OUT WITH THE OLD AND IN WITH THE NEW- THE UPGRADE OF THE YOUNG SEWAGE TREATMENT PLANT

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1.0 INTRODUCTION

It was out with the old and in with the new when Young Shire Council recently completed an upgrade to its Sewage Treatment Plant (STP). It was back in 2007 when Council initiated the process to upgrade the STP with a draft concept design. After five years of consultation with NSW Public Works the final design was accepted in January 2012 for the treatment works and February for the recycled water scheme (RWS). Council was granted funding of $1.5M for the RWS by the Federal Government under the *Strengthening the Basin Communities* program and a 25% subsidy from the NSW Government under the *Country Town Water Supply and Sewerage Program*.

The upgrade was originally two separate contracts but was later combined into one contract to save costs, time and management of the contractor. The project was programmed for fifty two weeks construction however with some slight delays was completed in sixty eight weeks. Over the course of the upgrade there were a few tribulations that arose both expected and unexpected. This paper will discuss the background of the old plant, the new plant, complications that were faced, a comparison from the old to the new and how parts of the old plant were recycled to become parts of the new.

2.0 The Old Trickling Filter Plant

The old trickling filter plant was beyond its last legs of operation. The plant was constantly being patched as parts were breaking down or being corroded from age. It was apparent that if the town received over 15mm of rain in a short period of time the plant would over flow. The detention time in the digesters was reduced to somewhere around three days due to grit build up and the undersized capacity of the overall plant for the town.

The original Young trickling filter plant had been designed to treat between 3,500 to 5,000 EP. It was commissioned in 1938 with a minor upgrade in the 1970's which included an inlet channel and flume with bar screenings, flow meter and a comminutor. A storm water balance tank was also installed with four submersible pumps to deliver flow up to the Imhoff tanks and sedimentation tanks. To cater for the extra flow an additional sedimentation tank was added including a separate pipe across to the dosing channels for the effluent and a valve in the tank to drain sludge off the directly into the No.1 Digester.

The two digesters were originally used as number 1and number 2 with supernatant drawn off at different levels from the number 2. In the early 1980's the energy authority of NSW provided funding to install solar heating panels which ran water up through a header tank, then through the panel and into a boiler room which was controlled by a sundial. The sundial would turn the solar panels off when there was insufficient sun to heat up the water and turn a diesel boiler on to keep heating the water which was added to the number 1 digester into a set of six horse shoe like pipes and back around into either the boiler or the solar panels.
An additional humus tank was also installed to divide the flow coming from the trickling

filters between two humus tanks. The new humus tank had a sludge wet well with a submersible pump in it so they could return activated sludge back to the head of the works. Sludge from the number 2 digester was either pumped into the drying beds in the summer or into two sludge lagoons in the winter. Effluent was gravity fed to tertiary ponds for further cleaning with natural UV.

During the 1990's and early 2000's the Young Golf Club committee and volunteers installed a pipe line and pump from the outlet of the tertiary ponds to pump effluent to the golf course. This has since been upgraded and is still used today from the new works, irrigating the whole course.

Towards the end of the old work's life a new sludge lagoon was constructed to accommodate the start up process of the new works. During the process of demolition and construction, any old sludge from the old works that had been stockpiled over the years was removed off site after it was tested to be used as biosolids by YLAD for agricultural use.

During the process of demolition asbestos was encountered in parts of the old plant that we had removed. Part of the demolition required the trickling filters media to be disinfected with chlorine and stockpiled onsite with the sun doing its job to help clean the media as well. The media was then used at a later date to help beautify the surroundings.

Problems with the old plant were many but some of them were odours, not enough detention time of sludge in the digesters, inflow during wet weather and of course there were some major site work health and safety issues and old age in general.

Sampling and testing was only done from the tertiary ponds once a month. These were only samples sent to a lab with no operational testing done onsite.

Figure 1: ***Young's Trickling Filter Plant built in 1938.***

3.0 The New IDEA Plant

The upgraded treatment plant is designed as an activated sludge system. The plant process consists of the inlet; IDEA reactors; effluent balance tank; a disinfection system comprising of UV and chlorination; chemical dosing of alum, caustic and chlorine and sludge handling and dewatering system. The design plant load is 12000 EP with an average dry weather flow of 223L/EP/day. The inlet caters for screening >5mm and consists of a grit removal for 0.2mm. The inlet flow is recorded by flow measurement through the flume and also has a flow diversion for flows that exceed 412L/s that is bypassed to the effluent ponds.

The activated sludge process comprises BOD removal; suspended solids removal; nitrogen removal through nitrification & denitrification; intermittently decanted extended aeration cycle and sludge age. The IDEA reactors are activated bio-reactors producing secondary treated quality effluent. The tanks are fed from both ends to minimise short circuiting. The tanks can conduct full treatment for up to three times average dry weather flow (ADWF) and partial treatment for up to seven times ADWF. Typically, the IDEA tanks complete 8 cycles a day consisting of aeration, settling and decant.

Chemical dosing of alum for phosphorus removal and caustic for pH control is dosed into the IDEA tanks. The effluent is disinfected by UV, this can operate at full treatment up to 118L/s and partial treatment for flows up to 300L/s. Liquid sodium hypochlorite is then dosed into the effluent utilised for reuse into the rising mains. There are three sludge lagoons onsite which can be used periodically throughout the year with one being filled, one stabilising and one ready for dewatering. With the new plant came a more extensive regime of testing and monitoring. Onsite testing includes mixed liquor suspended solids, depth to sludge blanket, pH, and phosphorus, nitrates, ammonia and suspended solids.

Over the course of the construction Council, along with Leed Engineering (Contractors) agreed to share costs to get aerial photographs taken of the job each month. The aerial photos not only proved to be a worthwhile asset as a record of the upgrade but also an important source of information to Councillors and the community to be able to see how the works were progressing without having to interfere with the worksite.

Figure 2: ***Young's IDEA Plant March 2014.***

4.0 Complications in the upgrade

An expected complication that was faced during the upgrade of the plant was the decommissioning of parts of the old plant whilst operations continued. In order for the upgrade to continue the original sludge lagoons had to be decommissioned to allow for construction of the IDEA tanks and balance tank. Council predicted this complication and built an additional lagoon to enable operation of the existing plant to continue whilst sections were decommissioned. The new lagoon allowed for a smooth transition from the old to the new and also for an onsite disposal all of the old "left overs" from when the plant was decommissioned such as the sludge and grit from the digesters. Whilst the lagoon has provided an adequate disposal point to allow it to digest, it has been a bit of a sore point for the community as it is still active and very malodorous which at times can be smelt offsite. The benefit of the pond is that it will provide an area to receive septic waste in the future.

The project also had a few unexpected site complications to deal with. These included subsoil leakage under the old lagoons and also into one of the IDEA tank, granite rocks in one of the IDEA tanks and the road and a much larger than expected volume of unsuitable material that had to be excavated from the site.

Substantial leakage into the soil from the sludge lagoons and drying beds resulted in the substrate being contaminated with organic matter making it unsuitable for construction. This resulted in 2800 tonnes of soil being removed, stockpiled onsite and replaced. Previous boreholes and geotechnical reports had not discovered the unsuitable material. Whilst Council expected there to be rag pits and some biosolids disposed of on site the amount that was discovered was well beyond what anyone had estimated. It was evident that over the past 70 years not much waste had been taken off site.

Leakage into IDEA tank number 1 from an underlying water table resulted in pre-emptive measures being tank to ensure the construction of the tank and program would not be affected. The water leaking into the tank whilst not fast was enough to concern designers and the contractors. A subsoil drainage system was installed along the extent of the problem area with two inspection and suction points to remove any build up of ground water.

Granite rocks were common in the area and during the course of construction only two caused problems to the project and program. One was in IDEA tank number 2 which was situated in the corner of the tank slowing down construction as a 22 tonne rock hammer was brought in to cut out the required amount of rock. The second rock was found within the roadway at the entrance of the STP and was within the alignment for the trunk main coming into the plant. The 22tonne rock hammer however was not able to break through the rock. In order to keep construction on time and to keep costs down Council opted for a realignment of the main to go around the rock and raising the road slightly.

5.0 A comparison of the old and new works

The operator's job description and role at the STP has changed with the upgrade of the plant. The old plant was a "hands on" run plant. Everything was manually run by the operator. The new works is completely electronic with minimal manual operation. Technology has enabled the plant operator's role to change from one of labour to a scientist and observational role.

No longer does the operator have to manually turn on valves or remove stop boards or

screenings. All of these functions are now run electronically through the SCADA control system. The operator can now look on screen and see how each stage of the plant is running and if there are any faults. Electronic alarms safeguard the equipment limiting the damage caused if a fault is detected. Not only does the equipment have alarms for faults but also for maintenance purposes. The old plants motors and equipment maintenance schedule was estimated and done on an as required basis.

The biggest challenge for our operators has been the testing. The old works required no onsite testing. The new works requires constant monitoring and testing of the inflow, the decant effluent and the outlet discharge to ensure the plant is running to it optimum capabilities. The operators whilst finding it challenging stepped up to plate and grasped the task by the horns, calling on the Utility Director (Nicole Vonarx) from time to time for assistance with the lab testing and the operations of the plant.

6.0 Recycling the old plant

Due to the nature and condition of the old plant, there wasn't a lot that Council was able to salvage. Many of the structures on the surface had eroded and were dangerous and not of any future use. Any old pumps that were still in good working order were auctioned off. One piece of the old plant that Council were able to recycle was the trickling filter media.

The media once disinfected was stockpiled onsite and left in the sun for further disinfection. As the media is different grades of granite it has now become a valuable source. Council has used the media onsite along batters and banks to help stop erosion and to also limit the amount of mowing. The media once washed came up looking like new and has become a real feature of the STP landscaping. There was more than enough to be used onsite. The remainder of the media remains onsite and will be of use to Council's operations crew who will be able to use the media for many different areas such as rubble drains and bank rehabilitation.

6.0 CONCLUSION

The entire process of the upgrade has been one of education, amazement and gratifying experience for Young's Utility department. The new works has brought about a new confidence in the operators. We can now thank the rain when it comes and not curse it as we know the plant will cope. We now have a plant to be proud of and we can assure the community that our discharge is of great quality and that we are no longer harming the creek. In a town where change can often be difficult especially for large scale projects such as the STP upgrade, Council has never been happier to say out with the old and in with the new.

7.0 ACKNOWLEDGEMENTS

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