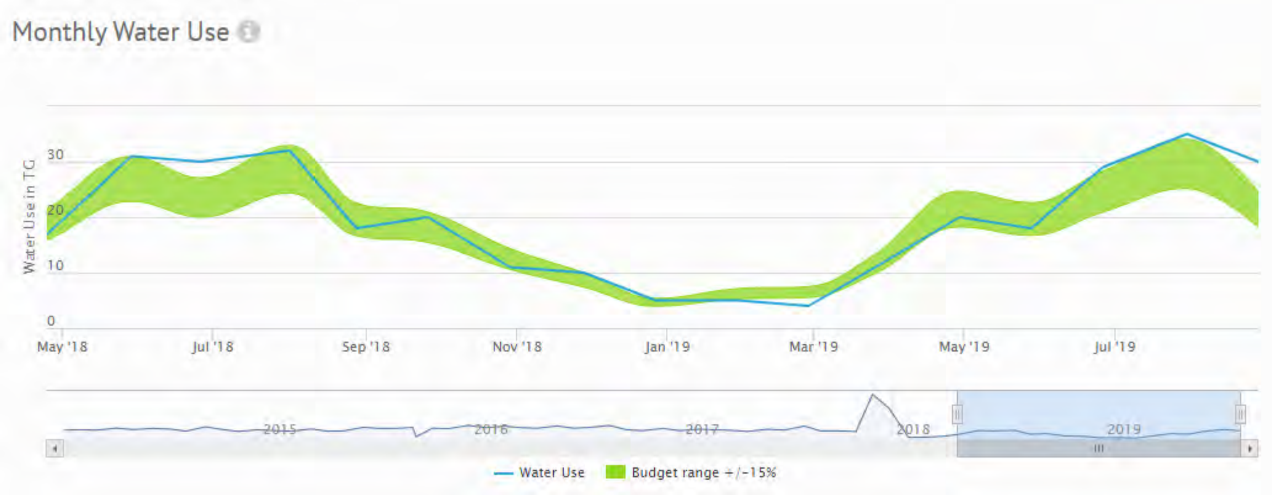
- Landscape water use is often the highest use (by far!) of potable water in a service area.
- Technology that saves water. (How exactly?)
- **Elevate** and **inform** the landscape and irrigation industry *and its customers*
    - We have the same customers!

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)

Scheduling Multiplier Lookup Table

Uniformity	Scheduling Multiplier	Uniformity	Scheduling Multiplier	Uniformity	Scheduling Multiplier
1.00	1.00	0.78	1.15	0.58	1.34
0.98	1.01	0.76	1.17	0.56	1.36
0.96	1.02	0.74	1.18	0.54	1.38
0.94	1.04	0.72	1.20	0.52	1.40
0.92	1.05	0.70	1.22	0.50	1.43
0.90	1.06	0.68	1.24	0.48	1.45
0.88	1.08	0.66	1.26	0.46	1.48
0.86	1.09	0.64	1.28	0.44	1.51
0.84	1.11	0.62	1.30	0.42	1.53
0.82	1.12	0.60	1.32	0.40	1.56
0.80	1.14	Fix sprinkler problems if below 0.40			

K. Thompson
& ASSOCIATES, LLC

experience AND implementation SM

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.)

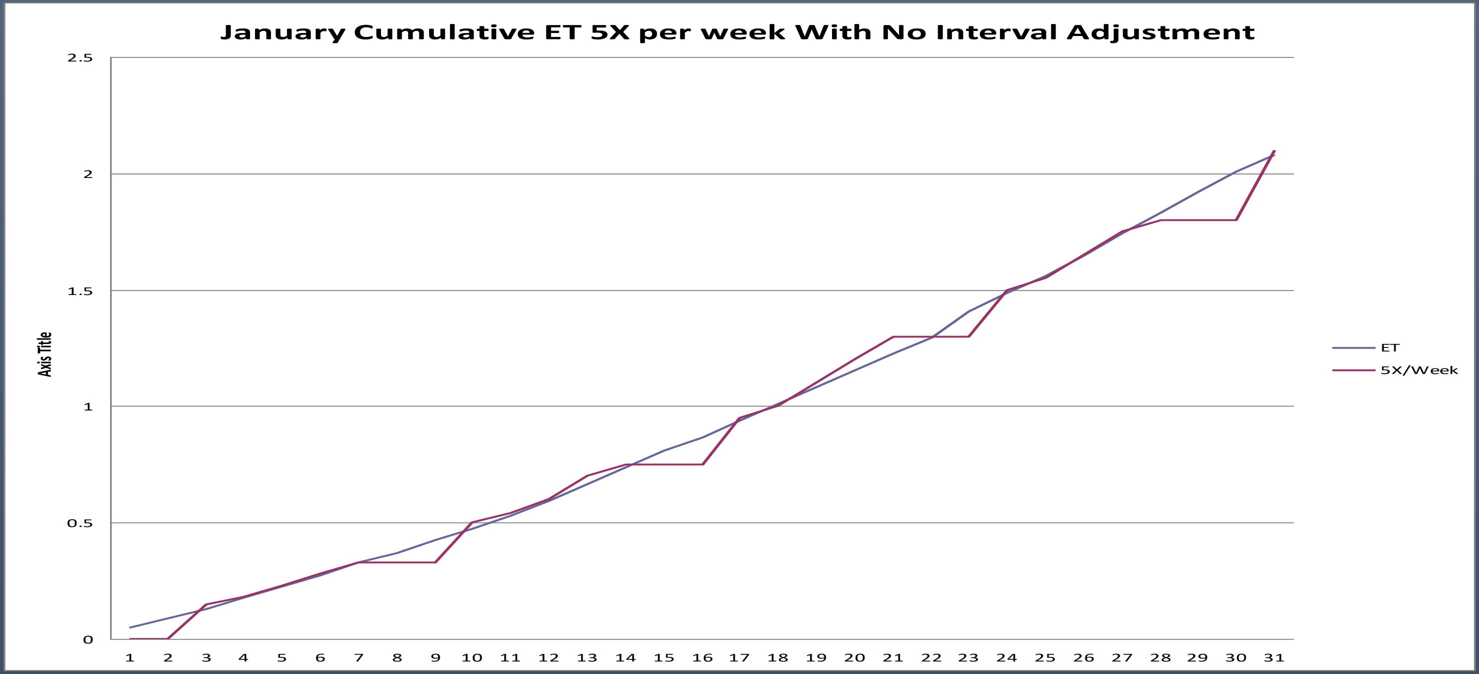
- **We assist in programming the controller after installation if needed.**
- **Monitor for optimal results, following up as necessary.**

- 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 has 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!

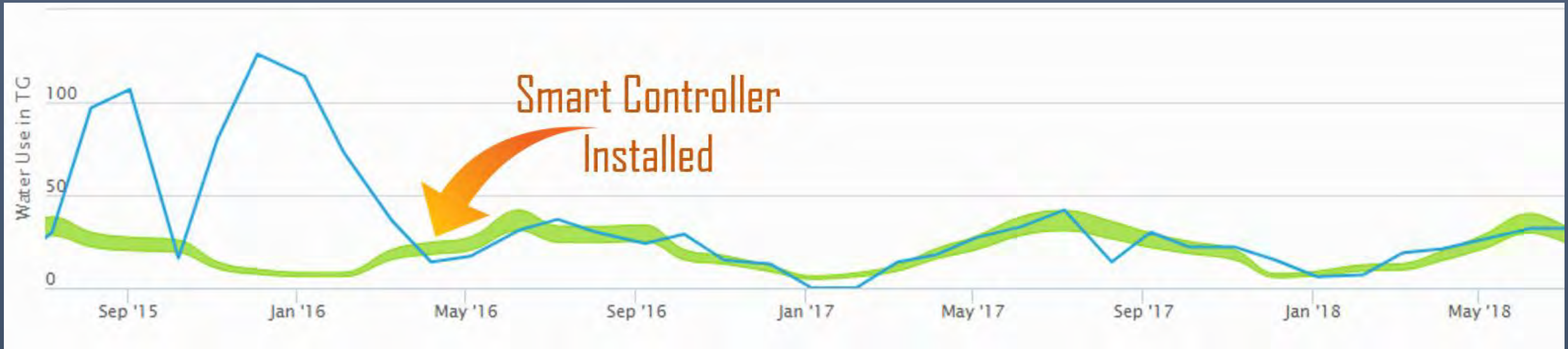
Gilbert believes in healthy landscapes that are **irrigated efficiently**.

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)

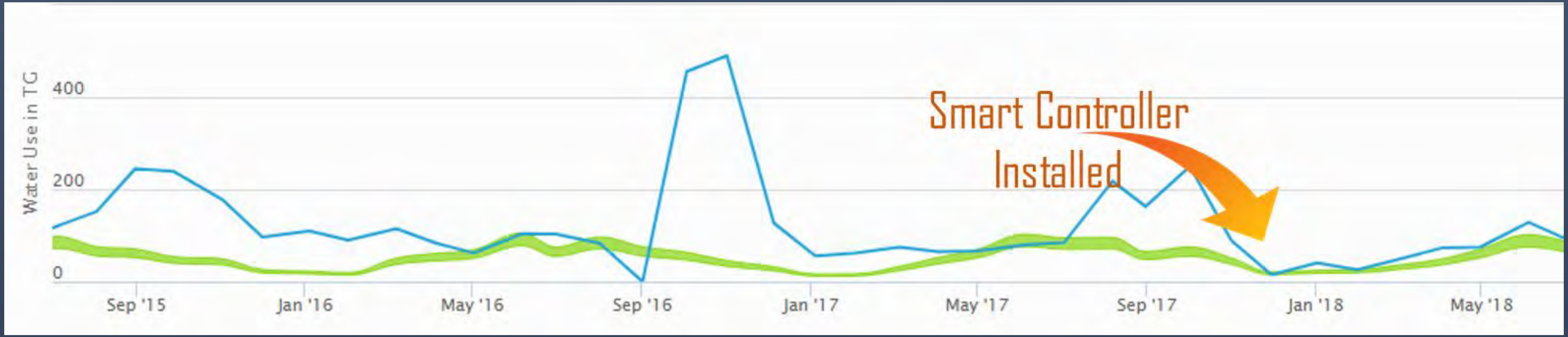


~ 500,000 Gallons saved in first year

Results

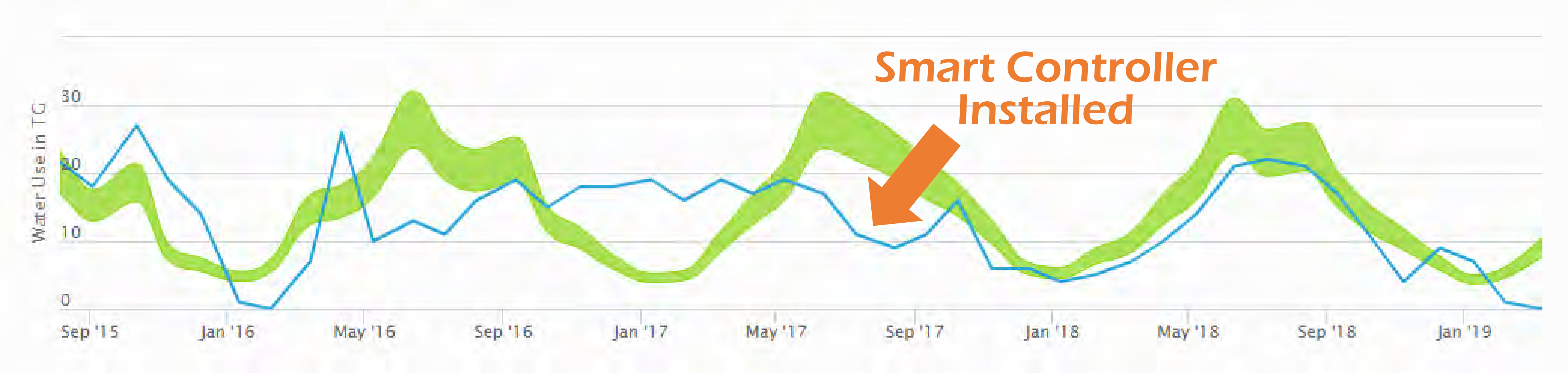
Grocery Store Plazas
(Smart Controllers)

Already about 800,000 gallons saved each



Results

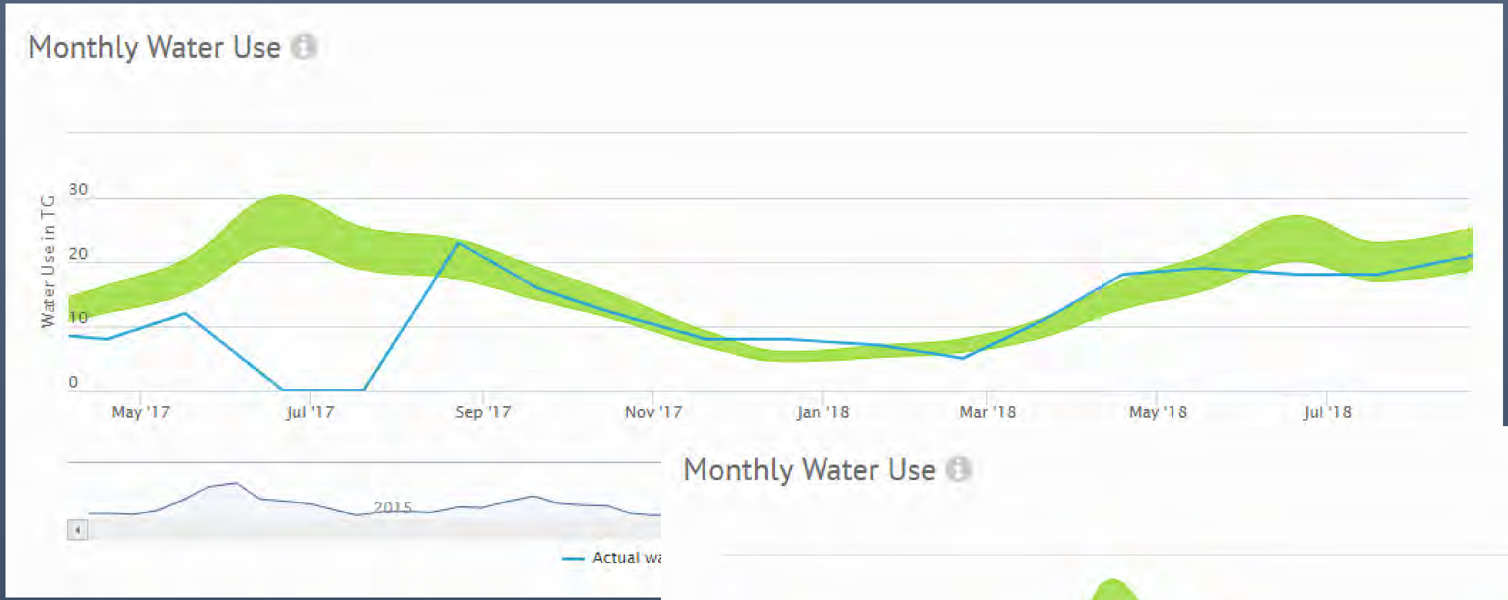
Fire Stations
(Smart Controller)

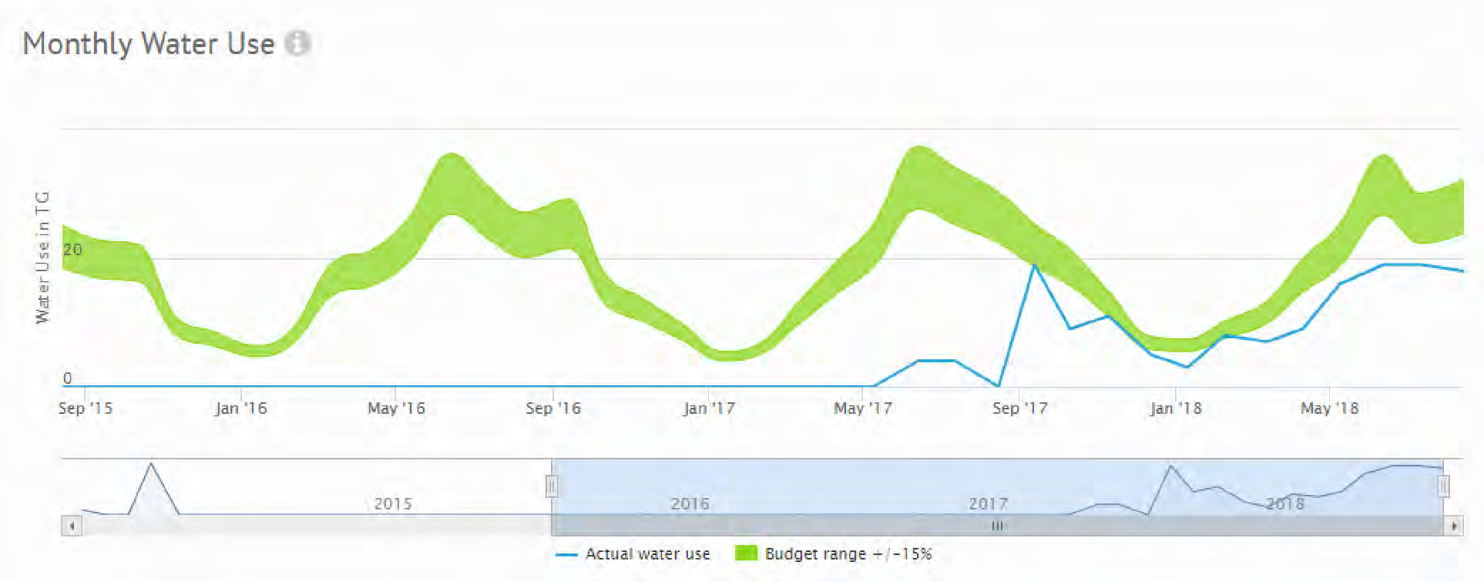


Water savings may be small, but plant health is much improved

Results

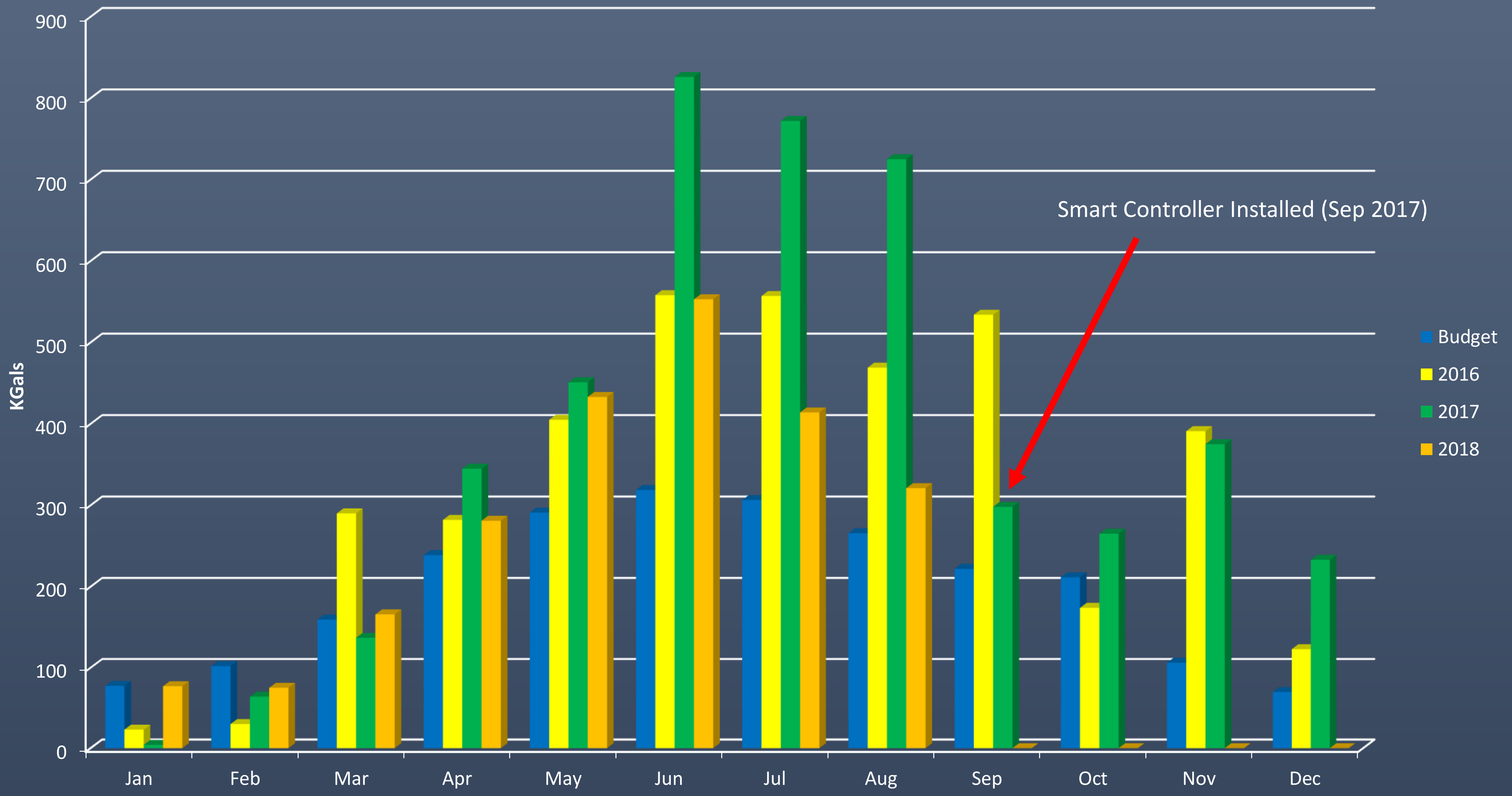
Fire Stations
(Smart Controllers)





Results

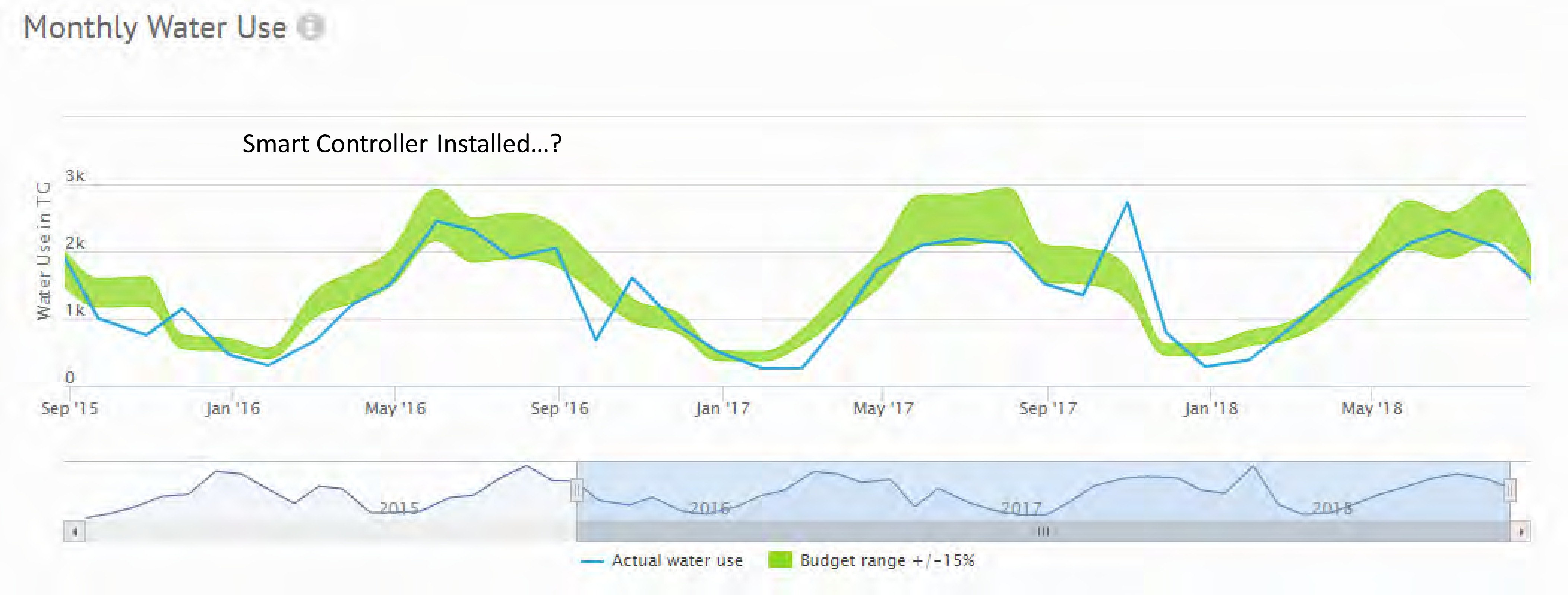
HOA's (Smart Controller)



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

Results

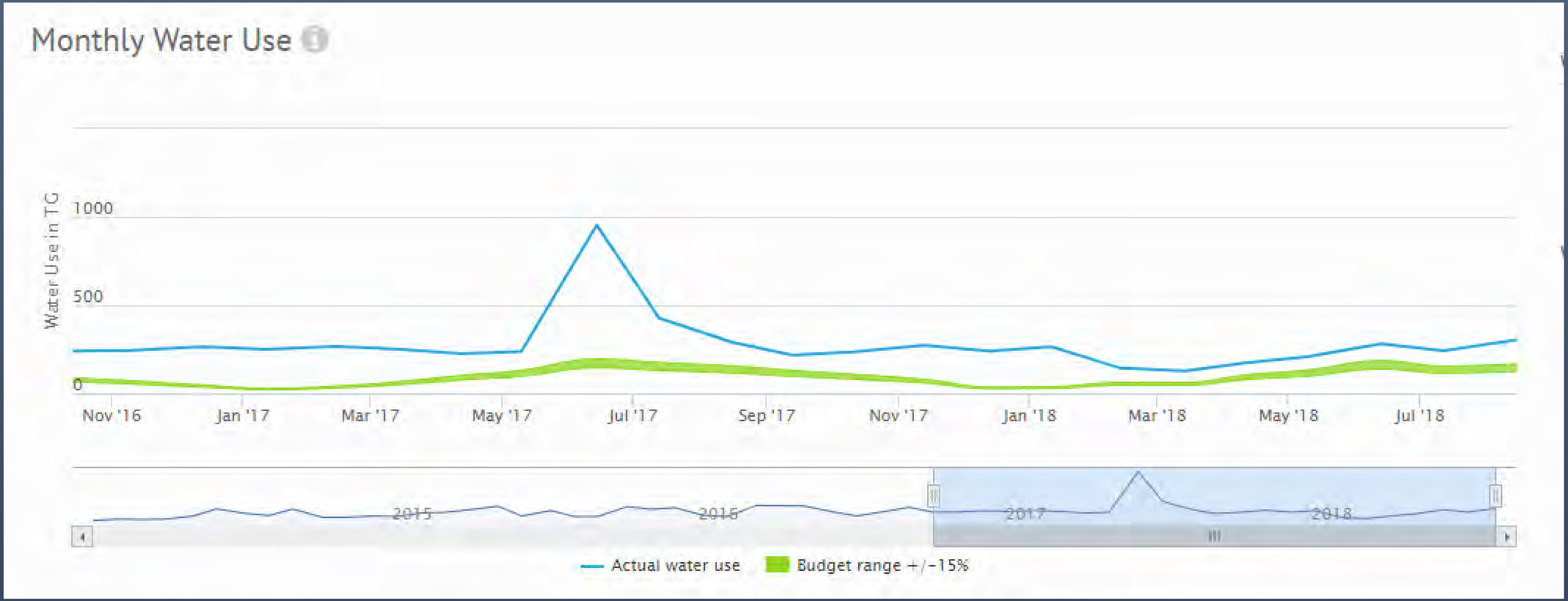
HOA's
(Smart Controller)



Sometimes there are little savings potential with a smart controller.

Potential for Smart Controller

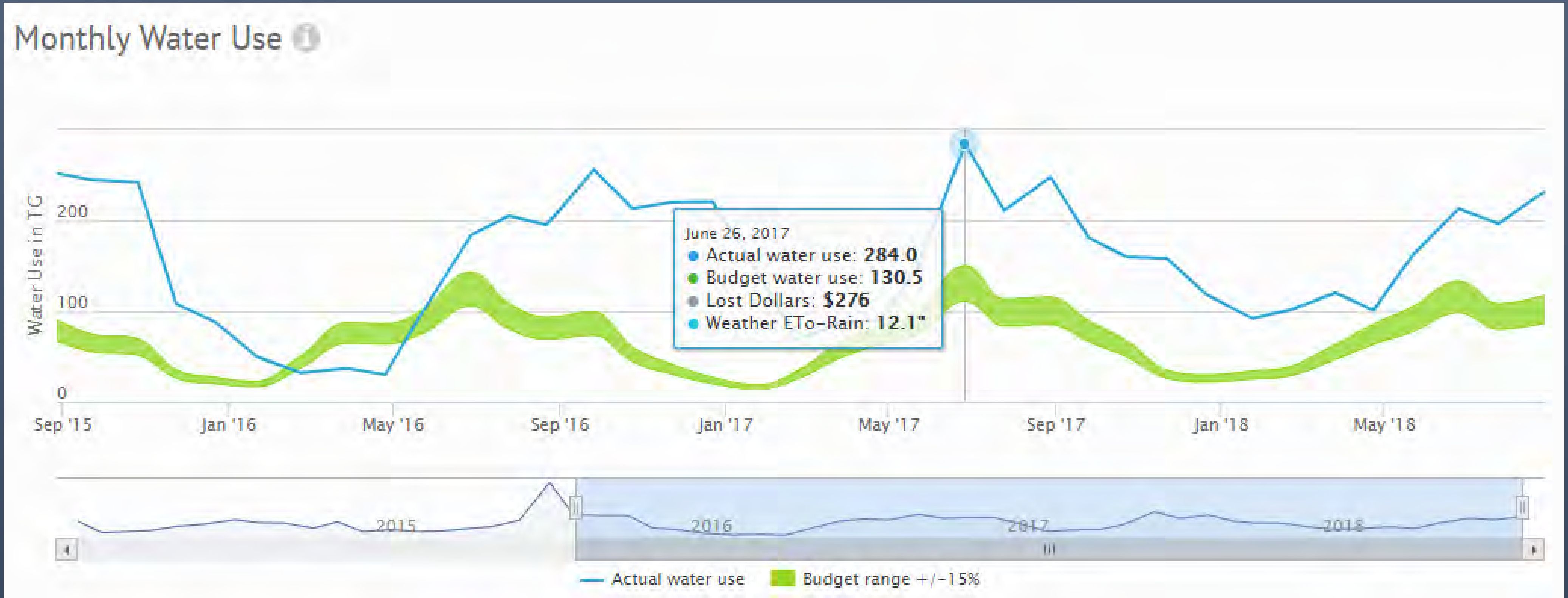
Flat-lining irrigation schedules



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)**

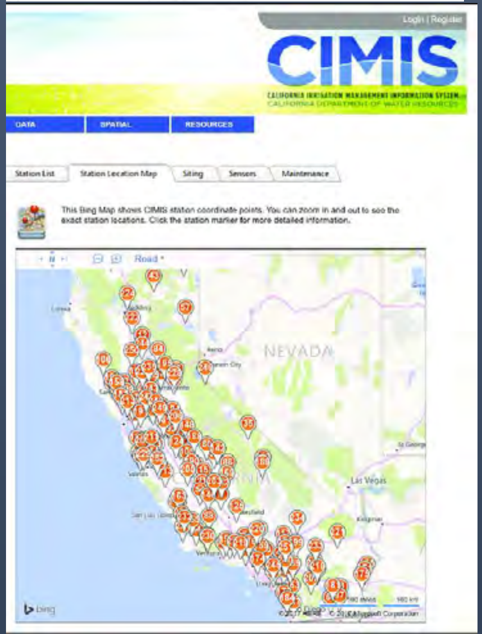
Future for Smart Controllers

- 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.

AZ Meteorological Network



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

Sustainable Manufacturing

Hunter®

HUNTER INDUSTRIES
Built on Innovation®

December 2019


Hunter

Value Chain

Supply

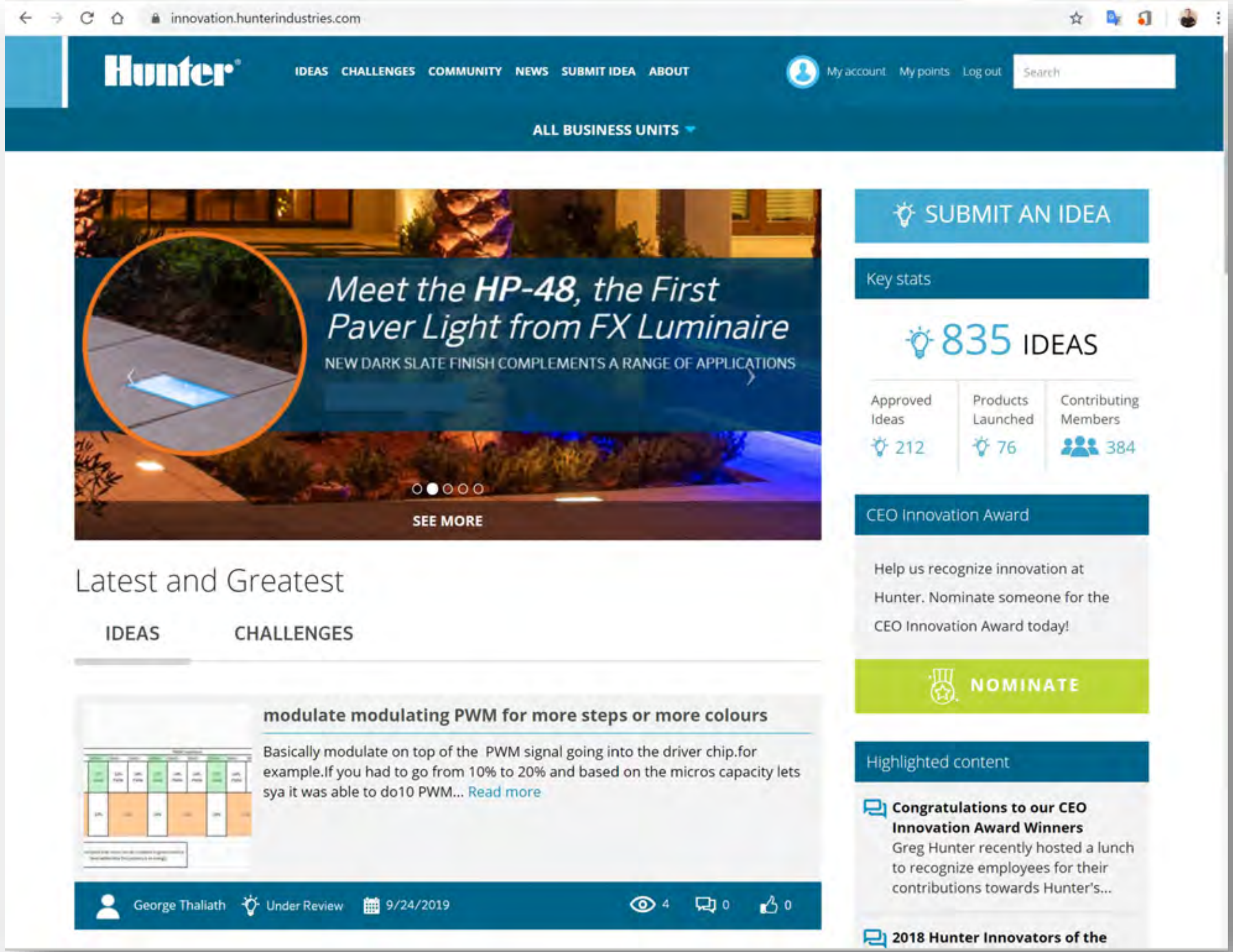
Manufacturing

Distribution

End User

Manufacturing Overview

Design and Innovation



Design and Innovation: Design Process

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

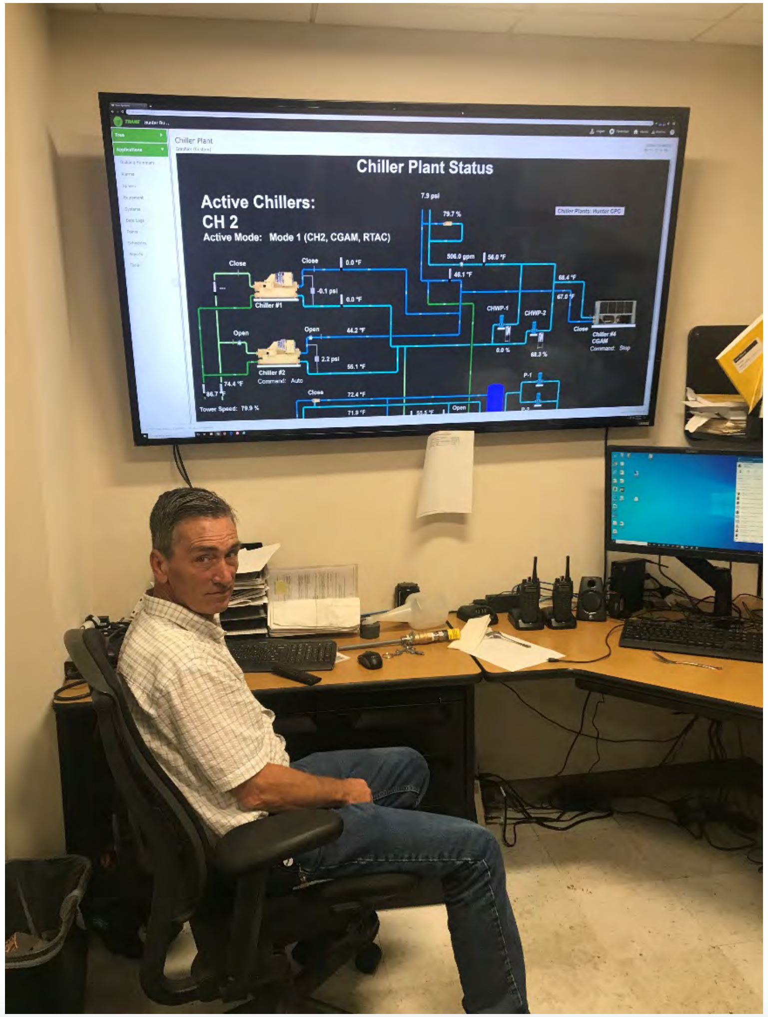
Tooling and Manufacturing: Efficacy

Tooling and Manufacturing: Waste

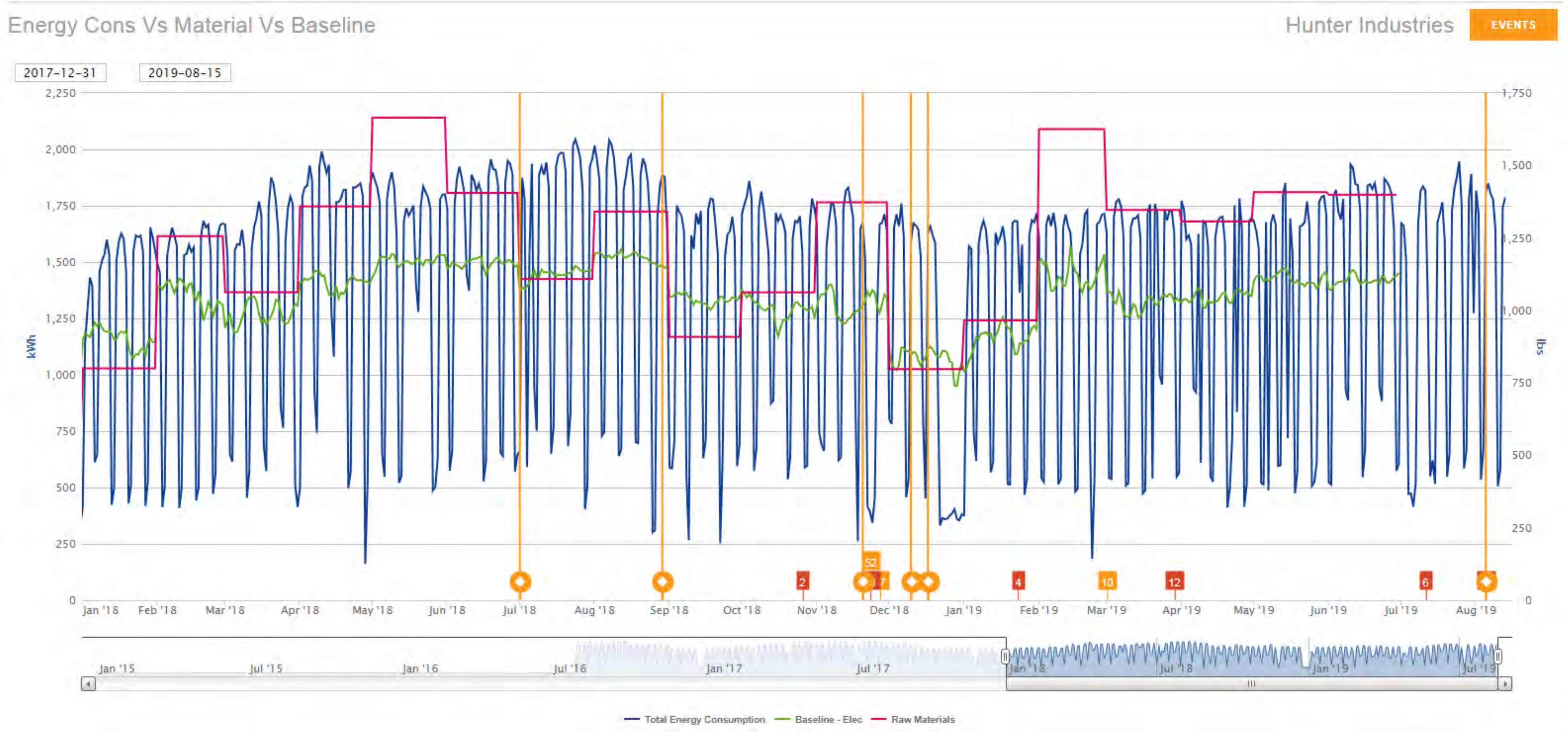
Resources

Resources: Consumption

Resources: Measure and Manage

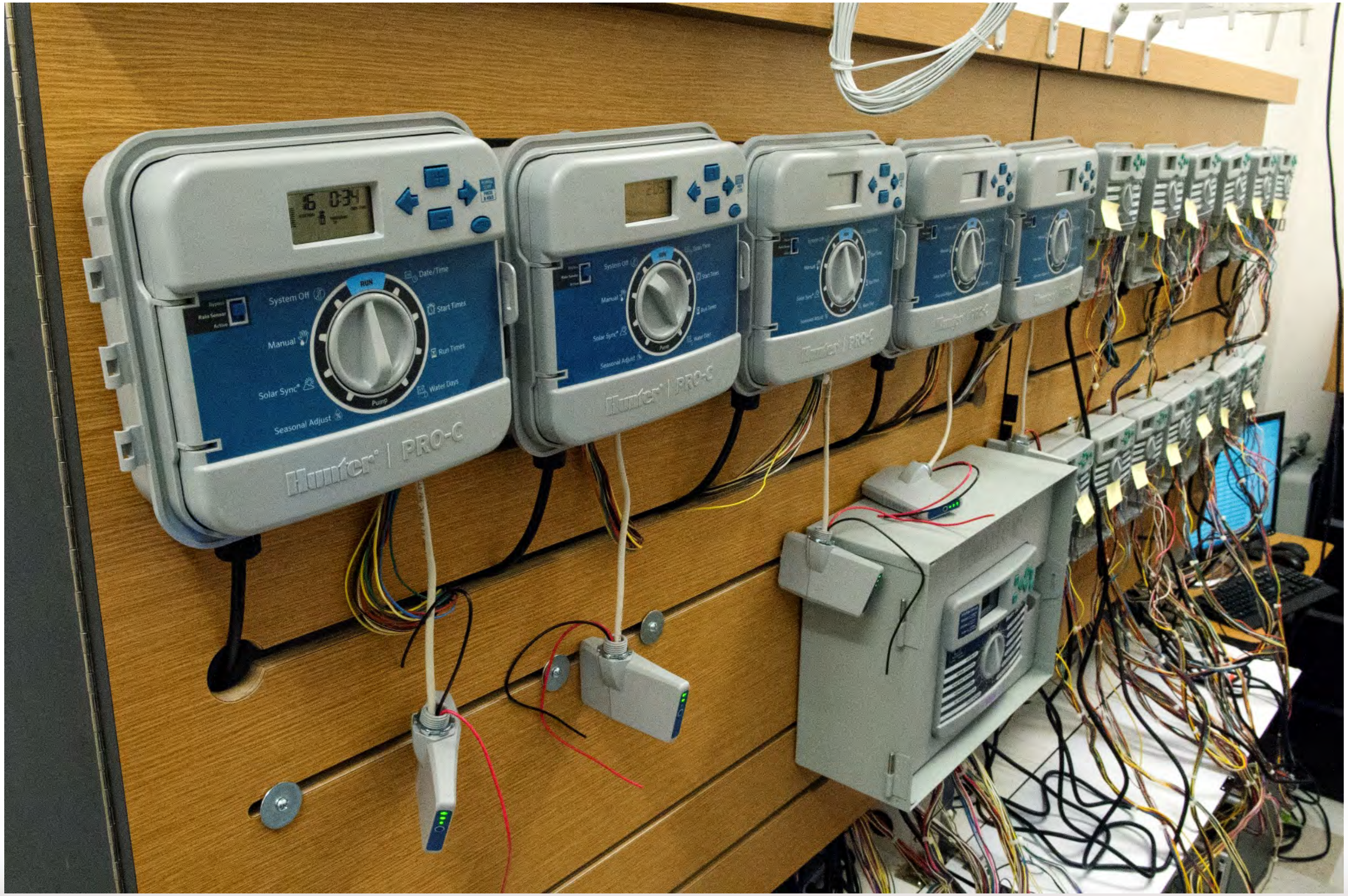


Resources: Measure and Manage



Resources: Employees / Social Governance

Quality Control



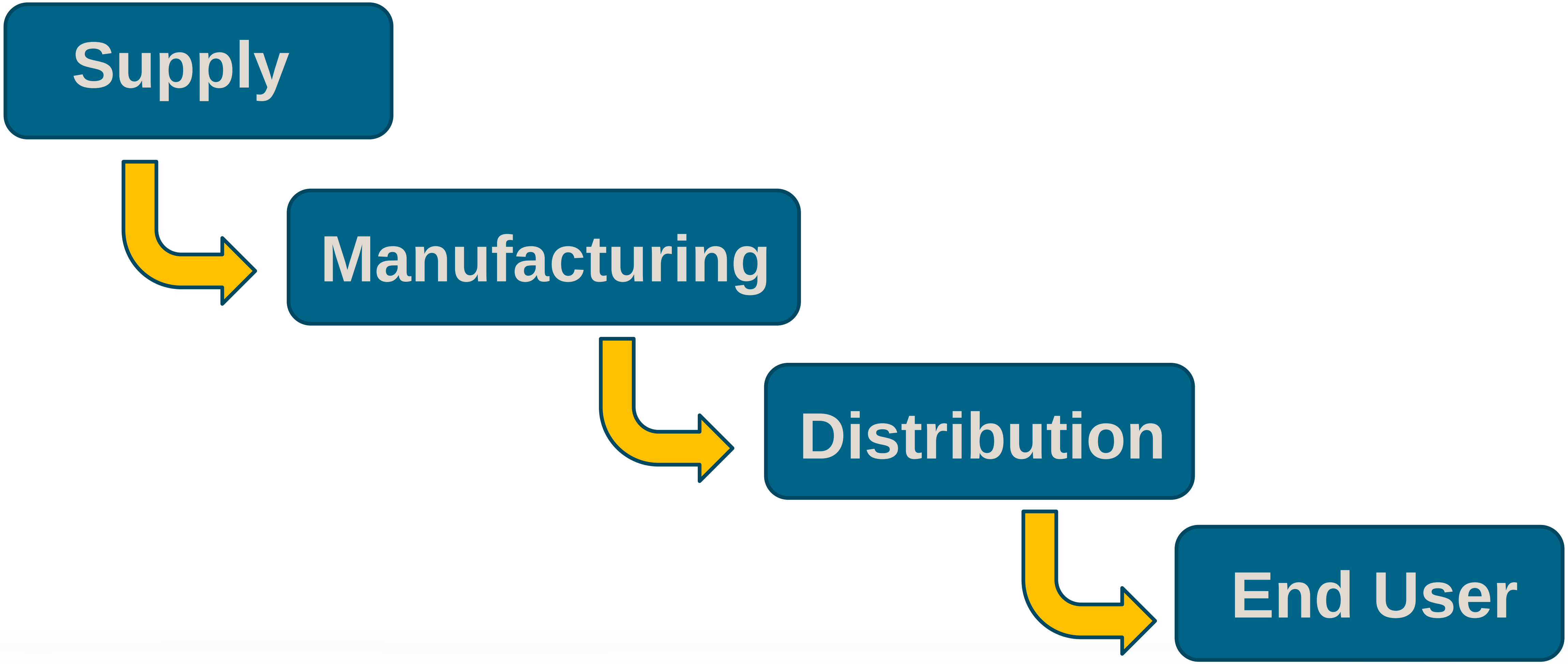
Transportation

We proudly offer UPS carbon neutral shipments

ups

ups.com/ carbonneutral

Value Chain



Green Infrastructure

Green Infrastructure: Community

Green Infrastructure: Heath and Well-being

Green Infrastructure: Environment

Green Infrastructure: Economy

Green Infrastructure: Performance

05.02.17

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

R.I.P. parking lots.

3/7 [Image: courtesy SWA]

LANDSCAPE PERFORMANCE SERIES

Case Study Briefs
Fast Fact Library
Benefits Toolkit
Collections

More

The Landscape Performance Series is the online set of resources to help designers, agencies, and advocates evaluate performance, show value and make the case for sustainable landscape solutions.

Uptown Normal Circle

Renaissance Park

Health & Wellbeing
Carbon & Climate
Urban Agriculture

Active Living
Resilience
Biodiversity

Frontier Project

Revitalization
Social Equity
Water Management

Sarah E. Goode STEM...

Dutch Kills Green

Green Infrastructure: Irrigation

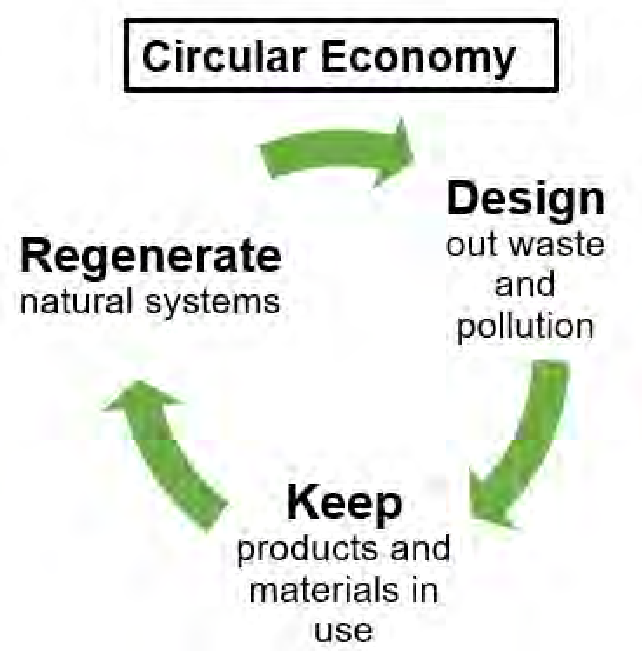
Green Infrastructure: Balance Inputs and Outputs

Resource Efficiency

Waste

Linear Economy

Take resources from the ground → **Make** into products which are used → **Waste** discarded when no longer needed or wanted



Partnerships

BlueStarRecyclers

Focus on disAbilities

Inspiration & Investment

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

BlueStarRecyclers

*Bureau of Labor Statistics, 2014
** US News & World Report , 2014

With one solution…

BlueStarRecyclers

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

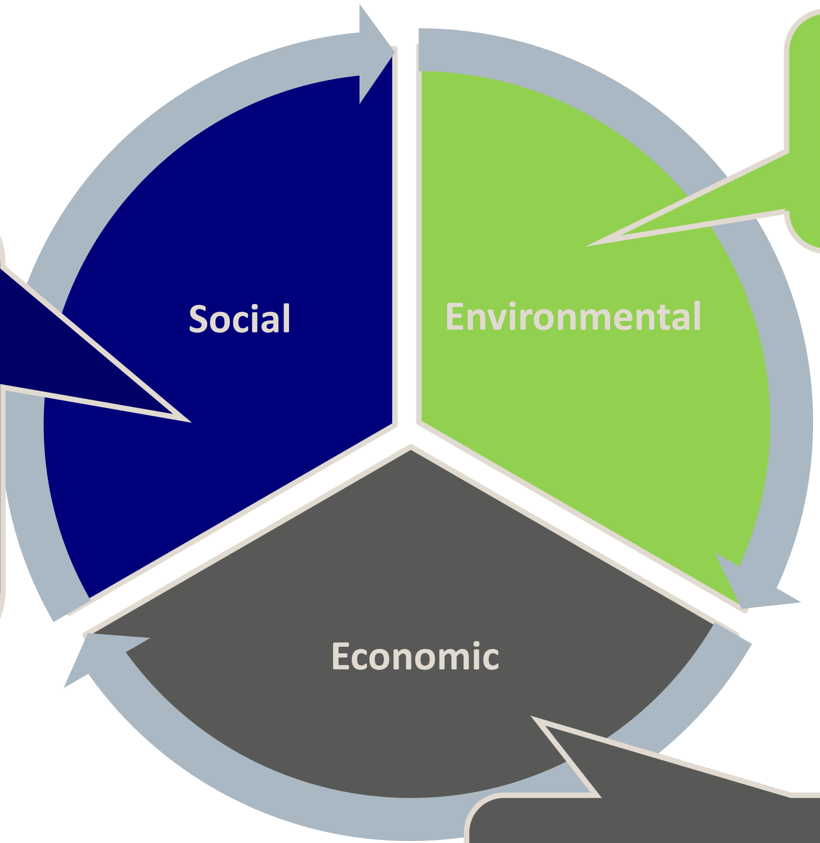
Asset vs. deficit-based employment model
Reduces taxpayer burden

Transforms waste into community benefit
Produces triple-bottom line impact

BlueStarRecyclers

Impact To Date

Permanent employment for 40 people with disAbilities



20 million lbs. of e-waste recycled

2018: $2.5 million in SROI ($2.65 return on every $1.00)

BlueStarRecyclers

*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

BlueStarRecyclers

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

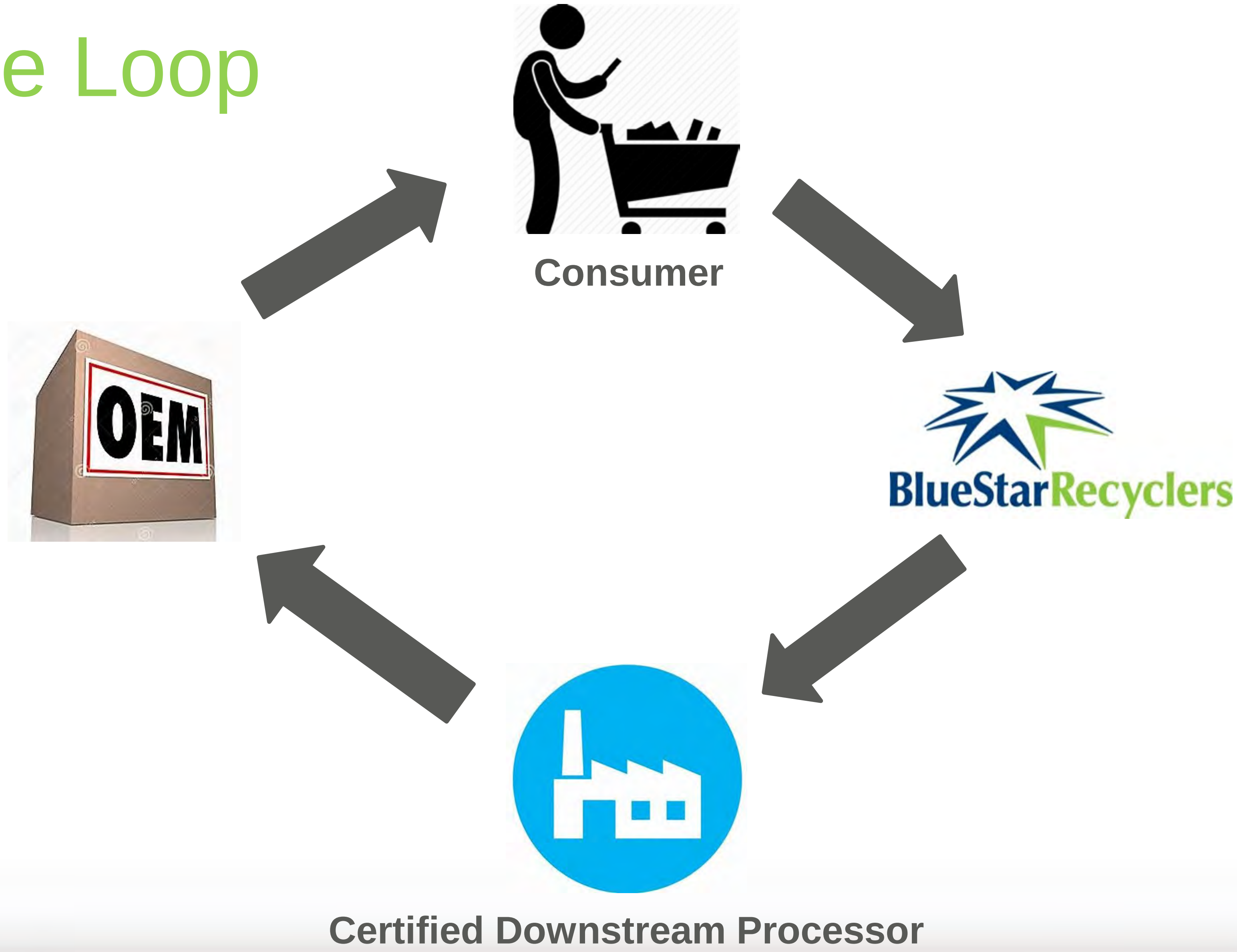
Win-Win-Win:

- ✓*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

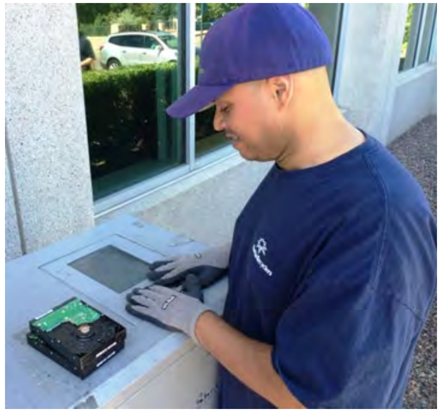
Kian Phair Age 22 – 2018 Recycling Tech/ BSR

Closing The Loop



Enterprise & Certifications

- Certified electronics recycling
- Data Destruction
- Computer Refurbishing
- Fluorescent Bulb Recycling
- Recycling events management



e-Stewards CERTIFIED

ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14001

OCCUPATIONAL HEALTH & SAFETY OHSAS 18001

COLORADO Environmental Leader Gold

RECYCLE COLORADO

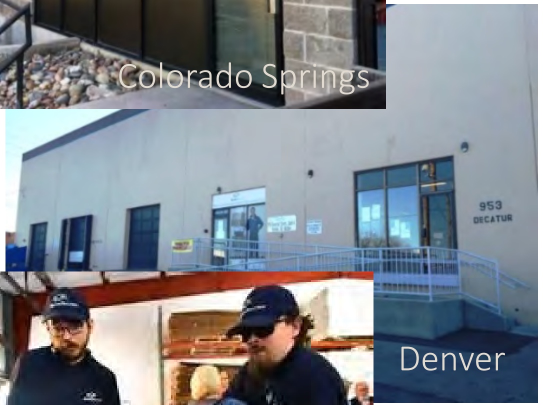
BBB ACCREDITED CHARITY

BBB ACCREDITED BUSINESS A+

Locations:

Current Recycling Operations:

Colorado Springs



Denver

Boulder

2019 Expansion:

Chicagoland, IL

Roaring Fork Valley, CO

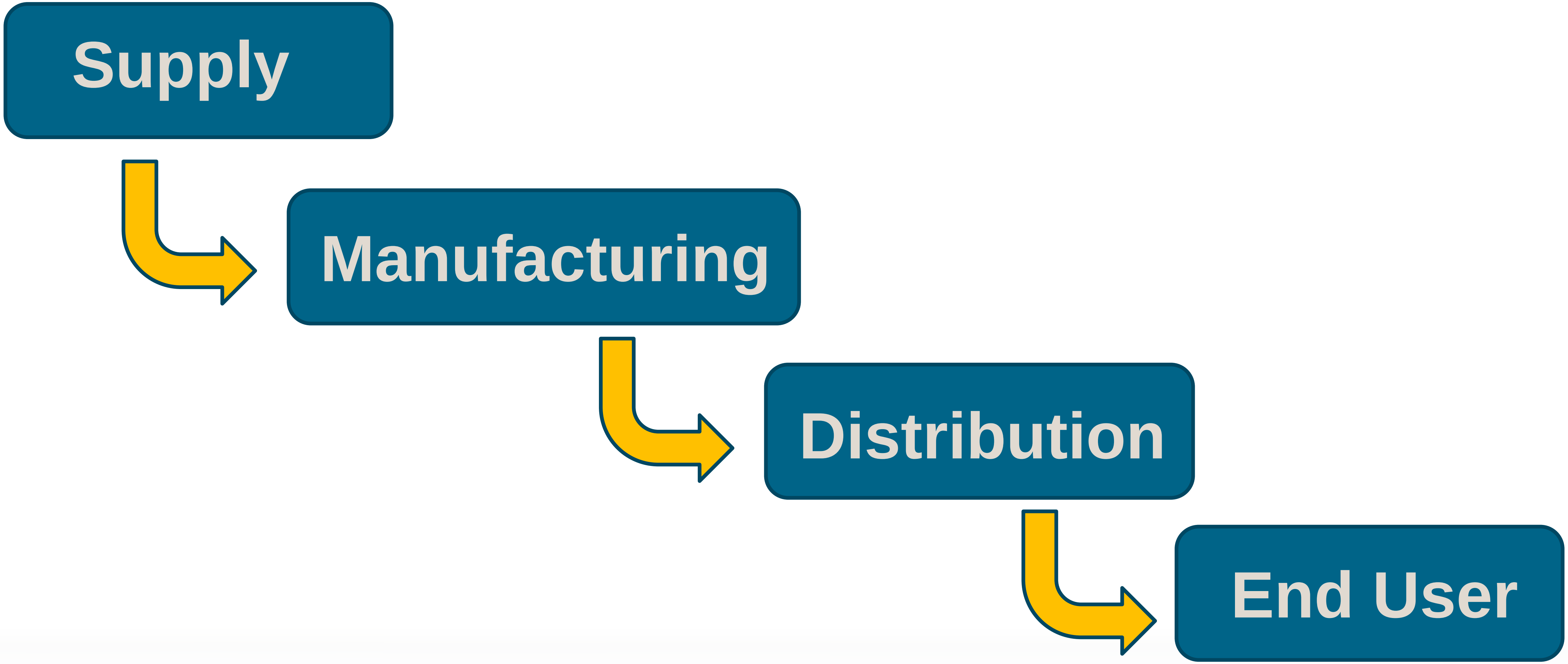
BlueStarRecyclers

Thank you!

BlueStarRecyclers

www.bluestarrecyclers.org

Value Chain



Creating partnerships to find solutions

Sharing the story

Creating a Resilient and Sustainable Industry

Sustainable Manufacturing

Hunter®

HUNTER INDUSTRIES
Built on Innovation®

December 2019

Wi-Fi Controller Are Revolutionizing / Disrupting The Irrigation Business!

Presented by:
John Newland
Irrigation Association

Irrigation Association | EDUCATION

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

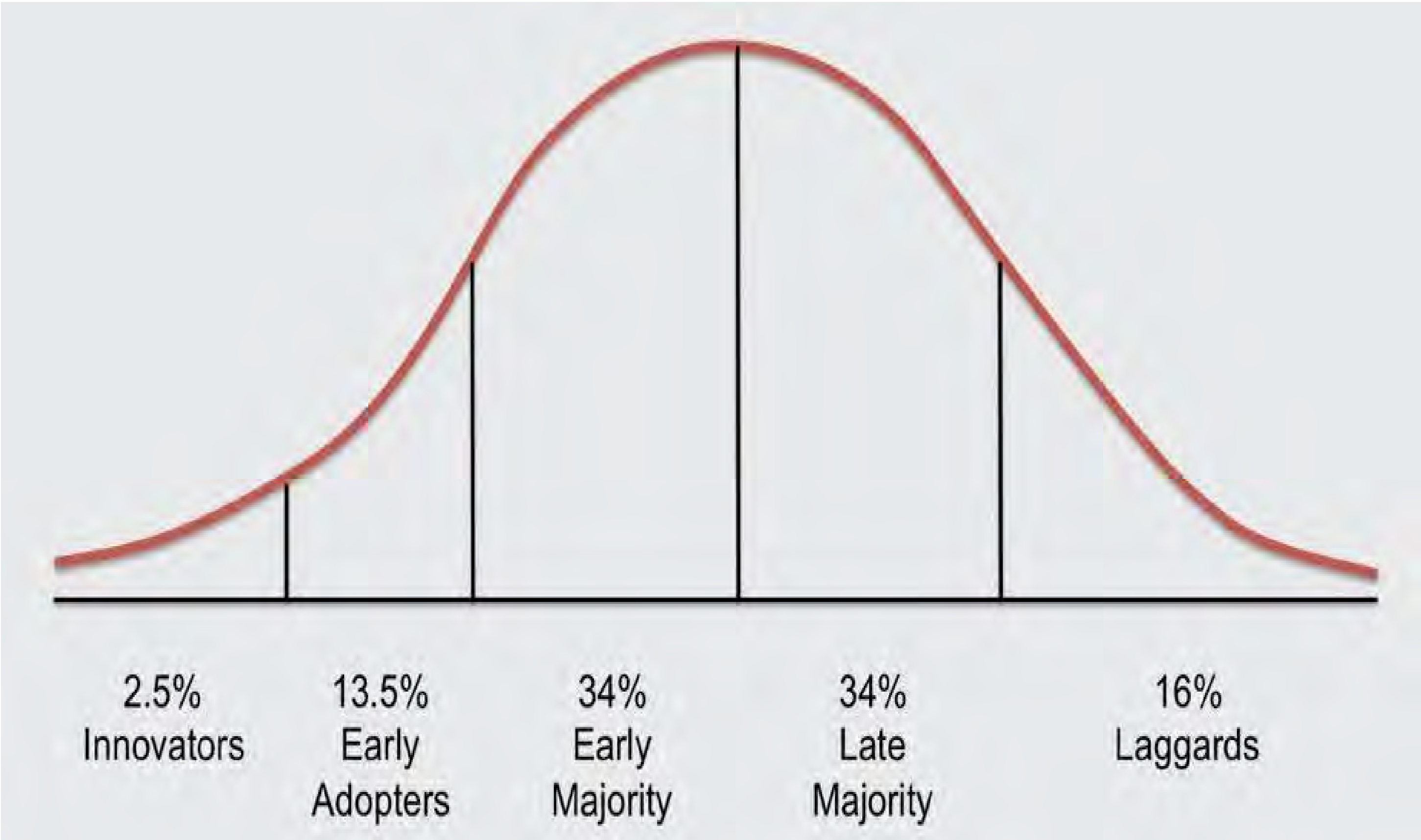
- 43,000,000 + 1” systems in NA
- WiFi Controllers (Just taking hold)
- Water conservation
- Market to existing customers Base
- Owners need to think REBUILD FIRST
- Change Business to Proactive VS Reactive

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!

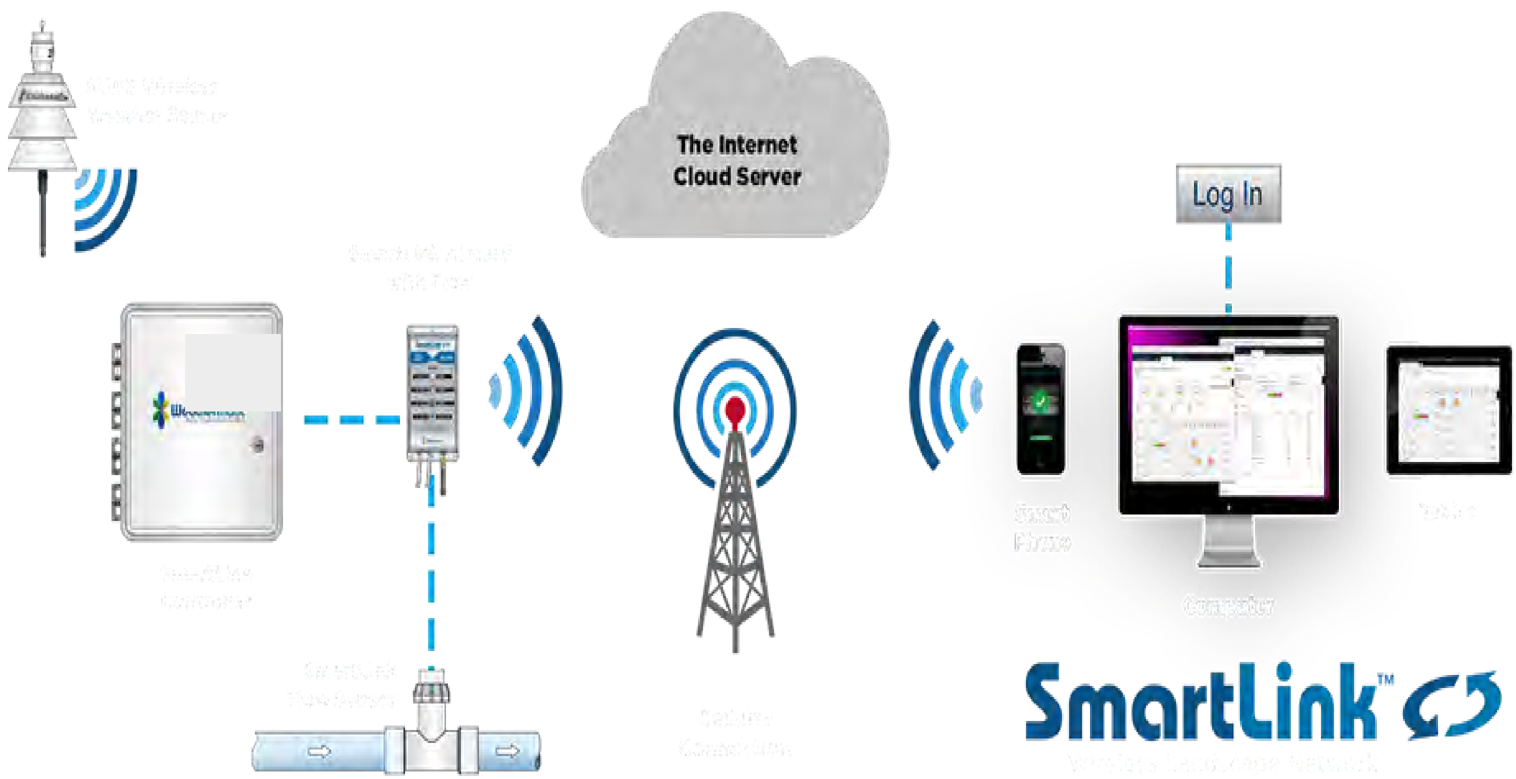
Understanding WiFi Controllers

Market and Contractor Acceptance



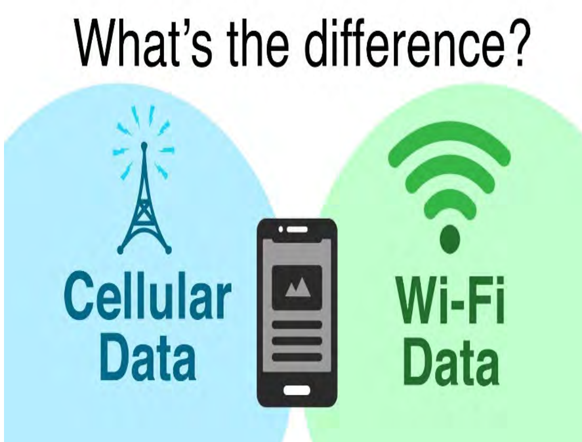
What is out there for tech?

- Cloud based control systems.



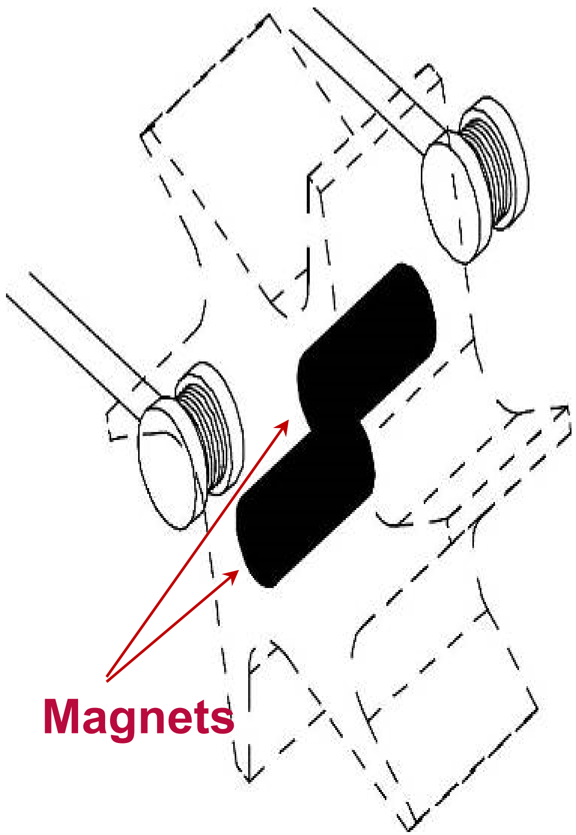
What is out there for tech?

- 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

14

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

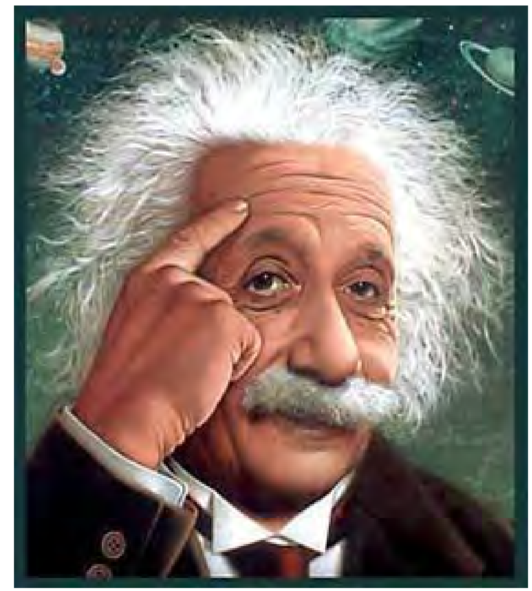
- Service alerts must be continually managed, “emergency” calls and alerts must be managed.
- Setting expectations that monitoring and repairs are two different charges.
- Customer communication must be primary concern – may be contrary to company culture (texting, Email and phone)

Business Future

Irrigation Association® | EDUCATION

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*"?

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.

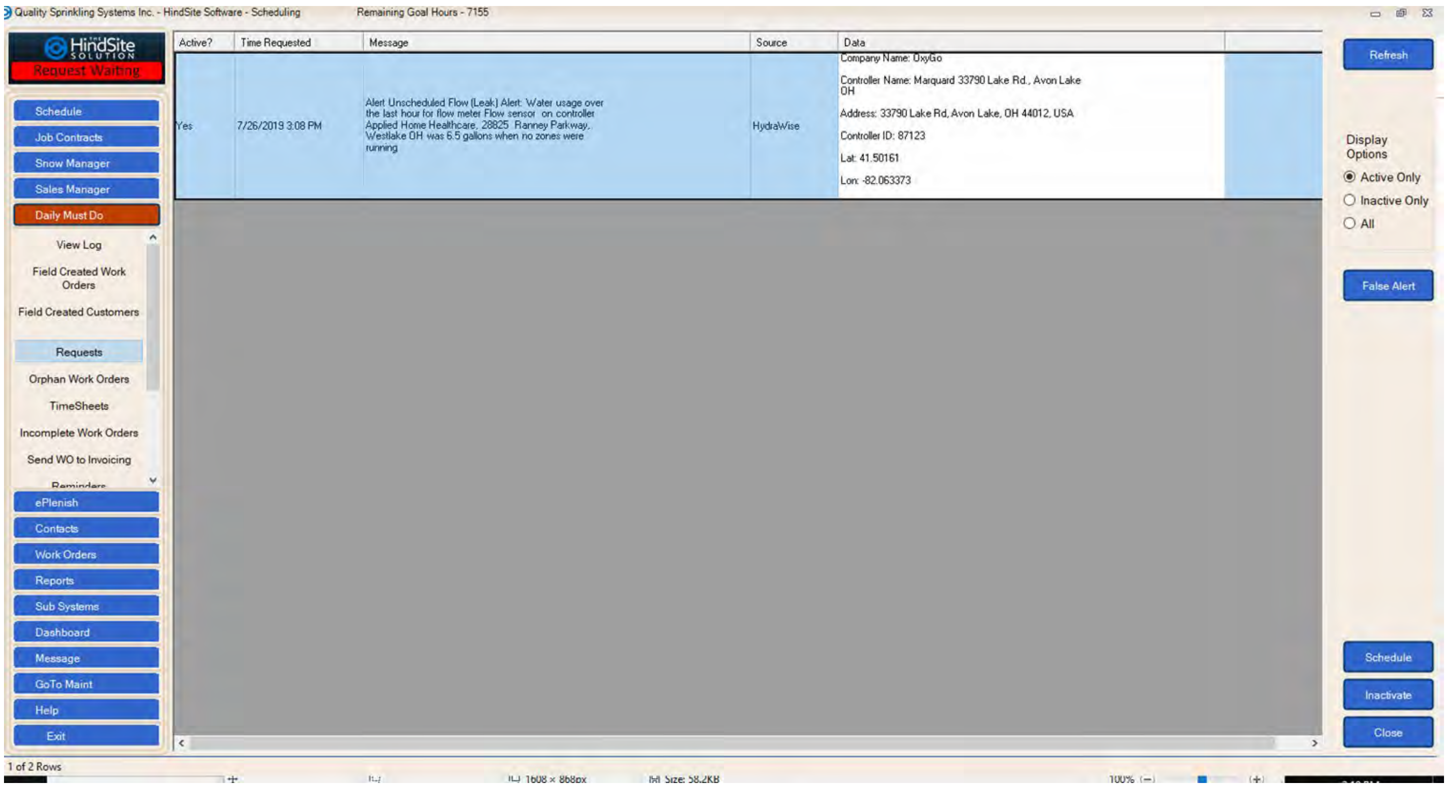
What WiFi Controller to Sell?

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

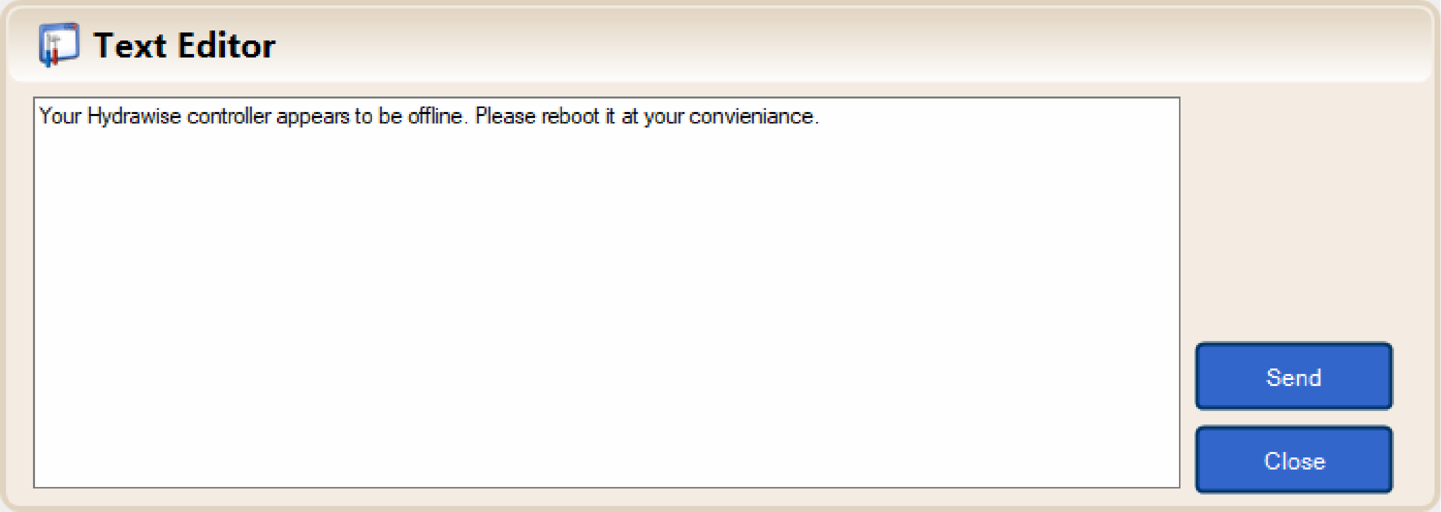
Hunter's Hydrawise Controller Sends Alert

Directly into my office's HindSite Software

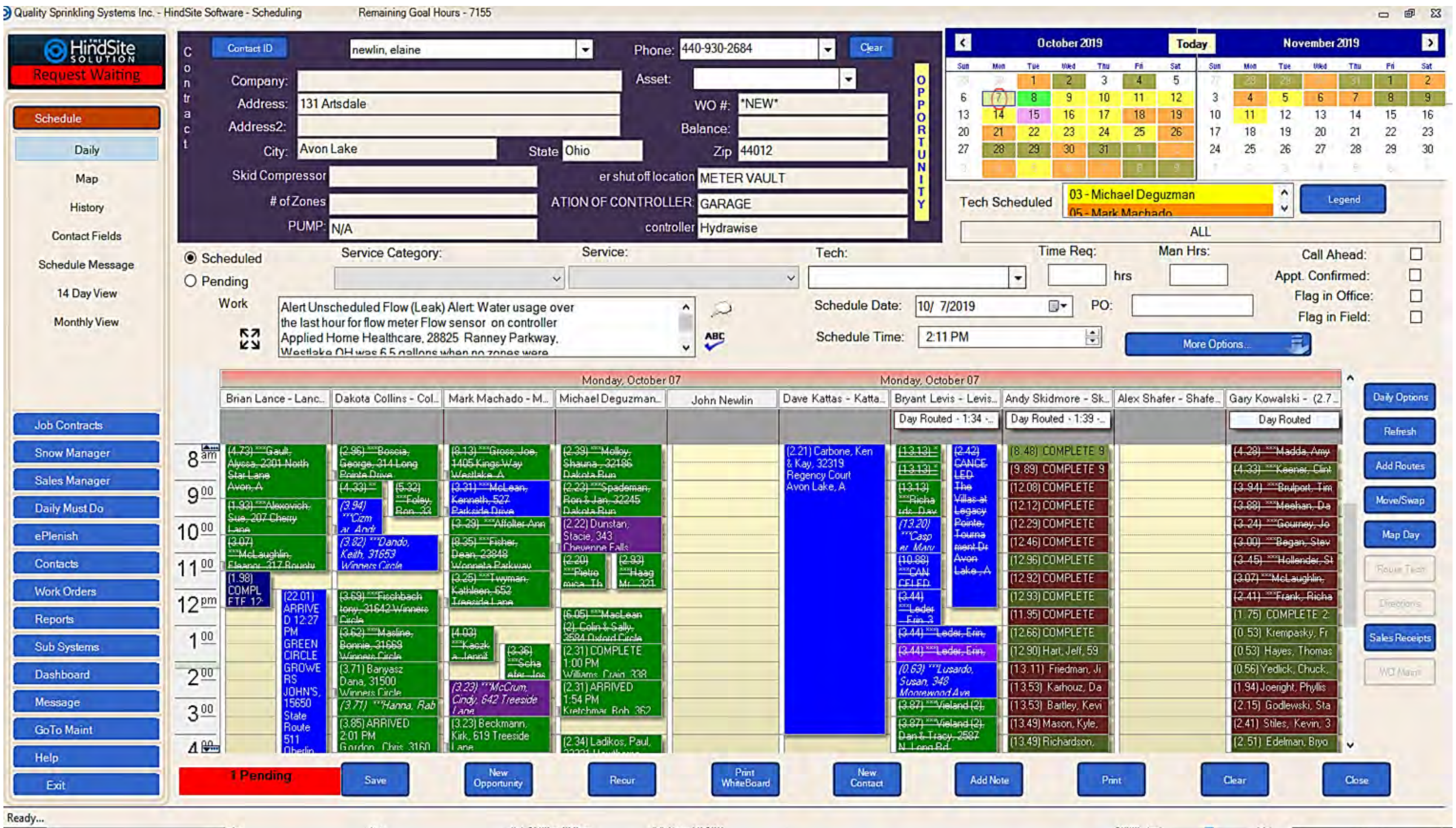


Office staff processes the Alert

- By texting customer



Or by scheduling a Tech to repair issues



Hunter Hydrawise & HindSite Software

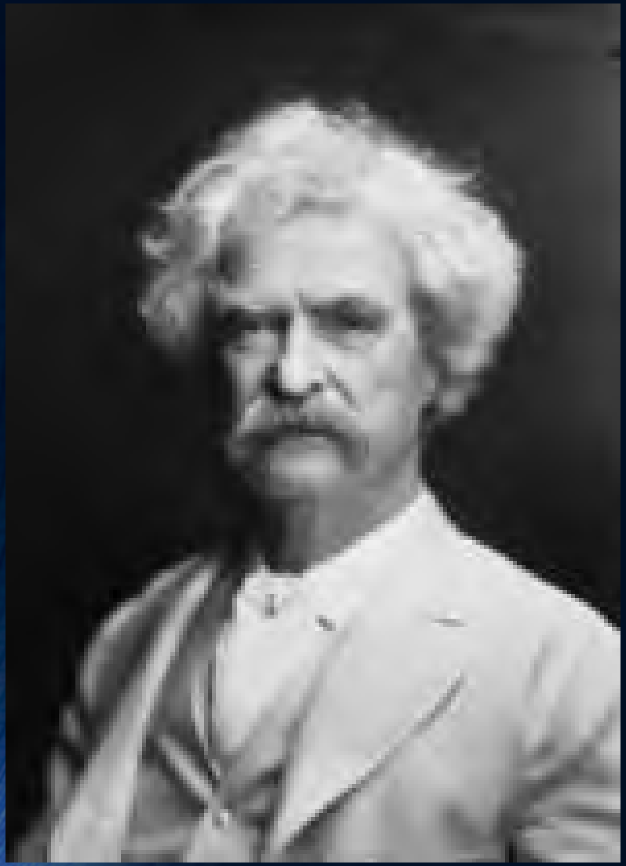
1. Direct communication from customer controller into your HindSite Software base.
2. Office Staff does all the managing of the alerts.
   a. Office staff makes can automatically communicate with your customers
   b. Hydrawise marketing templates integrated with HindSite Connect to make marketing very 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?

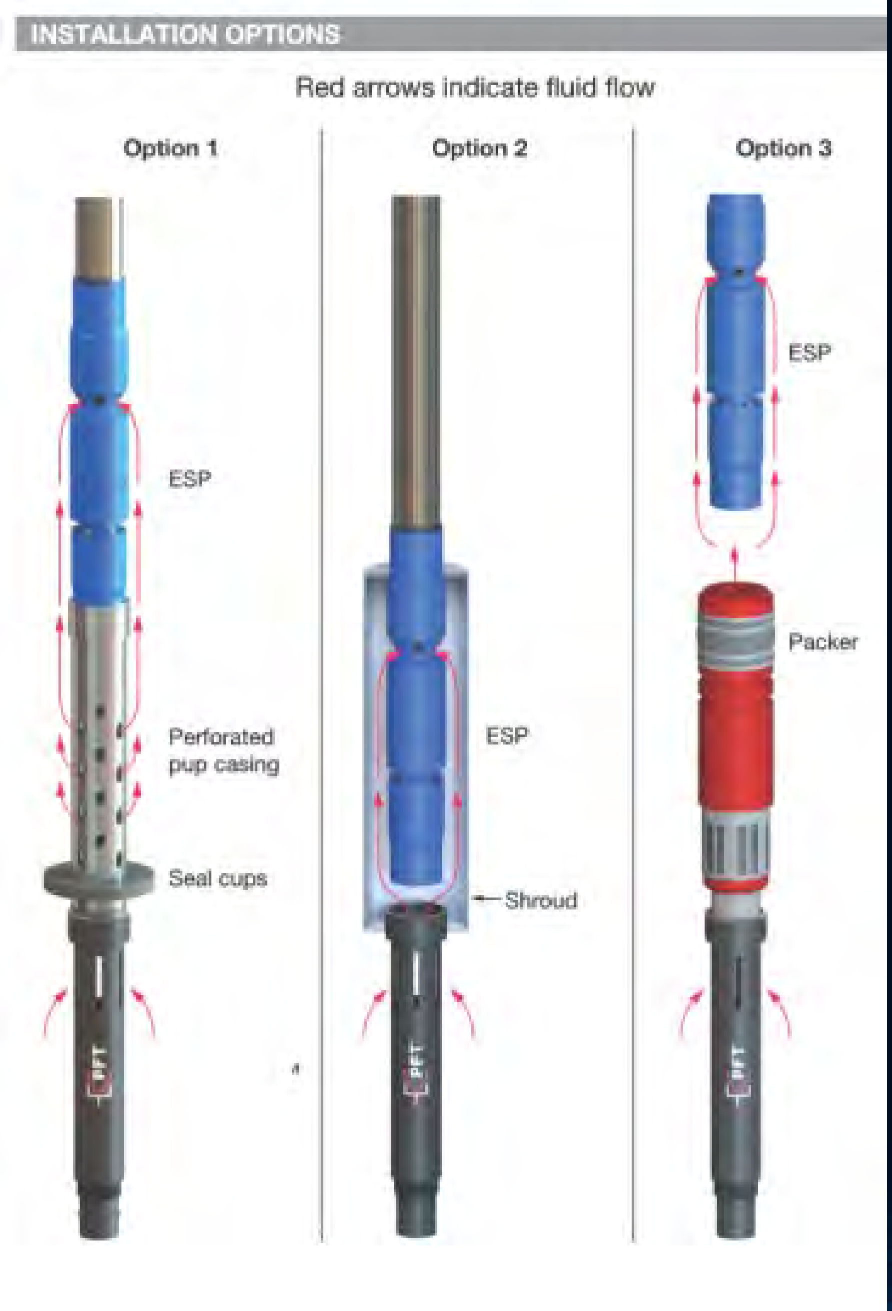
- Declining well water levels
- Decreased well production
- Silt and Sand intrusion
- Damage to bowls and impellers

<u>MAIN BENEFITS</u>

INCREASES LIFE OF PUMP UP TO <u>FIVE</u> TIMES

MAINTAINS FLOW AND HEAD FOR LONGER

Downhole Pumps – Solutions for Submersibles



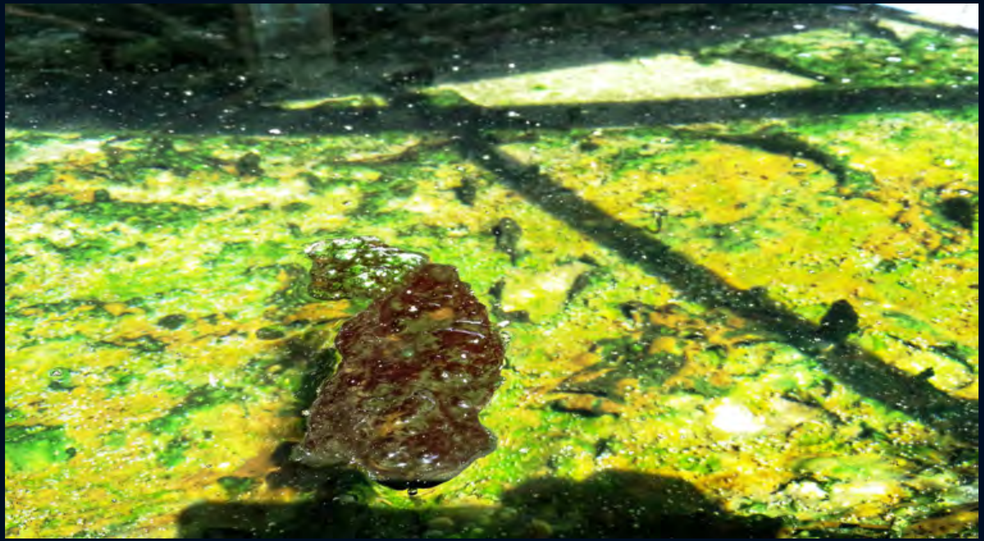
Downhole Pumps – Solutions for Turbines

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

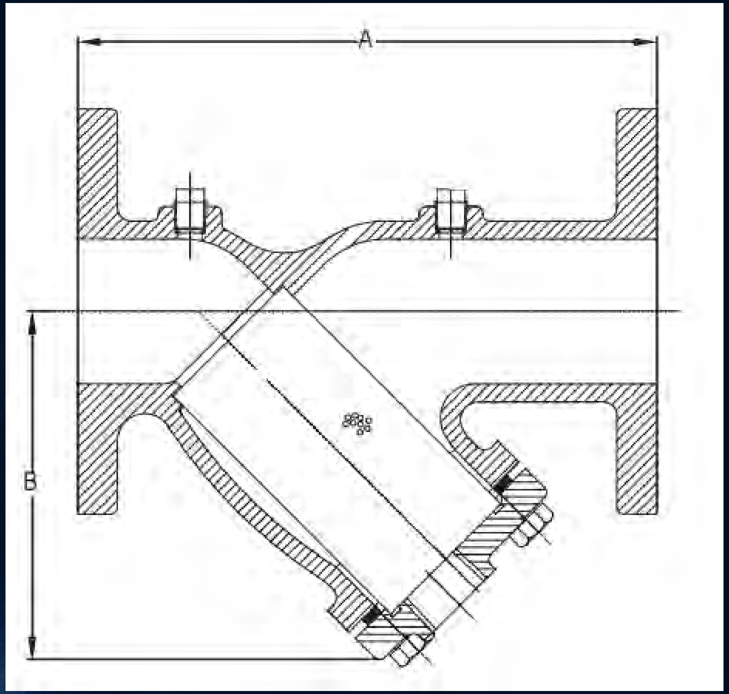
- More Flexible Installation
- Flushable
- More turbulence
- Higher Friction Loss

BASKET STRAINERS

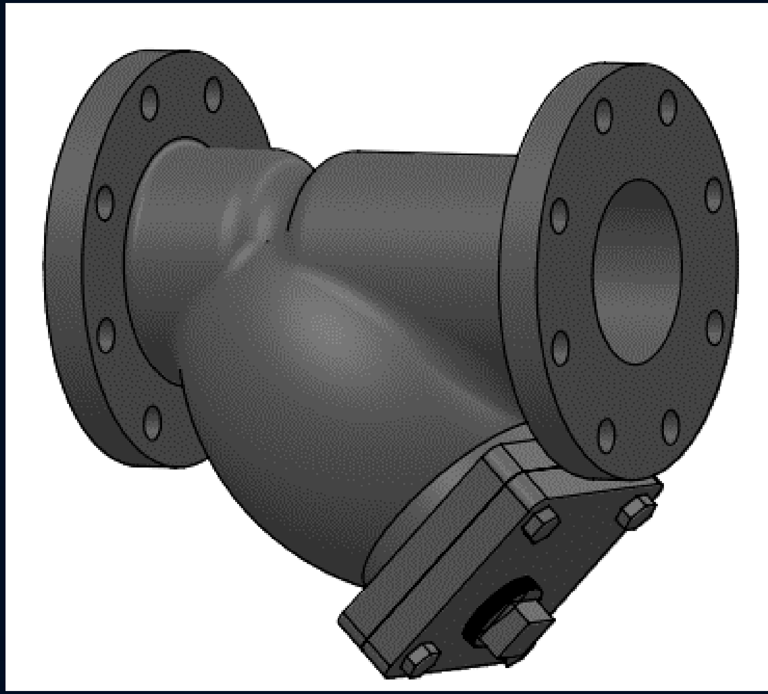
- Only installed one way
- Not Flushable
- Less turbulence
- Lower Friction Loss

Types of Strainers

Y STRAINER

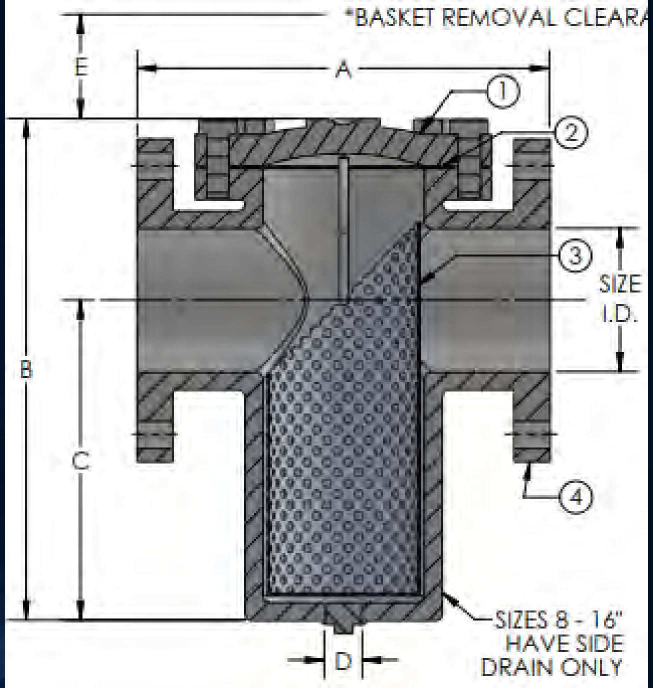


Y STRAINER



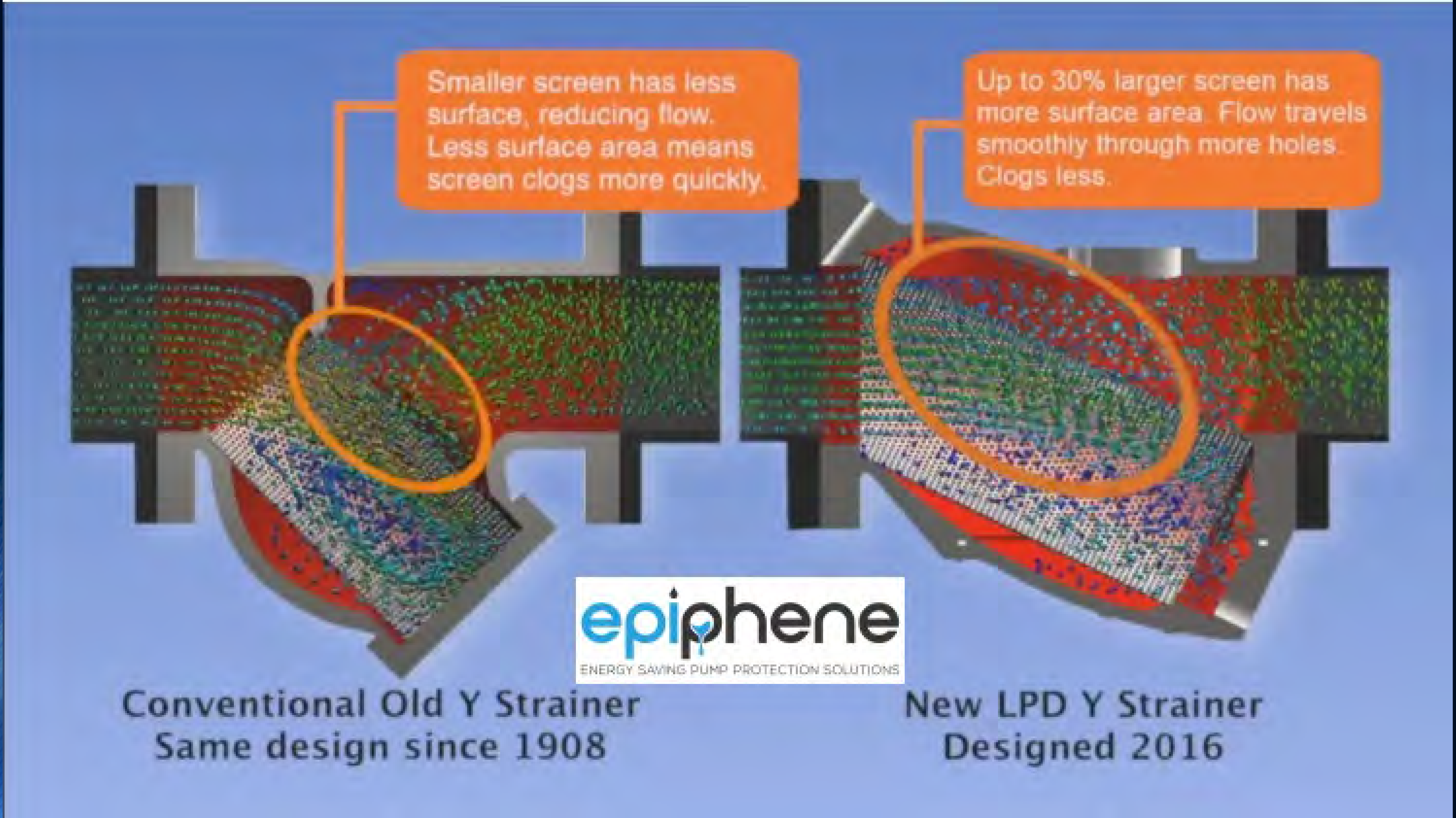
Types of Strainers

BASKET STRAINER

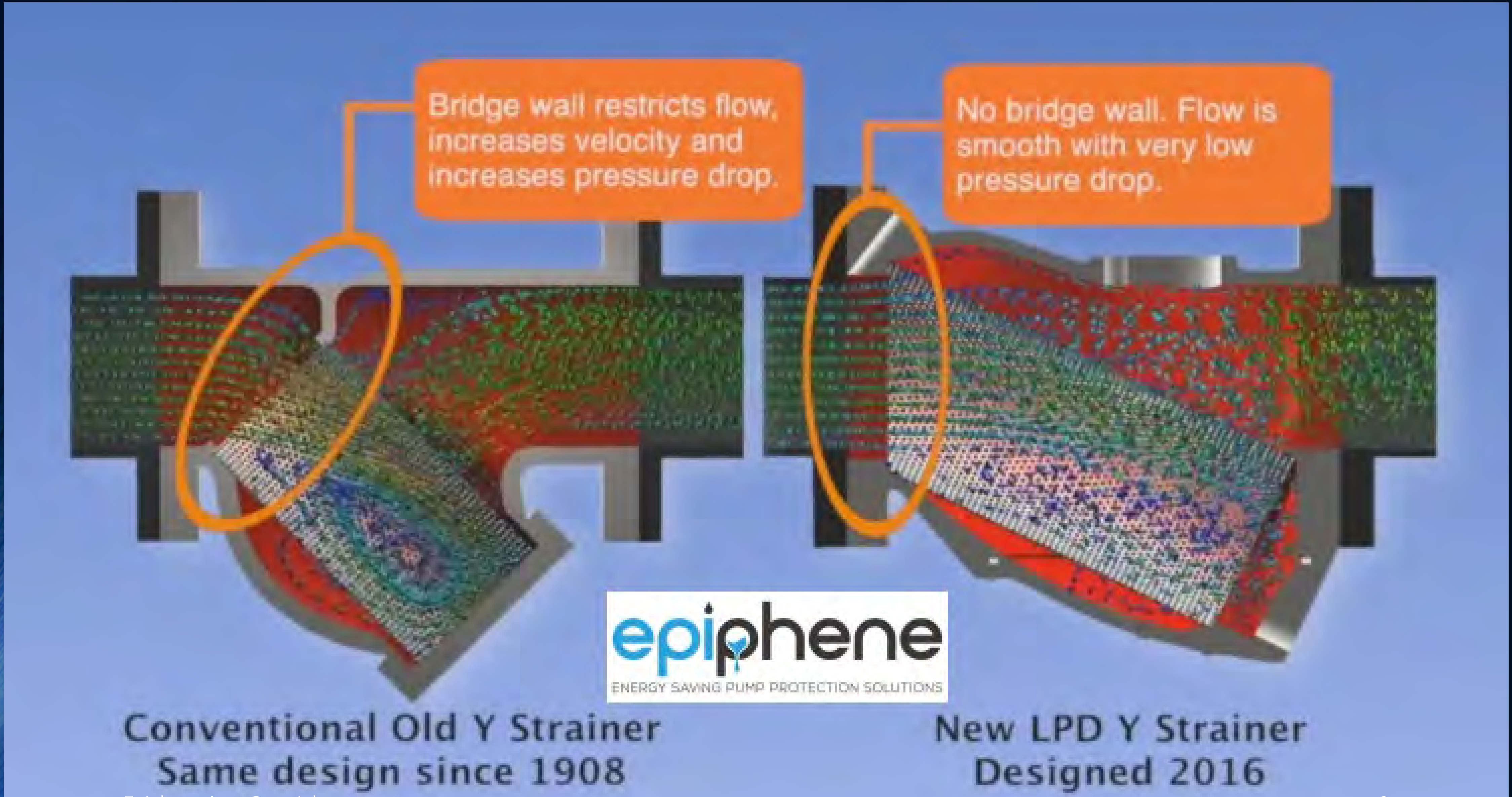


BASKET STRAINER

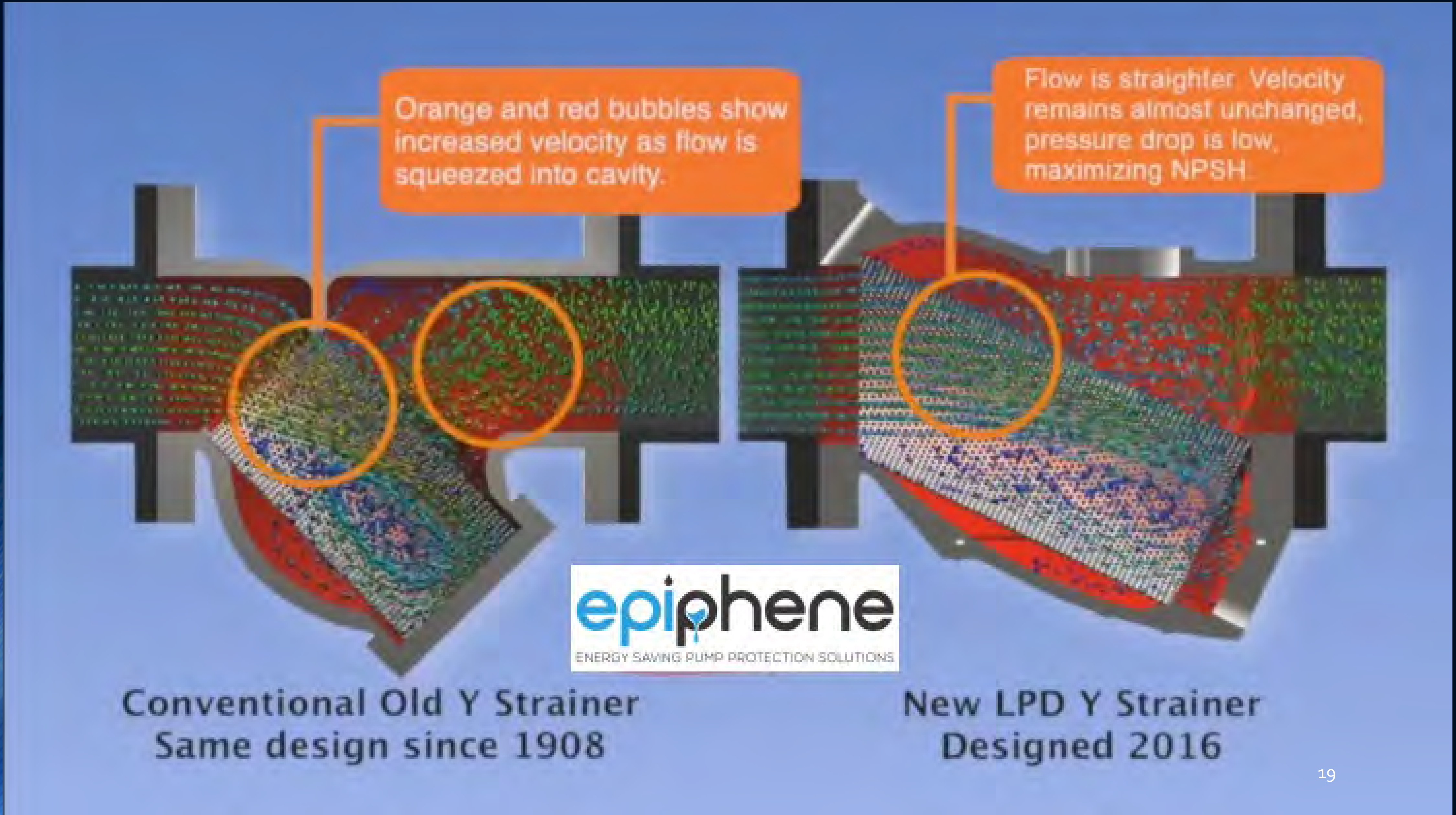
Strainer - “Saving Energy”



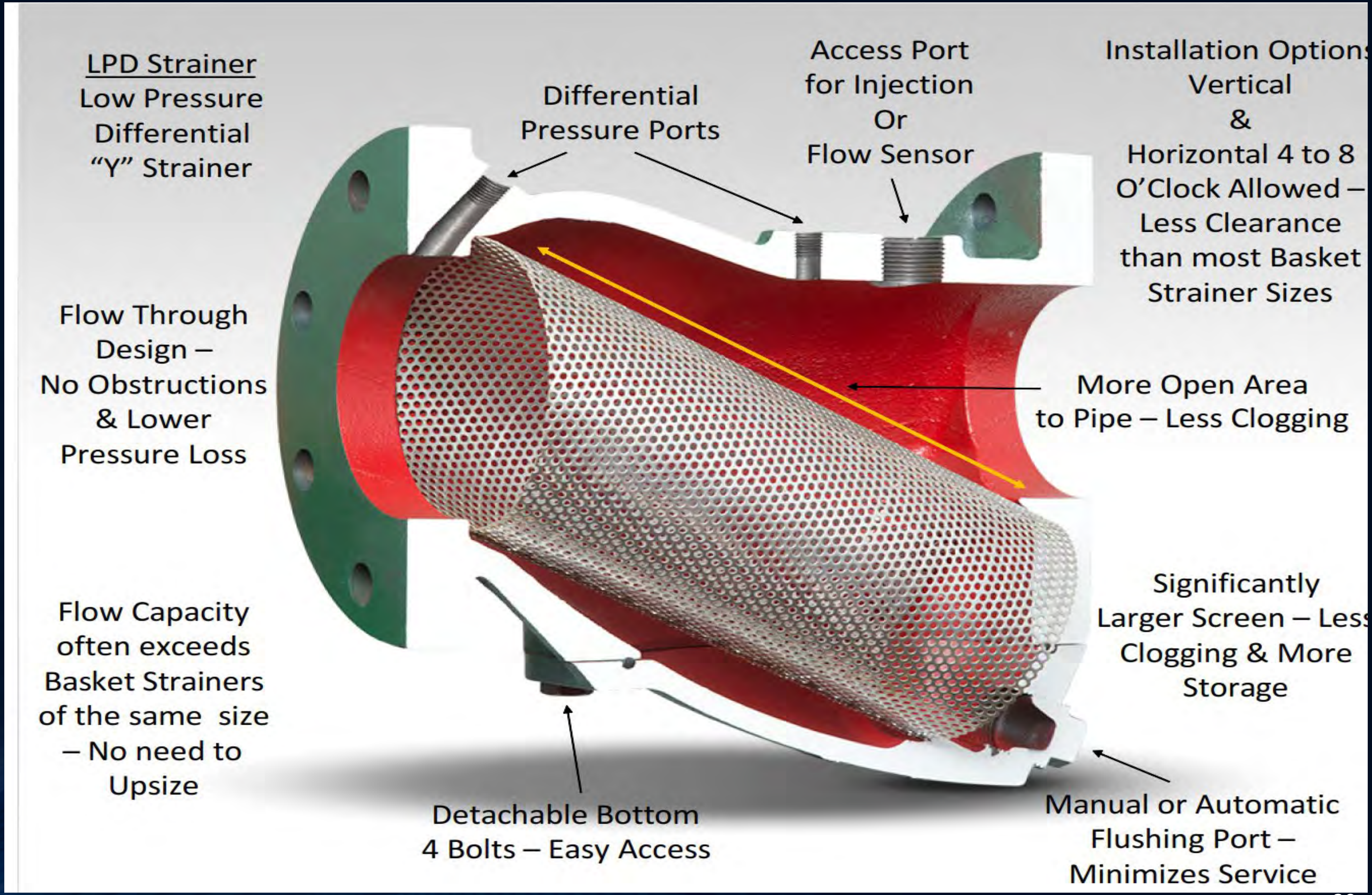
Strainer - "Saving Energy"



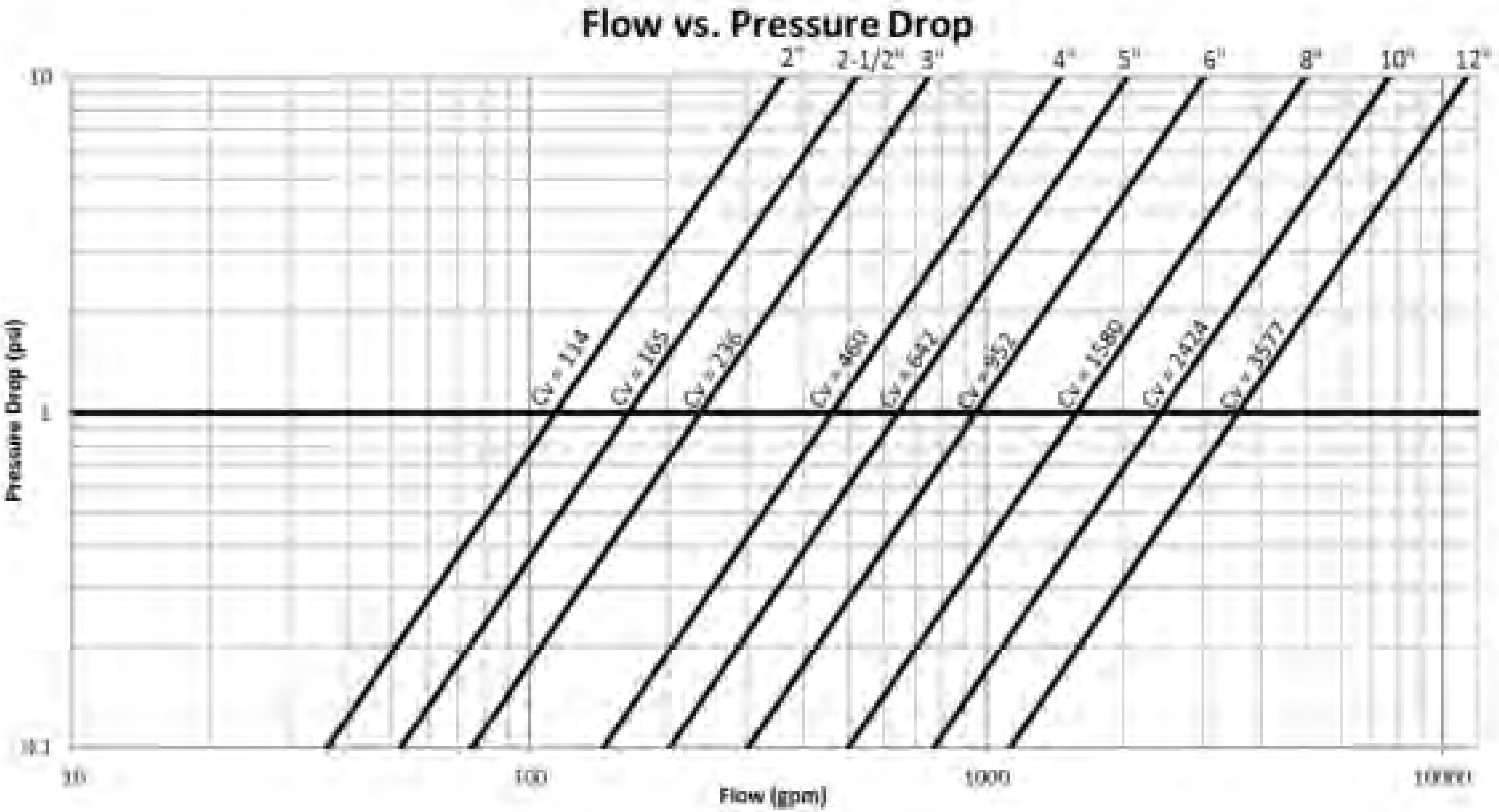
Strainer - “Saving Energy”



Strainer - "Saving Energy"

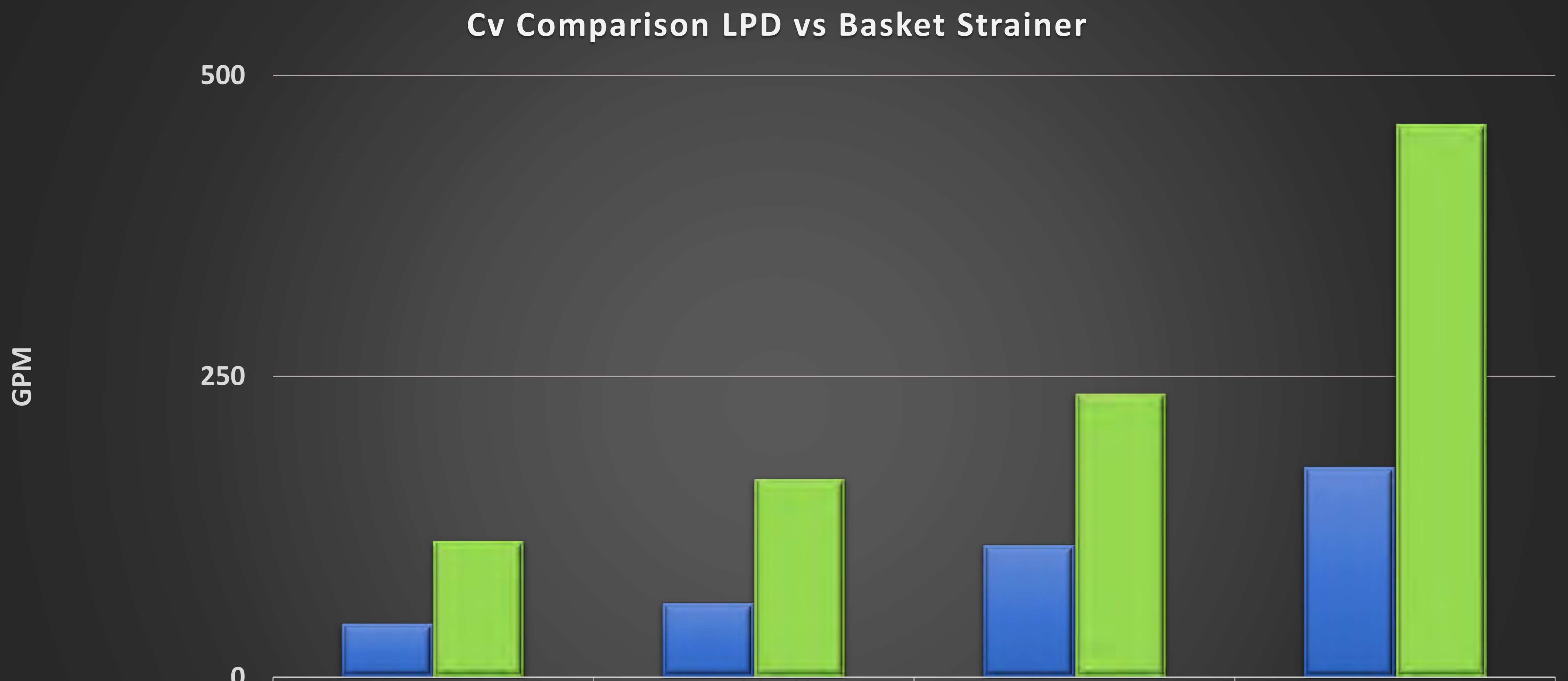


Strainer – Design Flows



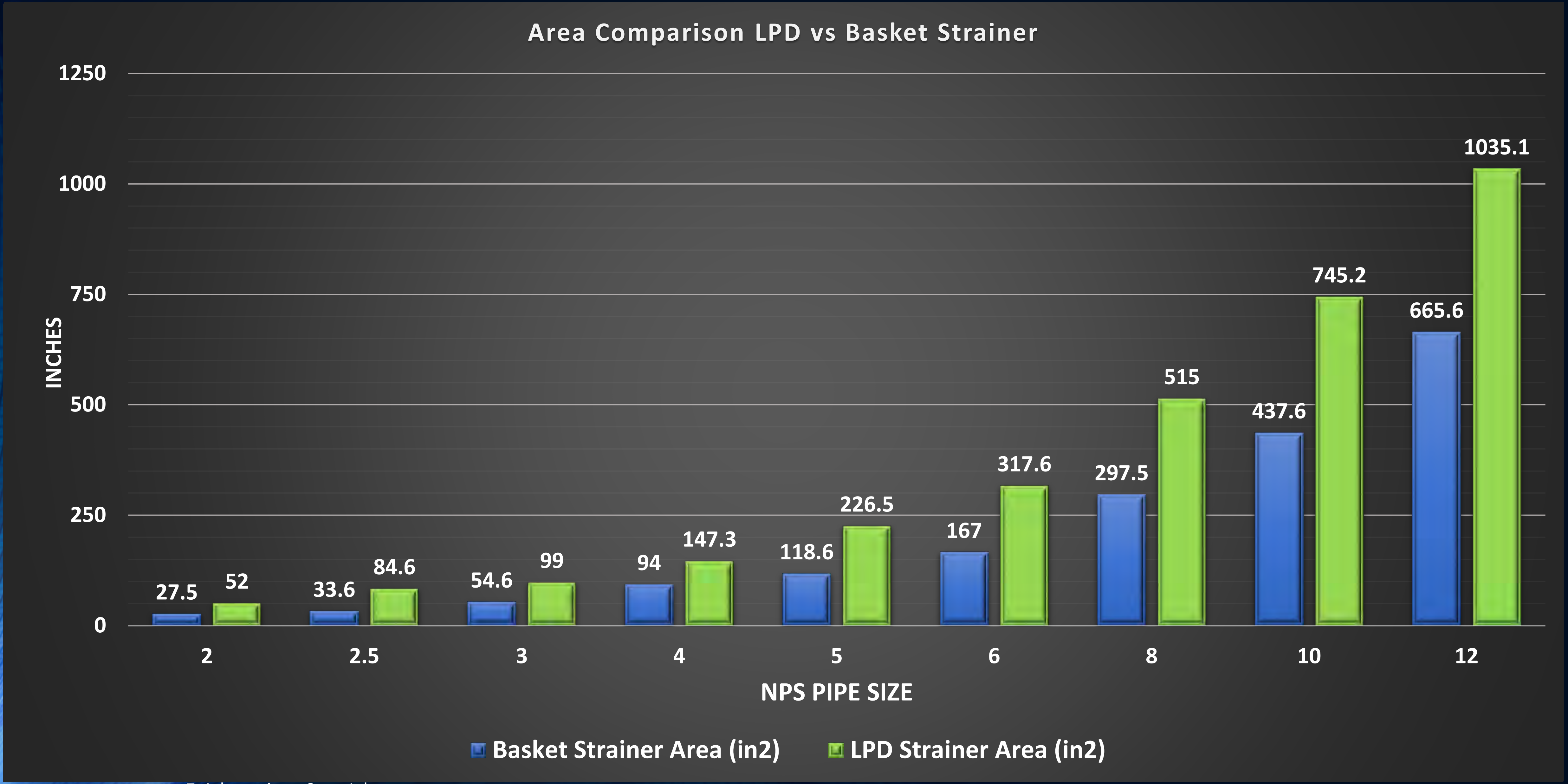
Size	Cv
2	113.8
2.5	165.1
3	236.1
4	460
5	641.9
6	952
8	1579.5
10	2423.5
12	3576.5

Strainer – Design Flow Comparison

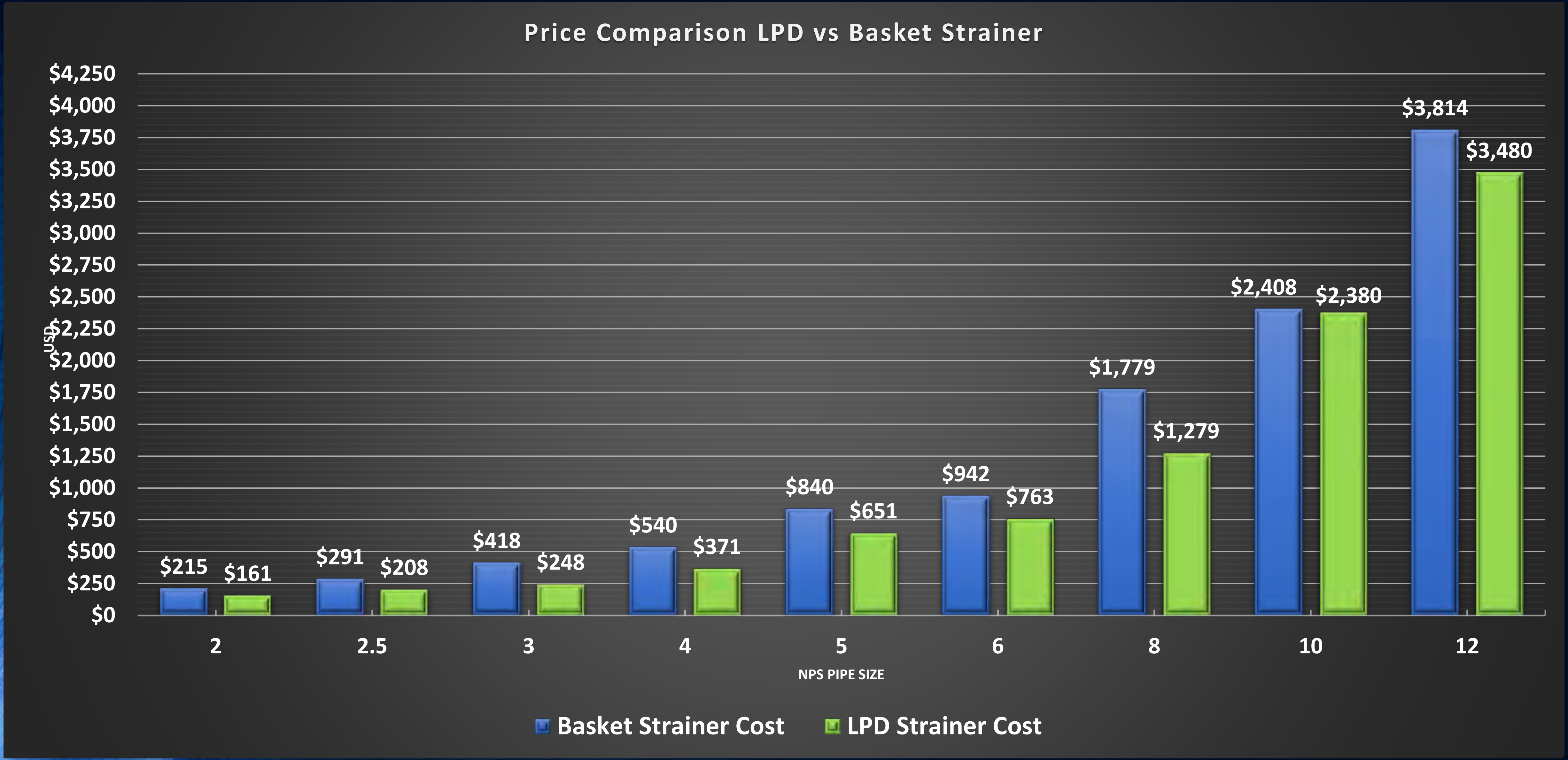


	2	2.5	3	4
Cv Basket Strainer	45	62	110	175
Cv LPD	113.8	165.1	236.1	460

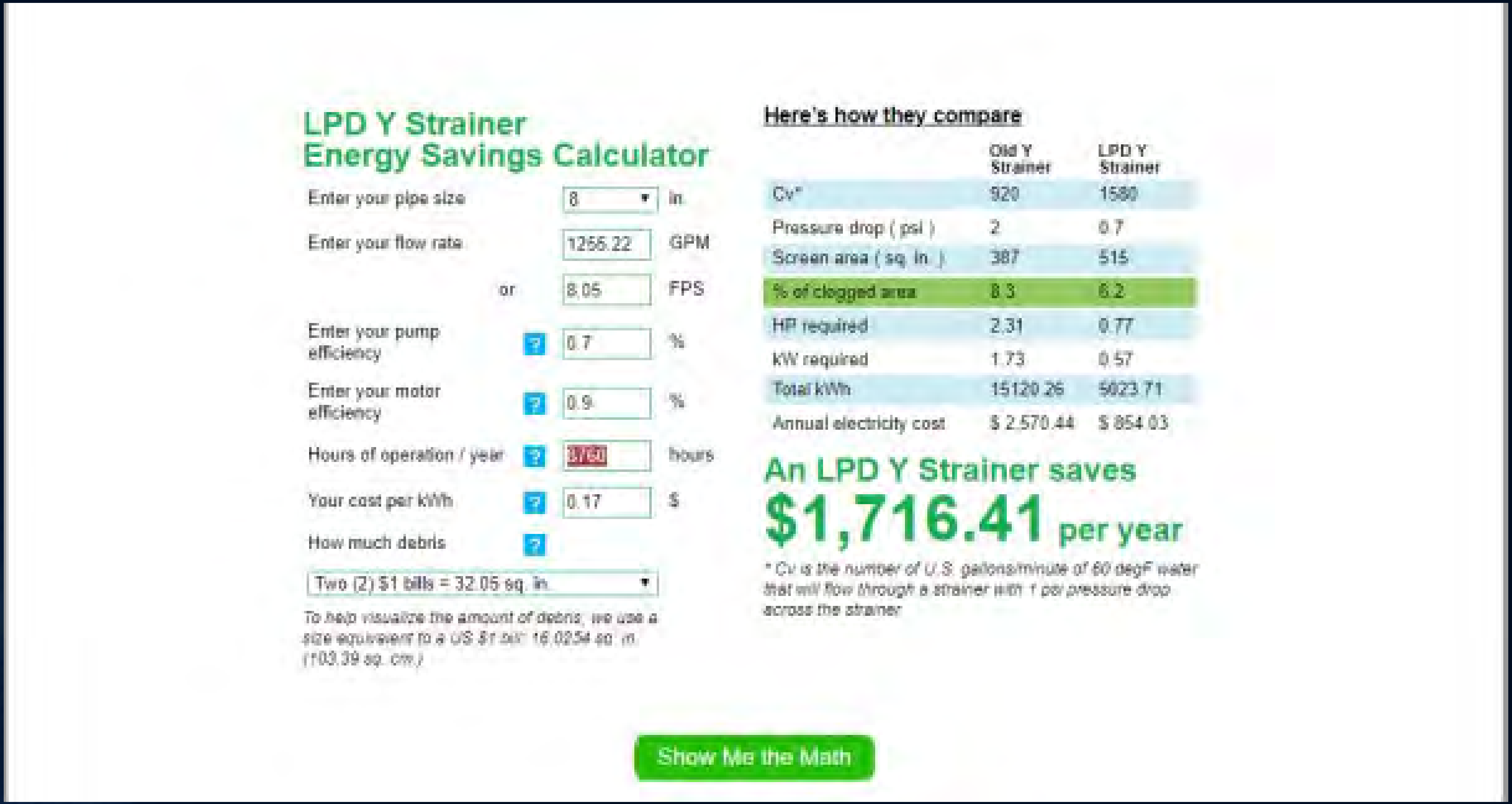
Strainer – Design Flow Comparison



Strainer – Economic Comparison



Strainer - "Saving Energy"



LPD Y Strainer Energy Savings Calculator

Enter your pipe size	8	in
Enter your flow rate	1256.22	GPM
or	8.05	FPS
Enter your pump efficiency	0.7	%
Enter your motor efficiency	0.9	%
Hours of operation / year	[illegible]	hours
Your cost per kWh	0.17	$
How much debris		

Two (2) $1 bills = 32.05 sq. in.

To help visualize the amount of debris, we use a size equivalent to a US $1 bill: 16.0254 sq. in. (103.39 sq. cm.)

Here's how they compare

	Old Y Strainer	LPD Y Strainer
Cv*	920	1580
Pressure drop (psi)	2	0.7
Screen area (sq. in.)	387	515
% of clogged area	8.3	6.2
HP required	2.31	0.77
kW required	1.73	0.57
Total kWh	15120.26	5023.71
Annual electricity cost	$ 2,570.44	$ 854.03

An LPD Y Strainer saves

$1,716.41 per year

** Cv is the number of U.S. gallons/minute of 60 degF water that will flow through a strainer with 1 psi pressure drop across the strainer*

Show Me the Math

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

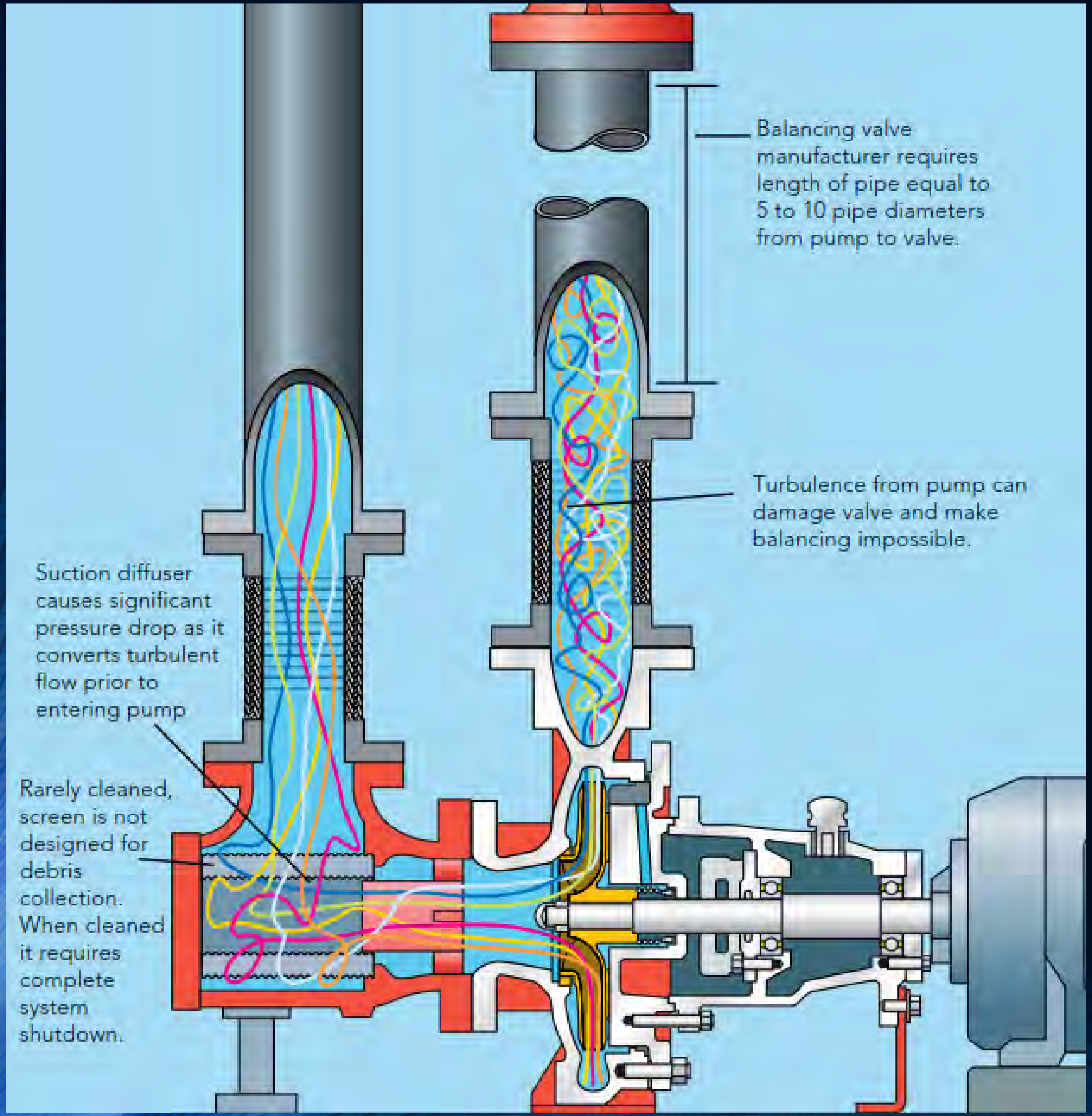
- SUCTION DIFFUSER

- FLOW CONDITIONER

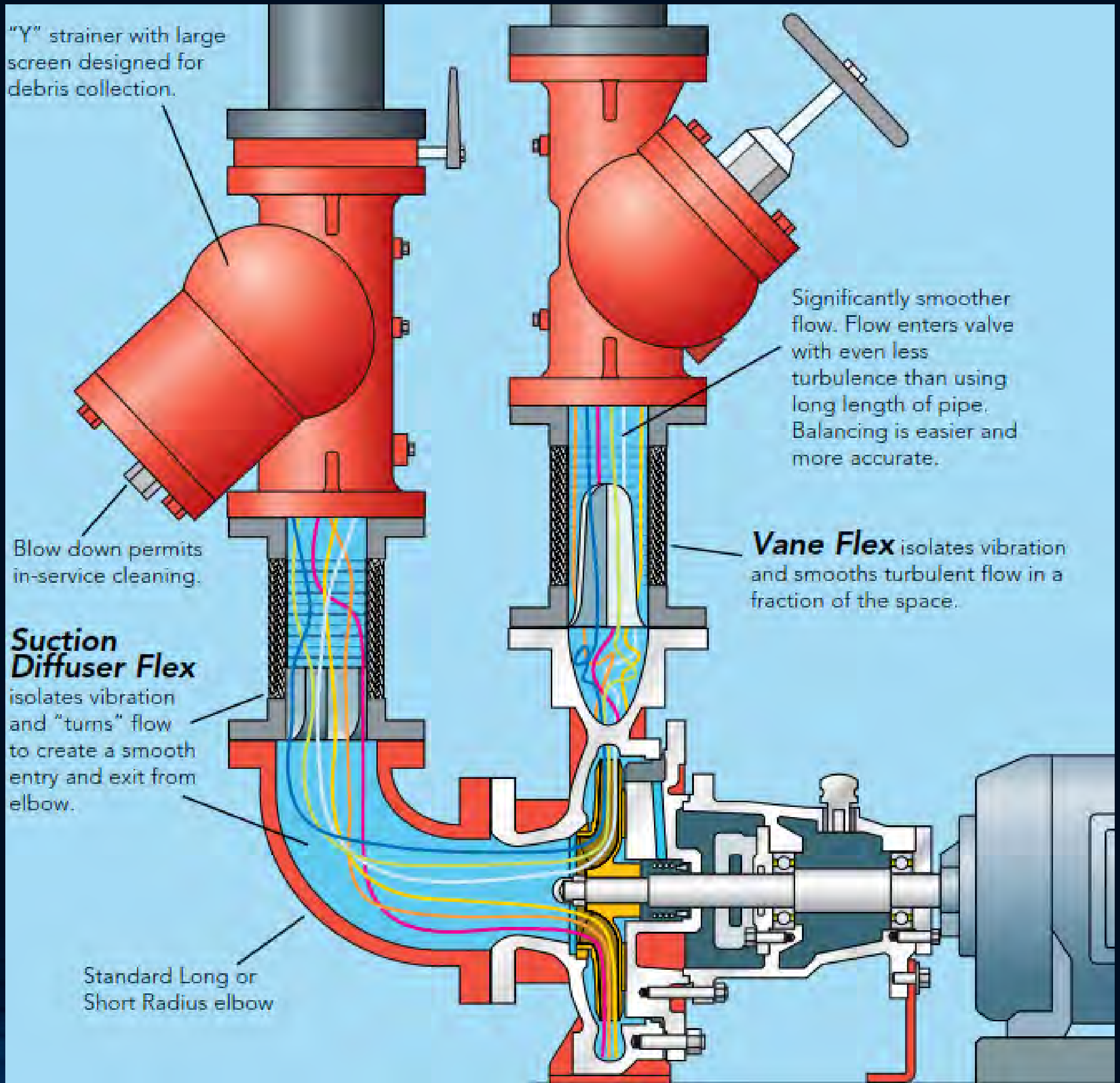
Flow Conditioning

"Saving Energy & Assets"

BEFORE

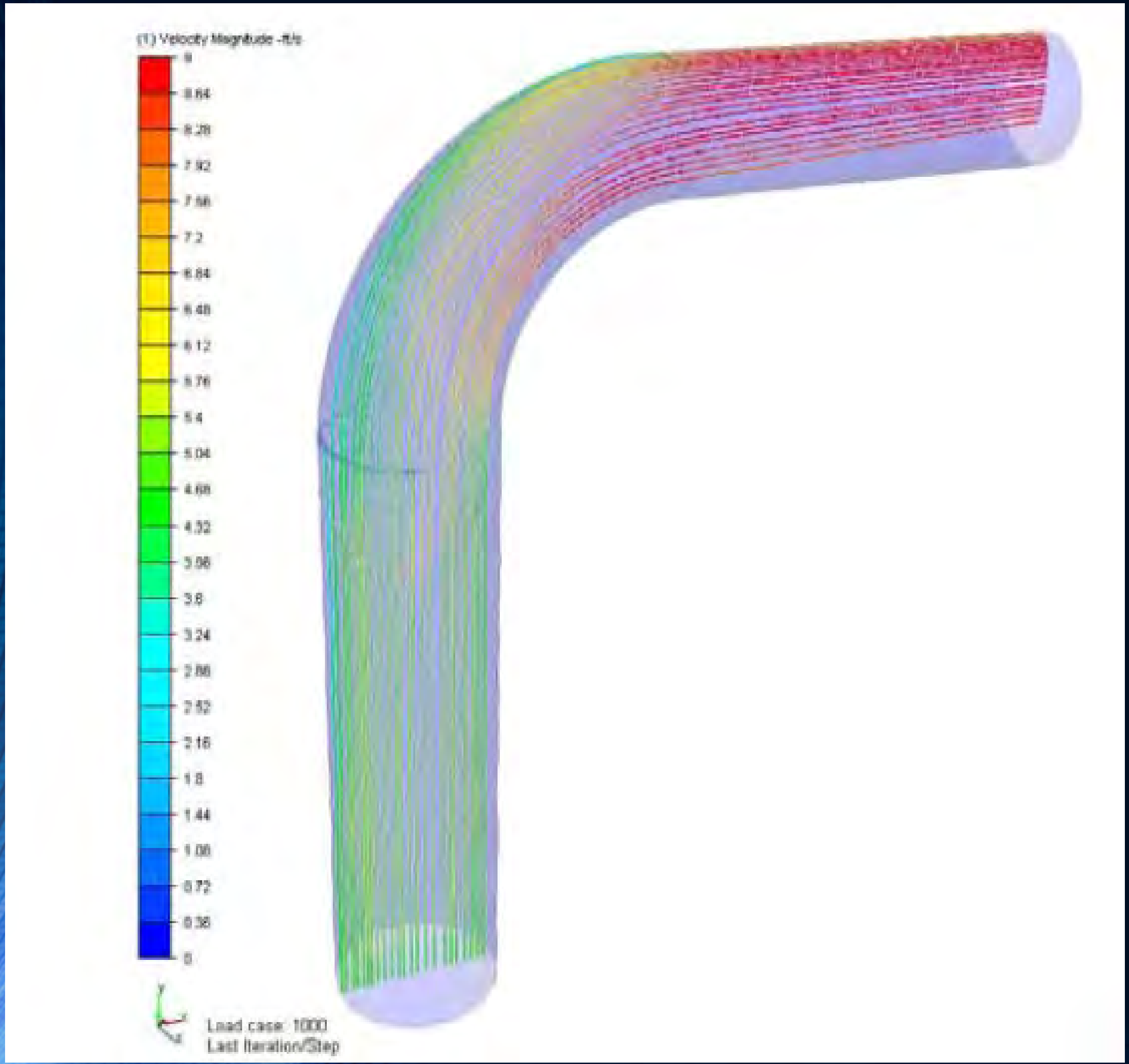


AFTER

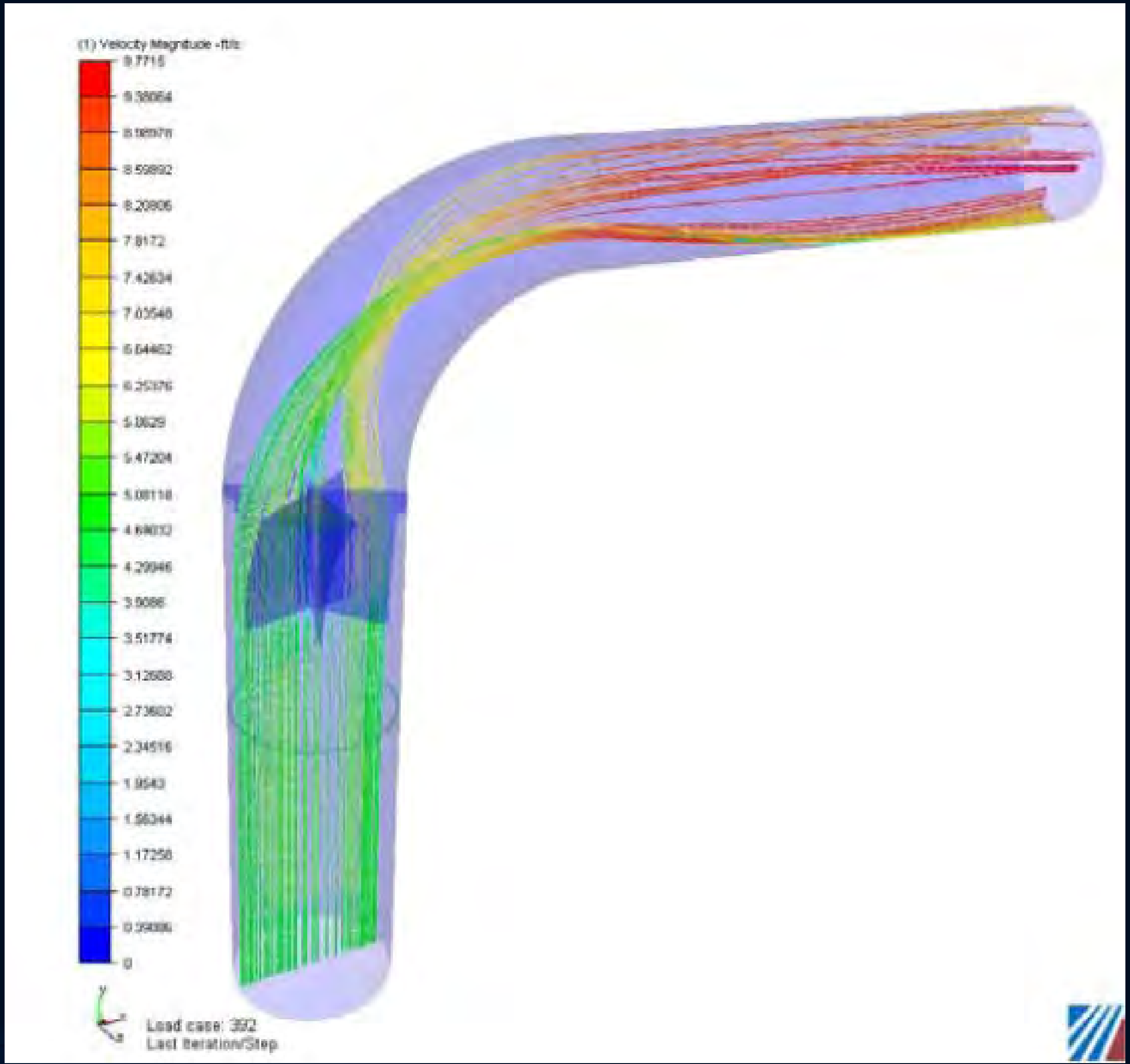


BEFORE ELBOW FLOW CONDITIONING
REMOVING TURBULENCE

SUCTION DIFFUSER – 2" THRU 16"

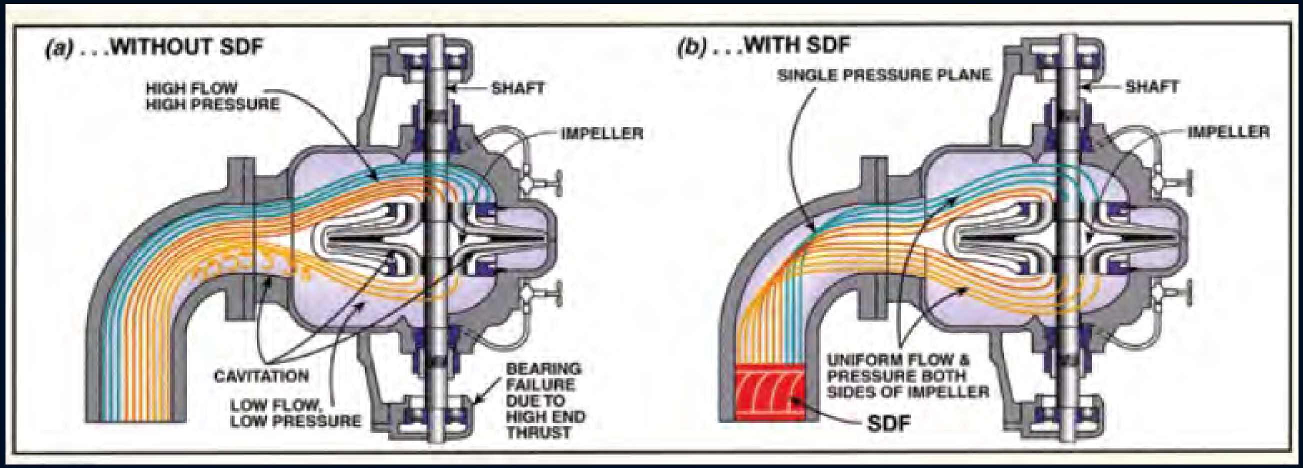


(1) Velocity Magnitude -ft/s
9
8.64
8.28
7.92
7.56
7.2
6.84
6.48
6.12
5.76
5.4
5.04
4.68
4.32
3.96
3.6
3.24
2.88
2.52
2.16
1.8
1.44
1.08
0.72
0.36
0
Load case: 1000
Last Iteration/Step



(1) Velocity Magnitude -ft/s
9.7715
9.38064
8.98978
8.59892
8.20806
7.8172
7.42634
7.03548
6.64462
6.25376
5.8629
5.47204
5.08118
4.69032
4.29946
3.9086
3.51774
3.12688
2.73602
2.34516
1.9543
1.56344
1.17258
0.78172
0.39086
0
Load case: 392
Last Iteration/Step

Flow Conditioning



4.5%
Flow
Increase

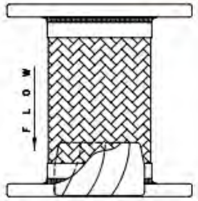
7%
HP
Reduction

8.6%
Discharge
Head
Increase

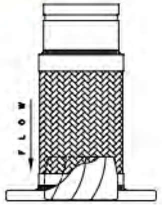
Flow Conditioning

Standard Suction Diffuser Flex Configurations

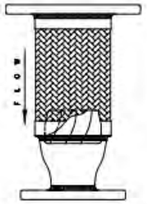
Long Radius Elbow



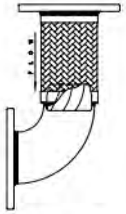
Suction Diffuser Flex with 150# plate flanges for connecting to a long radius elbow



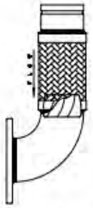
Suction Diffuser Flex with 150# plate flange x groove end for connecting to a long radius elbow



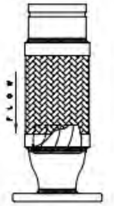
Suction Diffuser Flex with 150# plate flanges with concentric reducer for connecting to a long radius elbow



Suction Diffuser Flex with 150# plate flanges with long radius 90° elbow

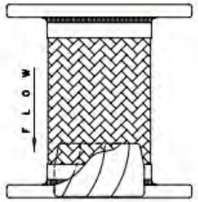


Suction Diffuser Flex with 150# plate flange x groove end with long radius 90° elbow

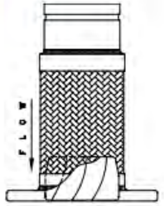


Suction Diffuser Flex with 150# plate flange x groove end with concentric reducer for connecting to a long radius elbow

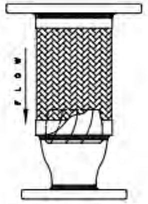
Short Radius Elbow



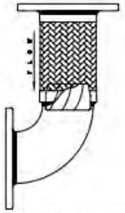
Suction Diffuser Flex with 150# plate flanges for connecting to a short radius elbow



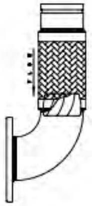
Suction Diffuser Flex with 150# plate flange x groove end for connecting to a short radius elbow



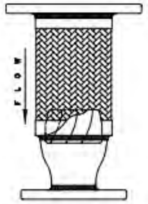
Suction Diffuser Flex with 150# plate flange with concentric reducer for connecting to a short radius elbow



Suction Diffuser Flex with 150# plate flanges with short radius 90° elbow

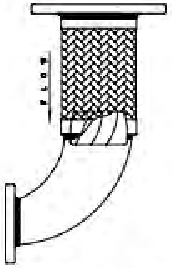


Suction Diffuser Flex with 150# plate flange x groove end with short radius 90° elbow

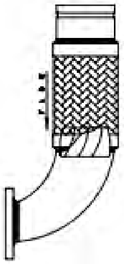


Suction Diffuser Flex with 150# plate flange x groove end with concentric reducer for connecting to a short radius elbow

90° Reducing Elbow

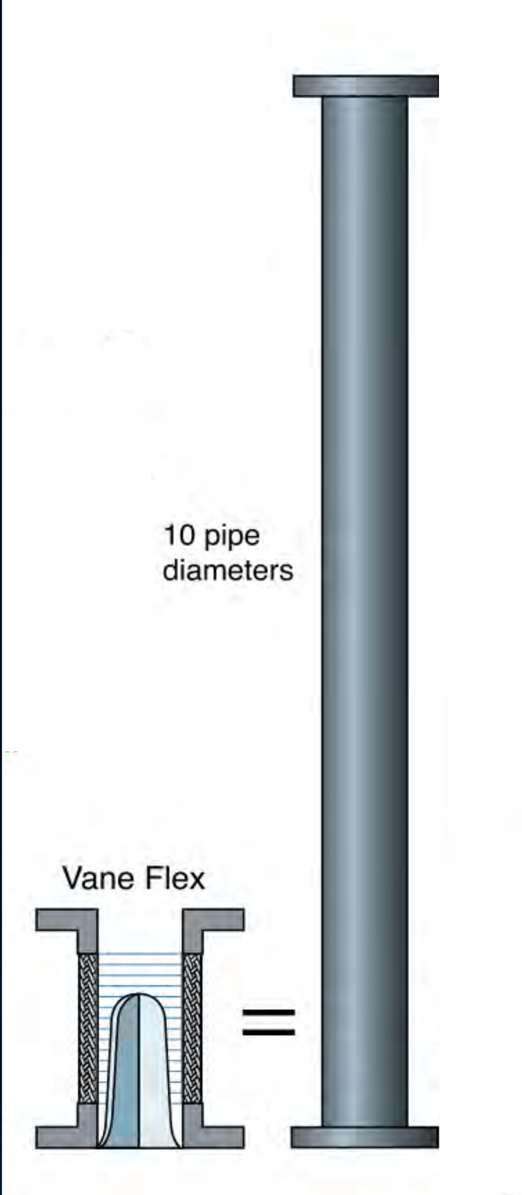


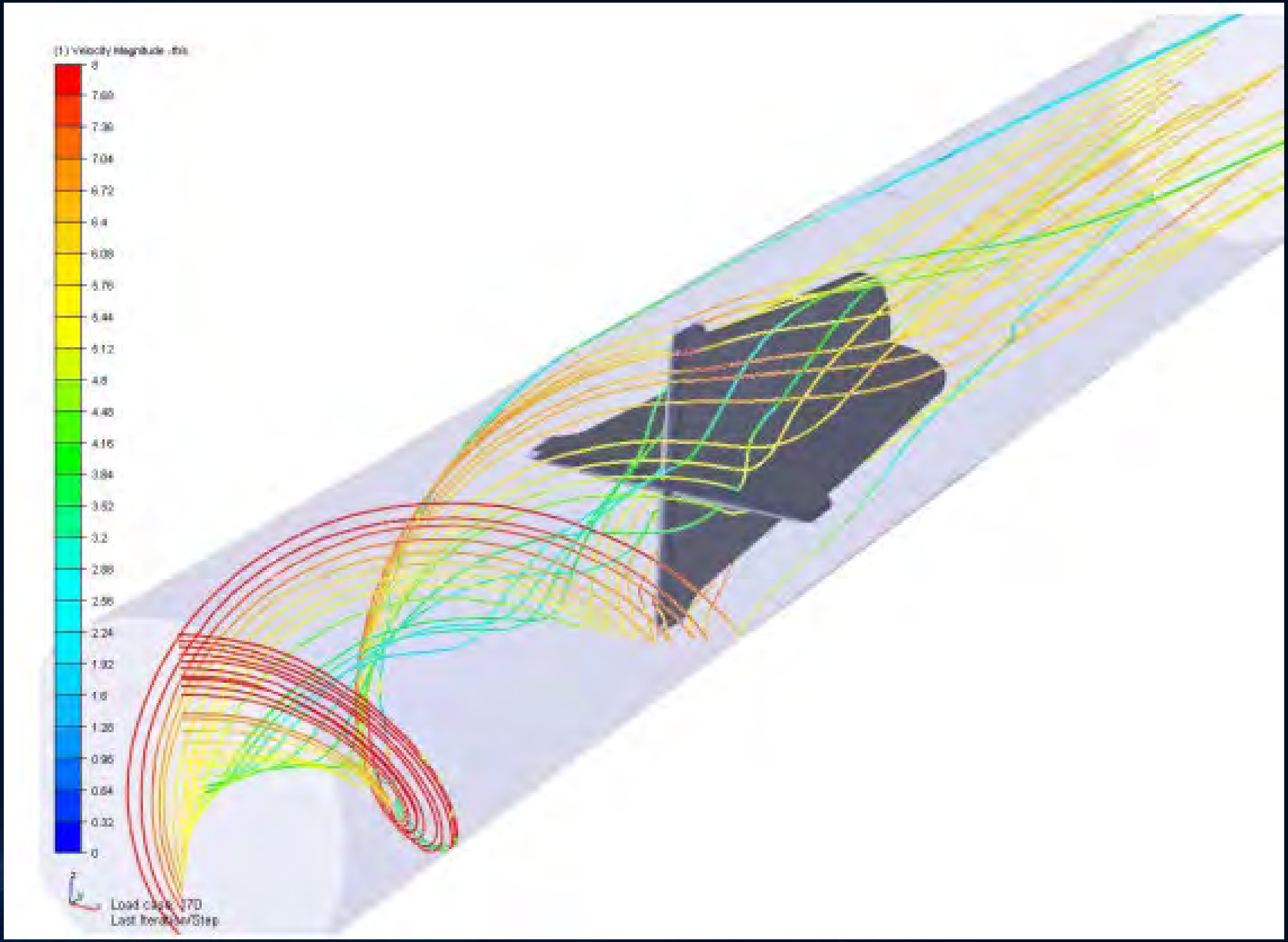
Suction Diffuser Flex with 150# plate flange with 90° reducing elbow



Suction Diffuser Flex with 150# plate flange x groove end with 90° reducing elbow

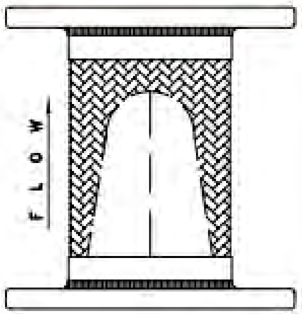
Flow Conditioning



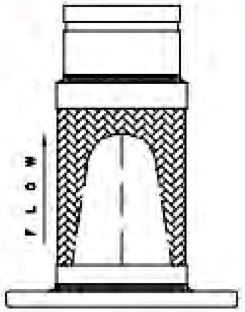

8
7.68
7.36
7.04
6.72
6.4
6.08
5.76
5.44
5.12
4.8
4.48
4.16
3.84
3.52
3.2
2.88
2.56
2.24
1.92
1.6
1.28
0.96
0.64
0.32
0

Flow Conditioning

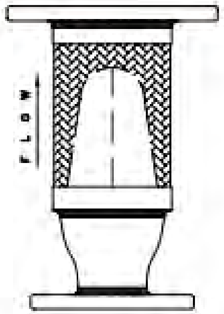
Standard Vane Flex Configurations



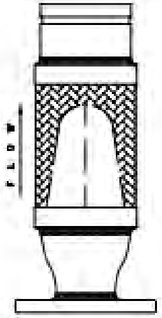
Vane Flex with 150# plate flanges



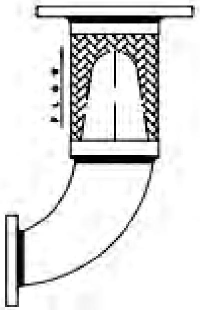
Vane Flex with 150# plate flange x grooved



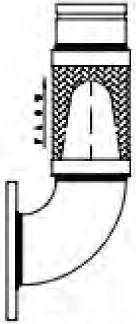
Vane Flex with 150# plate flanges with concentric reducer



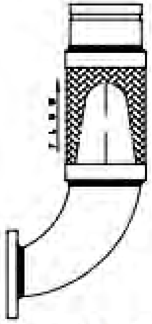
Vane Flex with 150# plate flange x grooved with con-centric reducer



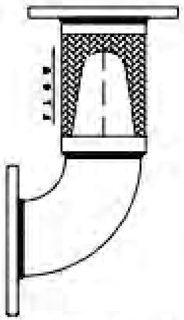
Vane Flex with 150# plate flanges with 90° reducing elbow



Vane Flex with 150# plate flange x groove with 90° elbow



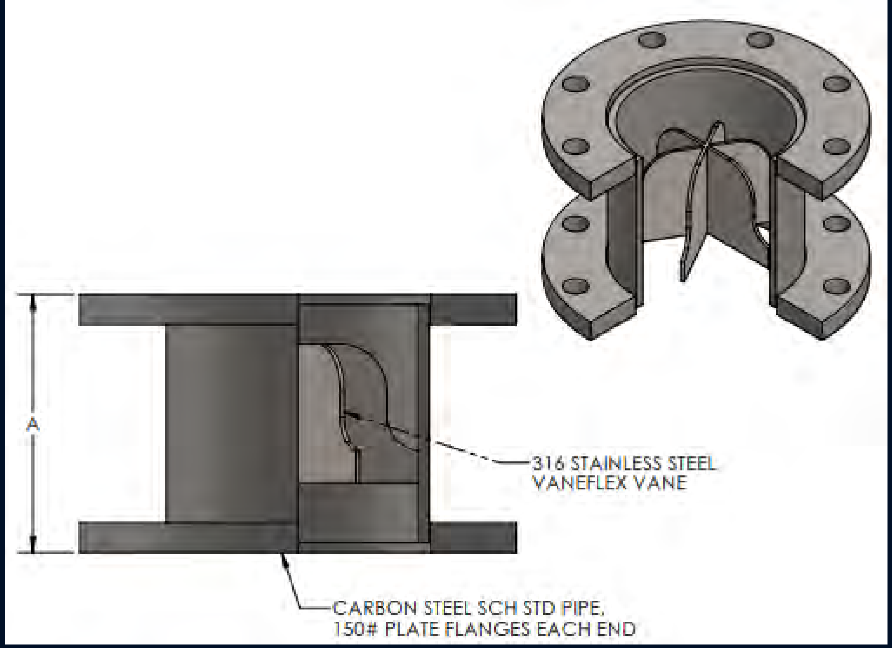
Vane Flex with 150# plate flange x groove with 90° reducing elbow

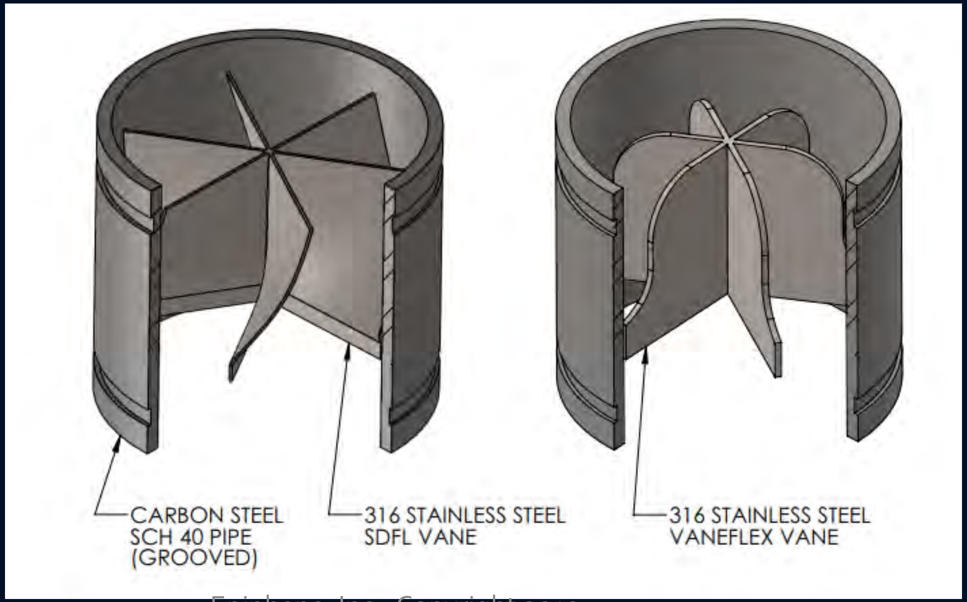


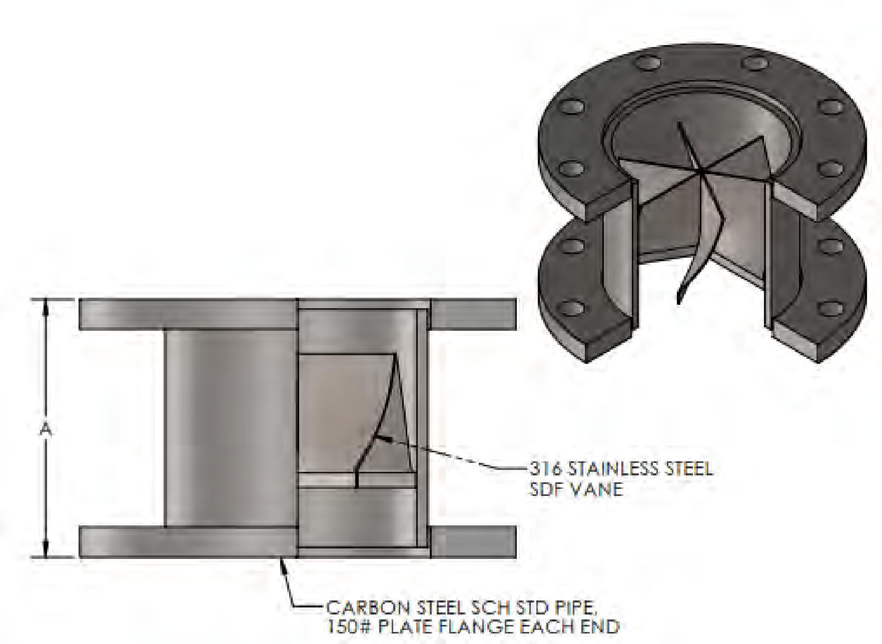
Vane Flex with 150# plate flange with 90° elbow

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?


CLEOPATRA
DIAMOND VAULT
CLEOPATRA
DIAMOND VAULT
DIAMOND VAULT
FORT KNOX
$15,149.09
$1,111.66
$262.67
$37.65
$14.36
DIAMOND VAULT

Just a side note:

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

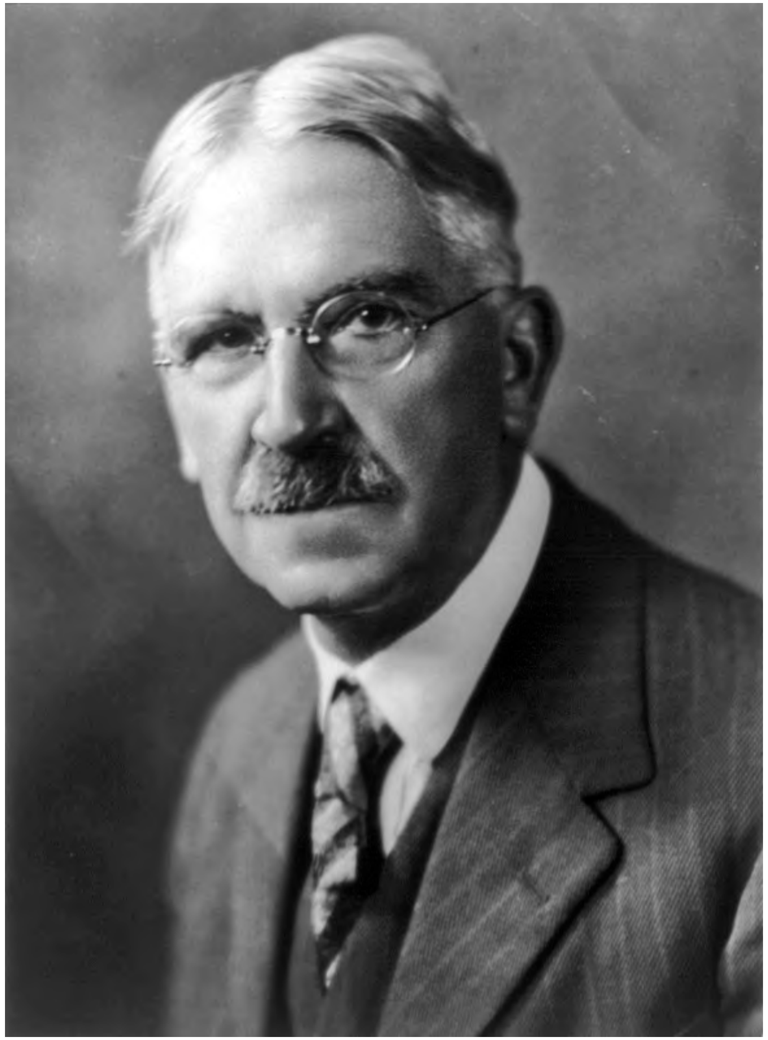
In 2016, the typical visitor spent an average $827 gambling.

Las Vegas Visitor Profile, annual report by the Las Vegas Convention and Visitors Authority

So, what is the value <u>your</u> 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.



1 Problem Recognition – Perception of a Need

<u>Need:</u> Financial needs are expenditures that are essential for you to be able to live and work.

Housing   Transportation   Gas and Electricity   Insurance   Food

<u>Want:</u> 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 Memberships   Designer Clothes

Nerdwallet.com

2 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.

3

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.

4 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.

5 Post Purchase Behavior – Value in Consumption or Use

Customers will often compare their expectations to previous experiences and will be either ecstatic, satisfied or dissatisfied.

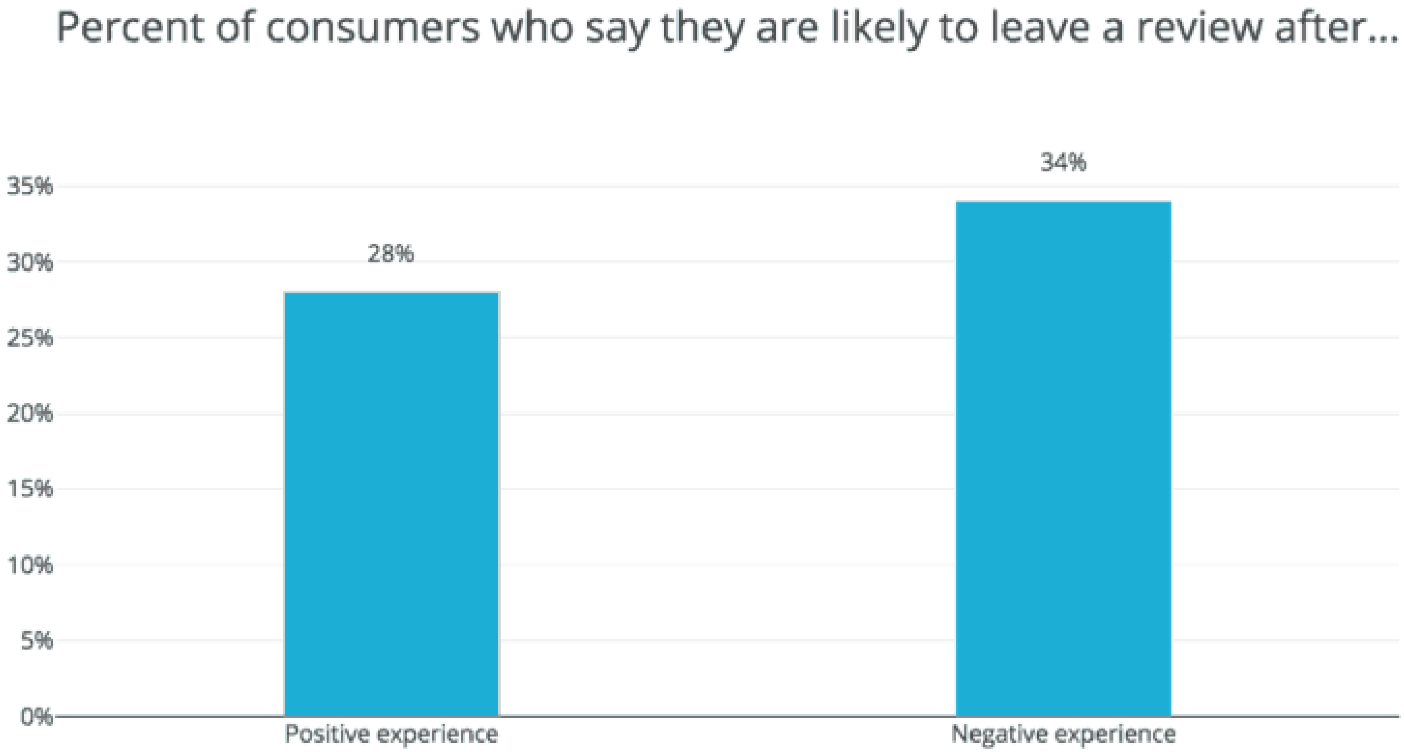
If your customer is ecstatic the result is total brand loyalty.

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?



(Review Trackers.com)

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

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.

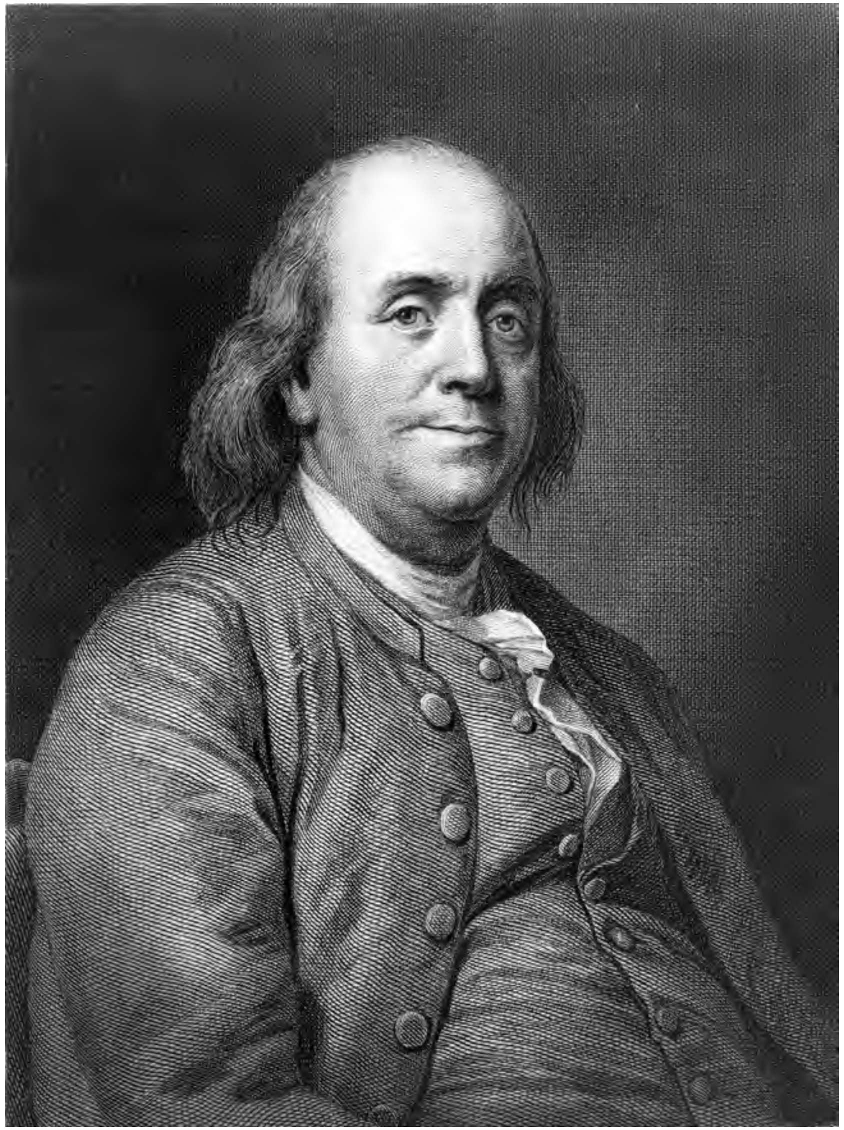
Consumers: Are influenced by price but are also concerned about product quality and durability, suggesting their preference towards purchasing high quality products at an equitable price rather than searching for cheaper products.

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

munro

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 stewarts 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 devises.
  - Flow meter's 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.

When it makes sense…

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

When it makes sense…

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?

IRRIGATION SHOW Dec. 4-5, 2019
EDUCATION WEEK Dec. 2-6, 2019

Las Vegas Convention Center
Las Vegas, Nevada

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

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

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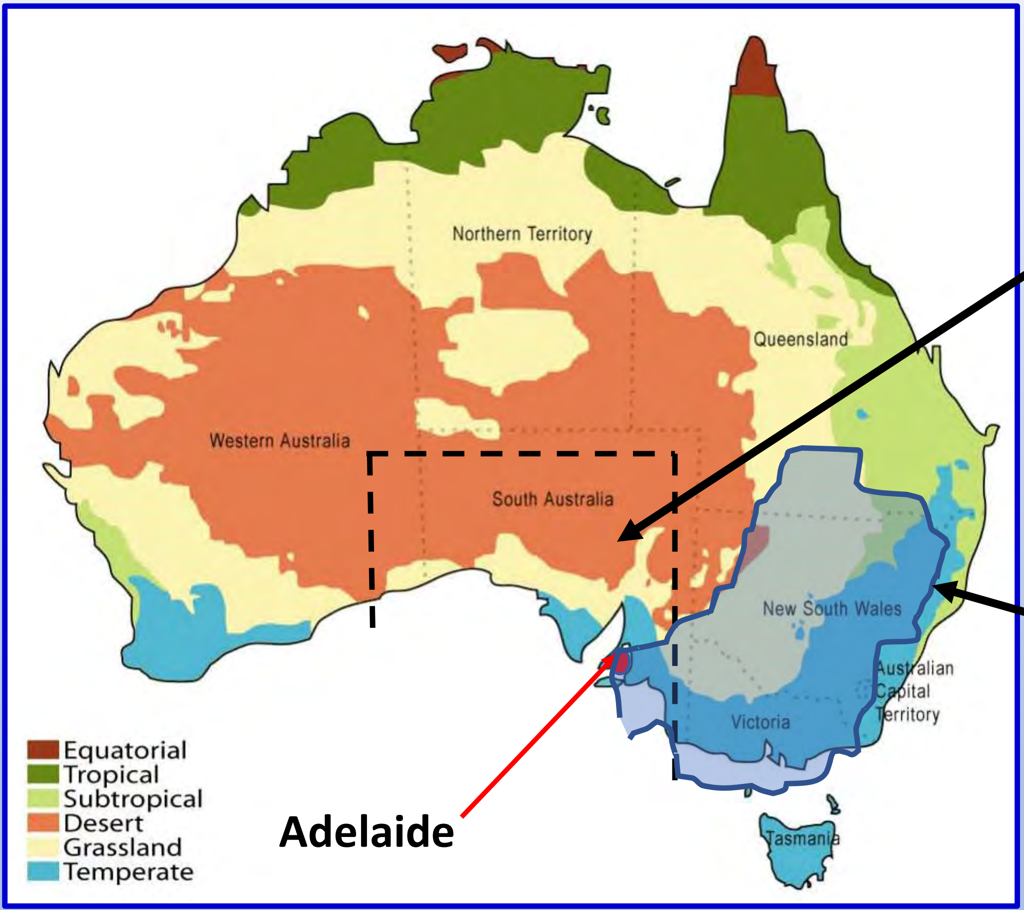
Adelaide, South Australia

TALLEMENCO
Irrigation Pumping Academy

Water efficiency vs Energy efficiency

What's the difference?

Irrigation Show 2019 Week Education



South Australia

<u>Driest State</u>
of the
<u>Driest Continent</u>
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**

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Associate Diploma, Mechanical Engineering,
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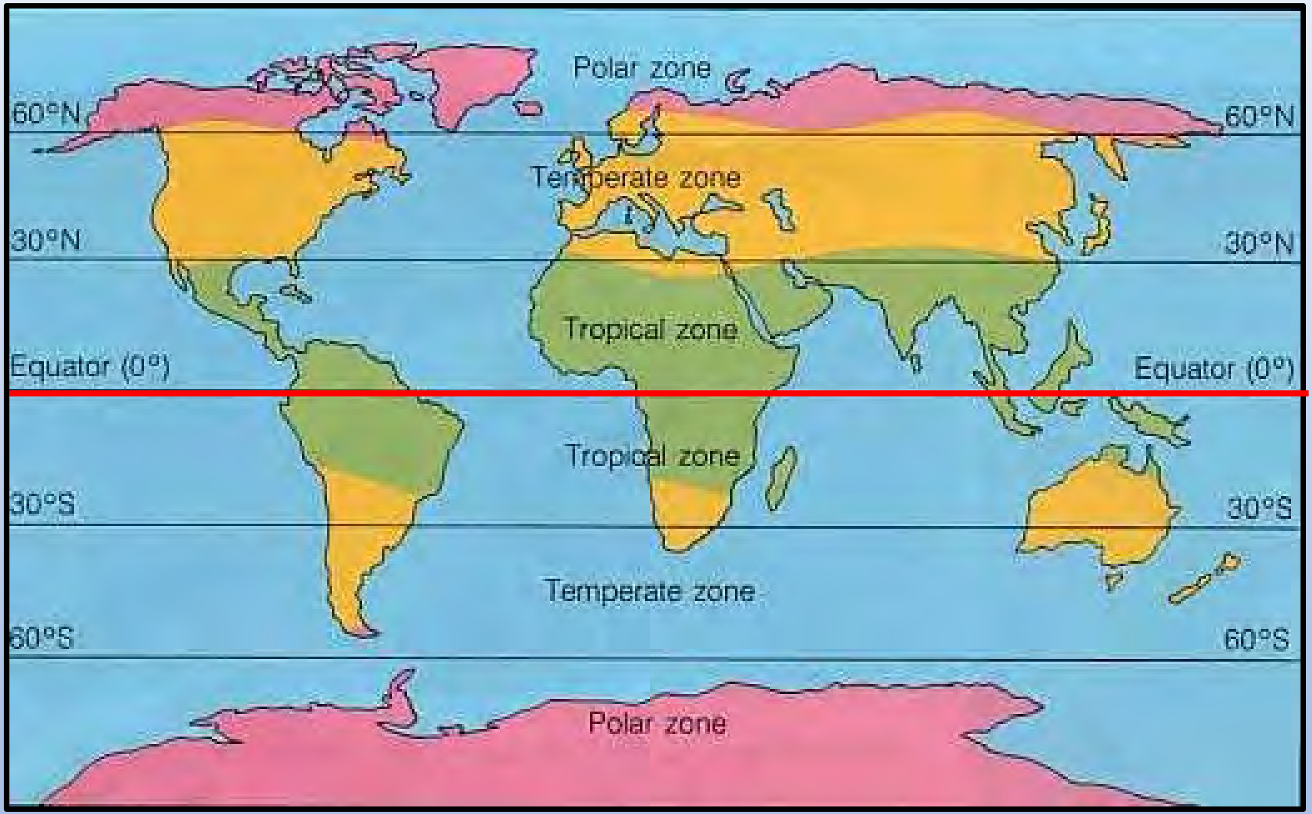
Water efficiency vs Energy efficiency

What's the difference?



Note that USA almost all above 30th Lat Nth. Australia almost all above 30th Lat Sth.

Therefore, Australia much hotter/drier climate.

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

TALLEMENCO
Irrigation Pumping Academy

Water efficiency vs Energy efficiency
What's the difference?

Irrigation Show 2019 Week Education

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?

PIPELINE 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)

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

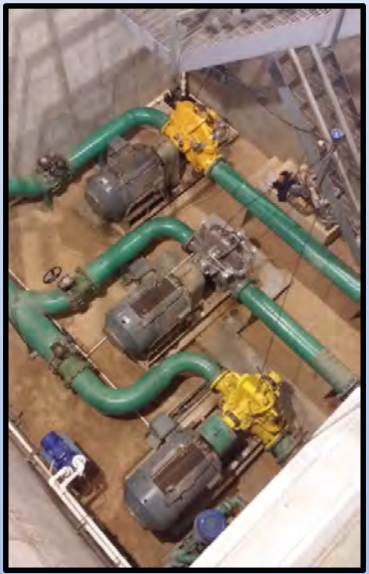
TALLEMENCO
Irrigation Pumping Academy

Water efficiency vs Energy efficiency

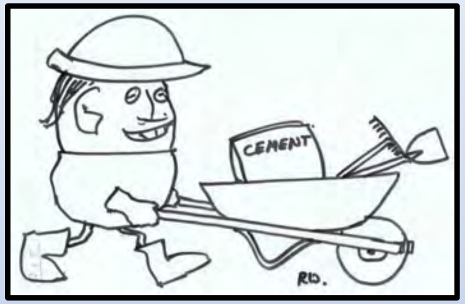
What's the difference?

Pump Design and Build
Hydrotech (Aust) 6 yrs

- ❑ 100 pumping systems
- ❑ Turf, Horticulture, Ag, Golf
- ❑ Design, Build, Commission
- ❑ Engineered Product

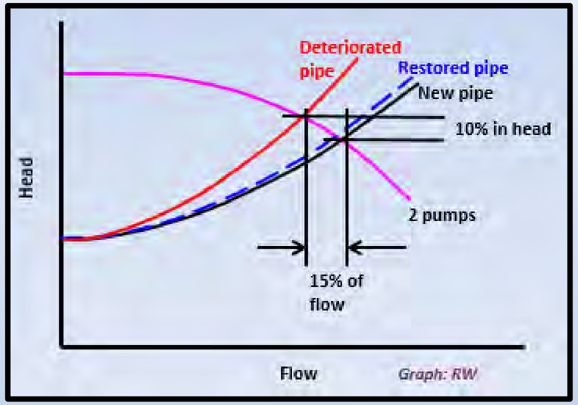


Defining moment



"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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TALLEMENCO Irrigation Pumping Academy

Water efficiency vs Energy efficiency

What's the difference?

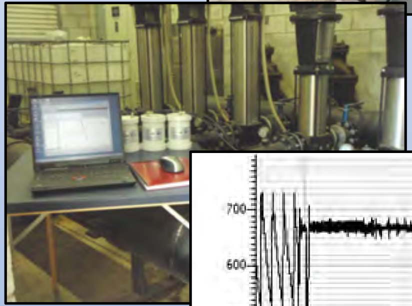
Irrigation Show 2019 Education Week

Pump Design 3 yrs HydroPlan (Aust)

- Pumping systems
- Pipeline systems, Dams
- Irrigation systems (drip)

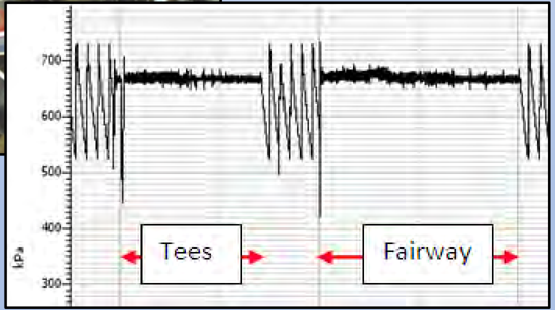
Tallemenco Pty Ltd 2003 to present

- 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



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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

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Las Vegas, Nevada

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How many "MPG" does your pump system do?

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

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

Pump efficiency
- Worn
- off-BEP

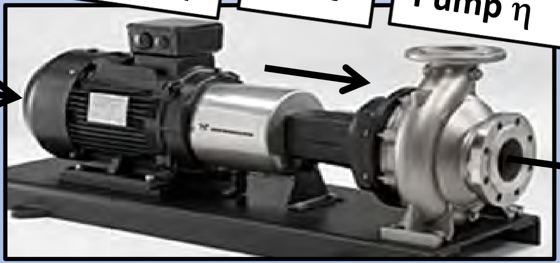
Tariff – choice of
- ❑ peak
- ❑ Off-peak
- ❑ Week-end

Motor η

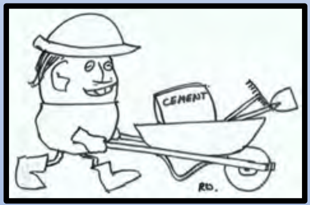
MkW

Pump η

EkW



WkW



*Refer www.talle.biz/data.html

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Water efficiency vs Energy efficiency

What's the difference?

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Water Efficiency	V's	Energy Efficiency
a) Water Requirement		a) Head pumped
b) Irrigation scheduling		b) Pump effy
c) Distribution Uniformity		c) Motor effy
d) Crop water use efficiency		d) Tariff (c/kWh, $/Litre diesel)
		e) ML pumped

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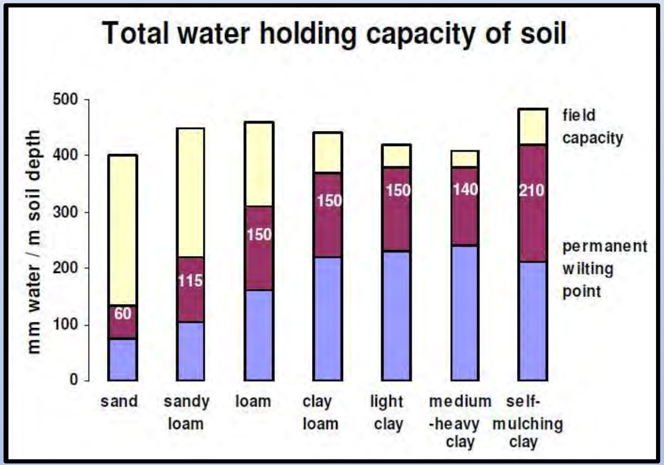
Water efficiency vs Energy efficiency

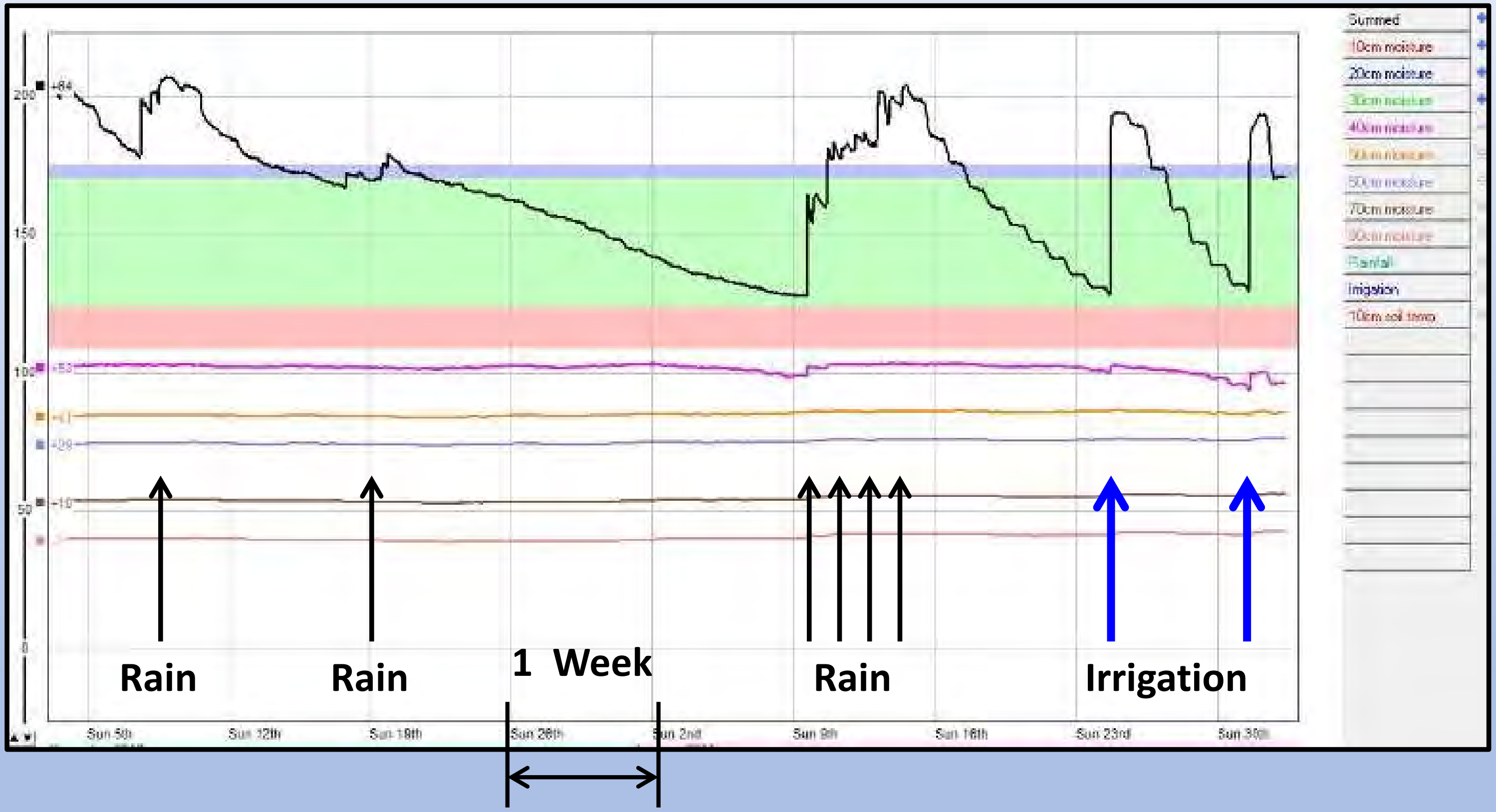
What's the difference?

Water Required vs Pumped Volume

Soil Moisture Monitoring

Eg, Capacitance Probe





Less irrigation = less pumping costs.

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Water efficiency vs Energy efficiency

What's the difference?

Water Efficiency V's Energy Efficiency

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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**

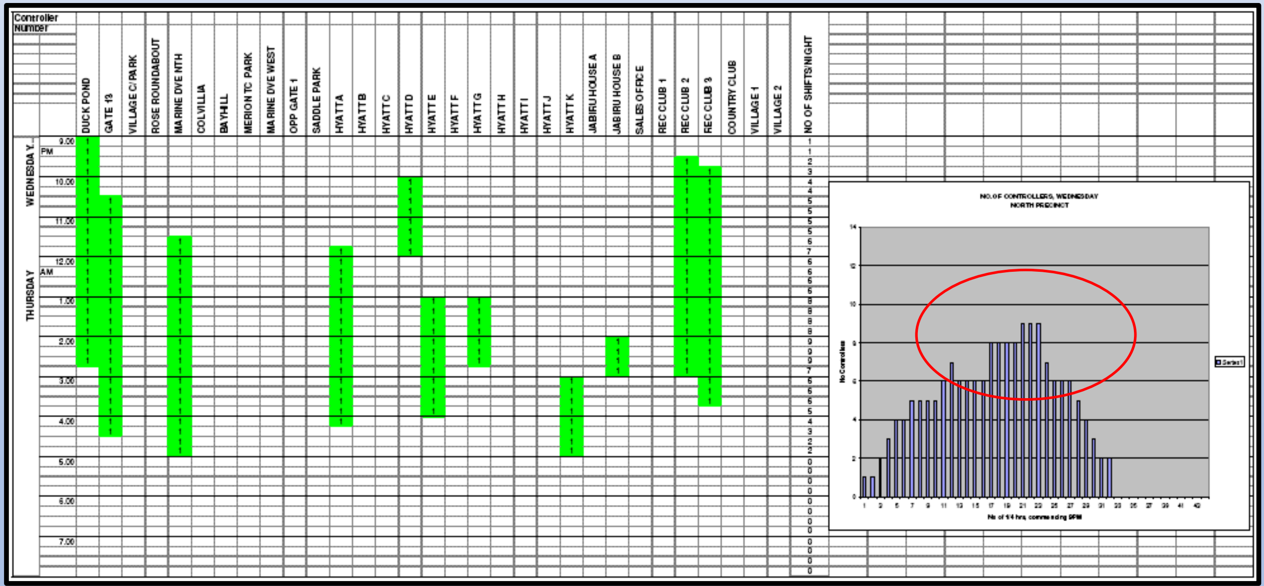
Manual scheduling 1

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



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Water efficiency vs Energy efficiency

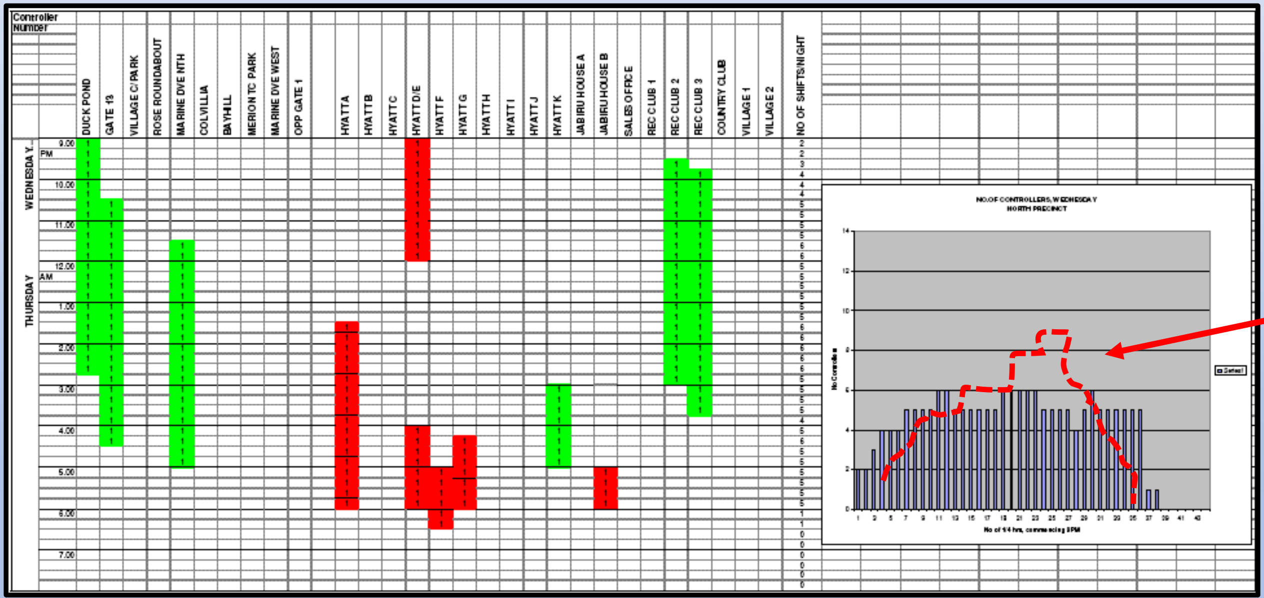
What's the difference?

Irrigation Scheduling vs Pumped Head

Manual Scheduling 2

28Ha landscaping site, 31 remote controllers

Rescheduling optimised pump duty required



Rescheduling reduced peak flow by 35%, resulting in less friction losses.

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Charts: R Welke

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Water efficiency vs Energy efficiency

What's the difference?

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Water Efficiency V's Energy Efficiency

Water Efficiency	Energy Efficiency
a) Water Requirement	a) Head pumped
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Water efficiency vs Energy efficiency

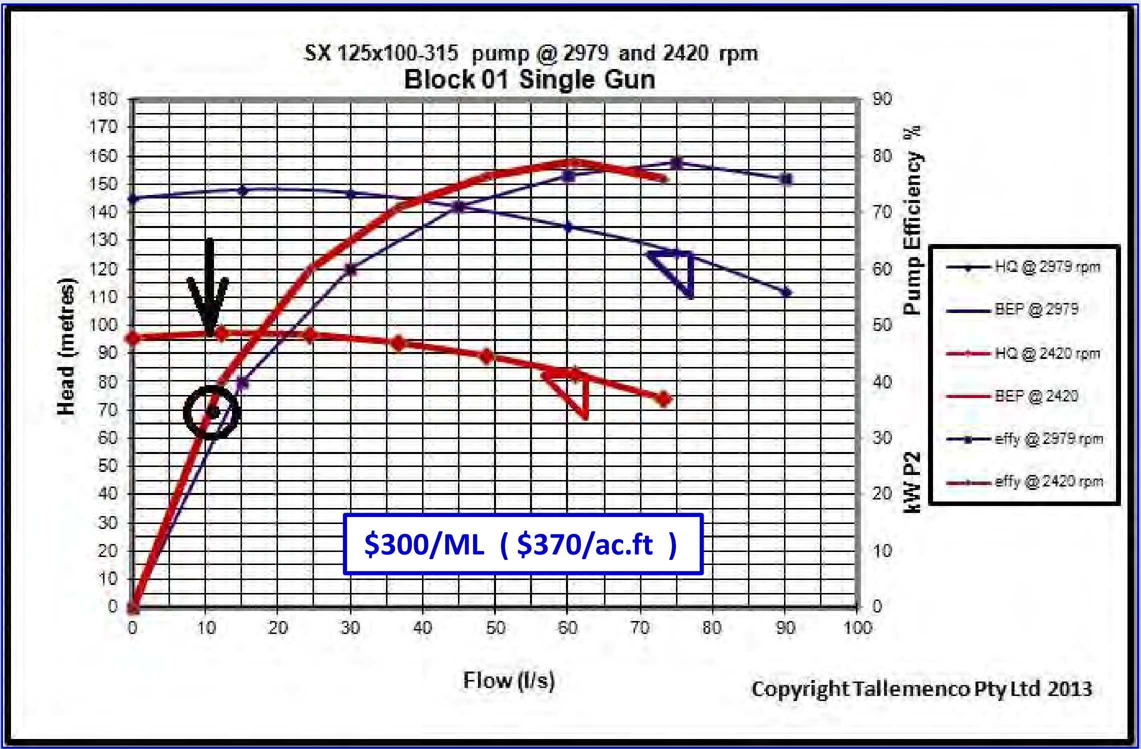
What's the difference?

Irrigation Scheduling vs Pump Effy/motor effy

Charts: R Welke

Irrigating cabbages
Lindenow, VIC.
Mitchell River

57kW (75hp) diesel
125x100-315
2950rpm pump



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

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Water efficiency vs Energy efficiency

What's the difference?

Water Efficiency V's Energy Efficiency

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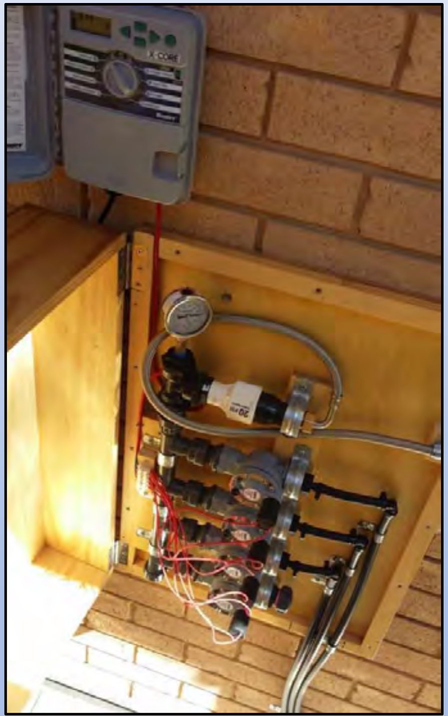
Water efficiency vs Energy efficiency

What's the difference?

Irrigation Scheduling vs Pumped Volume

Irrigation Scheduling – pulse irrigation



- Clay soil
- 6 water melon plants
- 8" x 8" soil (paver removed)
- Pulse irrigation (Hunter X-Core)
- 1 x Shrubbler
- 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

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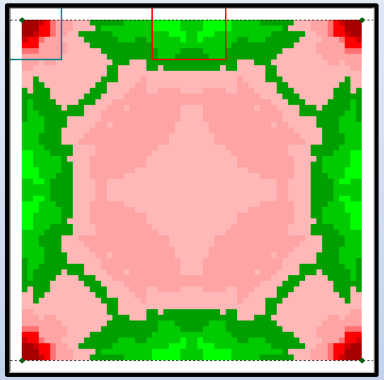
Water efficiency vs Energy efficiency

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

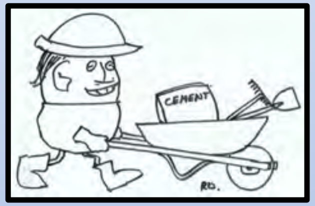


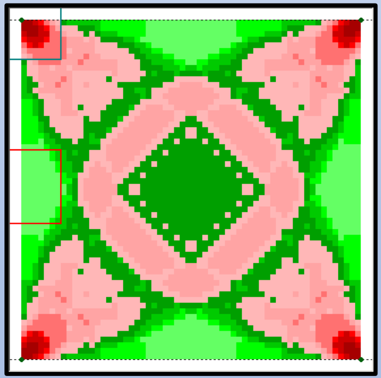
Example:

Toro 640 @ 450 kPa

DU = 84%

SC = 1.3





Example:

Toro 640 @ 350 kPa

DU = 73%

SC = 1.6

Image: Space Pro by Hunter

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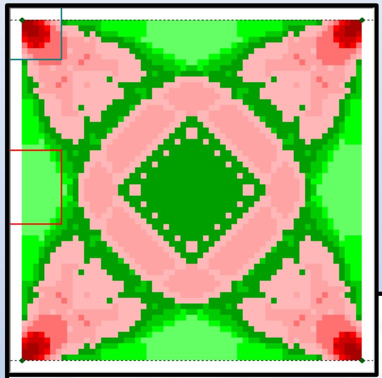
Water efficiency vs Energy efficiency

What's the difference?

Distribution Uniformity vs Pumped Head



Example:

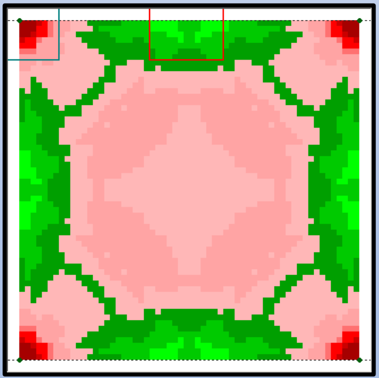
Toro 640
@ 350 kPa

DU = 73%
SC = 1.6

Restoring Pipeline efficiency – known as Pigging or Swabbing

(removing the wheel barrows)

Pigging 6" PVC, Penrith NSW



SC Restored

Toro 640 @ 450 kPa

DU = 84%

SC = 1.3

Image: Space Pro by Hunter

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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

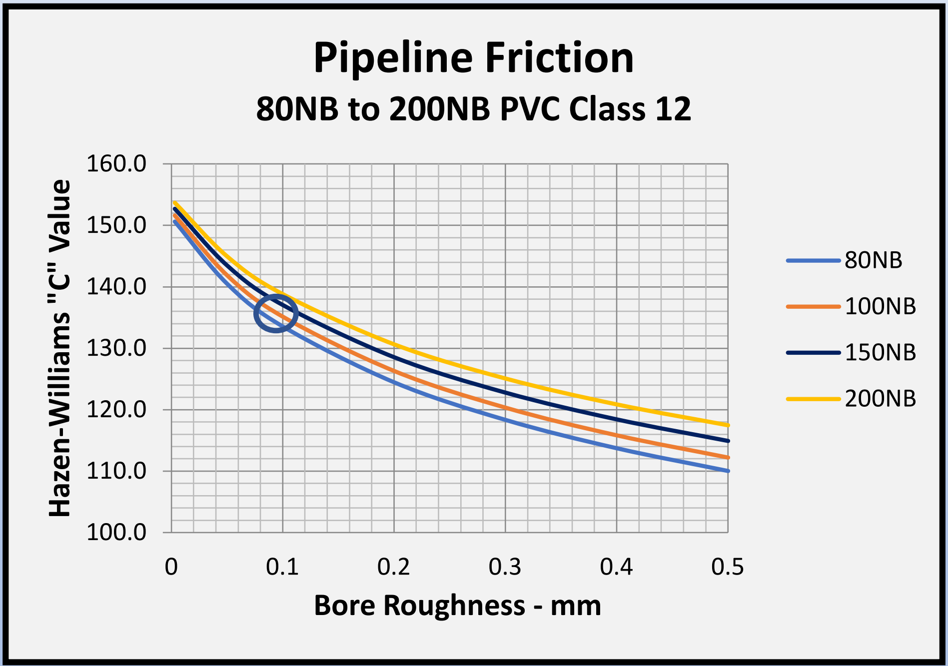
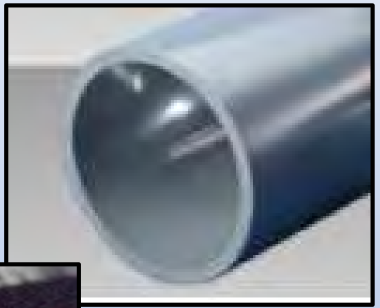


Chart: R Welke

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.



New pipe

Old pipe

Photos: R Welke

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Irrigation Pumping Academy

Water efficiency vs Energy efficiency

What's the difference?

Irrigation Show 2019 Education Week

Distribution Uniformity vs Pumped Head

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

River Murray, Mannum SA

- **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

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Water efficiency vs Energy efficiency

What's the difference?

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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

Blue Lake PS
Mt Gambier, SA.
Primary Lift Pumps

Photo: ABC.net.au

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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

Mannum - Adelaide No.1 PS

Photo: R Welke 1973

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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


Neil Harvey painting a rebalanced pump impeller with an epoxy coating.

Photo: R Welke

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What's the difference?

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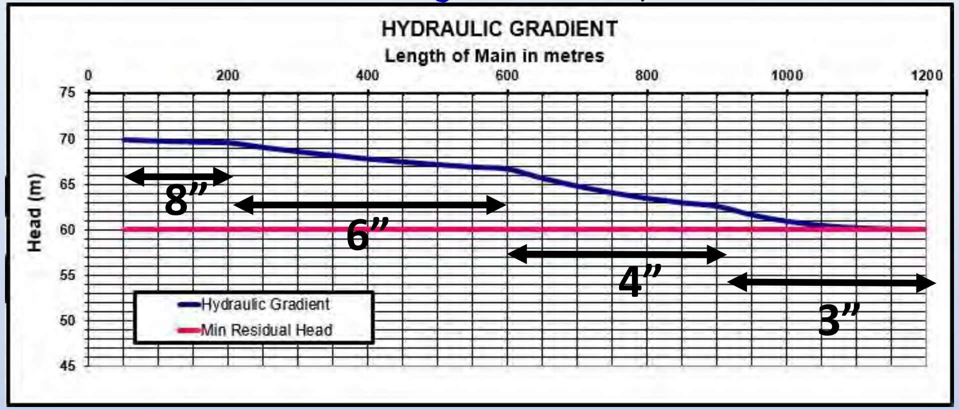
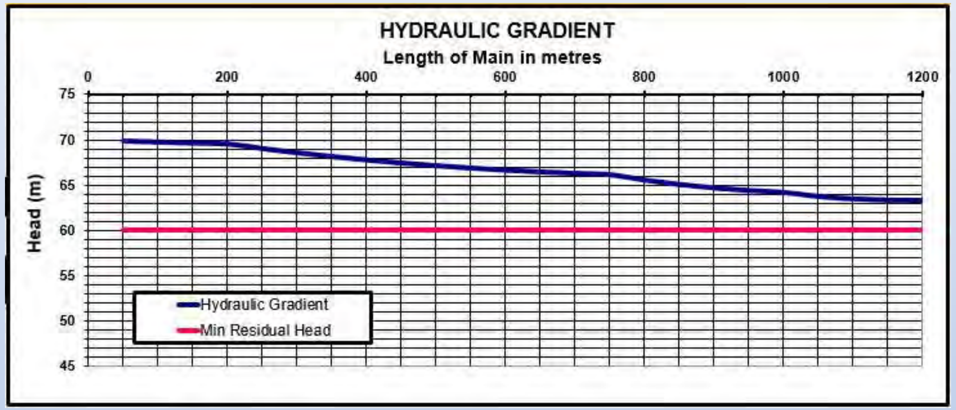
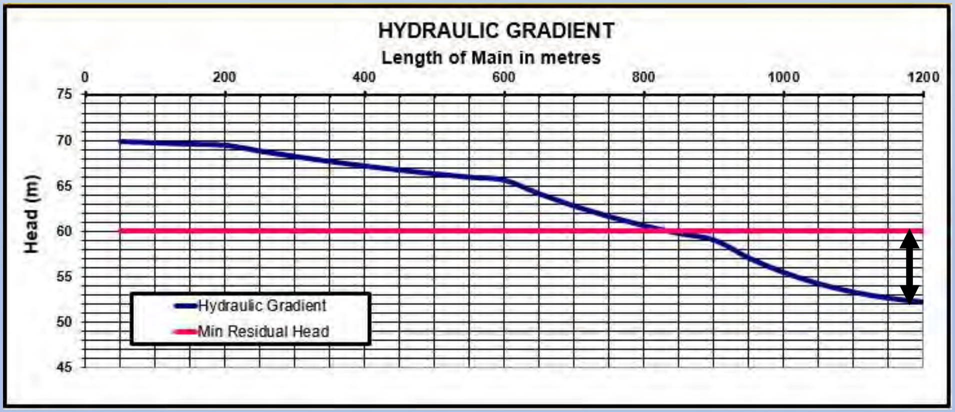
Distribution Uniformity vs Pumped Head



As designed
25 l/s flow
10m head loss





Modified

- Add 3 l/s end of pipe
- 8m extra 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

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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

Energy Efficiency

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

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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

1. Energy Charges				
Peak	43063.50	kWh	8.4598	c/kWh
Off Peak	54288.50	kWh	5.2035	c/kWh

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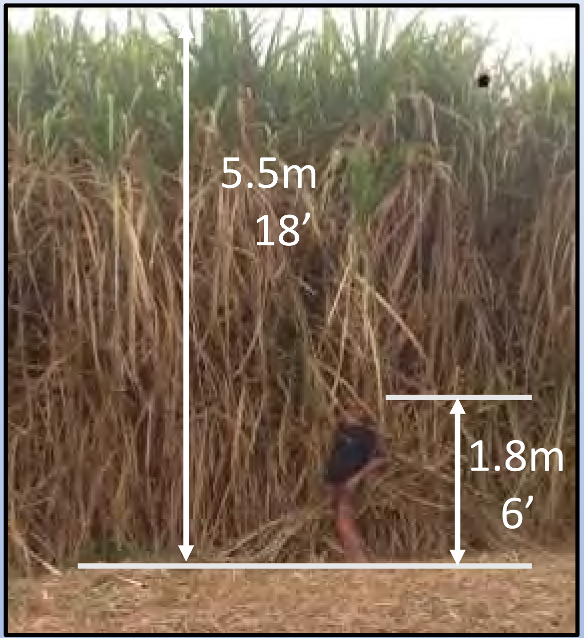
Water efficiency vs Energy efficiency

What's the difference?

Crop Yield vs Pumped Volume (+ Scheduling + 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)
- 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

ML x 0.81 = ac.ft

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Water efficiency vs Energy efficiency

What's the difference?

Water Efficiency V's **Energy Efficiency**

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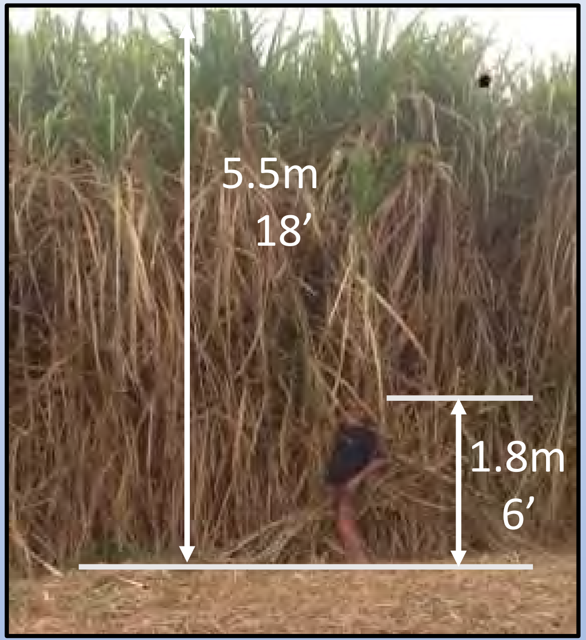
Crop Yield vs Tariff

Irrigation during day time
"crop water uptake"
= higher tariff costs

ML x 0.81 = ac.ft

Sugar cane crop, Nth QLD



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Water efficiency vs Energy efficiency

What's the difference?

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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
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d) Tariff (c/kWh, $/Litre diesel)
e) ML pumped

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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!

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 - typical

Irrigation design

By Robert L Welke
Associate Diploma, Mechanical Engineering,
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TALLEMENCO Irrigation Pumping Academy

Water efficiency vs Energy efficiency

What's the difference?

Irrigation Show Education Week 2019

Irrigation System Design approach - typical

Irrigation design

Pumping/pipeline design – all too often

Irrigation control

Life Cycle Costs

Pump cost

NPSH

Energy cost

Corrosion

Pump control

Pipeline friction

PS design

Specification

By Robert L Welke
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Irrigation System Design approach - Tallemenco

Irrigation design

Pumping/pipeline design

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TALLEMENCO
Irrigation Pumping Academy

Pumping Energy Efficiency

More than just testing pumps….

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

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Water efficiency vs Energy efficiency

What's the difference?

Where can energy be saved?

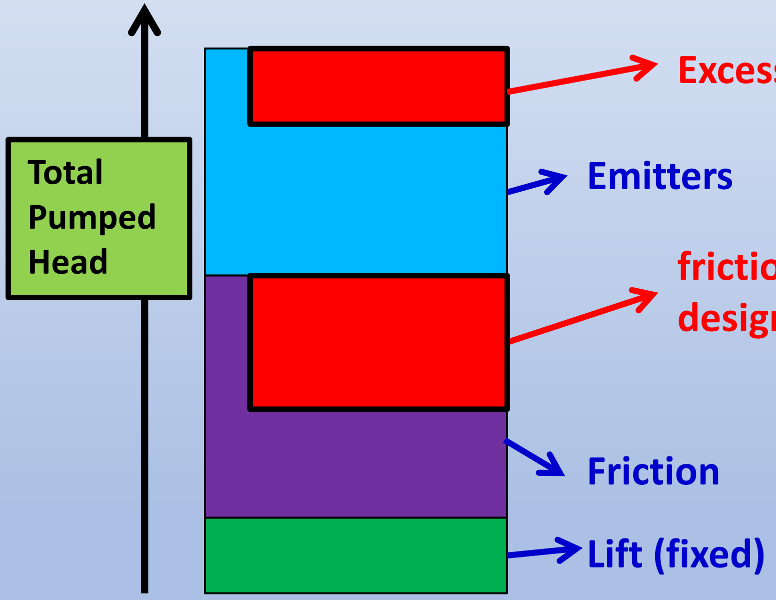
Pump efficiency

Typically < 50%
Recoverable energy losses

Hydraulic efficiency

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

Pump efficiency



Mains
Submains
Pipe ageing
Pump suction
Valves
Filters

IRRIGATION SHOW Dec. 4-5, 2019
EDUCATION WEEK Dec. 2-6, 2019

Las Vegas Convention Center
Las Vegas, Nevada

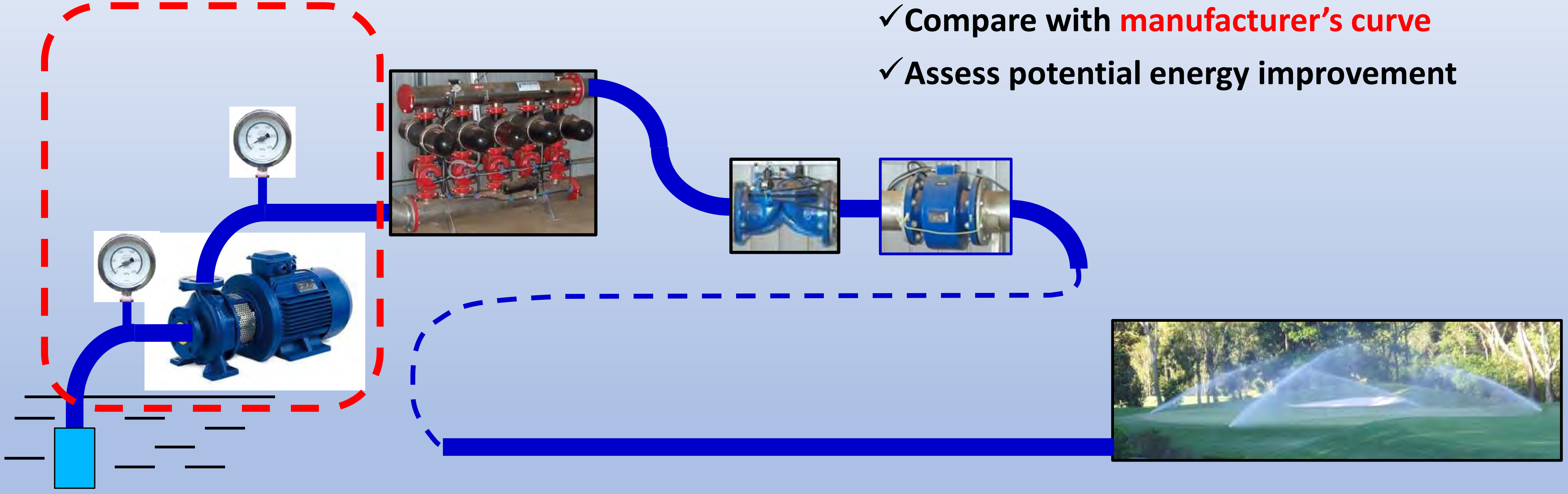
By Robert L Welke
Associate Diploma, Mechanical Engineering,
Irrigation Agronomist, Irrigation Auditor
Adelaide, South Australia

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



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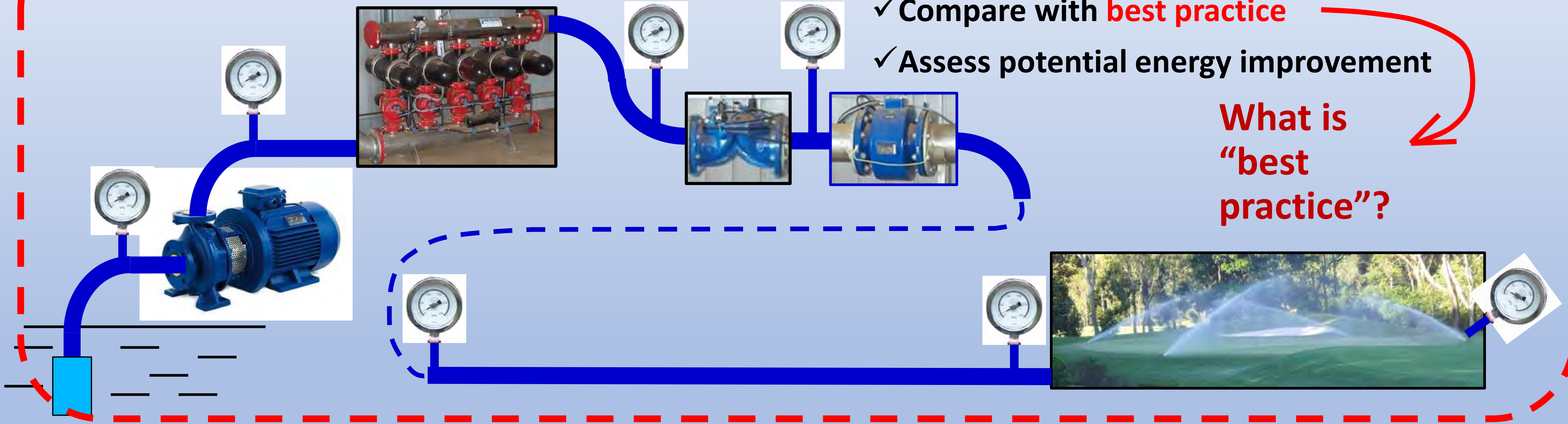
Water efficiency vs Energy efficiency

What's the difference?

Irrigation Show 2019 Education Week

Conduct a pumping system energy efficiency audit

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



What is "best practice"?

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TALLEMENCO
Irrigation Pumping Academy

Water efficiency vs Energy efficiency

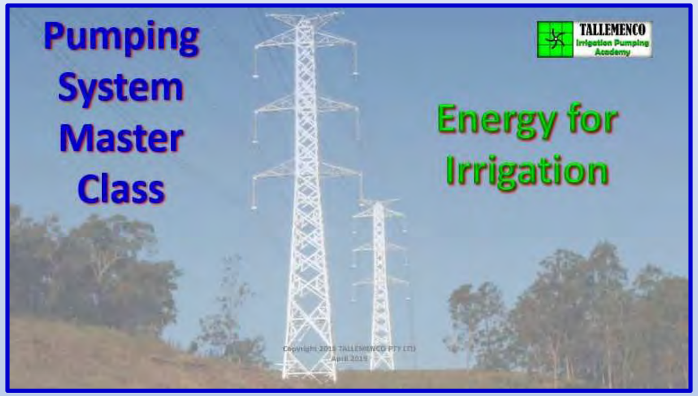
What's the difference?

Irrigation Show 2019 Week Education

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

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Water efficiency vs Energy efficiency

What's the difference?

Water Efficiency V's Energy Efficiency

Proudly presented

by

Rob Welke, Tallemenco

Thank you

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

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

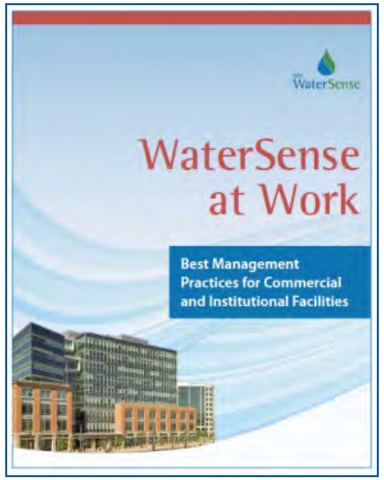
The WaterSense Vision

- 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

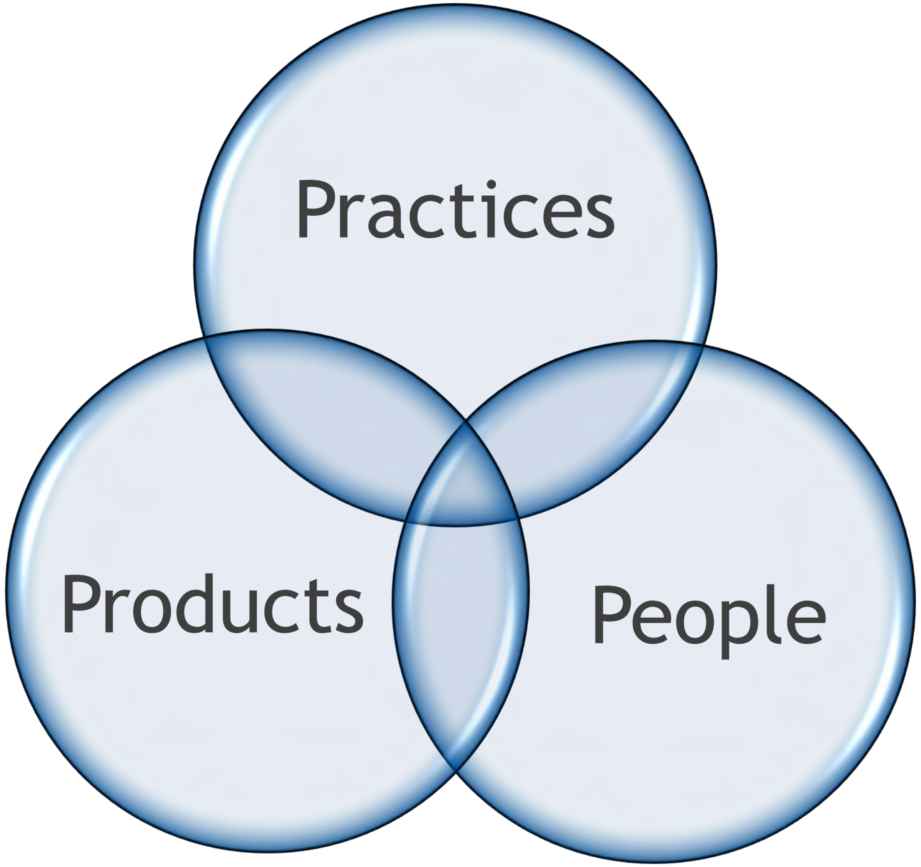
How will we achieve it?

- 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



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

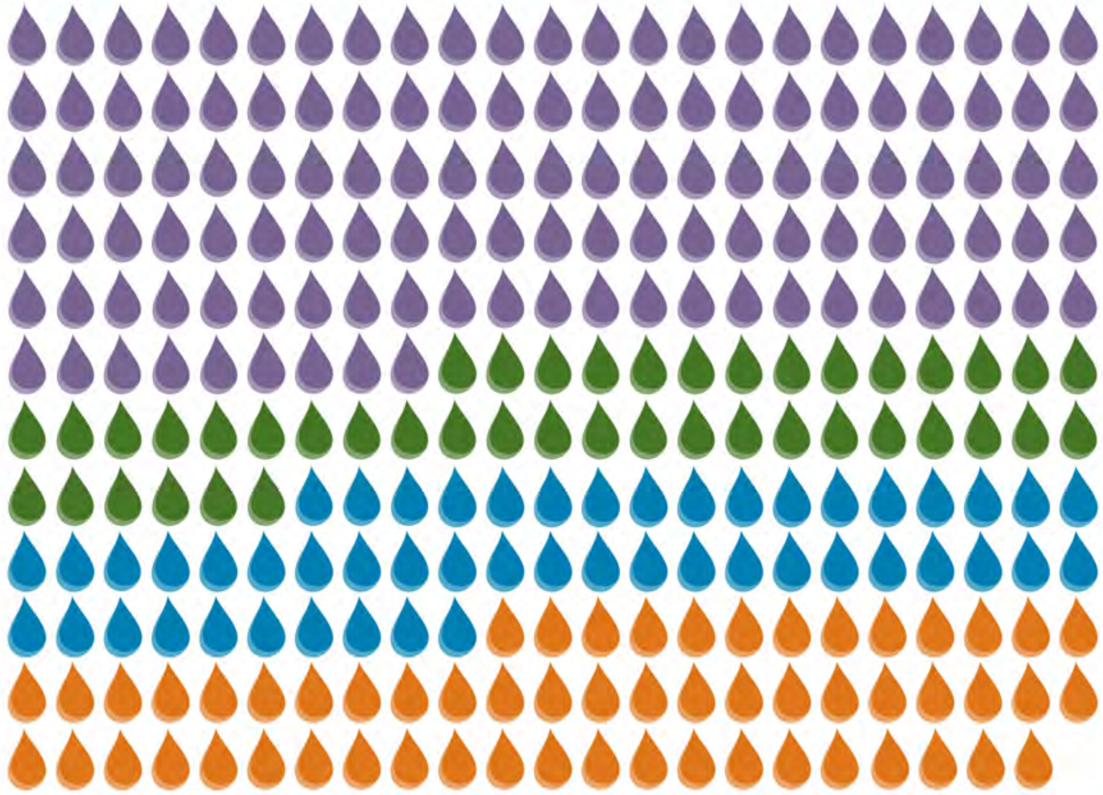
Pre-Rinse Spray Valves
(Recently Sunset)
Labeled from 2013 to 2018
30 previously labeled models

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

Thru Mar 2019

Internal Research
- Update product information, analyze WaterSense product database, conduct industry research
- Issue *Notice of Specification Review* and hold first stakeholder meeting

Mar-Jun 2019

Stakeholder Engagement
- Hold meetings with individual partners, standards committees, industry experts, and utilities
- Review comments, conduct additional analysis based on in house data
- Hold product type meetings with stakeholders to review information collection to date

Jun-Aug 2019

Analysis
- Compile additional comments received and post to website
- Review and analyze information collected
- Continue engagement with standards committees and industry as necessary

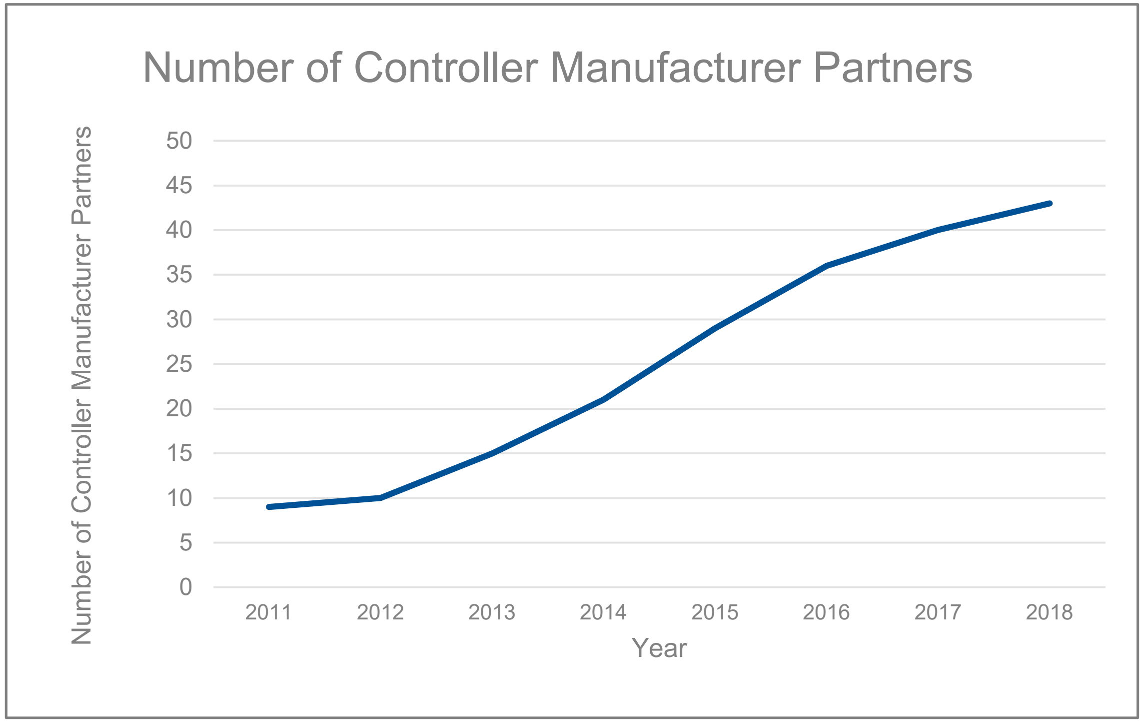
Aug-Dec 2019

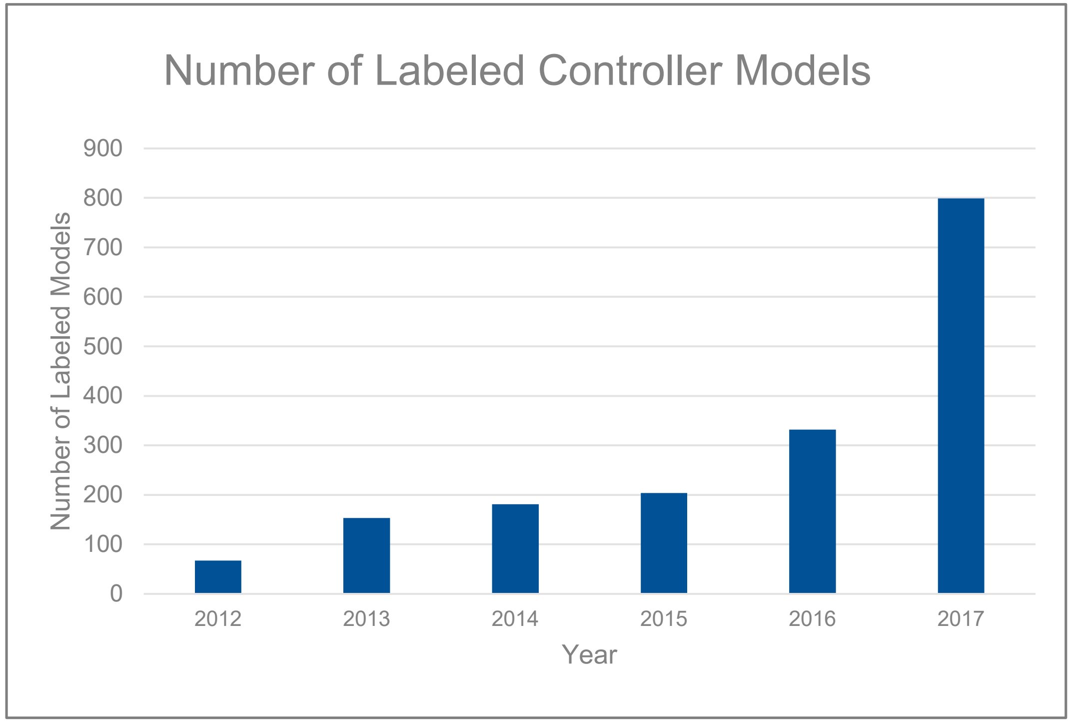
Develop Recommendations and Announce to Stakeholders by December 31, 2019
- Develop recommendations and review with EPA Management
- By December, present recommendations, post material to website, host public meetings

We are here

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 =

$$\frac{\text{GPM X 96.3}}{\text{Head Spacing X Row Spacing}}$$

- 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!

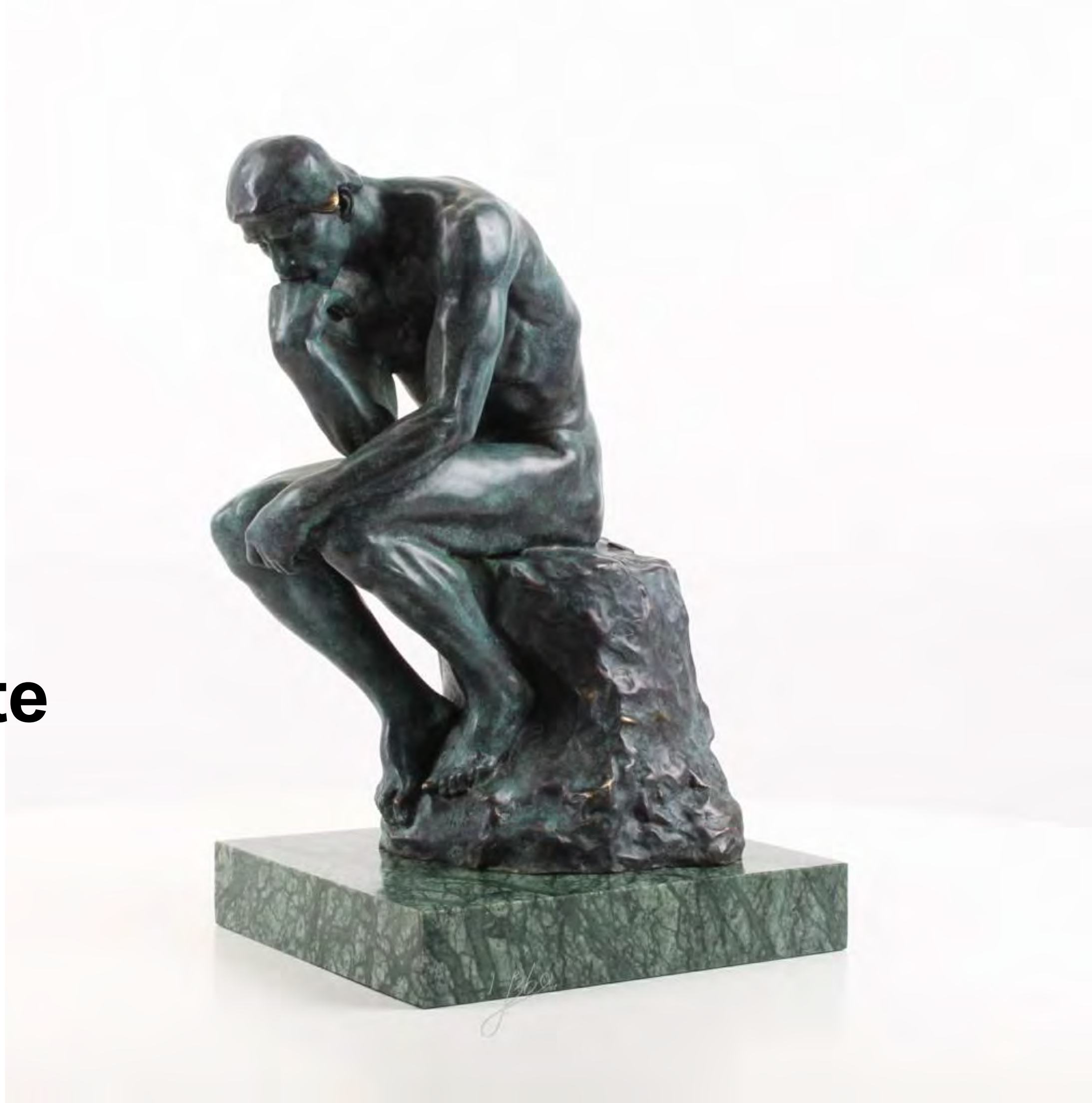
- **California State Polytechnic University – Pomona**
  – 2/3 of Loss = Wind Drift & Evaporation;

  – 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

Ron Wolfarth
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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

Rushed Repairs = higher costs

- Repairs on prepared schedule capitalize on:

  -off season rates

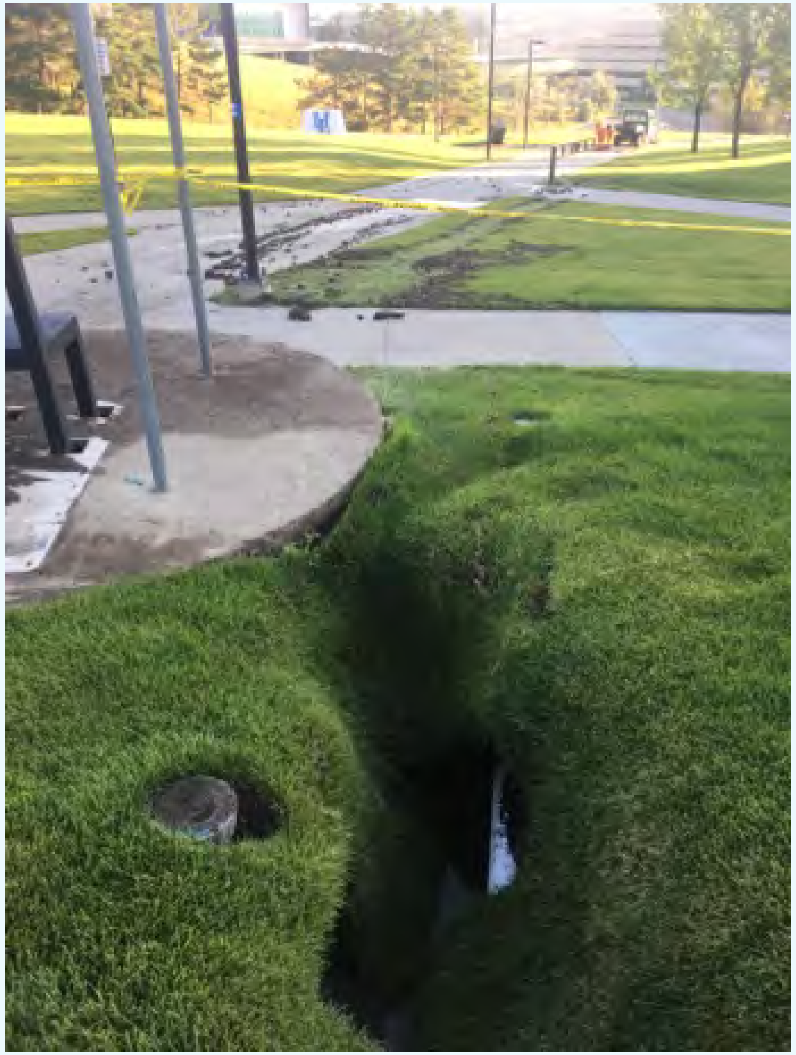
  -low irrigation times

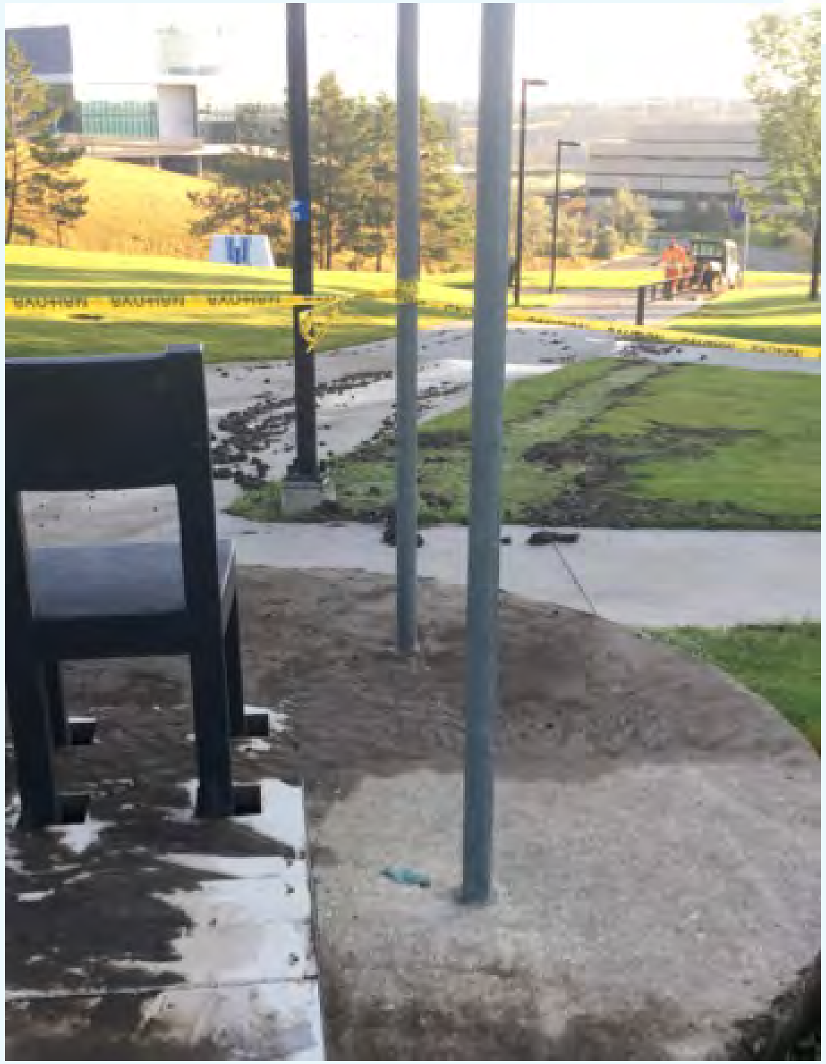
  -high availability of staff

  -no effect on core functions of business.

Risks : Break Example

University of Lethbridge





University of Lethbridge

FIAT LUX

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 ______________________________(Add photos if available)

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.

University of Lethbridge

All lines that are pressurized when pump is on.
Three status codes for isolation valves.

University of Lethbridge

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

University of Lethbridge

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.

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