PASS

2014 PASS Award Winner Lester Little from TasWater with Jillian Busch from Aqualift Project Delivery

W-I-O-A Australia EXCELLENCE IN OPERATIONS

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.

AQUALIFT Pty Ltd PROJECT DELIVERY

PASS

Problem Accepted - Solution Supplied

Objectives of the Award

- 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 website www.wioa.org.au/awards/PASS.htm 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 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 WIOA NSW Conference. Aqualift Project Delivery will provide sponsorship of $2000 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.

Contents

Using an air diffuser system to clean a major pump station wet well.

Lester Little, Coordinator (South), TasWater

THE PROBLEM

A major sewer pump station south of Hobart suffered from a continual build-up of rag, fat and other foreign material in the wet well. This caused continuing pump blockages,and also required a monthly clean out of the wet well. The flow from the PS is around 1.0 to 1.5ML/day.

How did the problem impact you or your work situation?

A vacuum truck was arranged on a monthly basic to pump out fat/scum and rag from the wet well and with the design of the wet well being a rectangle shape, we were unable to access to majority of it. One of the pump attendants would put on the safety harness and be lowered into the wet well along with a man-made rake. The staff member would try and pull the scum etc. back towards the suction hose of the vacuum truck - a totally unsafe situation. It was determined that this wasn't good practice and staff were informed not to enter the wet well any more.

How long had the problem been occurring?

The pump station had continuous problems with the wet well since it was first constructed in 1996. Staff had managed it the best way they could in the past but with safety legislation changing, the old way was not best practice. Also, access to landfills for the disposal of hazardous waste removed from the wet well became an issue.

Outside the pump station, wet well in front.

Scum in the wet well before the diffuser was installed.

THE SOLUTION

There was an old, unused blower at one of our treatment plants that was formerly used to aerate the primary sludge in the sedimentation tank. All we had to do was relocate and install it at the pump station, fabricate a diffuser to suit the wet well and electrically wire it in. By aerating the wet well, this would keep the scum / rag to a minimum and reduce odour, not to mention removing the dangerous aspect of entry by staff.

Who helped work on the solution?

- TasWater senior fitters - fabrication and installation of the diffuser and blower.
- Clear Water Controls - John Dragt incorporated control mods.
- TasWater electrical staff - installation of all electrical components.

Describe the solution.

Senior fitters installed the diffuser in the wet well with air outlets about 400mm/500mm under the water level. The blower was located inside the dry well of the pump station. A flexible pipeline was installed from the blower, through the concrete wall into the wet well to the diffuser inlet. Electricians wired the blower in and Clear Water Controls configured it into our SCADA system so that it could run on a time sequence, changeable by the operator. Initially we had some concerns with the air entering the pumps from the diffuser causing the pumps to cavitate but after running for some time there was no evidence of this. Overall the project works well and after a couple of years of operation it has provided a very pleasing result at a reasonably small cost of less than $7,000, given that we already had the blower.

Wet well after diffuser was in installed.

How has it helped you at work?

Some of the benefits are;

1. Improved safety for staff attending the PS.
2. Improved mechanical maintenance and reduced pump blockages.
3. Improved operational costs, savings around $30,000 annually in contractor costs.
4. Minimum rag / scum issues.
5. Reduced reactive inspections of the PS.
6. Reduced odour (H_2S) from the PS.

Suggest improvements.

Look at improving the design of the diffuser as there have been some issues of rag tangling around the diffuser off-takes. This has to be removed on occasions and there is still some need to use vacuum trucks once per year to remove rag build-up.

Examine alternatives such as installing dump valves on the rising mains from the pumps back into the wet wells to break up scum, rag etc. This would be advantage on problematic pump stations.

More investigation should be considered in the design and maintaining sewer pump stations.

Diffuser S/S fabricate to suit wet well.

Chlorine dosing skid modification.

Steve Signor
Senior Plant Operator - Snowy Works and Services Tumut

THE PROBLEM

Airlocks constantly occurred in the sodium hypochlorite dosing system when the reuse plant started up at 10.00pm, resulting in poorly chlorinated water in the reuse scheme.

This dosing was into a pressurised line of approximately 7 bar.

How did the problem impact you or your work situation?

Extra work was needed to secondary dose the poorly treated water in the holding dam. An extra dosing plant was set up at the holding dam to continually dose small amount of chlorine. This was implemented because of the sporadic nature of the air locks occurring.

How long had the problem been occurring?

The problem of airlocks was sporadic for the past 3 years, and we had problems with it right from the start of the re use scheme. Initially we had installed a manually operated bleed valve, which we would open every morning to relieve pressure from the dosing line. This would allow any gassing to pass through the dosing pumps preventing the pumps from losing their prime. Then at the end of the day we would close the valve allowing for the dosing line to pressurise when the system started up at 10 pm. Occasionally there would be failures due to this step would be forgotten or due to the gassing occurring after the valve being closed.

THE SOLUTION

The above solution was reasonably successful but would be better if it was automated. Closing the valve closer to the time that the dosing pumps started would give a longer period of time to bleed out any gassing that would build up during the day.

Who helped work on the solution?

I needed a solenoid or actuator that was capable of handling both pressure and chemical. I contacted a chemical dosing supplier and discussed some possible solutions. They recommended that their ball valve actuator would handle both pressure and chemical.

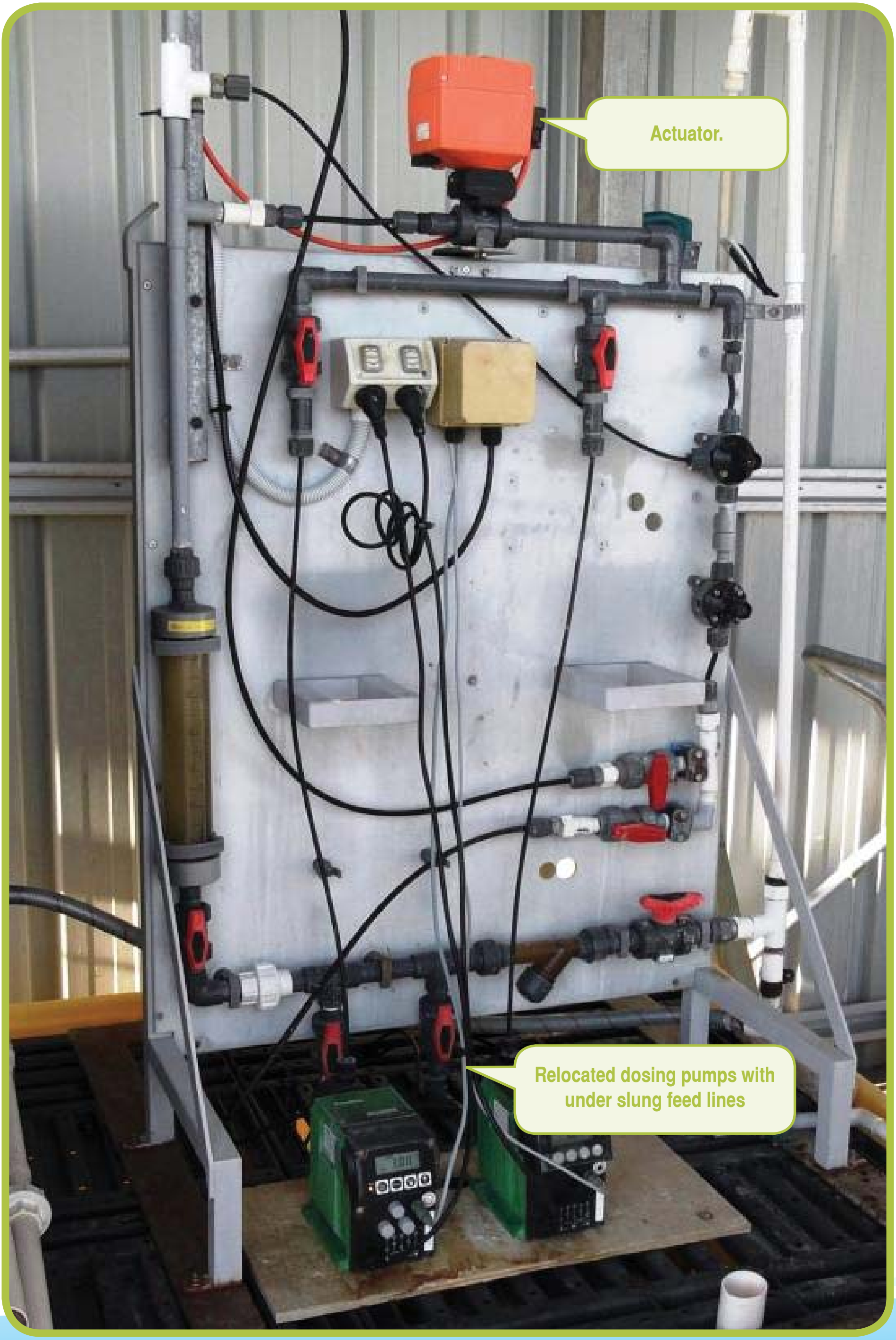
Describe the solution.

I purchased an actuator and fitted it into the dosing line pipe work at the top of the dosing skid prior to the pressure load valve. When the transfer pump starts, the actuator closes, allowing the dosing pumps to pressurise the lines. We also changed the location of the dosing pumps to a lower position and changed the position of the feed lines to the dosing pumps – these are now in a downward facing position so they draw from the bottom of the pipe work eliminating any other potential gassing pockets.

How has it helped you at work?

This has greatly improved our chlorine readings. We now have both automation and reliability. Our chlorine levels are very consistent now, this also allows greater control on our dosing rate, which are considerable less than before.

The addition of an actuator may help others that who are experiencing airlocks while dosing into a pressurised system.


Actuator.
Relocated dosing pumps with under slung feed lines

Vacuum trolley for desludging catch pond.

Steve Signor
Senior Plant Operator - Snowy Works and Services Tumut

THE PROBLEM

Looking for an easy way to desludge a catch pond that was easy to handle and didn't require man handling heavy hoses.

How did the problem impact you or your work situation?

The desludging was an annual event that required a fair bit of physical effort with man handling the hoses and suction head. We had looked at the commercially available arrangements but found the cost was too high.

How long had the problem been occurring?

Ever since the Tumut Sewerage Treatment Plant was in operation 2007.

THE SOLUTION

The hand held suction head arrangement worked in the past but it was slow and cumbersome and I thought that a trolley supporting system would help.

Who helped work on the solution?

A local company helped with the materials and engineering.

Describe the solution.

A trolley was designed with 4 wheels that had nylon bushes rather than bearings for movement in water. Adjustable frame to support the vacuum head.

The vacuum head is made of 80mm PVC pipe with a slot and end caps all connected with a T piece to a suction hose cam lock fitting. A 4 inch self priming pump is connected to the trolley and discharged to the sludge lagoon.

How has it helped you at work?

The trolley system has made the job so much easier and desludging can be accomplished in a shorter time.

Suggest improvements.

None to make, apart from getting outside help to do the job!

Desludging Trolley with Catch Pond in background

Mt Kynoch WTP failed filter inlet valve position stoppers.

Paul Lowien, Jason Toombs, Brad Feichtner
Fitter and Turner, Toowoomba Regional Council

THE PROBLEM

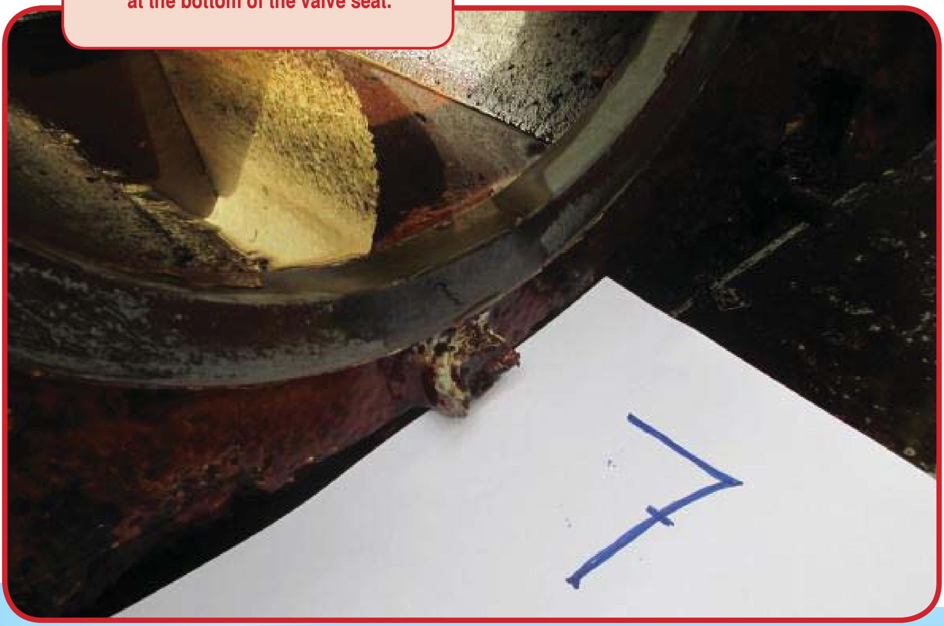
The filter inlet vale position stoppers had failed after prolonged operation. While the 8 valves were still in good condition, the stoppers had failed causing the inlet vales to fail in the closed position after closing for a backwash cycle. The valve tongue slides down a wedged guide, the failed stoppers allowed the valve tongue to travel too far and bind tight in the closed position.

How did the problem impact you or your work situation?

Valves failing during backwash cycles causing operator call outs and loss of operational efficiency. Being the maintenance team responsible for the plant we had to come up with either a solution to the failure or the plant would require significant capital expenditure to replace all 8 valves. While the valves still travelled and seated adequately, it did not seem economical to replace them.

How long had the problem been occurring?

The problem started recently when one of the worst valves failed during every backwash cycle, inspection on the additional 7 valves indicated they too had faulty stoppers that required attention.



Filter 7 inlet valve with a faulty stopper at the bottom of the valve seat.

New adjustable stopper installed fixed to filter inlet channel floor.
The old stopper has been removed.

Valve closed sitting on new stopper.

THE SOLUTION

The three of us inspected the faulty valves and we considered a few options for repair involving removing each valve and re-welding stoppers in the workshop. This would have taken considerable time and required a heavy crane to get the reach required to remove the valves. Eventually we came up with the solution to cut the old stopper from the valve casting and fix a new adjustable stainless steel stopper to the inlet channel floor. It was important the new stoppers were adjustable as the concrete floor had a variance of approximately 25mm along the filter inlet channel.

Who helped work on the solution?

This was a group effort from the three fitters in the Water Infrastructure Services team.

Describe the solution.

The solution involved organising a plant shut down to inspect all filter inlet valves. We brainstormed a solution and set to work on a prototype to test and ensure the design would work. We manufactured the prototype in our workshop that comprised of a mounting plate and an adjustable thread with a stopper that could be set to height then locked into position with a lock nut. The prototype was installed and worked successfully eliminating valve failure in the closed position. Following this we set to work to produce another seven stoppers.

How has it helped you at work?

The valves now operate as they are required to; there is no need to go through the effort and expense of replacing the valves. Without this design all valves would have required replacement that would have required significant capital funding, plant downtime and additional man hours.

Suggest improvements.

We are currently in the process of manufacturing the remaining stoppers ready for installation. The valve bodies are all in good condition and we have planned to give them all a coat of paint that should see ongoing operation well into the future.

In house manufacturing.

How to protect a D.O. analyser from deteriorating after being exposed to harmful U.V light.

Peter Knihinicki
Leading Hand Mechanical Fitter, Toowoomba Regional Council

THE PROBLEM

There are twenty D.O analysers operational across the plant. Each analyser is fitted in a sunshade, however the screen is still exposed to U.V light and the plastic face of the unit breaks down and falls apart requiring replacement prior to operational life expectancy of the analyser.

How did the problem impact you or your work situation?

Analysers failing after breaking down in the sunlight, each failure required an unnecessary capital expense to replace.

How long had the problem been occurring?

For approximately the past 12 years.

Failed analyser from exposure to U.V light.

THE SOLUTION

I knew the problem was caused by exposure to sunlight, the answer seemed easy - if I can protect the face of the analyser from the sun it will not fail from exposure to the U.V light.

Who helped work on the solution?

Wetalla Fitting and Operational staff.

Describe the solution.

Initially I came up with a cover made from sheet stainless steel I recovered from the scrap pile. I folded the steel into shape and fitted it to the sun cover, protecting the analyser from the sunlight. At first the cover hinged from the top of the shade cover however this proved to be unsuccessful as the cover was required to be held open while viewing or maintaining the unit. I refitted the hinge point to the bottom of the sunshade and allowed gravity to hold the cover open. This made it easy to view and maintain when required.

How has it helped you at work?

The twenty analyser units operational across the treatment plant no longer fail from exposure to U.V light. The units will now only need to be replaced as they exceed their operational life. This is both an economical and operational advantage to the plant.

The protective covers I installed were all made from scrap stainless steel recovered from an old conveyor shroud. The only expense associated to the task was labour to cut, fold and install the covers.

Cover fitted and in the open position

Cover closed and operating safely out of the sun and U.V light.

Magnesium Hydroxide liquid batching plant.

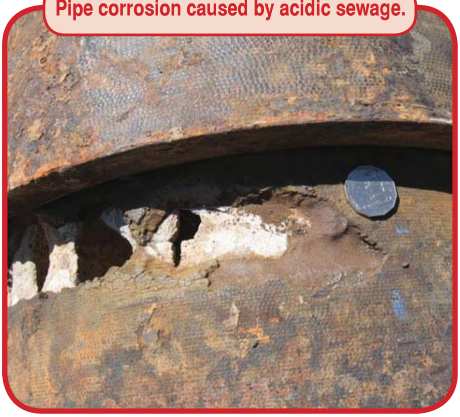
Scott Barnes
Manager, Field Services Unitywater

THE PROBLEM

Hydrogen sulphide gas, otherwise known as rotten egg gas, is an unfortunate by-product of the sewage treatment process. Within sewerage networks, the gas is converted to corrosive sulphuric acid which attacks the sewer pipes from the inside, dramatically shortening their life. The gas also gives off a particularly offensive odour that is noticeable at levels as low as .00047 parts per million. It is this odour that sometimes gives sewage networks a poor reputation within communities.

The problems of odour and corrosion can be treated, however the remedy preferred by Unitywater and many other utilities – that of dosing sewage in the network with Magnesium Hydroxide Liquid (MHL or 'milk of magnesia') – brought with it an additional problem of cost. MHL was expensive because it needed to be purchased from a company that held a monopoly in the Australian market. This monopoly exists because the company controls the intellectual property relating to the method of producing a product of suitable quality.

Pipe corrosion caused by acidic sewage.



How did the problem impact you or your work situation?

Untreated corrosion within sewerage pipes and pump stations means that assets designed to last 100 years can fail in a much shorter time frame. In extreme cases the asset life can be reduced to less than ten years if the problem of acidic sewage is not addressed.

A number of chemical treatments are available to water and sewerage utilities to counteract these problems, including dosing with oxygen, ferric chloride or calcium chloride. Microbial options are also available, with varying degrees of success. Each of these treatments brings its own challenges – for example some of the chemical solutions are hazardous in nature – and all options are expensive.

The easiest, most effective and non-hazardous treatment is dosing with Magnesium Hydroxide Liquid (MHL or 'milk of magnesia'). The need to transport the product from a single production facility all over Australia added to its already high costs.

How long had the problem been occurring?

Dealing with smelly sewage has been a problem since the dawn of civilisation. The problem of replacing corroded sewage infrastructure has been faced by sewerage service providers throughout their extensive development into the utilities we have today. Throughout this time, utilities have grappled with the challenge of extending the life of the assets to avoid the disruption and extensive costs of replacing corroded infrastructure, while meeting community expectations.

THE SOLUTION

Unitywater had developed a working relationship with local service provider Wise Waste Solutions. In discussions over time with Wise Waste Solutions, the problems as outlined in the previous section were examined, including undertaking an analysis of the chemical properties of MHL. This collaboration led to the invention of a new process of manufacturing MHL.

Who helped work on the solution?

Over the two years it took to develop the solution, I worked with Wise Waste Solutions almost exclusively, however I received support and encouragement from management, in particular George Theo who was at the time the Chief Operating Officer.

Describe the solution.

Unitywater worked with Wise Waste Solutions to develop a micro-batching plant for the production and supply of MHL. Built at Unitywater's Maroochydore Sewage Treatment Plant, the batching plant currently produces 1.5 million litres of MHL a year. It employs a new patented formula and production process and uses water recycled from the sewage treatment plant.

The MHL is delivered to dosing stations, strategically placed where hydrogen sulphide gas is a problem, across Unitywater's sewerage network.

As well as reducing odour and increasing the lifespan of the assets, MHL has the additional benefit of reducing built-up fats and grease in the pipes and pumps. Furthermore, MHL increases the pH of the sewage, making the task of the bacteria used to treat it much easier.

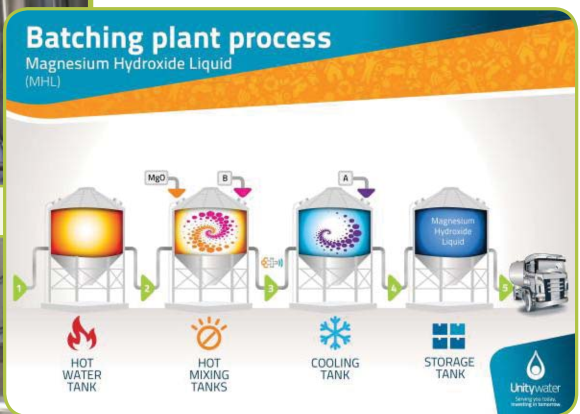
How has it helped you at work?

The ability to produce its own MHL at a fraction of the previous cost will save Unitywater around half a million dollars in chemical costs alone in the 2014/15 financial year. We calculate a return on investment from the batching plant at 740% and a payback period of eleven and a half months.

The savings will increase exponentially as Unitywater builds more MHL dosing sites across its sewerage network. Unitywater's network is relatively large, with 778 sewage pump stations and 18 sewage treatment plants.

The process we developed has been very successful because it found a way of keeping the magnesium in suspension in its liquid. The MHL micro-batching plant is fulfilling its intended role very well and has ample capacity for Unitywater foreseeable needs.

Unitywater's MHL batching plant.



PASS
Problem Accepted - Solution Supplied

AQUALIFT
PROJECT DELIVERY

W-I-O-A Australia
EXCELLENCE IN OPERATIONS

Water Industry Operators Association of Australia
PO Box 6012, Shepparton 3632
Phone: 03 5821 6744
Fax: 03 5821 6033

www.wioa.org.au