a PASS

Problem Accepted - Solution Supplied





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W-I-O-A Australia
EXCELLENCE IN OPERATIONS

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.

AQUA LIFT PACIFIC

Design and fabrication of a raw water inlet sand and silt trap

Mark Walker, Water Treatment Technologist, Gippsland Water

What was the problem that you experienced?

We harvest raw water from a small stream which is subject to high levels of sand and silt, particularly during periods of high rainfall.

How did the problem impact you or your work situation?

Although this problem did not directly impact on day to day operations, the sand and silt gradually build up in the raw water basin and requires removal by excavator and tip truck.

How long had the problem been occurring?

This has been an issue for a long period of time. There have been several attempts to address the problem with the most recent being the introduction of a stainless steel wedge wire cylinder screen. This screen was fitted to the weir outlet and was effective in removing larger debris, including sticks and leaves. However, the fine sand and silt still passed through to the basin.

The problem.

The Solution

How did you come up with the solution?

I had been thinking for a while how to design a better system that was more efficient and was less labour intensive. Once I started some sketches, the design developed quite quickly.

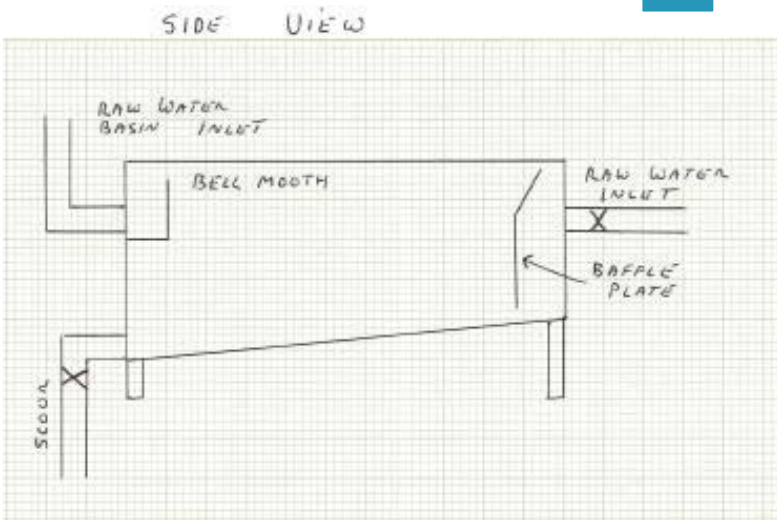
Who helped work on the solution?

Once the initial design was worked through, I had a Gippsland Water engineer look over the plans, with my main concern being if it would still be effective at peak flows of approximately 12L/s. Once this was confirmed, a local engineering firm was engaged to construct the unit.

Describe the solution.

The raw water enters the sand trap which has a baffle plate directing the flow down towards the base of the vessel. The sand and silt is heavy enough to settle on the bottom and accumulate, while the water level rises, spilling over the bell mouth outlet and entering the basin.

The sand trap needs to be cleaned out approximately every couple of weeks, which is a very user friendly exercise. As the trap has a hopper style base that slopes toward the scour, all we have to do is reduce the inlet to approximately 2L/s and it basically cleans itself out.



How has it helped you at work?

It has removed the requirement to have the basin cleaned out and also the inconvenience of having the basin off-line during the course of the works.

Apart from the inconvenience of having the basin off-line, the main benefit is the time and cost savings to the organisation.

Suggest improvements.

As far as the efficiency, the trap works exceptionally well and is very easy to clean out. I would like to replace the PVC pipework with stainless steel at some stage in the future.

The solution.

Making maintenance on lime dosing spears safer

Dean Andrews, Water Treatment Plant Operator,
Veolia Water Operations

What was the problem that you experienced?

An important ongoing preventative maintenance task at the Bendigo Water Treatment Plant is to do a monthly citric acid clean on the lime dosing system. This maintenance is essential for preventing blockages, which leads to failure of the lime dosing system and impacts process operations and water quality. The citric acid clean is done by disconnecting the lime dosing lines at the pump and pipe connections and reconnecting to a circulating citric acid feed, to dissolve lime build-up and flush out the system. Following the citric acid clean, the lime dosing spears are removed and the scale build up is bored out using a drill. The removal and maintenance of the lime dosing spears has been identified as a manual handling issue for the staff at the Bendigo WTP.

How did the problem impact you or your work situation?

Due to the size and location of the lime dosing spears, the task of removing the spears was identified as a manual handling issue, in that they were difficult to remove from their sleeve, requiring force and awkward posture (see photo of the problem).

How long had the problem been occurring?

The problem had been occurring every month for the life of the treatment plant, approximately 10 years.

The Solution

How did you come up with the solution?

A temporary solution was to remove these spears using the lifting jib attached to the forklift. This solution worked for the most part. However, whilst the use of the forklift reduced the manual handling risk it also introduced further hazards relating to mobile plant.

Who helped work on the solution?

Konrad Mueller (Plant Supervisor), and David Tickner (Assets and Projects Supervisor) assisted with the development of the lifting gantry.

Describe the solution.

A gantry was designed and mounted to the surrounding structure so the lime spears could now be removed using a chain block. This greatly reduced the risk of manual handling and eliminated the hazards involved with mobile plant. The operators can now easily attach the chain block without physical force or the need to work in awkward positions. Removing the lime spears and easily sliding the spear along the gantry to an accessible area to be cleaned then simply lowered back into position.

How has it helped you at work?

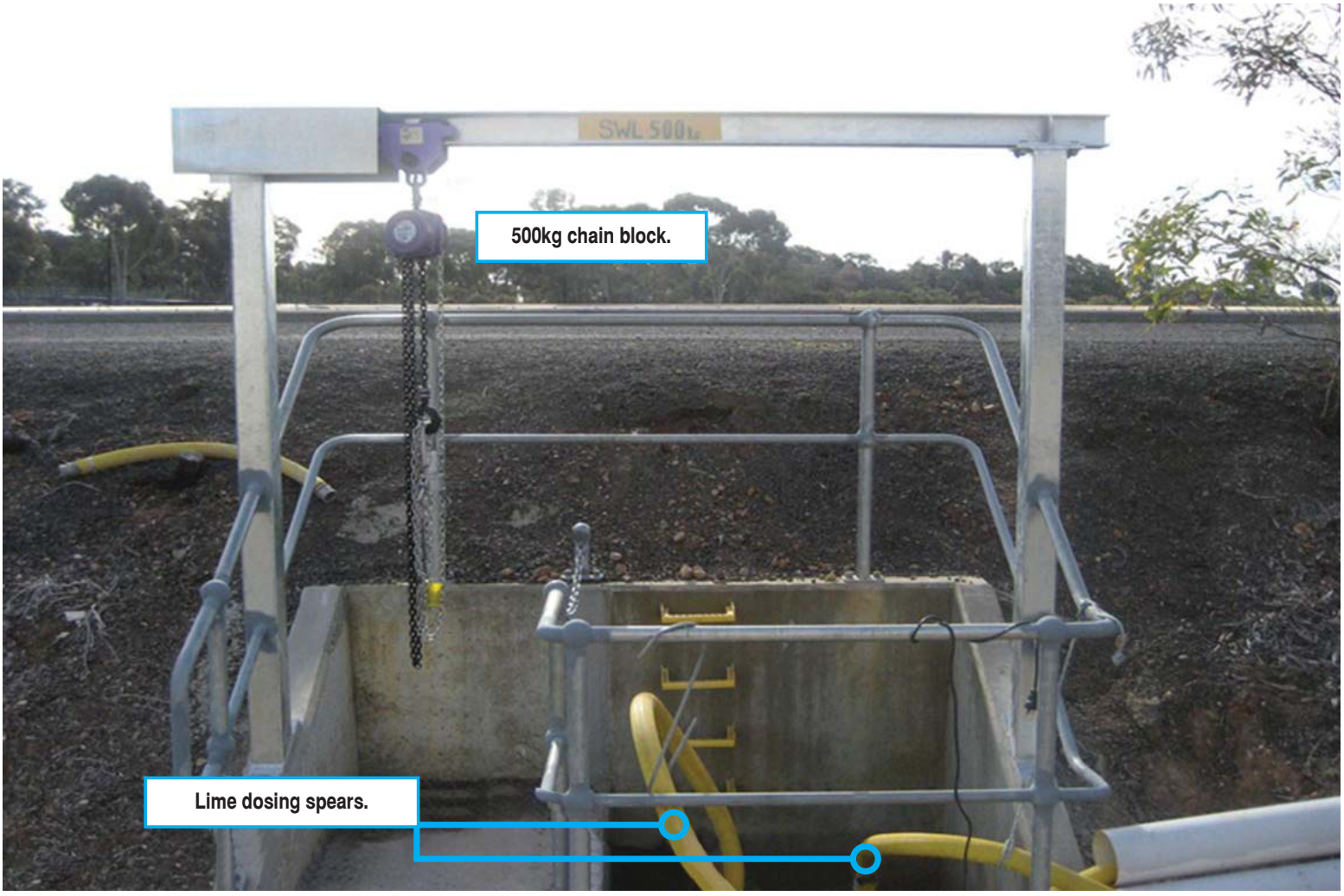
The lifting gantry has improved the safety and efficiency of this regular maintenance activity. It has enabled the ability to conduct work without requesting operator assistance from another site. The manual handling safety risk has been reduced and operators now feel more confident that they are working on this equipment in a safer and more effective manner.

Suggest improvements.

One possible improvement to the lifting gantry would be installation of an electric winch instead of the chain block.

▲ *The problem.*

The solution. ▼



Re-sleeving an AC water main

Dennis Dunley,
Water and Sewerage Operator,
Upper Lachlan Shire Council

What was the problem that you experienced?

An old low volume 100mm AC rising main in a small town kept breaking and leaking. This rising main was laid in the ground right next to the town supply main so extreme care was required when repairing any leaks.

How did the problem impact you or your work situation?

Constant repairs to the old AC rising main were necessary and often these were in the middle of town. The main also had a number of bends and dips and being AC, there was concern on what to do with it in this state of disrepair.

How long had the problem been occurring?

Over an 18 month period the number of breaks had been increasing.

Re-sleeving lead end - version one.

Re-sleeving lead end - version two.

The Solution

How did you come up with the solution?

To replace the main, this would have been a major job as the customer services often crossed the rising main. Other alternative techniques involve 'punching out' the old main was possible, but due to its close proximity to the treated water main, this was deemed too risky.

A low cost solution was required so it was decided to attempt to re-sleeve the main using 75mm blue line poly (PN16).

Who helped work on the solution?

Council staff and a local irrigation supply contractor.

Describe the solution.

Working on approximately 90m lengths at a time, a jet cleaner was used to blast a draw line through the AC pipe to pull through a winching rope to be connected to a winching system. On the 'lead end' of the poly pipe that was to be re-sleeved into the existing AC pipe, a 200 mm length of gal pipe (Version One) was inserted into the poly pipe containing a screw end (for protection) and a welded bar across the internal section of the gal pipe as a fixing point for the draw line. The poly line was then carefully winched through the rising main.

Unfortunately due to bends and dips, this system became stuck and had to be dug up and retrieved. It was then decided that the 'lead end' of the poly pipe needed to be modified to fit around bends etc. A 70 mm length of gal pipe (Version two) with a bar welded (once again for securing the draw line), was placed some 300mm down inside the poly line. 'V sections' were cut in the end of the poly line so the poly pipe could be closed into a cone shape and secured with duct tape. This modified head of the poly pipe made the pipe more flexible and was able to be drawn through the AC pipe, even around bends and through depressions without becoming stuck.

At the end of each day, the rising main could be connected back up to the existing raw water supply via a gibault and end cap arrangement, which ensured an uninterrupted supply to the system.

How has it helped you at work?

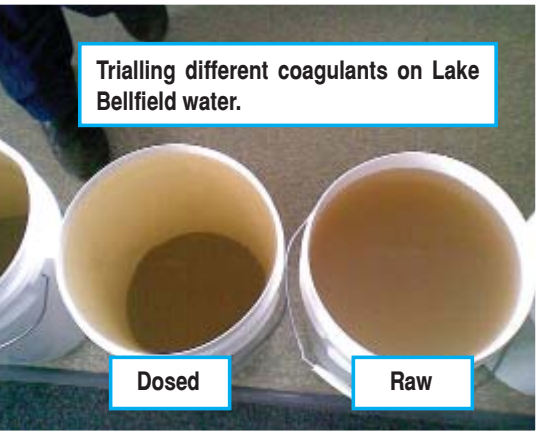
We were able to re-line the rising main at a minimal cost, and with no disruption to the towns water supply. There have been no further occurrences of leaks in the newly re-lined main, and a noticeable improvement in water quality.

Suggest improvements.

The only other alternative would have been to install an entirely new supply main, which was not financially feasible.

Regions Major Storage Lake Bellfield 3 months after January 2011 flood event of 200mm rain in 48 hours.

▲ The problem The solution ▼



Trialling different coagulants on Lake Bellfield water.

Dosed **Raw**

Treating poor water following the 2011 Victorian floods

Mark Ferguson, Water Quality Process Officer, GWMWater

What was the problem that you experienced?

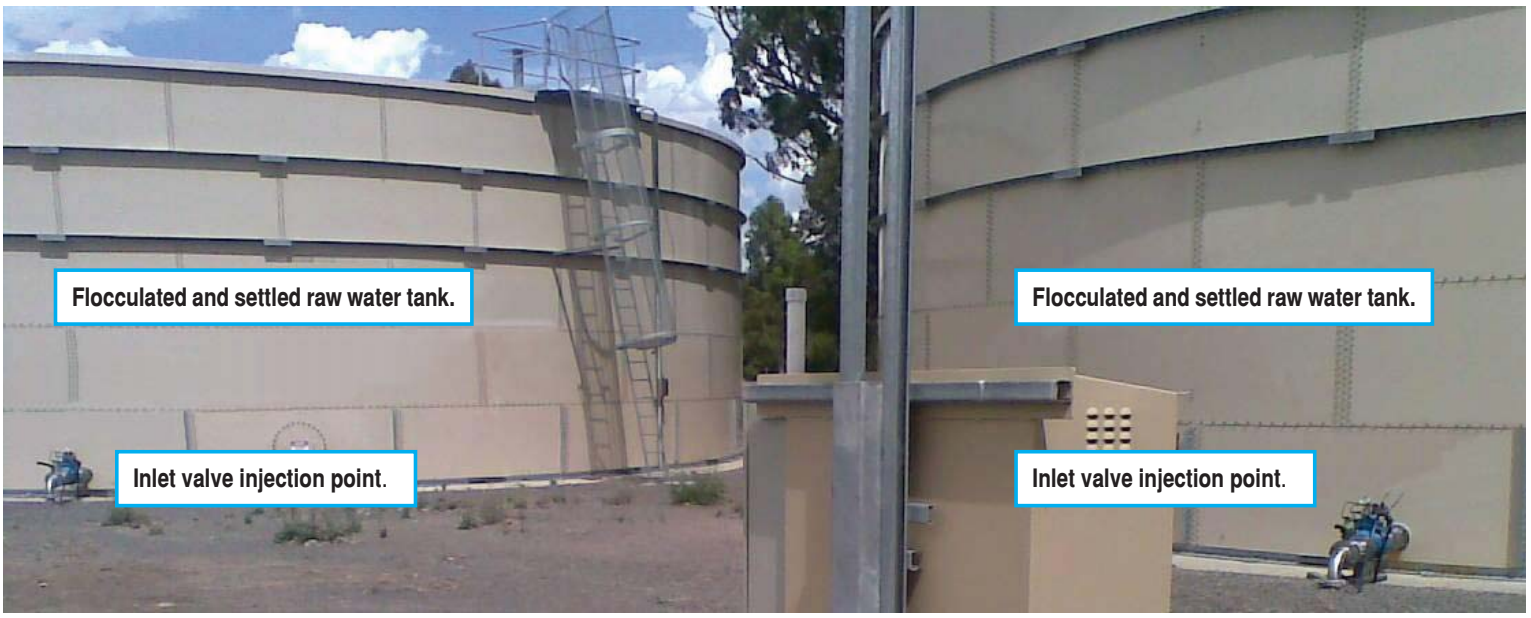
GWMWater's major raw water storage –Lake Bellfield, was severely impacted by sediment washed in by the January 2011 floods. After the flood, turbidity reached 580 NTU and colour 180 HU. The lake is the raw water source 15 towns in the region all with disinfection only systems and no filtration. The poor raw water quality impacted thousands of customers. Lab studies determined the turbidity was mainly fine clay and it could take several years to settle.

How did the problem impact you or your work situation?

GWMWater had no immediate solution to offer customers and experienced numerous customer complaints about water quality; elevated levels of customer communication and town meetings; the water supplied was not fit for purpose; the Department of Health was involved and there were towns writing petitions to escalate their problems. The problem was elevated to the highest priority and risk in the organisation.

How long had the problem been occurring?

Since January 2011. After this date, turbidity levels in these 15 towns went from 3 NTU to as high as 70 NTU and 100 HU units true colour.



Flocculated and settled raw water tank.

Inlet valve injection point.

Flocculated and settled raw water tank.

Inlet valve injection point.

The Solution

How did you come up with the solution?

Staff investigated a range of coagulants. We needed a coagulant that would leave no aluminium residue in the town reticulation system. We trailed various organic coagulants and settled on one from SNF which had no pH effects or metal residues. A field trial was conducted on a poly lined steel 1.5ML storage tank using different dosing methods. After many dosing trials the best was an injection dosing method into the inlet pipe prior to the storage tank. Suppliers were contacted and a dosing station that would operate under our conditions was organised.

Who helped work on the solution?

Dick Van Den Bosch (Manager), Greg Whorlow (Coordinator), Kev Munroe (SCADA electrician), Tim Oakley SCADA Technician, Acromet, SNF.

Describe the solution.

A 200 litre dosing station set up at town raw water tanks. There are 2 storage tanks at each town ranging from 500kL to 2.5ML, all supplied via pipeline from Lake Bellfield. The dosing station consists of an industrial strength plastic tank with a coagulant dose pump fitted on top. When the inlet control valve to the tanks turns on the dose pump automatically powers up and starts dosing the inlet flow at a preset dose rate.

Organic Coagulant Dosing Station only turns on when inlet control valve turns on.

Solution Benefits

- Automatic - an operator tops up the coagulant tank once per month.
- Cost of the dosing station is $3,500/town, compared to a treatment plant of $500K-$2.5M/ per town.
- Don't need to build treatment plants or find funding, removes the 1-2 year lead time to build a full treatment plant.
- Minimal power cost due to low dose rate required for optimum coagulation.
- Station can be installed outdoors in any location.
- Where electricity was unavailable solar power was utilised.
- Dose lines are buried 50mm underground inside 25mm polypipe.
- Dosed water is delivered into one inlet valve of one tank and flows through to the next tank. Only the top 10% of each tank is topped up at a fill cycle. This works the best operationally, ensures supply and delivers clear water.
- Sludge accumulation in the tank not an issue - it will take 6 years to reach the tank outlet. Minimise any adverse effects of sludge by cleaning the storage tanks once per year by desludging or with divers at a cost of $5K/tank.

This dosing station application using organic coagulants has been rolled out to 14 towns in our region to date.

How has it helped you at work?

The solution achieved the following:

- 80% less water quality complaints so far
- Taken the pressure off the organisation
- Water quality improved in these towns to less than 5 NTU and 5 Colour
- Customers are receiving the cleanest water they have ever had in their history
- Increased operational morale
- Better PR
- The application has been used in 2 of our fully treated towns also to clean up the storage water prior to the full treatment process.

Suggest improvements.

Have a more weather proof housing over the dose pump to increase the life of the external units.

Manganese removal issues at Thorpdale water treatment plant

Aidan Staley, Water Treatment Technician, Gippsland Water

What was the problem that you experienced?

Throughout the summer months, manganese residuals in the raw water rise to levels that the treatment plant process cannot remove. Once the filtered water was dosed with sodium hypochlorite, the manganese would oxidise and become insoluble in the clear water storage tanks. This causes dirty water, staining of assets and monitoring equipment and dirty water complaints from customers.

How did the problem impact you or your work situation?

The problem meant constant cleaning of sample lines and monitoring equipment to try and maintain accurate readings. The chlorine demand in the water was really high due to the manganese consuming the chlorine; also the plant was running less efficiently. The problem sometimes meant water needed to be carted to the clear water storage by tanker from other treatment plants.

How long had the problem been occurring?

The problem has been occurring during summer months, particularly throughout recent drought.

The problem - staining of water storage tank walls.

Flushing dirty water sample lines.

The Solution

How did you come up with the solution?

Used past experiences dealing with Manganese issues and trialled various solutions.

We conducted desktop research on the internet to see how other people have dealt with the issue.

Who helped work on the solution?

- Scott Laidlaw (Technologist) jar testing and delivering samples.
- Shane Wright (Transfield electrician) connecting power for extra dosing pumps.
- Geoff Mullin (Transfield fitter) helped perform the water tapping on raw water main.
- Russell Mack (Technologist): setup Potassium Permanganate tank and injection point on raw water.

Describe the solution.

After jar testing many different dosages and contact times, raw water pH correction was introduced. A new dosing point was installed on the raw water main for this; also another power point run from the PLC was required to power the extra dosing pump. The raw water pH was raised to 8.5 with soda ash and correct dose of potassium permanganate (which was already available in the process but had no affect) was added a few seconds later. We utilised a booster pump (already part of the process) to mix the chemicals thoroughly. Then with the standard coagulation/flocculation, sedimentation and filtration the manganese was effectively oxidised and removed from the treated water.

How has it helped you at work?

Significantly reduce the chlorine demand. Water does not have a dirty appearance from the clear water storage tanks. Overall better water quality.

Suggest improvements.

Aeration is a possible solution to oxidise the manganese without chemical addition. Also a detention tank could also assist with mixing and oxidisation of the Soda Ash and Potassium Permanganate.

The solution - new ph correction dosing point.

Jar testing Potassium Permanganate doses.

PASS
Problem Accepted · Solution Supplied

AQUA LIFT PACIFIC

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 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/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 WIOA NSW Conference. Aqualift Pacific Pty Ltd, as the PASS Award sponsor, 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 NZ WIOG operations conference.

W-I-O-A Australia
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