

a PASS

Problem Accepted - Solution Supplied

2017
WINNER



2017 PASS Award Winner Marcus Boyd (C) from Toowoomba Regional Council with Jillian Busch (L) and Rob Curtis (R) from Aqualift Project Delivery



An award providing opportunity for water industry operational staff to share their in the field innovations & fixes to problems so that others in the water industry can benefit.





Mixer Base Plate Removal Tool

Marcus Boyd,
Senior Technical Officer,
Toowoomba Regional Council

THE PROBLEM

The Wetalla Water Reclamation facility is a Biological Nutrient Removal (BNR) plant commissioned in 1995. During the biannual maintenance program, maintenance staff noticed significant wear on the mixer mast locating pin (see Figure 2). Each mast locates into a base plate fixed to the bioreactor floor (see Figure 4). There are 14 mixers in the bioreactor and all locating pins had evidence of similar wear. Each pin was repaired to original specifications within the workshop.

However, given the extent of the wear observed on these pins, there were serious concerns regarding the integrity of the base plates themselves. An in situ inspection was not possible as the bioreactor could not be taken offline without causing problems to the process. To work around this restriction, a commercial diving contractor was engaged to remove a single base plate for inspection. The first attempt to remove a base plate failed as it had locked onto the anchor bolts, making removal impossible without any specialised tooling.

How did the problem impact you or your work situation?

Biannually the mixer masts are removed for inspection, fitting of sacrificial anodes, and an application of a protective coating for corrosion control. During their operational life, the base plates had worn to a point where the masts were required to be rotated 90° to allow removal. This 90° rotation was necessary to free the mast from the groove that had worn into the base plate.

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Unable to inspect the base plates, concerns were raised as to how long the base plate could remain in service before a critical failure occurred. Given the requirement for effective mixing in the bioreactor, a critical failure was not an option. Initial investigations took place into taking the bioreactor offline and replacing the base plates. This process proved to be expensive (\$130,000+), while potentially compromising final effluent discharge, licence compliance requirements as well as the unnecessary disruption involved with taking a bioreactor offline.

How long had the problem been occurring?

The wear on the base plates and locating pins was a result of constant rubbing caused by the normal operation of the mixers, combined with the erosive nature of the fine grit within the wastewater. This rubbing had been continuous for the past 22 years. The mast locating pins were repaired when required while the base plates continued to wear. Approximately 18 months ago it became apparent the base plates would need to be replaced.



Figure 1. Mixer Mast



Figure 2. Repaired Locating Pin



Figure 3. Worn Baseplate

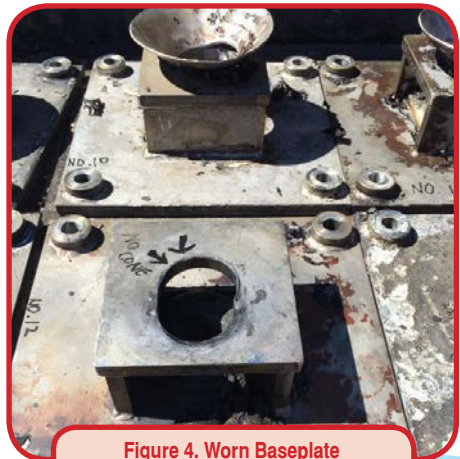


Figure 4. Worn Baseplate
Missing Locating Cone

THE SOLUTION

While the investigation was underway to take the bioreactor offline, we set about procuring the 14 replacement baseplates from the original supplier. The time to order and fabricate the new baseplates was 16 weeks. Upon arrival of the new baseplates, it became clear the proposed option of taking the bioreactor offline would not be possible. At this point I was looking at the new baseplates and thought “I could make a tool to lift them within the bioreactor”. Having the new baseplates on site made it easy to come up with a solution as there was something to “touch and feel”. Prior to the arrival of the new baseplates, only engineering drawings were available.

Who helped work on the solution?

The on-site Fitters manufactured the lifting tool. Diving contractors were engaged to remove and replace the baseplates with the assistance of the lifting tool.



Figure 5. New Baseplates



Figure 6. Lifting Tool



Figure 7. Lifting Tool Test



Figure 8. Removal of First Baseplate Attached to Jib Crane

Describe the solution.

I met with the on-site fitters and we started designing the lifting tool using a new baseplate as a reference point. After the lifting tool was made, I requested a baseplate to be bolted and glued, using Sika Flex, to the concrete in the car park. We did this to operate and test the tool as close as possible to the real application. The testing scenario was successful and became useful when divers were engaged. The dive crew could see the tool in operation prior to the installation which was extremely beneficial as there is zero visibility at the bottom of the Bio Reactor.

The final result was a lifting device which was lowered to the base plate using the onsite jib crane. A diver secured the lifting tool to the worn base plate using a locking pin, the height of the lifting tool could be adjusted with wing nuts and a hydraulic ram was fitted to each end of the lifting tool connected to two hydraulic pumps. Each pump had a visual gauge so the operator could watch the hydraulic pressure and maintain even pressure on each ram (see Figure 6).

I wanted this task to be as easy as possible for the diver to operate. When the lifting tool was fitted, the diver moved away while jacking took place. The diver had full audio communication with the fitters above which was essential for the safety and accuracy of the project. The hydraulic rams on the lifting tool had 25mm travel so a few ram height adjustments were required to clear the baseplate of the anchor bolts. The diver could feel if the baseplate was lifting off square and re adjust the wing nuts after each lift. When the plate was jacked off the anchor bolts, the lifting tool and base plate could be raised to the surface using the jib crane. This was possible as the lifting tool was still attached to the base plate with the locking pin (see Figure 8).

The day came to put the lifting tool to work. I had planned the project to take 5 days. The first base plate was removed before morning tea. I was relieved to see the base plate was as worn as expected and was in need of replacement. All 14 baseplates were completed in 3 and a half days with varying levels of wear depending on the load they were subject to.

How has it helped you at work?

Without the lifting tool, the baseplates could not have been removed without taking the bioreactor offline. All 14 baseplates have now been replaced and will be in service for the next 2 decades. The replacement project was estimated to cost in excess of \$160,000 if the bioreactor was taken offline. By using the baseplate removal tool, the project was completed for less than \$40,000.

Suggest improvements.

Improve the design of the mast to either eliminate wear, or have a sacrificial bush fitted to the mast pin which could be replaced from the surface.

I would like to thank the Wetalla Trade staff for their commitment to ensuring the success of the lifting tool.

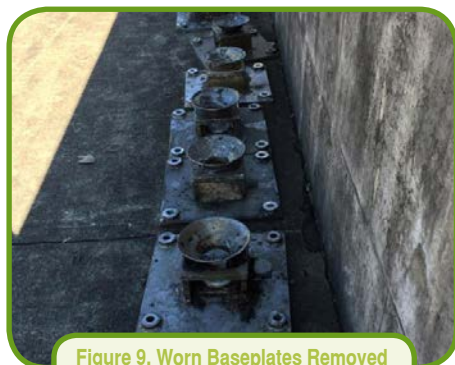


Figure 9. Worn Baseplates Removed from Service



Figure 10. The Team

CL₂ Gas Leak Location Assistance Shield for Minor Leaks

Brett Hill, Water Treatment Operator, SA Water

THE PROBLEM

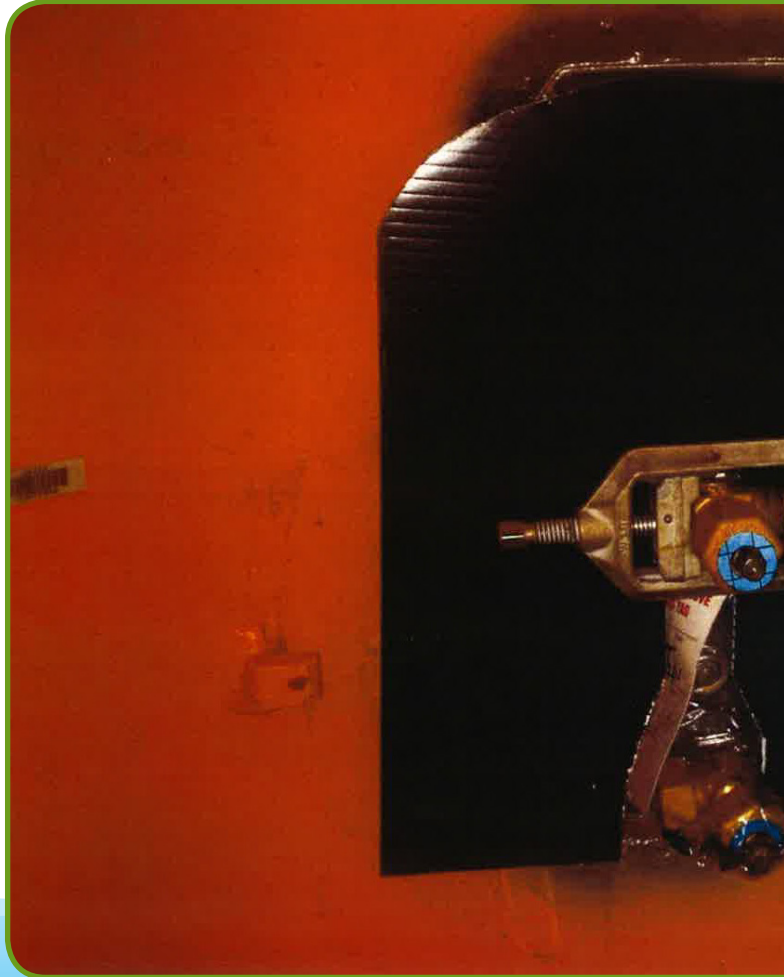
Locating a minor Chlorine leak in a large drum storage room with another co-worker during alarmed evacuation of work site. The drum room houses 20 x 920kg drums with 10 online and open, all with vacuum regulators attached.

How did the problem impact you or your work situation?

Locating the minor “wisp” of gas was made quite stressful with the added fear of exactly how many leaks or how easily it would be isolated.

How long had the problem been occurring?

It doesn't happen often, but I think it would have always been a problem.



THE SOLUTION

It was a case of seeing it in Black & White.

Who helped work on the solution?

Fellow co-worker.

Describe the solution.

A black piece of corflute cut to fit at the connection end, sitting behind the vacuum regulator.

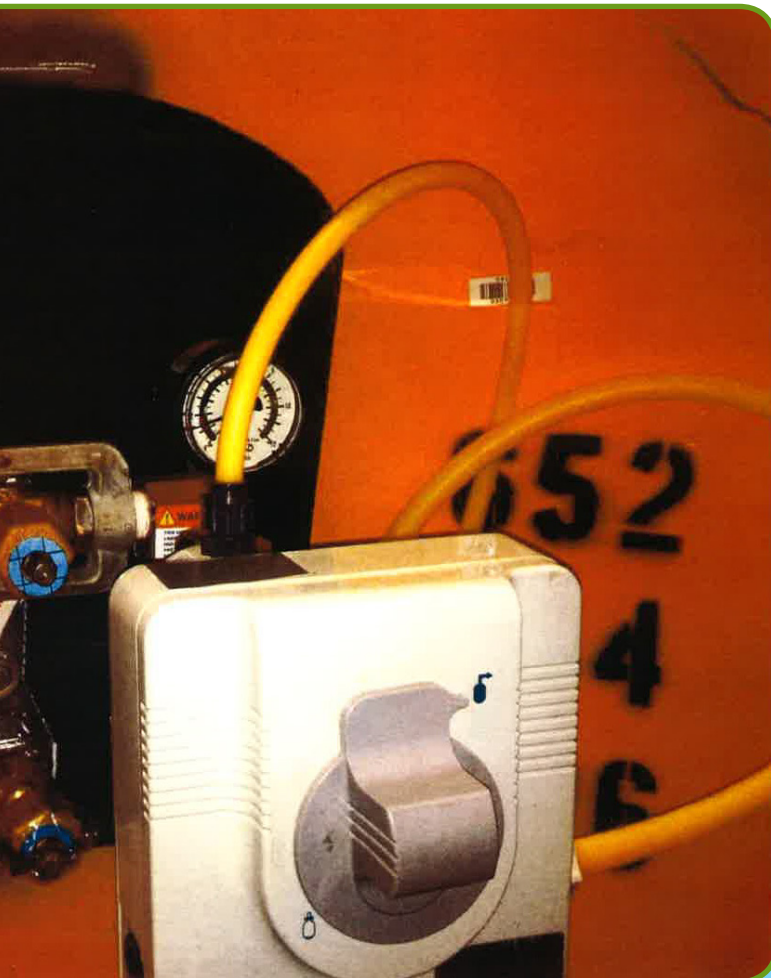
How has it helped you at work?

We use it during connection/disconnection and it works really well.

Suggest improvements.

I have requested connection ends to be painted black by supplier.

This is very effective as during connection/disconnection we have donned a Breathing Apparatus and do not notice faint smells of Chlorine gas if present.



DIY Odour Control Dosing

Glenn Jeffrey, Treatment Scientist, Wannon Water

THE PROBLEM

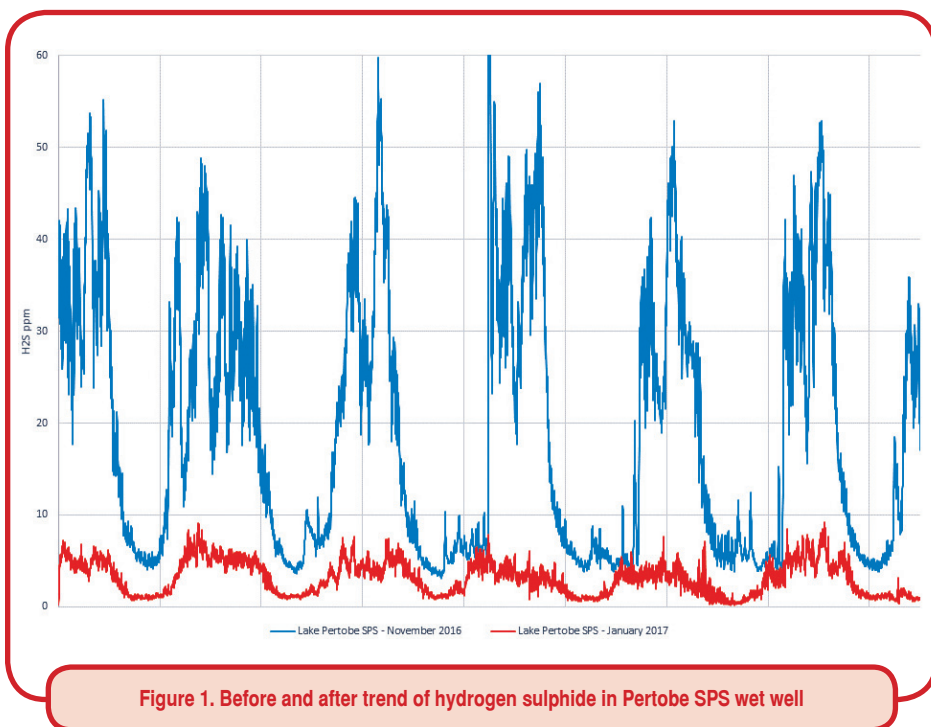
Lake Pertobe is a community use area that is busy during tourist season. The primary uses of the area are family recreation, playgrounds, boating, fishing, BBQ and beach access. There are markets, outdoor cinemas and public events throughout summer. The city council was keen for Wannon Water to control the odour problem from the Lake Pertobe Sewer Pumping Station (SPS).

How did the problem impact you or your work situation?

Hydrogen sulphide at the SPS was corroding copper and even stainless steel pipes and ducts. There was a general feel in the community that the SPS stunk, which is not good for Wannon Water's reputation.

How long had the problem been occurring?

There has been an intermittent odour problem for years but the council approached us to deal with it in November 2016.



THE SOLUTION

Over the past few years, we have been involved with various odour control trials. We opted to use Ferrous Chloride because it can be ordered, stored and dosed using standard chemical equipment, and because it works in a predictable way.

Who helped work on the solution?

I bounced the concept around the office, depot and chemical supplier to get some ideas on the best way to build the system which helped with the design, materials, suppliers and construction. One of our maintenance officers is a licenced plumber so he helped with a lot of the plumbing. A big thanks to Josh!

Describe the solution.

A 20-foot shipping container was dropped beside the upstream SPS. Inside we rolled out a portable bund and put in 3x 1000L IBC containers. The outlets were plumbed to one another effectively making one tank. A dose pump secured to the IBC delivers chemical to the wet wells via a carry water system to dilute the corrosive Ferrous Chloride.

How has it helped you at work?

This chemical dosing system has reduced the hydrogen sulphide levels by 95%, which has made Lake Pertobe much more enjoyable for all of the community.

Suggest improvements.

The long-term plan is to put in a permanent dosing facility with a larger storage tank, permanent building, dosing system and delivery bund.

This solution went from initial concept to solution in less than four weeks. It was a push to identify the problem and to secure the parts before the Christmas tourist influx.



Access to Floats/Transducers in Reservoirs

Bryce McDonell, Industrial Electrician,
Riverina Water County Council

THE PROBLEM

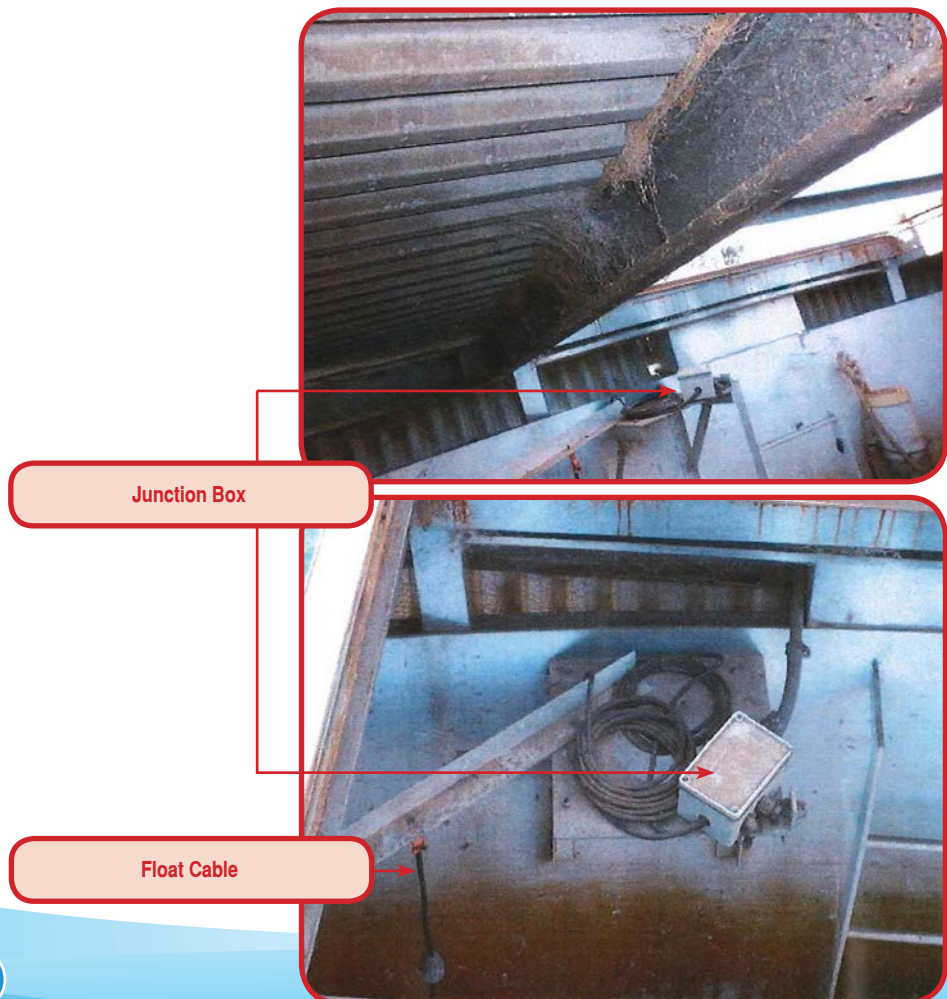
Accessing the floats and transducers which are located under the roof in reservoirs is very awkward. The floats and transducers need to be located away from internal ladders and as such can be very difficult to reach when they require maintenance or replacement.

How did the problem impact you or your work situation?

Reaching the equipment requires someone to climb part way down the internal ladder and while hanging on with one hand, reach out and grab the float and / or transducer. This is a WHS hazard.

How long had the problem been occurring?

This problem has been around since the early 1990's.



THE SOLUTION

While retrieving equipment, one of our trades assistants suggested it would be easier if the floats could be dropped through the roof and pulled up through a hole in the roof. After discussion about maintaining the integrity of the roof with regard to water quality, it was decided to trial using 90mm storm water pipe and capping to fit in the holes made in the roof. As long as the storm water pipe was easily removed the floats/transducers could be pulled up from on top of the roof, making the whole exercise safer.

Who helped work on the solution?

The whole Riverina Water electrical team had some input.

Describe the solution.

After discussion about maintaining the integrity of the roof with regard to water quality, it was decided to trial using 90mm storm water pipe drilled and a grommet fitted and capping to fit in the holes made in the roof. As long as the storm water pipe was easily removable, the floats/transducers could be pulled up from on top of the roof, making the whole exercise safer. As work is required on the floats and transducers, we are slowly installing more of these systems.

How has it helped you at work?

The days of hanging off a trapeze inside the reservoir are over. It also cuts down on time taken to access the equipment.



Disinfection Application Apparatus

Brock Stone, Water Quality Officer, Gunnedah Shire Council

THE PROBLEM

The disinfection of new mains has always been difficult for me as our organisation had no mechanical means of achieving Hypo delivery into a newly laid water main. Time spent introducing the Hypo solution through hydrants and main cocks by hand was how it was done and shown to me. I went along with this process, all the while thinking there had to be a better way.

How did the problem impact you or your work situation?

There were just too many things wrong with this method! This process started with an unflushed main. Hypo could not be introduced in a main that was already flushed clean and full of water, so we were starting with a contaminated dry main as the pipes are never installed as clean as one would like. The Hypo was poured by hand into the pipes mostly through main Cocks via a funnel at different sections of the main which left me vulnerable to splashes, spills and injury as this is all taking place in a trench only 600mm wide. It was also a time consuming process as I had to unscrew main cocks, add hypo and do them back up again. After the completion of this, a standpipe was installed at the end of the main closest to the stop valve. The valve at the start of the main was then opened only enough to fill the main and mix the hypo along the length of the pipe and then shut off when water began to exit the stand pipe at the other end. The main was left overnight to super chlorinate and flushed the next day.

How long had the problem been occurring?

As far as I know this is how it was done since the introduction of disinfection.

THE SOLUTION

After a lightning strike on one of our dosing stations I ended up with a two spare dosing pumps as they were swapped out for new units. One of these pumps still worked and I began to form an idea of somehow connecting this to a live water main.



Who helped work on the solution?

It was mostly a solo project but a big thanks to the Council workshop boys for building the frame for me.

Describe the solution.

From spare parts around the water shed I gathered the necessary fittings and as luck would have it, an injection lance, which I then attached to a small Hydrant stand pipe that had been lying around for years. The idea wasn't really new as it works just like any dosing station but I wanted a device that could be operated by one technician working alone, set up within minutes of arrival on-site and basically fool proof in its operation. It runs off a 12V power pack connected to a gamma/L pump with a 5L reservoir for the Hypochlorite solution. Injection takes place through the closest hydrant which in our case is now always beside the first valve.

How has it helped you at work?

No more safety concerns of the old manual technique. Water operators can now flush the new main before I arrive giving me a clean pipe to begin with. The portable dose unit can be set up within minutes and residual testing can begin immediately at the other end to achieve super chlorination quicker than ever before. Starting with the already flushed main I have been able to achieve and maintain +5 ppm free residual within the first five minutes of operation. The main is then flushed clean at minimum an hour later giving us same day completion of the job.

Suggest improvements.

Aesthetically, a smaller frame would be better. I started with a 20L reservoir for the hypo and the frame was originally built around that. I've now gone to a 5L container.

A larger pump for doing bigger and longer mains as you can understand the more water you push through the more you will dilute the hypo as the little pump can only do so much. I manage this at the moment by controlling the water flow rate at the stop valve.

I always knew there would be solution to my problem and when I looked at how major utilities were doing this it occurred to me that our small council could not afford such devices. I really wasn't able to find anything out there to suit but as they say, necessity is the mother of invention.



Extendable Valve Key

Gary Wingrave, Distribution Officer, North East Water

THE PROBLEM

Sluice valves at various heights especially around older sections of town, bending over or kneeling down to exercise valves.

How did the problem impact you or your work situation?

Valve keys were at various heights while trying to open or close them, would often have you in positions of poor posture.

How long had the problem been occurring?

As long as anyone can remember and there is a few blokes who have been around a while!

Original Problem



THE SOLUTION

We had some group discussion at our hand over meeting and I decided to take on the challenge.

Who helped work on the solution?

I took some valve covers and keys to J.A Cox Engineering and had some discussions with one of the engineers there.

Describe the solution.

The valve key stands at 1.5 metre high and has 3 x 300mm adjustments to extend it out to 2.4 metres.

How has it helped you at work?

It has stopped either kneeling down or bending over to exercise any valves.

Suggest improvements.

We have been very happy with the outcome from this project.

Any other comments you would like to make?

This is something that has come about from the changing ergonomics of our work force. Our OH&S team were happy to see some great outcomes from this project.



Partially Extended



Comparison - 1.5m to 2.4m Key



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Award Objectives

- To create an opportunity which encourages water industry operational staff to share their in-the-field innovations and/or fixes to problems so that others in the water industry can benefit.
- To provide an application process which is easy to complete and utilises a standard template. This will give all water industry operational staff the same opportunity for presenting their innovation.
- To provide the opportunity for operational staff to receive recognition for their innovation and efforts.
- To encourage operational staff to become aware of and involved with the Water Industry Operators Association of Australia (WIOA).

To allow WIOA to share the good ideas and innovations with other members through the Operator magazine and/or other publications.

The Process

The PASS application template and more details on the Award can be found on the WIOA web site or from the WIOA office.

Judging

All PASS applications received in the 12 month period ending 1st March annually, will be assessed by an independent panel on a number of criteria, including:

- Commonality of the problem
- Benefit to OH&S, water quality, and/or the environment
- Financial and sustainability benefits
- Application to other industries
- Uniqueness, adaptability and simplicity

Reward

The person who submits the PASS application deemed best in that particular year will be announced the winner of the PASS Award at the annual WIOA NSW Conference. Aqualift Project Delivery Pty Ltd, as the PASS Award sponsor, will provide sponsorship of \$2,000 for the winner to join the WIOA team on their annual operational tour of New Zealand including attendance at the New Zealand WIOG operations conference.