

FILLING OF TOOWOOMBA'S SURFACE WATER STORAGES AND THE ASSOCIATED IMPACTS ON THE MT KYNOCH WTP



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*36th Annual Qld Water Industry Operations Workshop
Clive Berghofer Recreation Centre, USQ, Toowoomba
31 May to 2 June, 2011*

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ABSTRACT

On the 10th of January 2011 Toowoomba Regional Council Toowoomba water storages Cooby, Perseverance and Cressbrook overflowed for the first time in 10 years, causing a significant change in raw water quality. This paper presents what associated impacts the change in quality of the raw water had on the Mt Kynoch WTP.

The following areas that will be covered are:

- WTP overview and process used
- Water quality before fill event and combined dam levels
- The filling event of the 3 dams and damage caused by the floods to infrastructure
- The water quality after fill event and the impacts on the WTP process.

1.0 INTRODUCTION

For over 10 years the Mt Kynoch WTP has been lucky to receive good raw water quality from our three surface water storages, Cooby dam, Perseverance dam and Cressbrook Dam. The Mt Kynoch WTP has been running contact filtration 80% of the time and only using low doses for chemical applications. It had no real issues in supplying finely tuned product to the consumers of the Toowoomba water network.

In early January of this year a one in a hundred rain event changed the quality that was has for many years into a poor quality from our 3 surface water storages which would change the wtp process quite significantly.

2.0 WTP OVERVIEW

The Mt Kynoch WTP is a 68 ML/day capacity plant can a maximum flow of 740 L/s with our Perseverance/Cressbrook main and Cooby main on. The WTP is conventional and contact filtration process plant with average flows of 160l/s to 200l/s during the day and higher flows during the night from 250l/s to 400l/s. The primary coagulant is a poly aluminium chloride or magnasol 589 from BASF chemicals. Aluminium sulfate and hydrated lime plants decommissioned due new chemical. The WTP uses a Pre and Post CL2 and a backwash recovery tank which pumps sludge to a balance tank and discharges sludge to sewer at low rate and two lagoons to settle out sludge from settling tank draw off valves and polish recovery water before injection back into head of plant. Plant also has fluoride and PAC dosing systems from prominent.

3.0 WATER QUALITY BEFORE EVENT AND COMBINED DAM LEVELS

Before the January 10th event the WTP raw water quality had been very good for a long time. The treatment plant had run in contact filtration 80% of the time unless there was a main scour higher flows through the raw water main or if there was high Fe and Mn bloom in the raw water sources then conventional treatment would be used during that period. Our coagulant dose rate at that time was always 3.2 mg/L to treat water to <0.2 ntu.

Our three surface water storages Cooby, Perseverance and Cressbrook dams got down to

combined lowest of 7.7% and the average raw water turbidity was from 1 ntu to 10 ntu with a colour of <n 15 Hu. Also during this period we used one of our sludge lagoons as a polishing lagoon to knock down the supernatant turbidity before coming back up to head of the plant and our other sludge lagoon was used for the sludge from our settling tank sludge draw off valves and also as a emergency if lagoon if we had rush through consecutive backwash's after each other as the recovery tank can only handle one backwash at a time.

4.0 FILLING THE DAMS AND FLOOD DAMAGE TO INFRASTRUCTURE

On the 10/01/2011, Toowoomba and the surrounding areas had a 1 in 100 event from heavy rain which brought our dams to over 100% and overflowing all at the same time large amounts of water which changed the water quality significantly with high colour and turbidity stirred up in all three dams. Other issues that happened that day were through the city were major damage was caused to city trunk main that crossed over the Gowrie creek and the flooding out some of the city's bore stations which are situated near our east and west creeks. There was also significant loss of volume from our WTP plants 3 storage reservoirs losing over 20 ML of treated water going down into creek due to western trunk main break. So we had to step up production through the plant to catch up that water that was lost and get residents water back on.

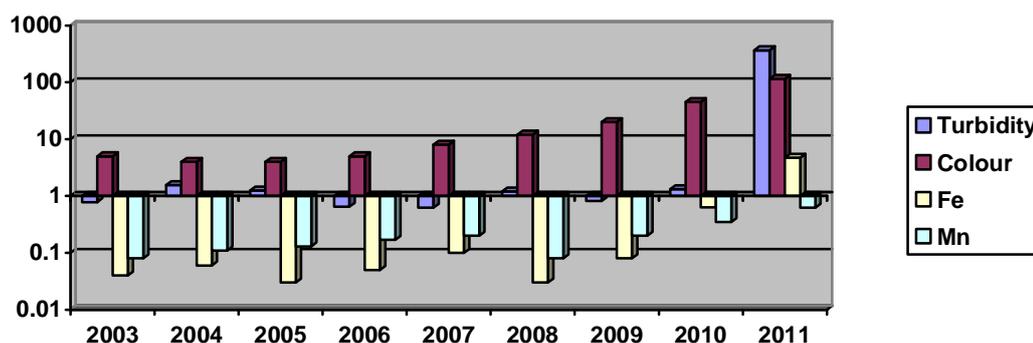


Figure 1: Average Water Quality Results

5.0 WATER QUALITY AND THE IMPACTS ON THE WTP PROCESS

After the January 10th the operators at the WTP noticed significant change in the quality of the raw water. Turbidity's went to 160 NTU to 850 NTU and colour went to 90 Hu to 160 Hu depending on which dam was our source and the dams were still overflowing. The operators made the quick decision to move to conventional treatment with high colour and turbidity and also high Fe and Mn was starting creep up as well. So the operators did some jar testing to decide on a good dose rate to start doing with and decided that 55mg/L from our original 3.2mg/L was the rate that was needed to treat the water to <0.3 NTU. Over the alkalinity in water was dropping of rapidly and lime dosing of pre lime as the coagulant could not form the correct size floc and luckily for the operators that we had recommissioned the plant a few months before to make sure everything was in working order if we were to fill the dams. So the lime was dosed immediately at 15 mg/L to get the alkalinity back over 50 mg/L. for the coagulant to work.

With the lime being of for so many years the remaining 8 tonnes of lime in the silo became very compacted and had to constantly be hit with the arch breaker hammer to keep lime

feeding out through screw feeders, because if it didn't it would after about 15 mins to turn the coagulant from working properly and forming the correct size floc which would cause a lot of floc carry over in the settling tank which would result in high turbidity waters in the filters and HACCP non-conformances for the plant.

With such high colour and turbidity waters coming in were also removing large amounts of solids in the settling tank which caused big problems in the operation of the with the sludge rake consistently jamming with the large amounts of sludge being settling out and being moved. The operators had to take plant offline on 6 occasions with different problems each time from debris getting caught under scrappers, rollers on rake wearing out and the weight for the balance of rake arm weld broke. On the sixth time operators through discussion with fitters it was decided to torque up and change the speed from one revolution in an hour to 2 revolutions in an hour for the rake to move the settled sludge. And this change has been working well with no more trouble with the rake.

The with all the high amounts of solids being removed the operators then encountered another issue was with the storage of sludge from the draw off valves from the settling tank was quickly filling our sludge lagoon, so the operator then had to take offline our polishing lagoon and use it as a sludge lagoon which that lagoon quickly filled as it was half the size of the other sludge lagoon. Through much discussion between operators a plan was thought up to try and remove sludge from the lagoons, as the operators could not afford to take lagoons offline to dry and desludge, so a high head yakka pump was hired from Coates Hire to pump up 15m head up to two old lagoons at about 27 litres a second which now has given us more room in our lagoons for storage.

6.0 CONCLUSIONS

During this period, even though the operators worked long days and nights on certain days, the operators gained a lot more knowledge and experience on what is needed to produce good quality drinking water after such a big rain and flood event that went into our 3 surface water dams. They were able fully test out the primary coagulant as it was never tested to these kind of water quality since being introduced to the plant back in 2003. And now the operators know the plants ability with the settling tank issues and can know be implemented further down the track when fill events occur again. Further more a new sludge thickener facility is to be built towards the end of 2011 which will incorporate the settling tanks draw off valves, so that in the future the sludge lagoons should not be needed to be used and will be empty for emergency use only which will help the operators more in there day to day operation of the WTP.

7.0 ACKNOWLEDGEMENTS

Special thanks to the Water Operations team and Marcus Boyd from water infrastructure asset management for their help and assistance.