golf industry show
San Antonio 2018
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GCSAA EDUCATION CONFERENCE | TRADE SHOW | GCSAA GOLF CHAMPIONSHIPS
February 3-8 | Henry B. Gonzalez Convention Center
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

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**Cruise Control vs. Foot on the Brake**

- Cruise Control
- Foot on the Brake
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:

**Mechanical / Hydraulics**
- 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:

**High Voltage & Controls**
- 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
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

- Intake
- Pump Head
- Column Pipe
- Vertical Turbine Pump
- Discharge
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

One Integrated Management System
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
NEED FOR MOBILITY
PC OR CLOUD BASED TELEMETRY SYSTEMS
Anywhere, Anytime

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

One Integrated Management System

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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
What is important in pump station controls?

Time....

When it's time to pick, time is short, typically you have 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 - it's 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 throughout 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
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)
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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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
kəˈmyōnəˈkāSH(ə)n
1. The imparting or exchanging of information or news
   a) a letter or message containing information or news
Communication

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

Don’t worry about this copier. It can take care of itself.

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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

- Cellular Gateway Modems
- 900 MHZ Ethernet Radios
- Ethernet Switch
- Hardwire Ethernet Modem
- WiFi
Pump Station Communication

The Internet of Things (IoT)

- Flow
- Pressure
- VFD Speed
- Electrical Performance
- Temperature
- Lake Level
- Water Quality
- Filter Status
Pump Station Communication

The Internet of Things (IoT)

VNC Viewing
<table>
<thead>
<tr>
<th>Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good: TSS ≤ 20 mg/L (ppm)</td>
</tr>
<tr>
<td>Example: Well Water</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Price per GPM</th>
<th>Particle Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>More</td>
<td>Big</td>
</tr>
<tr>
<td>Less</td>
<td>Small</td>
</tr>
</tbody>
</table>

- Intake Screens
- Wye Strainers
- Automatic Backwash
- Suction Scanning
- Disc
- Sand Media
Water Quality

Filter Selection

Big

Particle Size

Small

Cost
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