Wastewater Department Memorandum

DATE: February 20, 2015
FROM: Darryl Pyawasay, Maintenance Supervisor
TO: Jody Hooks, Public Works Manager W/WW
SUBJECT: Submersible Lift Station Pump Repairs- DSWWTP 185 hp, Woodcock LS 15 hp, & State Hwy 3 LS 7.5 hp

As requested, I visited Hahn Equipment on February 10, 2015, to speak with the service manager and visually inspect the three above mentioned pumps. This is in response to an abnormally high failure rate that we experienced in a 45-day period beginning in December 2014. Mr. Nhi provided a detailed breakdown of each pump evaluation, along with a service history of all pumps in question. Details and pictures from that discussion are provided below:

Dallas Salmon WWTP- Flygt 185hp Submersible Lift Pump Entered Service- 1997 (18 yrs) Service History- One Major in January 2007

This Image is the rotor shaft, which is part of the pump where the impeller is attached and the mechanical seals and bearings ride on. The wear shown is from worn imbalanced impeller that caused the shaft to wobble, ultimately leading seal and bearing failure. The shaft damage is considered excessive and exceeds allowable tolerances for reconditioning.



This image is the pump impeller that will be replaced. The damage occurred over time from grit and debris in wet well. Wear is excessive and beyond rebuild/rebalance capabilities.



This image is the pump cord. The leads and cord are damaged from the Hydrogen Sulfide gas intrusion in wet well environment.



This image is the internal wire connections to the pump. Shows the moisture incurred from the damage of the pump cord. The Mini-Cas (Electronic Protection) protected this pump from stator damage.



This image is the undamaged stator, leads and the windings were in very good condition.



In summary our conclusion of the damage caused to the pump was incurred by a number of different factors:

- 1. The amount of debris and grit being pumped, causing the failure of the impeller which damaged the impeller resulting in seal and bearing failures which, damaged the rotor.
- 2. Hydrogen Sulfide gases migrating into the electrical boxes damaging the cord connections.
- 3. Corrosion of the outer casing to the where the cords seal into the pumps causing moisture to seep into the upper pump electrical connections.
- 4. We have addressed most of these issues by frequent pump inspections of the impeller and other mechanicals on the pump. We have also increased the frequency of wet well clean out performed to reduce the amount of grit and debris being pumped. We are investigating the benefits and draw backs of raising the wet well level to fully submerge these pumps, to reduce corrosion of the outer casing from hydrogen sulfide gases.
- Woodcock LS Flygt 15hp Submersible Lift Pump Entered Service- 1999 (16 yrs) Service History- No repairs

This image is the bearing housing shows wear from water wash out due to water migrating into the pump from cord seal failure.



This image is the cord and cord seal notice the corrosion of the cord from hydrogen sulfide gases creating a cord seal failure which allows moisture into the top bearing and electrical housing pictured above.



This image is the pump impeller that will be replaced. The damage occurred over time from grit and debris in wet well. Wear is excessive and beyond rebuild/rebalance capabilities.



This image is the pump volute, where the pump impeller sets; this shows the amount of grit inside the pump causing damage to the wear ring area of the impeller. Volute will be reconditioned for proper fit.



This image is the internal electrical connections showing damage from moisture due to cord seal failure. To the left is the rotor shaft, which is part of the pump where the impeller is attached and the mechanical seals and bearings ride on. The wear shown is from worn imbalanced impeller that caused the shaft to wobble, ultimately leading seal and bearing failure. The shaft damage is considered within tolerances for reconditioning.



This image is the upper bearing flange where the upper bearing sets in, it shows wash out from water in the pump which will need to be replaced for proper fitment of the new bearing.



This image is one of the bearings that were washed out from water in the pump.



In summary our conclusion of the damage caused to the pump was incurred by a number of different factors:

1. The amount of debris and grit being pumped, causing the failure of the impeller which damaged the impeller resulting in seal and bearing failures which in turn damaged the rotor and reduced the insulation value of the stator.

The rotor and stator are only in need of reconditioning because the Mini-Cas pump protection had stopped the motor before significant damage had occurred. The stator was Megged and found to be out of Specs, which were less than 500 hundred Megohms which is the industry standard. Megging the motor is checking the insulation value of the windings on a stator with a Megohm meter. The rotor shaft damage was to the point where reconditioning could be done without the need of replacement.

2: Cord damage was caused by hydrogen sulfide gases in the wet well.

We have addressed these issues by frequent pump inspections of the impeller and other mechanicals on the pump to include the electrical cords. We have also increased the frequency of wet well clean out performed to reduce the amount of grit and debris being pumped.

 State Hwy 3 LS - Flygt 7.5hp Submersible Lift Pump Entered Service- 2003 (12 yrs) Service History- No repairs

This image is the stator, which the rotor rides in to drive the pump, picture shows the burnt out windings of the stator from water in the pump. The stator will be replaced because it is not cost effective to rewind on this size of motor.



This image shows busted guide rail slide that assists in the proper alignment of the pump to sit on the base 90 pipe. The broken tab is from improper installation after being serviced.



This image is the pump impeller. The damage occurred over time from grit and debris in wet well. Wear is not excessive and can be reconditioned and rebalanced.



This image is the pump volute, where the pump impeller sets; this shows the damage from grit inside the pump. Volute cannot be reconditioned for proper fit.



In summary our conclusion of the damage caused to the pump was incurred by a number of different factors:

1: The amount of debris and grit being pumped has caused the failure of the impeller resulting in seal and bearing failures which in turn caused moisture to get in the stator and bearings.

2: The Mini-Cas stopped the pump but was reset causing the short on the motor windings.

3: The busted guide rail slides on the volute were from improper installation.

We have addressed these issues by frequent pump inspections of the impeller and other mechanicals on the pump. We have also increased the frequency of wet well clean out to reduce the amount of grit and debris being pumped. We have also directed our Utility technicians to call maintenance before resetting to ensure protection of the motor windings. The Maintenance technicians are instructed to test the pump protection device to ensure proper operation before restarting the pump; they were also retrained and talked to about ensuring proper pump installation before putting back into service.