

A LIFT STATION CONTROL PANEL DESIGN OVERVIEW

DESIGN CONCEPTS AND IMPLEMENTATION



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LIFT STATION CONTROL PANEL DESIGN

Overview

- Codes and Clearance
- Construction
- Controls
- Contactors and More
- Communication – The 411
- Contingency Planning



LIFT STATION DESIGN CONSIDERATIONS

Purpose

Define code issues, present alternate construction approaches, look at controls considerations, comparison of the various pump controller options.

Share practical information for operators involved in the design process, whether it is a new station or a replacement upgrade project.

Answer questions that frequently come up in the course of design and construction so operators can make informed decisions on their next design project.

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CODES AND CLEARANCE

SAFETY FIRST, AND BECAUSE IT SAYS SO

CODES AND CLEARANCE

- NFPA 820
 - Space 0'-3' from vent opening is Class I, Div 1 hazardous environment, 3-5' is Class I, Div 2.
- NEC
 - Explosion-proof seal-offs required in closed conduit system
- 10-State Standards
 - Standby Pumping





CONSTRUCTION

HOW WHERE AND WHY

CONSTRUCTION

- Shiny new: Use Stainless Steel to be long lasting, especially next to the road (salt)
 - Control Panel
 - ATS
- Deadfront inner panel shields operator from incidental contact with high voltage.
- Intrinsically safe wiring needs separate conduit, and physical separation from other wiring in conduit and within the panel.



CONSTRUCTION

- The Ventilated Skirt –
 - A “classier” way to deal with hazardous environments



CONTROLS

THE HEART OF THE MATTER

CONTROLS

- Hardwired Relays and Floats
 - Most basic type of control
- Packaged Pump Controllers
 - Easy to install, but must go back to manufacturer for replacement parts.



CONTROLS

- PLC control these days is a good choice
 - Reliable
 - Easily updateable
 - Typically less costly construction than hardwired
 - Allows for easier incorporation with SCADA



CONTROLS

- UPS
 - 120V double conversion can be problematic and creates heat
 - 24VDC control system eliminates heat build-up from UPS
- Pump alternation
 - Based on starts and/or runtimes to equalize pump wear.



CONTROLS

- Local Alarming: Silence it!
 - It's good to have a way to silence local alarm notifications to be nice to neighbors when pumps are misbehaving.
 - Light on in alarm condition; may want battery back-up.
 - “Fail Safe” notification: steady burn light that goes out on power fail or alarm (won't need battery back-up).



CONTROLS

- Floats or transducer or both?
 - Transducer control
 - Finer, more control options
 - Flow calculations based on level sensor and wet well volume
- Keep it clean:
 - Programmed periodic grease/wet well pump down cycle.



CONTROLS

- Backup floats: two or three or four or more?
 - High float always out, Low float always submerged
 - Lowers maintenance issues
- Keep it simple:
 - Hardwired, basic On-Off
 - Stage pumps on and off with timers and floats



CONTROLS

- Operator Interface
 - High brightness screen that you really can read in the daytime (e.g. ProFace)
 - Allows for local adjustment of setpoints
 - The Poor Man's SCADA:
 - Data logging downloadable to a jump drive
 - Potential for remote access via internet connection (e.g. Maple Systems)





CONTACTORS AND MORE

MOTOR CONTROL

CONTACTORS AND MORE

- Full-voltage, across-the-line starters
 - NEMA construction vs. NEMA rated
 - Rated for millions of operations as compared to 100,000's of operations
- Reduced voltage starters (soft starts)
 - May required full voltage back-up contactors if soft start fails



CONTACTORS AND MORE

- VFDs-special considerations
 - Like soft starters, it is common and good practice to have back-up contactors for critical locations.
 - Good option for larger motors when full voltage starters can't be used.
 - Offer more control options than reduced voltage starters.
 - Can use if 3-phase service is not available (not common), an alternative to a phase converter
 - Heat build-up – may require cabinet ventilation, air to air heat exchanger, or air conditioning



COMMUNICATION

THE 411

COMMUNICATION

- Dedicated Lines
 - Provide basic monitoring and limited remote control options
 - Old school metallic pair systems
 - Not long for this world, due to upgrades to digital
 - Fewer and fewer personnel are familiar with these old systems.



COMMUNICATION

- Dialer
 - Basic, 4-channel dialer
 - Provides alarm notification only
 - Hard-wired traditional telephone, VoIP lines, or cell-based connection



COMMUNICATION

- Web-based services for dialers
 - Connect over cellular service or broadband (cable or telephone)
 - Hosted web service by an outside provider makes station data (status, runtimes, historical trending, alarms) available via internet interface



COMMUNICATION

- SCADA Radios
 - Radio system is owned and controlled by YOU!
 - Not dependent on a third party service.
 - Radio Path Study may be required since lift stations are typically at low points in the system
 - Path study should be done with leaves on the trees





CONTINGENCY PLANNING

EMERGENCY OPERATION

CONTINGENCY PLANNING:

- Some means of pumping is required if utility power is unavailable (10-State Standards and NR110)



CONTINGENCY PLANNING: STANDBY GENERATOR

- Stationary –
 - Site considerations
 - Orientation so exhaust is with the prevailing winds
 - Separation distances
 - 20' from transformers, electrical service equipment
 - 10' from combustible surface of a building



CONTINGENCY PLANNING: STANDBY GENERATOR

- Natural Gas/LP or Diesel?
 - Natural Gas lines could be shut down in a major storm event
 - LP requires setbacks from equipment and property lines
 - Diesel – “Goldilocks” sizing is a bit more important:
 - Not too big, not too small.
 - Need to run pumps, but avoid wet stacking or fuel spoilage



CONTINGENCY PLANNING: STANDBY GENERATOR

- Portable –
 - Important to identify all potential loads, required service sizes, that generator will serve.
 - Voltage selector switch
 - Voltage, Amperage, Phase
 - Cords and cord-ends need to match
 - If it is to be primarily parked in one place, can have an automatic transfer switch and connection to battery charger.



LIFT STATION CONTROL PANEL DESIGN

Considerations for your Project:

- Codes and Clearance
- Construction
- Controls
- Contactors and More
- Communication
- Contingency Planning



LIFT STATION DESIGN CONSIDERATIONS

Purpose

Be familiar with some common options and issues to optimize your lift station project.

Questions?



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