Emergency Backup Lift Station Pump Systems

Thompson Backup System

Brian Lee, Municipal Sales Engineer
David Perry, Municipal Sale Manager
August 9th 2016
Backup Lift Station Pumps

- What are Backup Lift Station Pumps
- Why Backup Lift Station Pumps are Needed
- Backup Pumps vs Generators
- Case Studies and Installations
- Conceptual Drawings
- Display Pump(s) Walk Around
What are backup lift station pumps?

They are permanently mounted, independently-powered pumps that are connected to the lift station and ready to handle the flows should a problem arise with the electric-driven pumps.
• Fully independent power source such as diesel engine, gasoline, LP gas, natural gas, etc.
• Sewage handling pump that can meet lift station flows & heads
• Fast, reliable automatic priming and repriming
• Automatic start & stop capability/run unattended
Requirements of a Backup Lift Station Pump

- Able to sit idle for long periods of time even in cold climates and still startup without any issues (battery charging systems and heaters)
- Able to run for prolong periods between refueling
- Low noise level
- Able to communicate with lift station SCADA system
Need For Standby Pumps
Pumps installed in parallel with one pump serving as the primary (lead) and the other serving as a backup (lag).

The back-up pump operates if the primary pump becomes inoperable or if the flows increase beyond the capability of the single pump.

Triplex and Quad stations have multiple back-ups due to exponential increases in peak flows.
What If...

Pump station loses power?
What If...

Storm debris or accidents disconnect/destroys panels?
Lift station accessories malfunction?
Lift station pumps require service or repair?
Flows exceed the lift station’s capacity?
Impact of Sewage Spills At Lift Stations

- Threaten drinking water
- Spoil recreation
- Hinder economic values
- Harm wildlife
- Costly to clean up
- Negative public opinion
High Dollar Lawsuit for Sewage Spills, 2013

- Between January 2007 to May 2013, Miami Dade County reported an approximately **211 Sanitary Sewer Overflows totaling more than 51 million gallons**

- The US-EPA, US-DOJ, and FLA-DEP filed suit against the County for numerous violations of federal and state pollution laws.

- The lawsuit states the County is violating federal and state water pollution laws by “failing to adopt adequate measures to reduce spills”.

- In June 2013, the county reported a **settlement of approximately $978,100.00** and were mandated to conduct a supplemental environmental infrastructure project totaling over $2 million.
Faces Suit Over Raw Sewage Spills, 2007

- City of Burlingame was sued for excessive discharge of raw sewage flowing into streets, backyards, businesses and San Francisco Bay.

- The suit described **250 sewer system overflows** between 2002 and 2007.

- Suit was filed after learning of the excessive number of sewage spills reported to the Bay Area Regional Water Quality Control Board, which is tasked with regulating local water agencies on behalf of the EPA.

- In 2006, the Bay Area Regional Water Quality Control Board **fined the City of Burlingame a record $516,000.00 for spilling raw sewage into the Bay 146 times since 2003.**
STAND-BY GENERATOR VS. STAND-BY PUMP
Provides backup power to the lift station in the event of power failure.

Stand-By Generator
During power outages, there are 7 stages involved in emergency back-up generator operations:

1) Transfer switch: Signals power loss
2) Diesel engine: Source of energy
3) Generator: Produces electric power required
4) L/S Pump control panel/circuit breaker/cables: transfers gen-set power to lift station pump motor
5) L/S Pump Motor: powers the lift station pumps
6) Submersible pump: moves the waste water
7) Discharge Piping and Valve System: transfers waste water from wet well to force main
Backup Generator Advantages

- Fully automatic system
- Reliable
- Can power other items
- No additional hoses/piping
- User friendly
Backup Generator Disadvantages

1) Only prevents spills due to loss of power
2) Requires a certified electrician
3) Annual load testing
4) Generator continuously runs
5) Double efficiency loss
6) Transfer switch
• Works together with the generator as part of the emergency power backup system.

• Monitors power supply and senses when utility power is interrupted.

• When the utility power fails:
  – automatically starts the engine and transfers the load to the generator once the generator has reached full power.
  – Continues to monitor utility power and when it is restored, automatically switches the load from the generator back to the utility.
7) More expensive overall
8) Service or repairs
9) Unreliable power switching accessories/connections
10) Fixed speed operation only
11) Must oversize generator
### Generator Sizing Chart

#### Note:
A 20% voltage dip should be considered a "normal" value. Some motor starters will tolerate voltage dips as low as 30% below nominal voltage. Some applications with multiple loads require the voltage stability to be much tighter under the transient conditions present during a motor-starting event. In these cases, 5% to 10% are common requirements.

<table>
<thead>
<tr>
<th>NEMA Electric Motor Code</th>
<th>Maximum Voltage Dip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td>13</td>
<td>35</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>35</td>
<td>55</td>
</tr>
<tr>
<td>40</td>
<td>125</td>
</tr>
<tr>
<td>45</td>
<td>125</td>
</tr>
<tr>
<td>50</td>
<td>125</td>
</tr>
<tr>
<td>60</td>
<td>125</td>
</tr>
</tbody>
</table>

**Generator Set Size Required**

<table>
<thead>
<tr>
<th>Electric Motor Horsepower</th>
<th>Generator Set Size Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>125</td>
</tr>
<tr>
<td>70</td>
<td>225</td>
</tr>
</tbody>
</table>
Backup Lift Station Pumps

- Discharge Line
- Backup Pump
- Suction Line

Electric Submersible Lift Station Pumps
Basic Emergency Pump Components

Pump

Auto Start/Stop Control Panel

Diesel Engine

Fuel Tank

Priming System
1) Fully independent system
2) Fully automatic system
3) Fuel efficient
4) Lower acquisition cost
5) Increased reliability
Backup Pump Advantages

6) Versatile
7) Less complicated
8) Increased efficiency
9) Increased flexibility
10) Easy to maintain
11) Smaller footprint
12) Economic
13) User friendly
14) Temporary bypass pumping
Pump Backup Disadvantages

1) Requires additional piping

2) Depth of wet well
Model: 6JSCEN
Solids Handling Straight Centrifugal Pump
Impeller Diameter: 12" (Enclosed)

Total Dynamic Head - FEET

Total Dynamic Head - METERS

Capacity

Gallons per Minute x 0.227 = Cubic meters per Hour
Gallons per Minute x 3.785 = Liters per Minute
HP x 0.746 = KW

S.G.: 1.0
Viscosity: 31.5 SSU
Temperature: 70°F
Altitude: Sea Level

Tests were conducted according to Hydraulic Institute ANSI/HI 1.5-1994 Standards.
• Reliability of priming system
• Efficiency at duty point
• ISO9001:2008 certified pump manufacturer
• Local design consultation/service/support
Additional Accessories

- 120 Volt or Solar Powered Battery Chargers
- SCADA Interface for 8 Alarm Notifications
- Telemetry Messenger inside Pump Control Panel
- Auto-Dialer Systems
- Double Walled Fuel Tanks: UL-Listed or Non UL-Listed
- Pressure Transducer, Level Transducer, or Auto Start Floats
Case Studies
And
Installation
Power Outage to Lift Station Causes Sewage Backup in Residents’ Homes

At least four homes experienced a sewage backup when the Dickinson Road lift station lost power.

The problem was traced back to a transformer that had blown and the 240-volt line feeding the pumps had been interrupted.

The 110-volt line feeding the control panel was still in service, though.

The automatic dialer alarm system did not activate with the interruption of power because the control panel remained in service and the system consequently did not recognize the failure of the pumps.

Courtesy of Chesterton (IN) Tribune
11/14/05
Facts:

• 119 Lift Station spill incidents reports in the state of Georgia from 2009-2011

• Of these incidents only 28 (23.5%) were power related and could have been rectified by either a backup generator (or backup pump system)

• All 119 spill incidents would have been appropriately handled by a permanent standby engine driven pump system, including the 91 non-power related occurrences. 100%
Utility Company Uses Backup Pumps for Lift Stations During Hurricanes

- Regional Utilities, a regional provider of water and sewer services to Walton County, Florida operates 125 lift stations serving several hundred thousand residents.

- In 2000, a strong Hurricane season struck the gulf coast causing widespread power outages and heavy damage to the company’s lift stations.

- Lightning strikes and damage to generator control panels prevented backup generators from operating.

- Regional Utilities decided to replace the generators with backup pumps.

- In 2004, the gulf coast was once again struck by a series of Hurricanes and this time, all of their backup pumps were there to keep the flow of sewage moving during the power outages resulting in zero spills.
Walton County, FL

64 Permanently mounted, emergency backup systems on lift stations
Oviedo, Florida

6- 4JSVM-DJDS-24T-MC
Camp LeJune, North Carolina

3- 12JSCJ-DJDS-45H-UC
Sarasota, Florida

4JSVM-DJDS-24T-DC
Dorchester County, South Carolina

12JSCJ-DJDS-45H-MC
DeKalb County, Georgia

4JSCC-GFS-MSG45-MC
Plan View Pump Station Layout

**WET WELL LAYOUT PLAN VIEW**

- **Control Panel**
- **Bypass Connection**
- **#2 Check Valve**
- **#2 Plug Valve**
- **Catch Basket**
- **#2 90° El Bends**
- **Fuel Tank**

**EJCEH-DJDS-24T-4C**
Diesel-Driven Skid-Mounted Bypass Pump
With ### GPM at ### FT TDH
And Silent Knight (Sound Attenuated Canopy)
Questions?