

# WORKING AT THE PERFUME FARM FOR 28 YEARS



*Paper Presented by:*

**Bob Banning**

*Author:*

**Bob Banning, Supervisor,**

Bathurst Regional Council



*4<sup>th</sup> Annual WIOA NSW Water Industry Engineers & Operators  
Conference  
St Stanislaus' College, Bathurst  
20 to 22 April, 2010*

# WORKING AT THE PERFUME FARM FOR 28 YEARS

**Bob Banning**, *Supervisor*, Bathurst Regional Council

## ABSTRACT

Having worked at the Bathurst Wastewater Plant for the past 28 years I have seen and worked on quite a few changes at the plant during this time. The plant has a long history having first been commissioned in 1916. In 1975, major changes were made and the “Bathurst Box” wastewater treatment process was born. Many more process updates have been completed since then and the plant now performs extremely well. This presentation is one “old” operator’s recollection of the evolution of the plant and processes and some things that have happened along the way.

## KEY WORDS

Wastewater, wastewater treatment, Bathurst Box, Imhoff tank, digesters.

### 1.0 INTRODUCTION

#### 1.1 History of Bathurst STP

The Bathurst reticulation system was completed in 1914 but after going over budget, it was interesting that the treatment plant wasn’t commissioned until 1916. So basically you could go, but it never went anywhere for 2 years - go figure. The first plant was the old septic tank type with an Imhoff tank digester. In 1929 two more primary tanks were added as well as a trickling filter and two humus tanks. In 1960 a lift station was added along with digesters and chlorination for disinfection.

After all these updates, the plant could handle a dry weather flow of 26,000 EP. Basically, the plant consisted of three Settling tanks, two Biological/Trickling filters and two clarifiers.

In 1975 another upgrade was required and Public Works were asked to come up with a design. At this time they were working on a more compact design of the Pasveer Channel. So a tank was built with a 3.0 metre deep biological Reactor and sized for 4,000 people. They allowed for a bit more concrete and put two floating aerators in it and a hydraulic decanting system. They then had to come with a name for this new system and with that the “Bathurst Box” was born.

There were similar tanks built like the Bathurst Box at Port Macquarie a couple of years later and their tank is basically the same but with sloping sides. In 1980 four more Bathurst boxes were being built with a new inlet works and a lift Pumping station and tertiary ponds for final disinfection. There have been more updates since then and I will mention a few of them later.

#### 1.2 Institution of Engineers Award

The reason for the history lesson is that in 2009, Bathurst Regional Council received the Institution of Engineers Australia, National Engineering Award for their contribution to the development of sewerage treatment technology in NSW. This award is a great honour as only major engineering projects like the Snowy Mountains Scheme, Sydney Opera House and the Harbour Bridge have received the award.



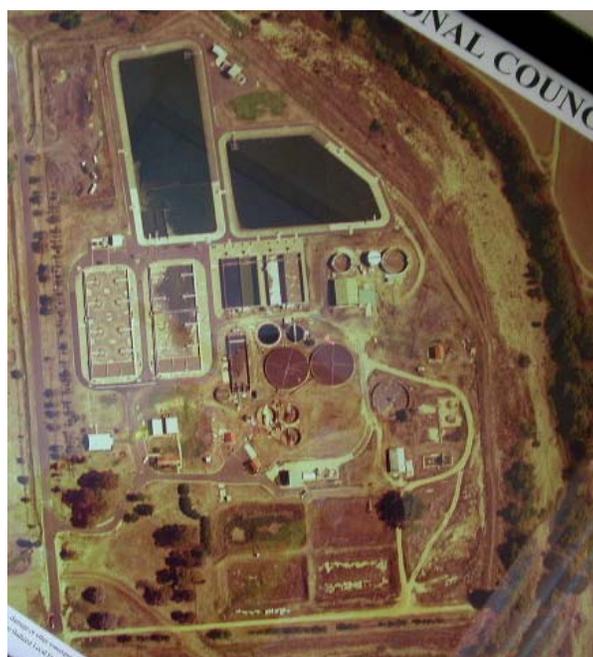
The plaque on the rock reads:

“Bathurst Wastewater Treatment Plant”

*“This treatment plant commenced operation in 1916 and has been progressively enlarged and upgraded to meet increased demand and higher effluent standards. The structures remain and demonstrate the evolution of sewage treatment technology in the 20th Century. In developing the Bathurst Box and in later research at the site, the NSW Public Works Department in partnership with Bathurst Council enhanced the removal of nitrogen, carbonaceous pollutants, and phosphorus without using chemicals. Adoption of this treatment system has improved effluent quality and produced significant economies in the construction and operation of sewage treatment plants in New South Wales, interstate and overseas.”*

### 1.3 About the Current Plant

Bathurst has a population of about 35,000, has approximately 350 kilometres of sewer pipeline and 15 pumping stations which deliver the sewage to the plant. The flow into the plant is approximately 10 ML/day and of that 20% is recycled water. About one third of the inflow is from trade waste installations.



**Figure 1:** Bathurst Wastewater Plant in 2004

The plant is run by four operators and a Laboratory manager who keeps us in line. On this basis, I'm fully staffed about three days a week seven months a year and this is only counting RDO's and Annual Leave., not sick leave or training.

The plant operates very well and last year was over 95% compliant with the licence conditions. The main problem impacting on our compliance is the Algae in the ponds which affects our Suspended Solids results.

The Aerobic sludge output is about 150T/wk and it is transported to a contracted site and reused as fertiliser. The farmer has very good results from not only the nutrients in the sludge but also he has gained out of the water content and microbes as well. Following are a few problems faced at the Plant from time to time.



**Figure 2:** *Issues caused by Bathurst floods*

## 2.0 PLANT AND PROCESS UPDATES

I arrived on the scene in 1982 and at the time, the plant had three settling tanks two trickling filters two clarifiers, the sludge lagoons, digesters and the effluent was chlorinated before went into the river. Accompanying this was the infamous Bathurst Box. When I arrived they were in the last stages of upgrading the plant with a new screening section, grit collection system a lift station and four more Bathurst boxes and some catch ponds which were designed to flow over a pipe into the river.

After a few weeks on the job, I started to learn a bit a bit more about sewage treatment, and the way it was supposed to work. These were the good old days before testing - if the effluent looked good it was good and if it wasn't you just put another aerator in.

### 2.1 Screening and Grit Collection

After a while, the engineer said we are going to start the New Inlet works and Lift pumping station. We all got a 10 minute lesson and were told not to worry as everything is automatic. So another lesson was learnt, nothing is fully automatic and this still applies today. Keep in mind these were the days before computers when life was less in a hurry and we knew very little about those things called nitrates and phosphorus.

We sorted out some problems with the fully automatic inlet works. The pumps were oversized and they would pump 375 L/s for about 2 minutes and then nothing for the next 10 minutes. This caused a few problems trying to run the plant. After a while we found out there was a controller behind that big orange cabinet which would run our grit collection system when we wanted it to. I didn't realise it at the time but this was my introduction to the computer revolution.

## **2.2 Sludge Management**

Next we had to get the other three Bathurst boxes going, so off we went. People didn't understand how much sludge had to be wasted from this type of process and mixed with the sludge from the digester. Four sludge lagoons filled quickly, with sludge going into the first lagoon and supernatant going out the fourth lagoon back to the head of the works.

We started to cart the watery sludge in trucks and tipping it out on the grass at the plant during the summer. This worked for a while but we had to come up with plan B which was to pump it out on a big drying bed. This again worked okay until winter came. Plan C come in effect and this was to mix sawdust with the sludge in the drying bed and this worked. There was only one slight problem with this idea and that was we now had twice as much sludge. Council ended up hiring contractors to empty the sludge lagoons.

In about 1993 we did something about the sludge problem. A sludge holding tank and a building with a 2.5 meter belt press in it was constructed and we hired a truck with the sludge being deposited at the tip.

## **2.2 Phosphorus Removal**

During this time the Public Works Department did regular sampling and found we were getting low Phosphorous levels from the Bathurst boxes built last. They wanted to find out why. Naturally, I informed them that we were just good operators and we knew what we were doing. I cannot repeat the words they used but at the end of the day they didn't believe us. What they found in their testing is the mushroom shaped diffusers left dead and unmixed sludge in the corners of the tank and these made ideal conditions for the growth of the right bug for Phosphorous removal.

At the end of the day, the boxes couldn't take the load they were designed for so we had another update and diffusers were installed. Next up, we were informed that the Trickling Filters were going to be updated with all the flow to be put through the sedimentation tanks and then the five Bathurst Boxes. The new centre columns and arms were installed, but the final phase was not implemented as they were worried about there were concerns that not enough strength in the sewage going to the tanks would not make them work.

Once again everything was cruising along until a new wastewater engineer come along and the next thing we were involved in a Pilot scheme with a container size tank which was designed for small towns while they connected to the sewage system.

We ended up with this so called Fully Automatic tank with communications back to head office and we were told we would have very little to do with it. Yeah right! We had more problems with their automatic system than the rest of the plant.

## **2.3 Biological Nutrient Removal**

The next trial was with something called Biological Nitrogen Removal and it was going to be done in a container sized tank with a couple of cells on the side. This time we did have a lot of help from a lot of people who knew a lot about what supposed to happen in the tank and we did learn a lot about the process. One of the problems we had with this container arrangement was that the whole tank was mild steel with a coat of paint on it.

Naturally everything started to rust, especially the flow division and at the last few months

of the experiment the flow was controlled by a house brick.

This trial led us to another upgrade. It included modifying the Bathurst Box and basically three cells with mixers were built in front of it, a couple of Return Activated sludge pumps and a Pre-fermenter Tank and a Laboratory were built as well.

Once the modifications were done and I thought they didn't do a bad job as we had back-up pumps and everything was sized right nearly. The Pre-fermenter was not used at this stage as we were getting good results with out it as the sewage at that time was very strong and it produced the right conditions for a BNR Plant. Also we were blessed with a computer to run the tank and I don't know what was worse me, trying to get the tank going or them trying to teach an old dog new tricks with this thing called a computer.

This was all overcome eventually, as my hair went greyer and I learned a few more words which mostly described the computing system. But at the end a lot was learnt from this experiment and we were getting Phosphorous results below 1 mg/L all done biologically. Although the results were good, we had a problem with the mixers stopping as they were continually being fouled by rags. This problem was shown to the right people and we then had another upgrade of the Inlet works screenings which was a bit of a problem as the plant has not been set up for a proper bypass.

We ended up with screenings and grit through the works for a couple of months, and this causes problems through the whole plant. After doing trials for a year or so plans for the next upgrade were provided which were for two 17,500 EP size tanks to be built with chemical back-up, new catch ponds and an Ultra Violet Disinfection unit. I did a couple more calculations and informed the powers to be they would not have enough sludge holding capacity. Naturally they said my figures were wrong. A couple of months later they built another sludge holding tank.

## **2.4 More Sludge Issues**

In about 1997, the new boxes and accessories were built and all flows were directed to the modified Bathurst Box and the new 17,500 EP tanks. The four boxes we were using were taken off-line. As with most updates, there are the usual design problems with pump sizing but you have to live with it. The chemical dosing pumps wouldn't pump the last 10,000 litres of Alum out of the tanks as the pumps were higher than the level of the last half of the tank. We ended up putting a header tank in.

We learnt to live with all the problems with the design but the sludge problem came up again. Too much sludge was fixed by making one of the Bathurst Boxes a sludge holding tank which increased the sludge age - another good thing. After a while they realised we need another upgrade in the sludge dewatering section.

So lots of joy here we go again, another update. They installed a DAF, a second belt press and a sludge hopper and a weighbridge. As usual the design wasn't quite right and the wrong type of sludge conveyor was installed. We still have this problem today. After this it was all quiet again until the wastewater engineer contacted me to say we are going to do another trial with two of the empty Bathurst Boxes.

## **2.5 A New Process Considered**

The idea was to feed sewage in over the whole floor of the tank instead of one spot. The tank next to it would be fed normally so we could compare the two. The plan was to

aerate for a while with no inflow and then turn the aerators off and turn the flow on. This could achieve really good results with low nutrient levels. I thought at this time he had gone to one to many seminars, as it was completely the opposite way to what we were taught. This way of treating sewage as far as I know hadn't been done before so a design for the pipework had to be done. My current boss was roped in to do that and we went along with the crazy experiment. We fired it up after we completed all the pipework and started to do some testing.

To my amazement what he said was right (that reminds me I must tell him one day that he was right). We kept the tank going for a few years and we ended taking it off-line as it had one major fault. This was that the pipework feeding the bottom had 25mm sized holes which kept on blocking up with screenings.

## **2.6 Aerator Maintenance**

Late last year one of the operators found rust on the arms of the aerators on the tanks we are currently using while giving them a hose down. Now we have problem with rust appearing on the three arms on the 16 floating aerators on the two 17,500 EP tanks. The galvanised arms are joined to a Stainless Steel Pontoon with no shield between the two different metals. Finding someone capable of replacing the Aerator arms safely was the first problem, as the original manufacturing company didn't exist any more. We made up two spare sets of arms and we would replace two aerators at a time. The sets they removed would be taken away, remodelled and regalvanised.

The day came to replace the aerator arms by lifting the pontoon high enough out of the water with a crane and with a smaller crane they would remove the aerator arms and put the new one on. We lifted the first aerator up and got our next surprise that the aerator stirrer was only partly there as Liquid Alum was eating the metal away.

We decided to get the arms rebuilt. At the moment we have one aerator off-line from each tank which is causing problems with Ammonia. It would be wise to check the aerator arms on your floating aerators if you are starting to lose the Dissolved Oxygen in the tank for some unknown reason like we were. Also, any new tanks should have a sump hole in each and make sure they slope the floor to the sump hole not away from it.

## **4.0 CONCLUSION**

What does the future hold for Waste Water Treatment Plants? I see more technology being thrown at us and the EPA laws becoming even more stringent. For old dinosaurs like me it's only going to get harder. The water will have to be treated to a higher quality and you will need to be a water and sewer operator at the same plant.

To any of you older operators out there, yes it is possible to teach old dog new tricks. I'm thinking of retiring in the next couple of years but perhaps I should re-apply for the job again. I've fixed most of the stuffups at the plant over the years so the next supervisor will have too easy of a job.