golf industry show

San Antonio 2018

CONNECT. DISCOVER. ELEVATE.

GCSAA EDUCATION CONFERENCE | TRADE SHOW | GCSAA GOLF CHAMPIONSHIPS

February 3-8 | Henry B. Gonzalez Convention Center

PRESENTING PARTNERS

GCSAA NGCOA

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USGA NGF

Session

Golf Irrigation
Pumping System Features

Presented by:
Irrigation Association and
American Society of Irrigation Consultants

Moderator - Bob Scott
Irrigation Consultant Services
Atlanta, Georgia

Speakers

- **Pumping Station Design-**
  Boyd Rose; Watertronics
- **Pumping System Controls-**
  John Murtaugh; MCI Flowtronex
- **Pump Station Communications & Water Quality-**
  Bryan Campbell; Rain Bird

Session Format

- **Speaker Power Point = 20 Minutes**
- **Speaker Power Point Q&A = 5 Minutes**
- **Speakers Panel Discussion = 15 Minutes**

** Golf Superintendents Questions are the Priority

Pump Station Design

Boyd Rose

Watertronics

Applications Engineering
Manager & Director of Marketing

Hartland, Wisconsin

Pump Station Configurations

- History and Evolution
- Elements that influence the design
- Pros and Cons to consider for every type
- Current trends and reasons why
- Potential future trends

History and Evolution- Fixed Speed

- Constant speed motors/ pumps
- Pressure control valve
- Full in-rush starting
- Pressure Tank
- “Stair-step” horsepower
- “Foot on the brake”

History and Evolution

Disadvantages

- Energy loss with control valve
- Control valve requires maintenance
- Zones need to match HP combos
- Pressure tank can be dangerous

Less efficient – Higher maintenance

Fixed Speed vs. Variable Speed

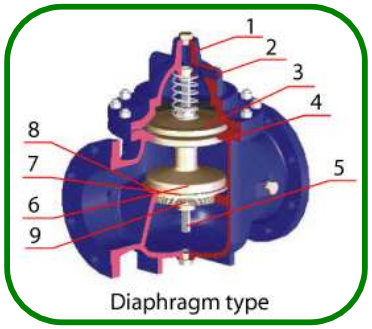
Cruise Control vs. Foot on the Brake!

Fixed Speed

- Pressure switch on/off
- Hydraulic valve pressure regulation
- EBV pressure regulation
- No pressure regulation

Variable Speed

- Electronic pressure regulation
- Varies speed of the motor



History and Evolution

Variable Frequency Drive

- Varies the speed for pressure control
- Eliminates control valve and tank
- Low in-rush, easier on pipes
- Pulls only the power required to meet flow demand
- Less maintenance
- “Cruise control”
- 25% power savings!

Pump Station Design Theory

Characteristics of a well-designed pump station:

<u>Mechanical / Hydraulics</u>

- Properly sized components that match capacity
- Piping layout that minimizes losses
  - Fabrication & Layout
- Proper use and application of sensing equipment
- Materials of Construction (steel pipe & salt water)

Pump Station Design Theory

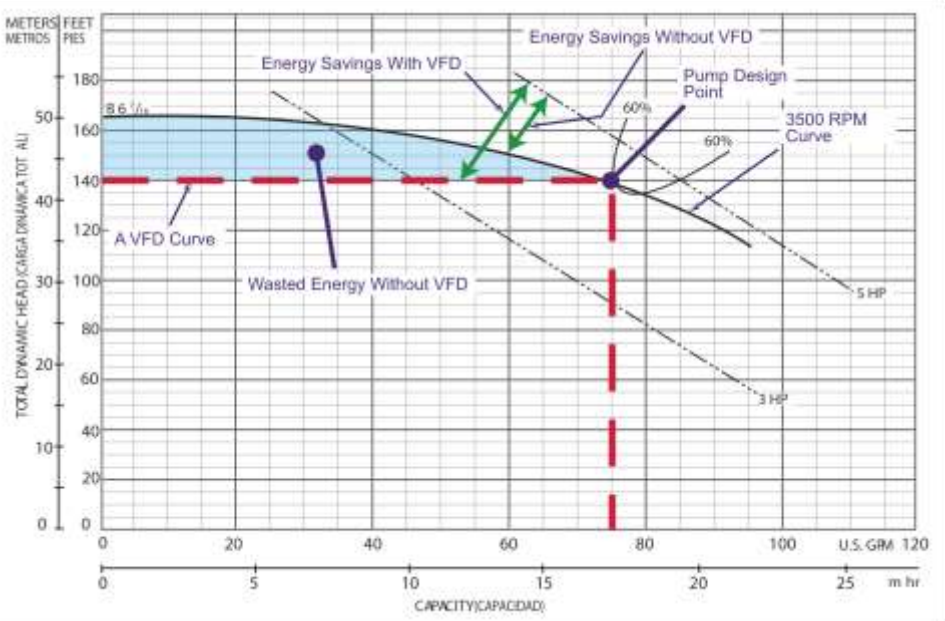
Characteristics of a well-designed pump station:

<u>High Voltage & Controls</u>

- UL 508 listed or other certification
- The panel has some type cooling method
- Type of panel is rated for the environment in which it is installed
  - (not just moisture but dust)
- Provides a level of personal safety (disconnect / interlock)
- Appropriate complexity or simplicity for the application

Pump Station Design Theory

- Mission of Pump Station:
  Regulate a constant pressure over a variable flow rate



Theory of Operation

- Basic Understanding of How a Pump Station Should Operate:

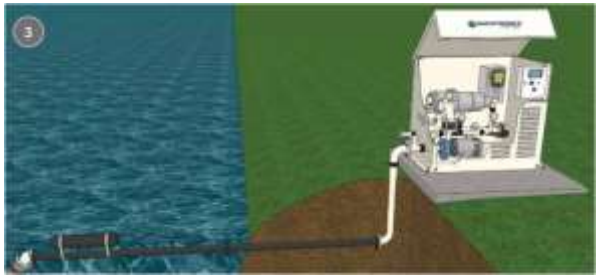
  1. Pressure drop initiates startup (remote signal or flow)
  2. Regulate pressure
  3. The right number of pumps running / demand
  4. Shutdown sequence

Why so many types ?

The water source defines the pump system configuration

Type: Horizontal / Centrifugal System

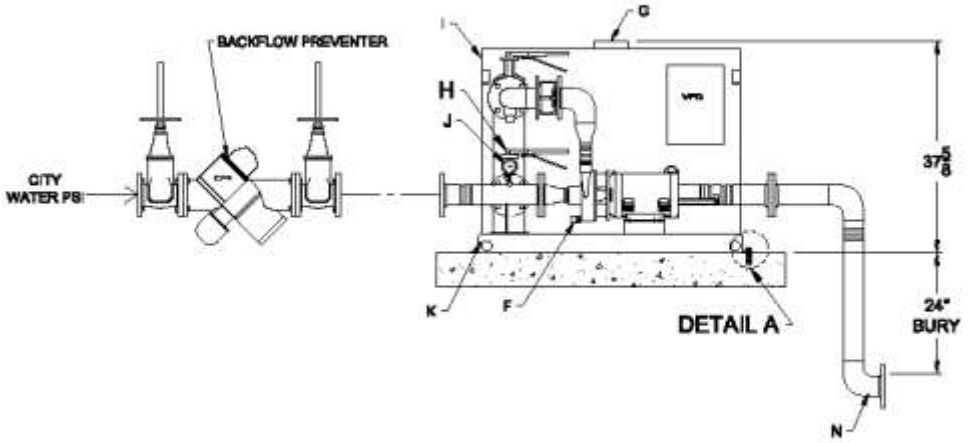
- Booster – pressurized source
- Flooded suction – tank or pond supply
- Suction lift



Horizontal Pump Station

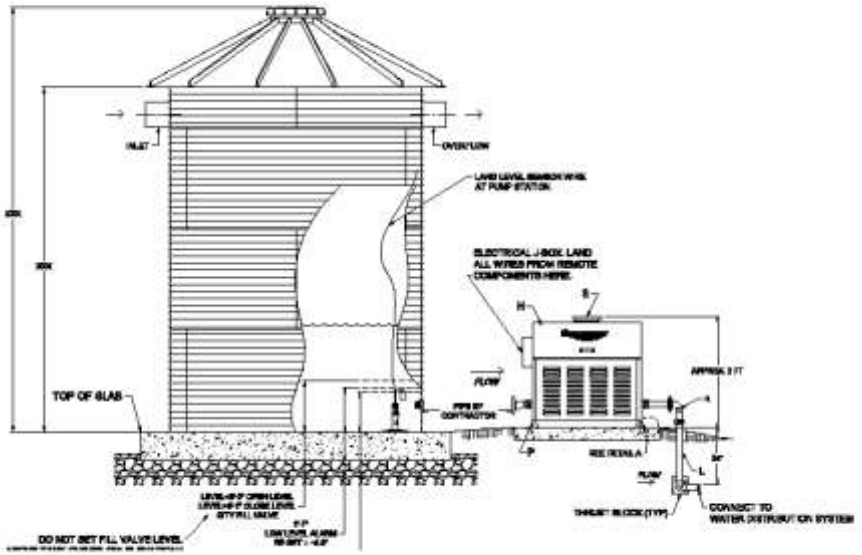
Types: Booster Pump

Booster Station

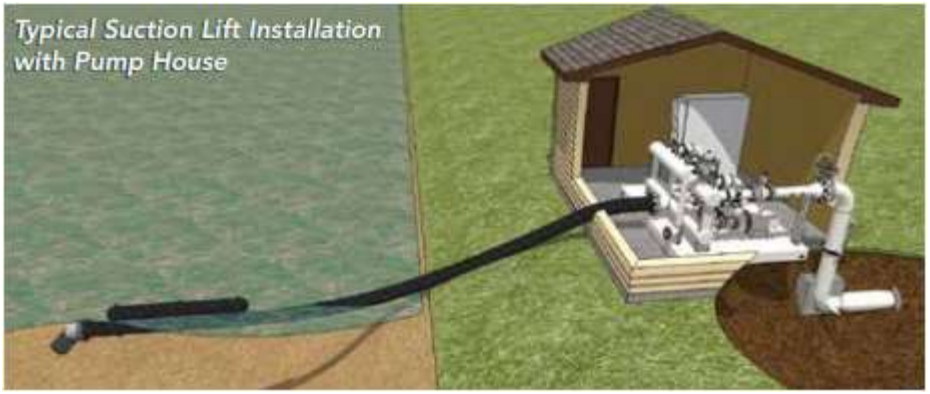


Type: Flooded Suction

Flooded Suction



Type: Suction Lift Horizontal

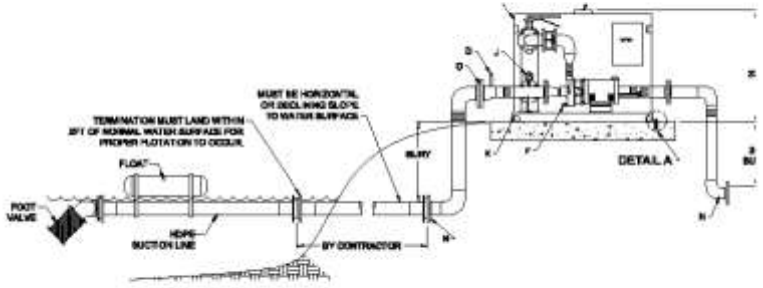


Types: Suction Lift

Suction Lift

HDPE Suction Line

Sure Flo Foot Valve



Pros and Cons – Horizontals

Flooded Suction – Boost - Lift

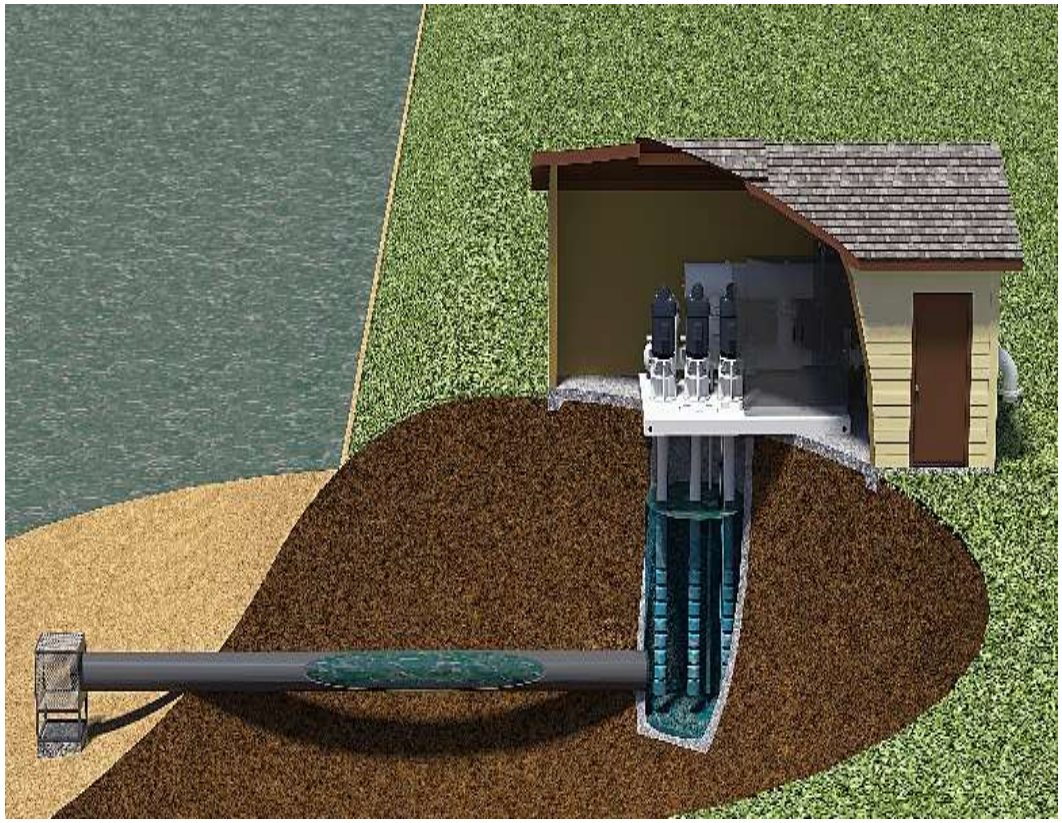
Advantages

- Least expensive
- Small in size
- Easy access
- Parts access

Weakness

- Lower efficiency
- 3600 rpm
- Marginal for dirty water
- Poor lifting capabilities

Type: Vertical Turbine



Type: Vertical Turbine

Pros and Cons – Vertical Turbine

Advantages

- Most efficient
- 1800 RPM - long life
- No “lift” issues
- Dirty water tolerant

Weakness

- More expensive
- Requires a wet well
- Submersible pressure maintenance pump
- VHS motor expensive to repair or replace

Canned Turbine

Pros and Cons – Canned Turbines

Advantages

- Most efficient
- 1800 RPM - long life
- Flooded suction but turbine efficiencies
- No wet well

Weakness

- More expensive
- Flooded or boost intake
- Needs a dry sump
- VHS motor expensive to repair or replace

Submersible Sled

Pros and Cons – Submersible Sled

Advantages

- Less infrastructure
- Low noise
- Common components
- No wet well

Weakness

- Setting and repair access more complex
- Must remove to service
- Must remove in winter
- Crane access can be a challenge

WATERVISION

PC OR CLOUD BASED TELEMETRY SYSTEMS

Current Trends and Influences

- Reduction or elimination of city water for irrigation – cuts costs
- Automatic source water blending – less city water use
- Water quality monitoring and management integration
- Cloud based monitoring and control – saves labor – no radios
- Premium efficient motors, now mandatory – less power, same work
- Dedicated VFDs per motor – simplifies controls – needs more cooling
- Disinfection before delivery via U.V. , ozone - safety concerns
- Skid mounted equipment enclosures – no building permit!
- Retrofit market requires more highly-engineered systems


V-1000

NEED FOR MOBILITY

PC OR CLOUD BASED TELEMETRY SYSTEMS

Anywhere, Anytime

✓***Available through any Web based device..iPhone, Pad, Home PC…***

WaterVision

Wrap-up

- Most Watertronics applications pump water into a pressurized piping system

Possible Future Trends

- "Internet of everything" is real and can be leveraged to gain even more resource efficiencies
- While power is nothing without control
  "Data is nothing without analytics"
  Smart analytics will be able to make decisions
- More system integration will only create more site resource efficiencies
- Dynamic pressure control direct to pump to reduce unneeded pressure – could have a substantial impact on irrigation design and equally important on power savings

Summary

- Water source and water quality drive the design
- Make sure you accept the limitations of your choice
- Healthy trends are creating resource efficiencies
- Future trends will likely double those efficiencies in 10 years


Q&A

Many Thanks!

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Pump System Controls

John Murtaugh

MCI Flowtronex

Vice President

Dallas,Texas

What is important in pump station controls?

Time….

When its time to pick, time is short, typically you have a 1000 things chasing you and just as people telling you a particular pumping system is the best ever built in the entire universe.

Then, confusing statements that sound similar - but not - its a bit like buying a new TV today, you think it has all the bells and whistles but confusing terms are used that sound similar.

Make a list of items that matter to you and your application.
This will help during review.

Focus on what could cost you money after you buy it, to make sure you can explain your reasons to your GM.

Pump System Controls

Check List

- Components
- VFD
- Safety
- User access and operation
- Remote Access
- Reporting
- Fault/Warning notifications
- Features
- Warranty fine print

Components

- Manufacture Qualifications
- Availability of replacement parts
- Consistent product through out time
- Track Record for product Reliability
- Component Warranty
- Availability of repair parts and qualified techs
- Industrial controls manufactures range from Yugo to Rolls Royce in quality and price, identify most accepted products

VFD

- Top tier products
- Warranty coverage
- Determine history on VFD failures by product

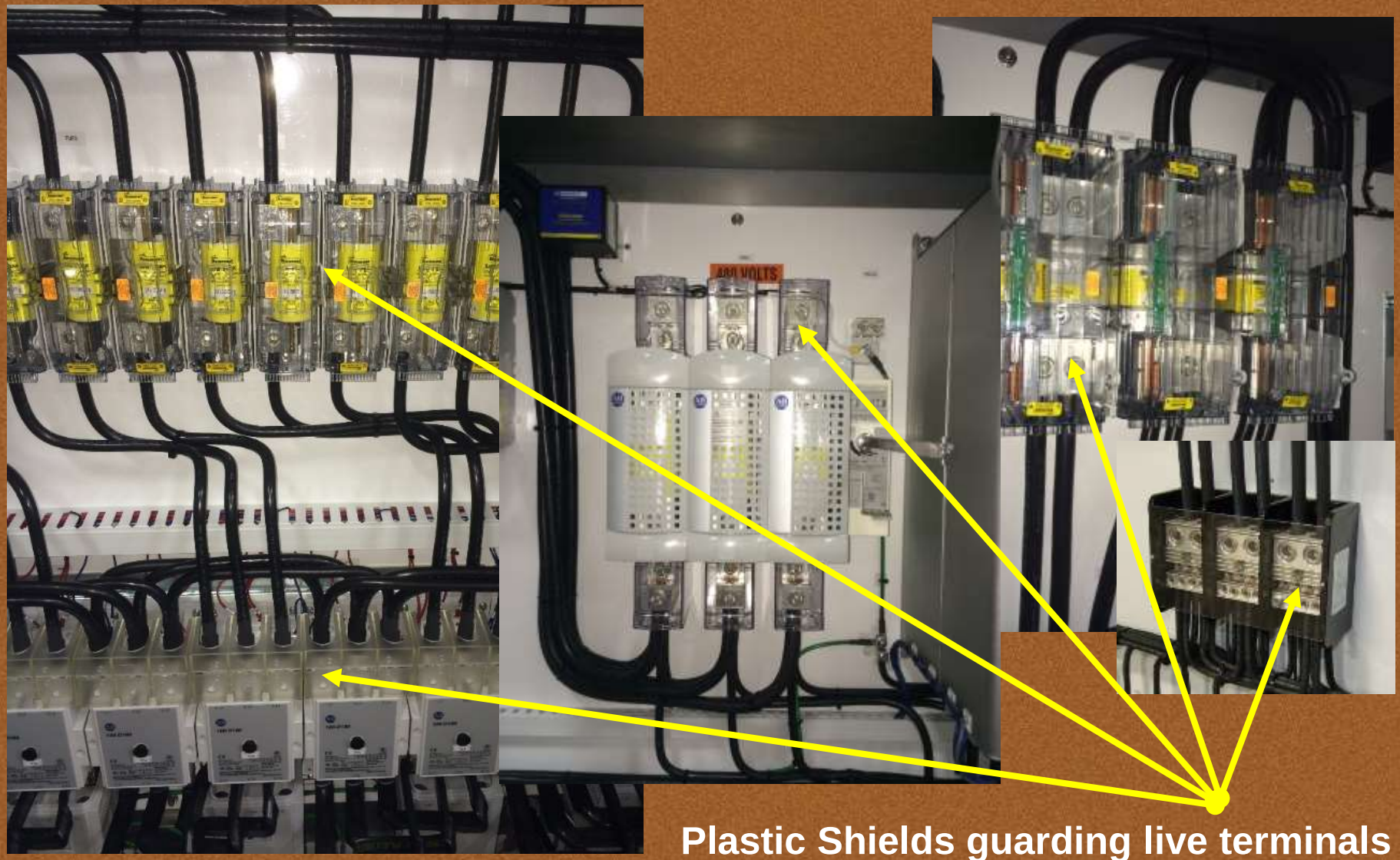
Safety

- Ratings such as Fault Current
- Electrical Arch flash prevention measures
- Surge Protection
- UL Rating
- Safety Certification

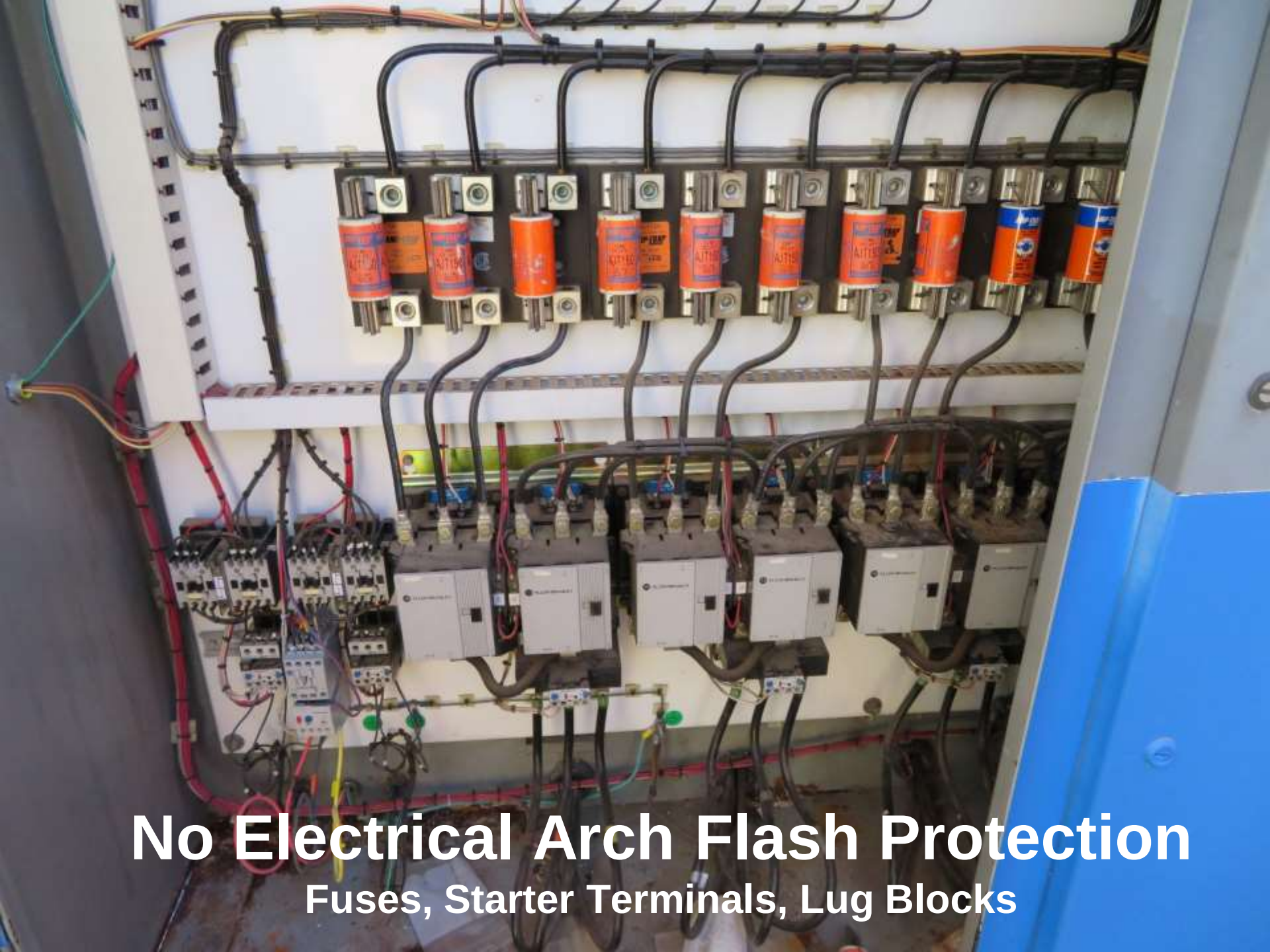
All the above add up to overall safety for you, your staff and subcontractors/service providers

Electrical Arch Flash Protection

Fuses, Starter Terminals, Lug Blocks



Plastic Shields guarding live terminals


No Electrical Arch Flash Protection
Fuses, Starter Terminals, Lug Blocks

BOOM !!!

Examples of catastrophic fault current and arch flash damage

User Access & Operation

- Intuitive driven or complex (iphone)
- Size
- What can you do and access on your own?
  - Flow, graphs, pressure set point, history and faults, can you make adjustments?
  - Email set up and changes
  - VFD access with doors closed or open
- Smooth pressure control under variable flow conditions, look at random samples

Remote Access

- Latest technology is cell communication
- Do you have to get an account/SIM card?
- Is it already online when delivered?
- How long is the service prepaid?
- How much per year after prepaid period?
- Manufacture remote access to VFD, PLC , HMI and Flow Meter for support, upgrades & changes
- What's included? Cloud data

Reporting

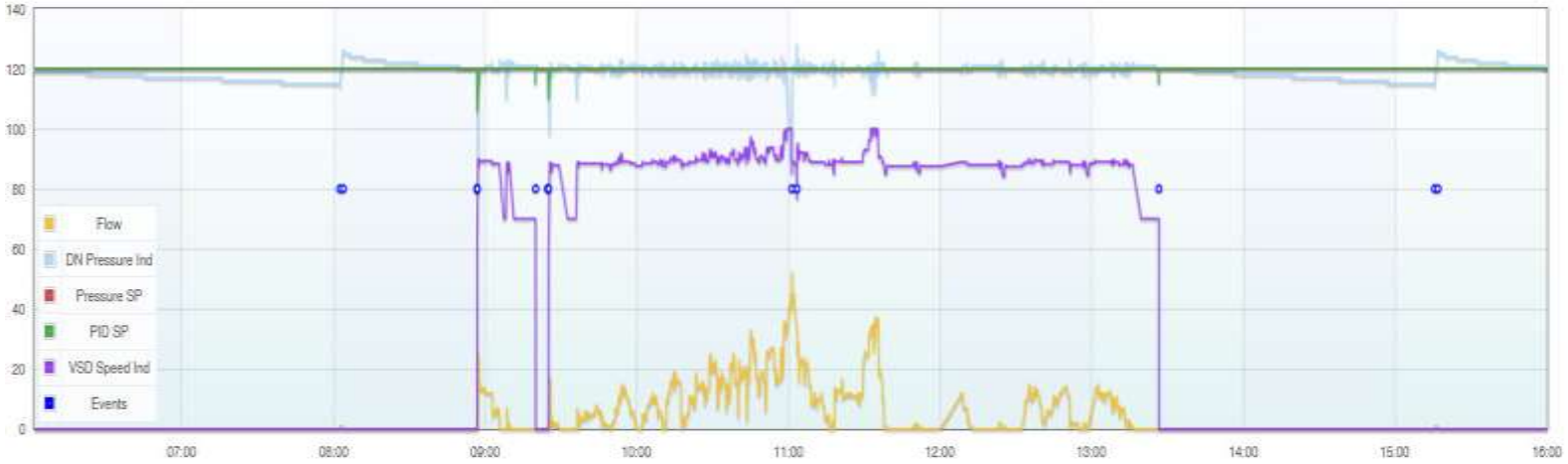
- Automated reporting via Email
- Access to history data if needed (cloud) mostly for troubleshooting trends, etc.
- Water use management and alerts based on limits (like your kids cell phone data)

MCI nSite Cloud Solution | Trends | Flow Totals | Administration | User Guide | Log Out

Start Date/Time: 01/14/2016 06:00 am End Date/Time: 01/14/2016 04:00 pm

Update

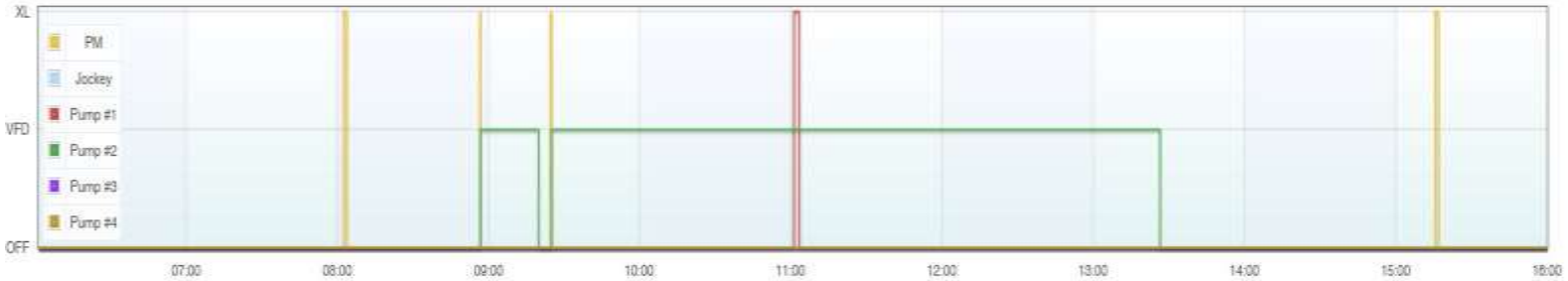
Flows, Pressures, and Events



Time Specific Data

01/18/2016 2:22:24 PM	
Flow:	0
DN Pressure Ind:	120
Pressure SP:	120
PID SP:	120
VSD Speed Ind:	0.0

Pumps



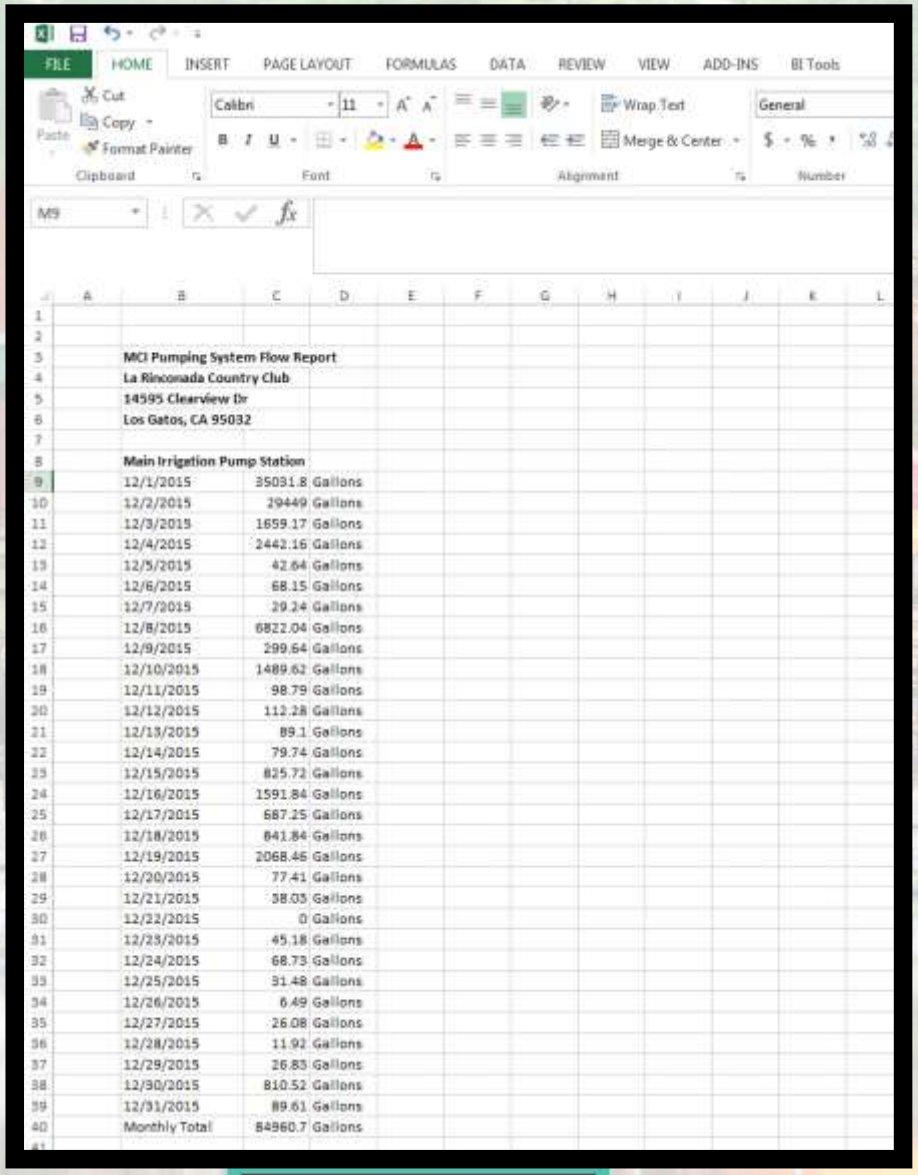
Time Specific Data

01/18/2016 2:22:24 PM	
PM:	0
Jockey:	0
Pump #1:	0
Pump #2:	0
Pump #3:	0
Pump #4:	

Event Log

Show 10 entries Search:

Timestamp	Message
01/14/16 8:02:32 AM	PM Pump Started XL
01/14/16 8:03:52 AM	PM Pump Stopped



MCI Pumping System Flow Report		
La Rinconada Country Club		
14595 Clearview Dr		
Los Gatos, CA 95032		
Main Irrigation Pump Station		
12/1/2015	35031.8	Gallons
12/2/2015	29449	Gallons
12/3/2015	1659.17	Gallons
12/4/2015	2442.16	Gallons
12/5/2015	42.64	Gallons
12/6/2015	68.15	Gallons
12/7/2015	29.24	Gallons
12/8/2015	6822.04	Gallons
12/9/2015	299.64	Gallons
12/10/2015	1489.62	Gallons
12/11/2015	98.79	Gallons
12/12/2015	112.28	Gallons
12/13/2015	89.1	Gallons
12/14/2015	79.74	Gallons
12/15/2015	825.72	Gallons
12/16/2015	1591.84	Gallons
12/17/2015	687.25	Gallons
12/18/2015	841.84	Gallons
12/19/2015	2068.46	Gallons
12/20/2015	77.41	Gallons
12/21/2015	38.03	Gallons
12/22/2015	0	Gallons
12/23/2015	45.18	Gallons
12/24/2015	68.73	Gallons
12/25/2015	31.48	Gallons
12/26/2015	6.49	Gallons
12/27/2015	26.08	Gallons
12/28/2015	11.92	Gallons
12/29/2015	26.83	Gallons
12/30/2015	810.52	Gallons
12/31/2015	89.61	Gallons
Monthly Total	84960.7	Gallons

Email with attached Excel Flow reports for regulatory submission

Fault/Warning Notifications

- Email or text for all faults to you, factory and service provider
- Notification for maintenance due
- Warnings on irregular operation (pumps, filters, flow, etc.)
- Sample of true predictive warnings to save expensive repairs
- Will the factory watch and respond to faults with remote access?
- VFD view actual internal fault on HMI remotely

Fault/Warning Notifications

- The control system must protect the equipment from costly repairs beyond normal expected wear and tear
  - Excessive pump cycles
  - Filter operation
  - Temperature inside and out of the panel

Features

- Advanced operational monitoring & self diagnostic capabilities
- Remote shut down of pump system
- Remote tuning of pump system
- On Screen flow totals
- Multiple stations on one screen
- Irrigation system integration and hardware to connect

Features cont.

- Water quality monitoring
  - Alarms messages, shut down or other actions such as mixing water
  - Typically watch pH, TDS & levels
- Manufacture access to PLC and HMI for updates and modifications remotely vs sending techs
- Integrated injection systems allowing remote access and monitoring

Warranty Fine Print

- Make sure on length of coverage
- On site labor included
- Power related damage on controls and VFDs covered
- How many ways will the warranty be voided?

Pumping water, protecting equipment and providing necessary information to manage both.

Questions?

Thank you!

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469-585-2198

Pump Station Communication & Water Quality

Bryan Campbell

Rain Bird Corporation

Senior Project Sales Manager

Systems Manufacturing Division

Tuson, Arizona

Communication

com·mu·ni·ca·tion
kəˌmyo͞onəˈkāSH(ə)n

1. **The imparting or exchanging of information or news**
    a) **a letter or message containing information or news**

Communication

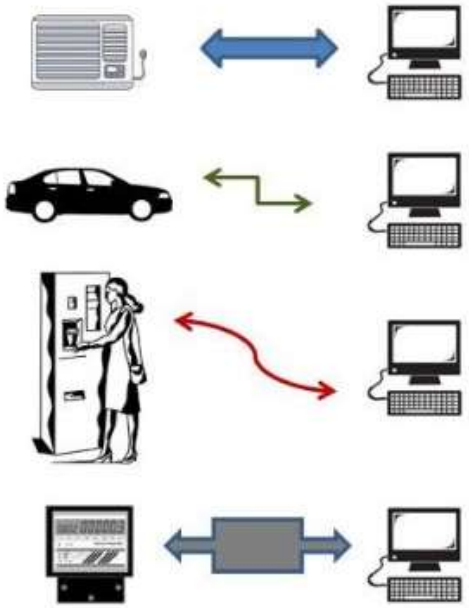
A Brief History in Time

Communication

com·mu·ni·ca·tion

2. **The means of connection between people or places**
    a) **the means of sending or receiving information, such as telephone lines or computers**

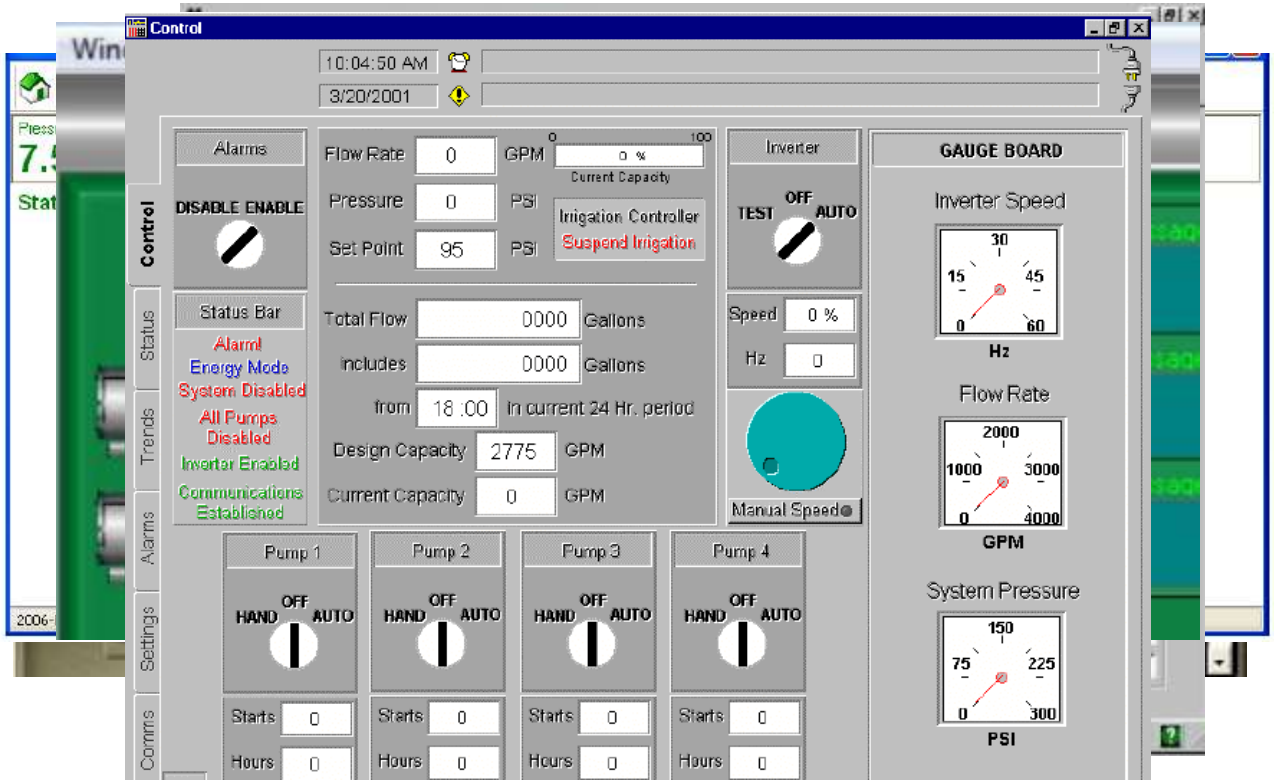
Machine to Machine



Early M2M

Pump Station Communication

Pump Station Communication



Pump Station Communication

Intelligent Pumping

- Maximize pump station capacity
- Optimize water window efficiency
  - Save money on energy costs
  - Less wear and tear on pump station
- Monitor and respond to pipe leaks, breaks, and pump faults

Pump Station Communication

Communication Hardware Today

900 MHZ Ethernet Radios

Cellular Gateway Modems

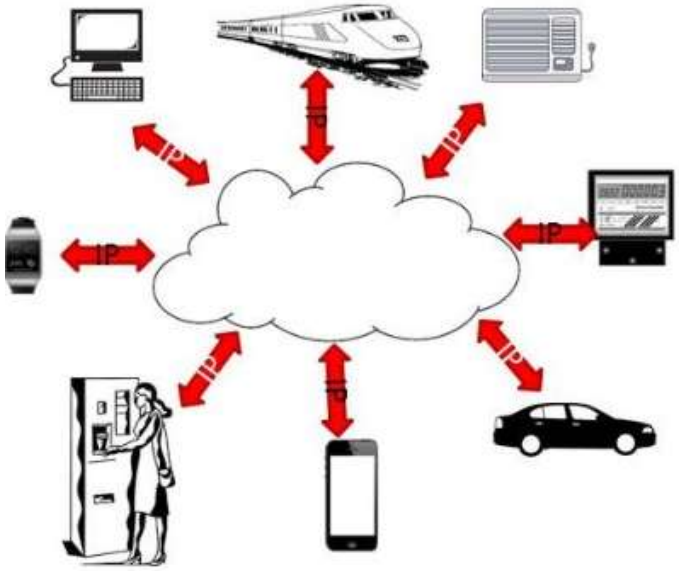
Ethernet Switch

Hardwire Ethernet Modem

WiFi

Pump Station Communication

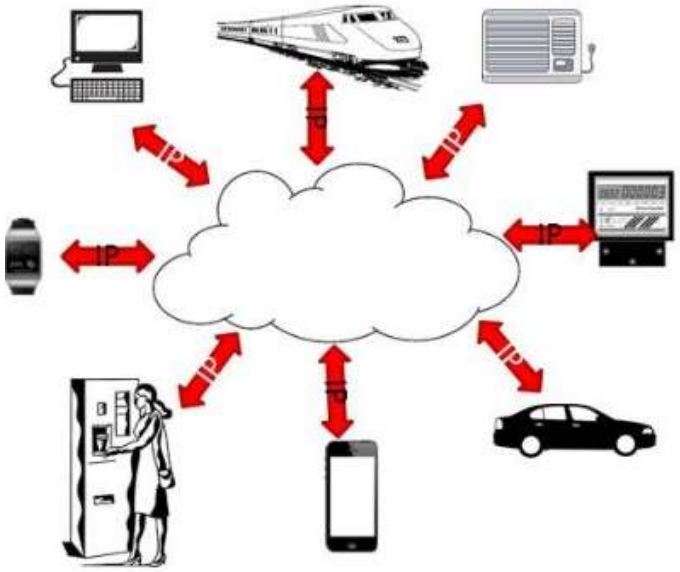
The Internet of Things (IoT)

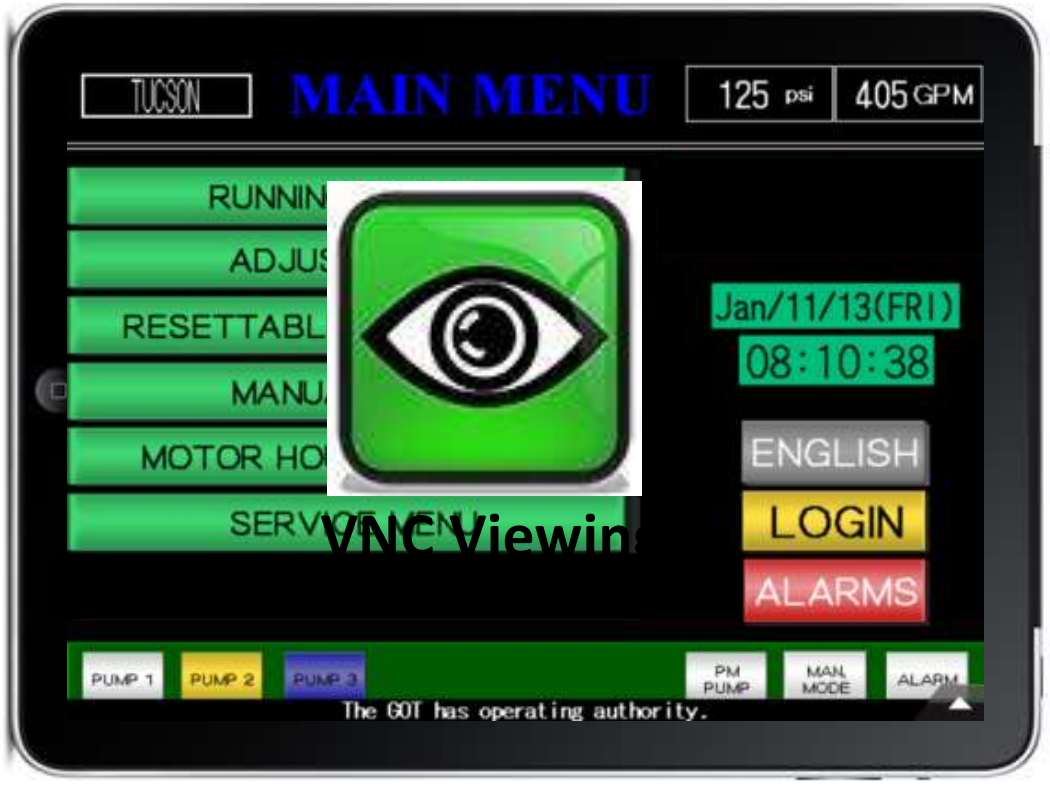


- Filter Status

Pump Station Communication

The Internet of Things (IoT)





Water Quality

Water Quality
Good: TSS≤ 20 mg/L (ppm) Example: Well Water

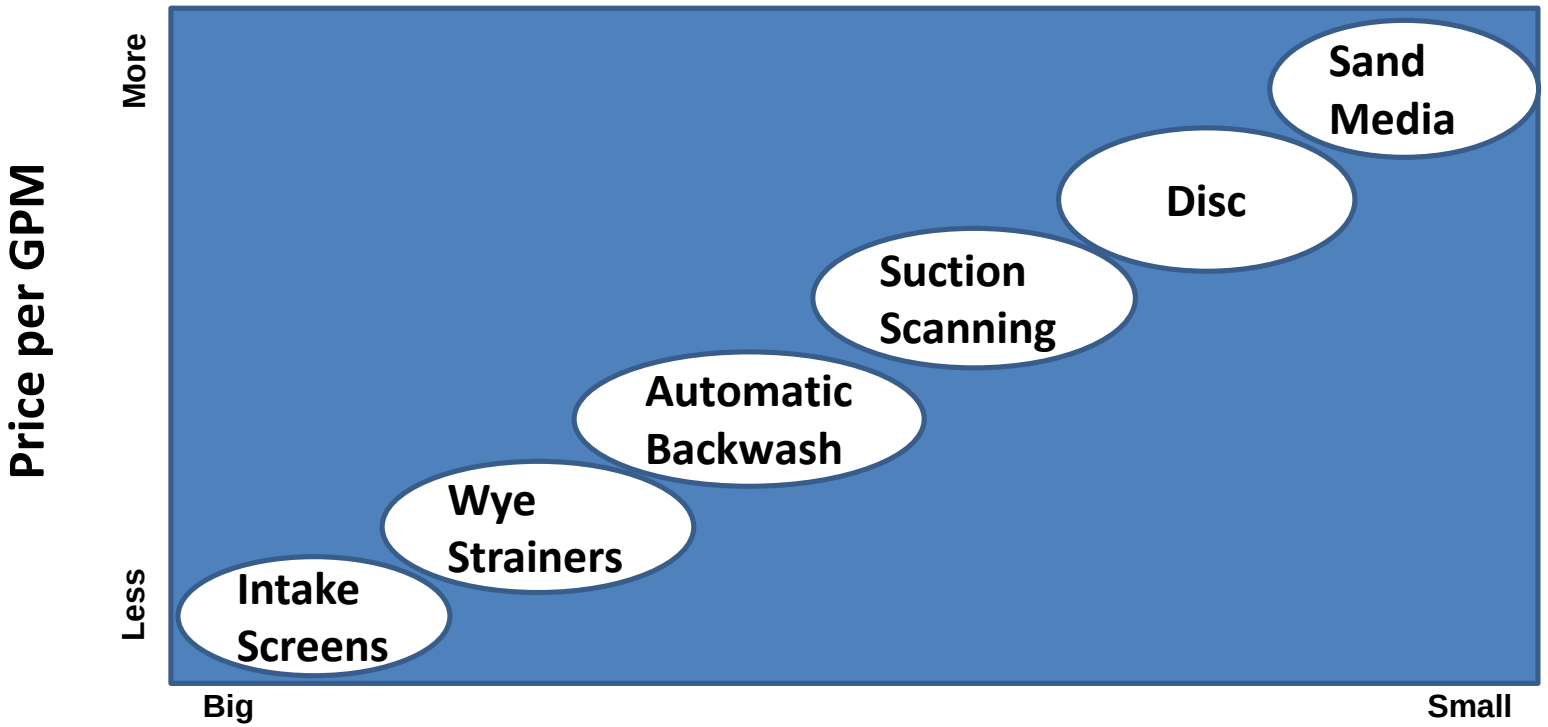
Water Quality

Considerations:

- Have you had a change in water supply ?
  - Example: fresh to reclaimed or good reclaimed to bad reclaimed
- Do you have a water supply that worsens?
  - Example: storm runoff
- Excessive labor/maintenance on rotors?
- Irrigation system efficiency?
  - Nozzle wear
- Turf quality

Water Quality

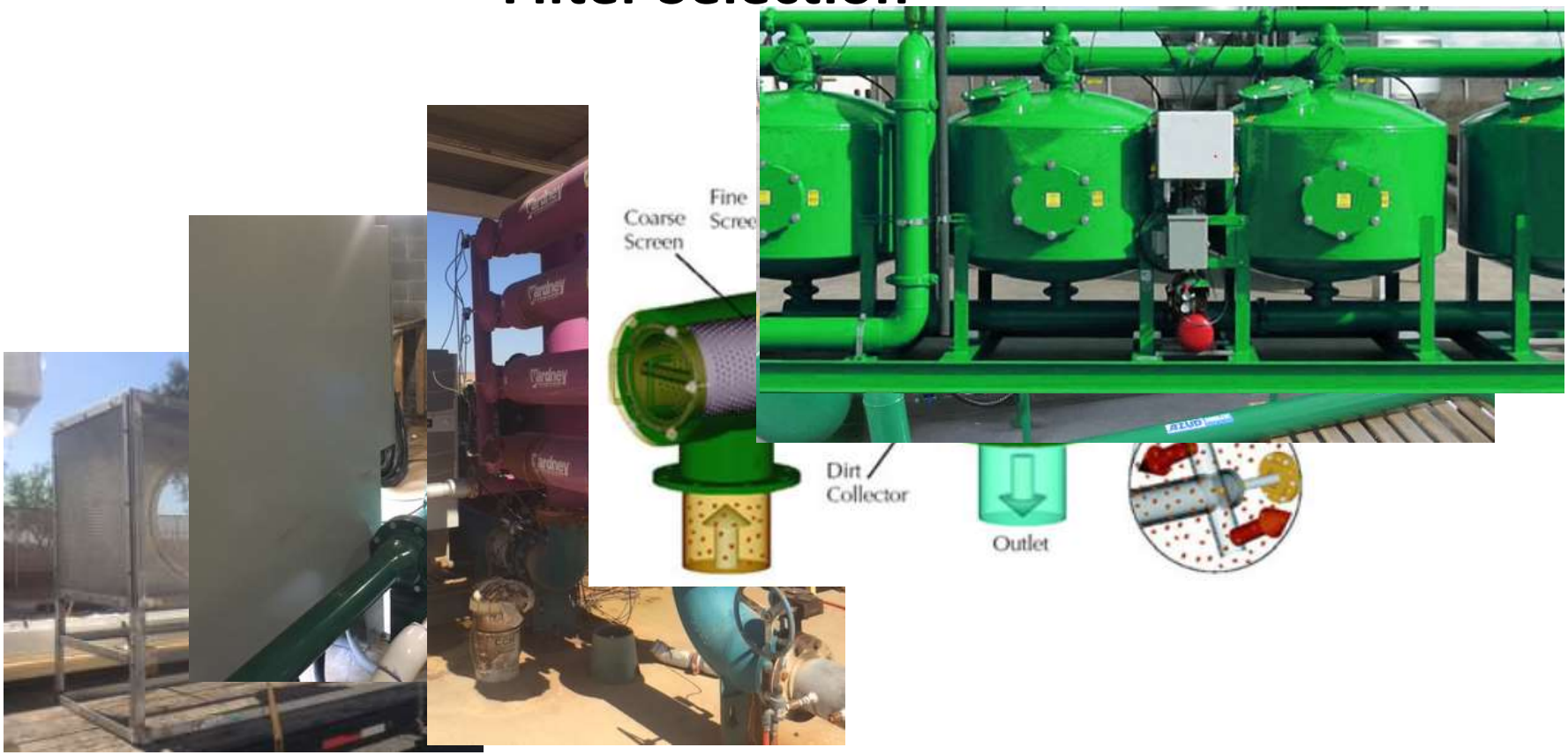
Filter Selection



Water Quality

Filter Selection

Cost



Big

Particle Size

Small

Water Quality

Information to Provide

1. Existing Line Size
2. Operating Flow (min / max)?
3. Operating Pressure (min / max)?
4. General idea of water quality (worst case)
5. What are we removing?
6. Water sample for particle size analysis

Thank You