

Safer and Simpler Strategies for Maintaining Wastewater Pumps

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ABSTRACT

Sydney Water was looking to further optimise its maintenance cycle, particularly for wastewater pumps at several of its sites. The initiative formed part of its Partnering for Success (P4S) project designed to simplify procurement, optimise value through its supply chain, and deliver \$4 billion of construction works and services by 2030. Through implementing a maintenance strategy designed by FITT Resources that relies on Chesterton Split Seals, unplanned downtime can now be completed in hours instead of days. The new strategy means there is no need for heavy machinery to remove pumps for repairs, which saves on costs and reduces downtime. This whitepaper will explore how these seals are ideal for water or wastewater environments as effective and safer solutions.

1.0 INTRODUCTION

Sydney Water provides water and wastewater services to the Sydney metropolitan, Illawarra and Blue Mountains regions. Its area of operations covers approximately 13,000 square kilometres and comprises water and wastewater treatment facilities, distribution/collection network assets, and stormwater assets. In July 2020, Sydney Water launched its new infrastructure and delivery model – P4S: Partnering for Success – designed to simplify procurement, optimise value throughout the supply chain, and deliver \$4 billion of construction works and services between 2020 and 2030. Water and wastewater specialists FITT Resources successfully tendered to undertake work in three main areas with the new delivery model: the repair and overhaul of submersible pumping units, centrifugal pumping units and positive displacement pumping units, with work commencing in April 2021.

2.0 DISCUSSION

The scope of the contract meant that FITT Resources would work on various types of pumps from different manufacturers, all of which needed repair, maintenance, and overhaul in various ways, depending on the age, condition, location, and use of the equipment. Retrofit and repair are essential in system overhaul due to budget constraints related to replacement. However, without quality parts, seals, packing, and industrial coatings, repairs would be required more frequently and negate the efforts put in.

The timing was an essential element for the repair of assets. The concerns were not only around the current degradation of assets for an initial overhaul, downtime for repair and impact on users, but also what the mean time between failures (MTBF) would be to inform the ongoing maintenance schedule. As such, shortening downtime and maximising operational efficiency was a top consideration for the selection of parts and repair partners to collaborate with on the FITT Resources P4S program.

The following sections outline part of the maintenance program where FITT Resources and Chesterton worked together to deliver a safer and more efficient solution.



Figure 1: St Mary's Sewage Pump Station – Vertical split pump units, Chesterton 442 Split Seal and overhaul including ARC Industrial Coatings.

2.1 Pump repair and overhaul using Chesterton® seals and packing

The scope of the P4S project meant that FITT Resources would be working with pumps from a variety of manufacturers. Each of these would need repair, maintenance and overhaul depending on their age, condition, location, and equipment use.

Since their last overhaul in 2015, two tunnel pumps had started to leak excessively through the glands due to shaft wear and packing degradation. As part of a 'stop-gap' solution, they were both re-packed with Chesterton DualPac® 2211 1" section in a bull ring configuration at the bottom and sealing ring configuration on the top.

This packing upgrade and configuration has been very successful in terms of the ongoing operation of the glands. As a result, the approach has now become the norm for packed pumps as it provides excellent sealing against worn shafts and enables the unit to continue operations until the next programmed shutdown.

With updated safety requirements calling for safer distances from rotating equipment, the opportunity to “retighten” gland nuts to ensure packing remains compressed can be a challenge. Chesterton’s 2211 packing has proven to require less retightening over its lifespan, making it a perfect choice for this type of application.

In addition, Chesterton’s CMS 2000 packing is an injectable packing system that can be remotely used to “top up” packing. This means that there is no need to retighten the gland nuts throughout the life of the packing.

Sydney Water is currently trialling the CMS 2000 packing. This helps to provide operators and maintenance personnel with a much safer work environment.



Figure 2: Main outfall pump packed gland upgrade to Chesterton 2211 DualPac®



Figure 3: Outfall pump gland being re-packed with 1" square Chesterton 2211 DualPac®

2.2 Chesterton 442 Split Mechanical Seal Program

FITT Resources was also tasked with upgrading and maintaining existing raw sewage pumps using Chesterton 442 Split Mechanical Seals. These pumps had been initially fitted with packing and then later with cartridge seals. A decision was made to replace these with split mechanical seals to benefit from reduced maintenance time and costs. The seal set-up utilises either an API Plan 11 or 13, depending upon the pump type, with close clearance or EnviroSeal SpiralTrac™ gland bushes. Additional benefits of the 442 mechanical split seals include protection and security for seal faces during installation, less heat under extreme pressure, and a compact gland design.

The use of a split seal solution provides several advantages that make them well-suited for the water and wastewater industry. These benefits include:

- **There is no need for equipment disassembly.**
With split seals, the only item that needs to be removed from the pump is the seal itself. This adds to the safety for maintenance crews.
- **Heavy lifting equipment is not required.**
This saves time and cost while improving safety. It also means that Pump Alignment is also eliminated, as heavy pump frames, bearing housings and electric motors do not need to be moved.
- **Reduced wear and leakage.**
Split Seals eliminate sleeve wear and leakage better when compared to packing.

- **Visual indication when it's time to service.**
Split seals help reduce equipment maintenance and operating costs by providing a visual indication of wear. This makes it easier to tell when servicing is required.
- **Reduces or eliminates flush water usage.**
This can result in significant savings where precious potable water is traditionally used to flush packing and mechanical seals.
- **Minimises production loss and downtime.**



Figure 4: Chesterton 442 Split Mechanical seal



Figure 5: Vertical Sewage pump upgraded during overhaul with Chesterton 442 split seal, EnviroSeal SpiralTrac™ and Chesterton ARC ceramic coating



Figure 6: Potable Water pump overhauled with Chesterton ARC ceramic coating and 1810 cartridge seals

2.3 Chesterton ARC Industrial Coatings

All sewage units for Sydney Water were rebuilt and reclaimed using a Chesterton ARC industrial coating. The coating ensures that reclaimed casings and impellers are in the best possible condition to provide prolonged operational life in harsh pumping environments. Chesterton ARC coatings also offer protection against erosion and corrosion attacks, making it an ideal solution for potable water and sewage pumps.

Industrial coatings provide protection of the base substrate material such as cast iron and steel from aggressive media, such as those found in raw and treated wastewater. They can also provide additional pump efficiency by using a thixotropic surface. This type of surface reduces the surface tension, allowing liquid to flow more easily over the pump's internal surfaces, which in turn reduces the power needed to move that liquid.



Figure 7: Vertical Sewage pump unit overhauled with hardened 420SS casing & impeller rings combined with ARC ceramic coating, reducing erosion wear.



Figure 8: Pump casing repair and coating process showing machined wear ring locations and ARC ceramic coating applied.



Figure 9: Pump casing repair and coating process showing machined wear ring locations and ARC ceramic coating applied.

2.4 Other Opportunities

There are several other opportunities to reduce maintenance and improve the running life (MTBF/R) of pumps in water and wastewater applications. These include ensuring that bearings are using the correct greases that match the actual pump application. Combine this with the use of an automatic greasing system to ensure perfect delivery of the grease into the bearing at the right time and at the right quantity.

The remote monitoring of seals can also help to understand the life expectancies of the sealing system and will help to determine more accurate shutdown timing and planning. This is because seals are the weakest link in pumps. Monitoring the pump bearings should be a secondary consideration compared to monitoring the part that fails the fastest.

3.0 CONCLUSION

As well as its recent work with Sydney Water, FITT Resources partners with water authorities and government utilities around Australia. For several customers, the team at FITT Resources have found that using Chesterton's range has led to an increase in efficiency, extended equipment life, and reduced downtime. The partnership between FITT Resources and Chesterton continues to grow, with both companies constantly looking for innovative ways to increase and improve plant operating life and reduce the cost of ownership.