MANAGEMENT OF A NEW EP LICENCE AT TANILBA BAY WWTW

Paper Presented by:

Jason Holding

Author:

Jason Holding, *WWTW Plant Operator,*

Veolia

10th Annual WIOA
NSW Water Industry Operations Conference and Exhibition
Newcastle Jockey Club,
6 to 7 April, 2016

MANAGEMENT OF A NEW EP LICENCE AT TANILBA BAY WWTW

Jason Holding, *WWTW Plant Operator,* Veolia

ABSTRACT

This paper will outline the operational limitations discovered within the Tanilba Bay Waste Water Treatment Works (WWTW) from the introduction of new EPA licence limits.
The plant is operated by Veolia on behalf of Hunter Water Corporation since October 2014. As the new licence became effective immediately, an interim management plan was developed by Veolia in an effort to comply with the new licence.

The new licence has required a greater focus on the plant operation. By setting more stringent operational targets to achieve the new ammonia requirement, the operators are monitoring the plant very closely, and making more regular process adjustments. A minor SCADA/ PLC upgrade has provided them with a better control over effluent pump and Ultraviolet disinfection (UV) operation. Alarms have been reviewed and improved to ensure timely response to any issues. Finally, this is supported by increased preventative maintenance and shorter response time to breakdowns to ensure ongoing plant performances.

1.0 INTRODUCTION

The Tanilba Bay WWTW was designed and built in 1993 by Public Works to serve the communities of Lemon Tree Passage, Mallabula and Tanilba Bay in the Newcastle region. The treatment process consists of removal of screenings using a rotary screen, biological treatment through Intermittently Decanting Extended Aeration (IDEA) and UV disinfection. The effluent is then discharged to the environment through a series of four sand infiltration ponds and eventually into Tilligerry Creek.

The plant currently treats 1.27 ML per day and can handle wastewater from a population equivalent of 10,000 EP. It has been operated by Veolia on behalf of Hunter Water Corporation since October 2014 through an operation and maintenance contract.
The EPA released a new licence in November 2014, enforcing tightened licence conditions.

As the licence became effective immediately, an interim plan was developed by Veolia in an effort to comply with this new licence. This involves a mixture of preventative activities, control improvements, additional process monitoring and close management of yearly dewatering activities. This paper will outline the interim plan developed for the management of these new licence conditions and suggests further upgrade requirements.

2.0 DISCUSSION

Tanilba Bay WWTW is located close to Tilligerry Creek, where renowned Pacific and Sydney rock oysters are farmed; and where professional licenced fishing is a major industry.

The plant discharges to infiltration ponds to minimise discharges that may affect the oyster farm. An upgrade added Ultraviolet Disinfection (UV) in an aim to minimise Faecal Coliform in the discharge at the outlet of the plant.

2.1 New Licence Conditions

In November 2014, the EPA issued a new licence imposing new 90%ile and 100%ile ammonia limits, based on monthly sampling, as shown in the table below. The EPA is also looking to enforce new enterococci and faecal coliform limits.

Table 1: ***Comparison of New and Old License Limits***

Analyte	Old licence until Nov 2014		New licence from Nov 2014	
	90%ile	100%ile	90%ile	100%ile
Ammonia	-	-	3	5
BOD	35	45	35	45
TSS	55	70	55	70
pH		6.5 – 8.5		6.5 – 8.5

Historical performances of the plant have shown there would have been regular exceedances of the new 100%ile limits, when past weekly samples are considered. This is displayed on the graph below compared to the new licence limits.

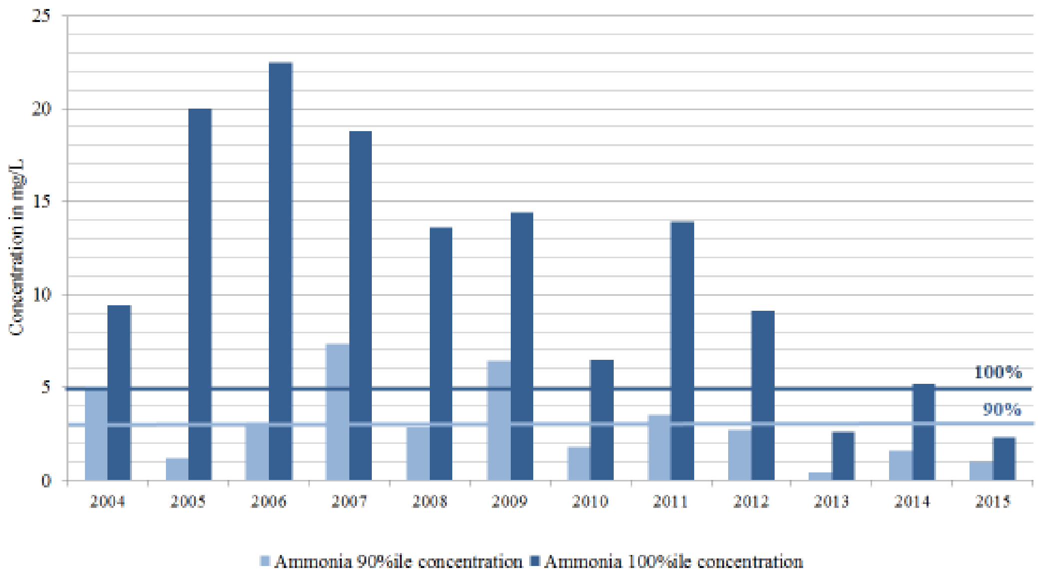


Figure 1: ***Tanilba Bay WWTW Historic Effluent Ammonia Concentration***

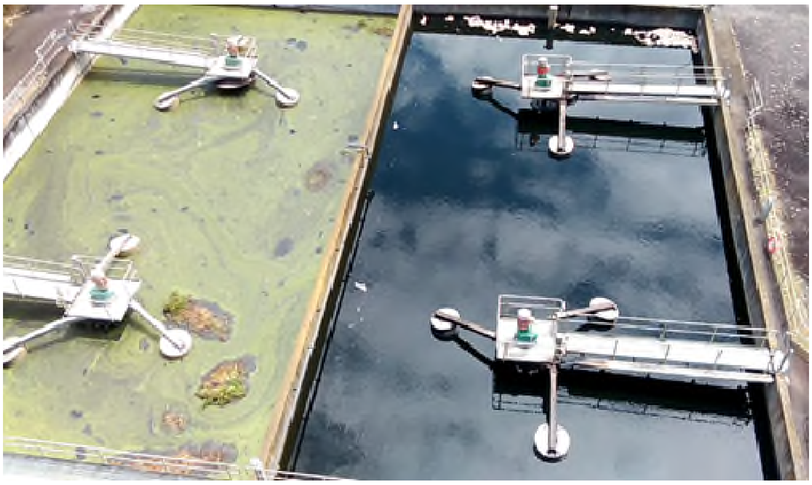
It should be noted that until 2012, septic waste tankers were discharging at the plant. They were having a substantial impact on plant performance with respect to ammonia removal.

2.2 New Ammonia Concentration Limit

Existing challenges at the plant to achieve new ammonia licence limits

Operators are based at Boulder Bay WWTW (50 to 60 minutes away) and visit Tanilba Bay WWTW 3 times a week; or more often if operational issues occur. Based on the existing challenges, a lot of manual intervention and process follow up is required to ensure correct treatment of ammonia and nitrate. The very manual nature of the plant makes this challenging, as a lot more attention is required at Tanilba Bay WWTW due to the new licence limits. Several challenges can prevent the plant performing as required due to intrinsic capacity limitations at the plant.

In June/July 1997, the sludge lagoons were irreparably damaged due to very heavy rainfall and subsequently a high water table. Given that the plant had additional existing capacity, the immediate solution was to use one of the IDEA as a sludge holding tank, until a new sludge lagoon was constructed. Remediation activities have commenced, with completion expected in 2020. In the context of the new licence, relying on a single IDEA creates a significant reliability issue as no standby arrangement is available in case of a single point failure such as a decant rubber failure.



<u>Figure 2:</u> ***Tanilba Bay WWTW IDEA / Sludge Lagoon Arrangement***

In addition, the plant controls are quite basic. Ammonia is removed during the aerated phase of the IDEA process. Aeration is based on fixed speed aerators running on a timer. A dissolved oxygen (DO) probe is fitted in the IDEA for observation only and does not control aeration. This means that the plant is not well equipped to respond to unusual variation in influent quality under the new licence requirements.

Wasting of Mixed Liquor Suspended Solids (MLSS) is based on run time as there is no flow meter fitted on the wasting line. This does not allow early detection of chokes that can slow the flow, allowing MLSS to build up in the bioreactor. Therefore, wasting control requires visual supervision. A suitable amount of sludge is required in the bioreactor to ensure ammonia will be treated; however, high MLSS will create settleability issues which will affect effluent quality.

Interim management of the biological treatment and ammonia removal

An upgrade is the most effective method to ensure the new 100%ile limits can be reliably met, which as previously discussed will take some years to design and build. In the meantime, Veolia have devised the following interim management plan in an effort to meet the new requirements despite the plant limitations.

A risk assessment identified that several single point failures would likely result in an EPA licence breach. This is the case for decant mechanism failure, including decant rubbers failure, motor and gearbox failure. Such failures would mean that either sludge would be sent to the catch pond, or influent would have to be stored while the repair is taking place. Higher than usual ammonia levels could be experienced when the plant restarts. Also, an aerator failure would result in high ammonia in the effluent. Dewatering of the sludge holding tank once a year adds additional ammonia load to the plant, putting excessive ammonia load through the plant that would be better managed by two IDEAs.

Veolia has based its strategy on increased monitoring, improved alarms, preventative maintenance and management of dewatering activities.

<u>Figure 3:</u> ***Veolia's Strategy to achieve Improved Plant Performance***

First of all, the operators are monitoring ammonia and nitrate effluent concentrations three times a week to identify any process deviation early and make changes to aeration patterns as required. If the ammonia concentration increases, aeration time is increased slowly, to avoid losing denitrification. The external laboratory provides results for MLSS concentration weekly and the operators ensure that the wasting is adjusted based on the results to maintain the required sludge concentration and sludge age targets.

After review of the alarms on site, it was found that the priority of the alarm for WAS pump failure was not sufficient to support effective response, and this has since been resolved.

Maintenance reviews were conducted on all Hunter Water sites operated by Veolia to minimise the risk of an EPA licence breach due to asset condition and to assist operations to meet the EPA licence limits. These reviews were based on a structured and documented approach and provided the basis for the preventive maintenance schedule and spare parts requirements. As an outcome, a spare IDEA decant rubber was purchased and is now kept locally.

Plant operation during dewatering

Dewatering of the sludge holding tank happens once a year on average using a mobile centrifuge. The centrate return from the centrifuge adds additional ammonia load to the plant. Experience has shown that ammonia concentration in the centrate can be around 200 mg/L, which is 5 times more concentrated than the influent. Careful monitoring and adjustment of the plant is required during dewatering. A number of improvements were undertaken to cope with the dewatering based on the new licence.

Sludge dewatering is now scheduled based on plant operations. Monitoring of the sludge holding tank filling is done monthly, and the schedule is readjusted accordingly. As Tanilba Bay is a tourist destination, dewatering must be carried out before summer and peak system loading. During dewatering, the operators monitor ammonia and nitrate daily in the IDEA, catch pond and the final effluent.

The plant parameters are adjusted based on these results; wasting is decreased progressively to cope with the additional load.

During dewatering activities, aeration is progressively brought up by 30% as required based on the onsite ammonia testing. This is done in small 5 to 10% increments, to avoid losing denitrification, and a new change is only made once the daily test results have been carried out.

The centrate used to be returned directly at one end of the IDEA, and therefore was unevenly distributed through the IDEA. The centrate is now redirected to the inlet works, where it mixes with the influent and splits to each end of the IDEA to be distributed evenly. Special care was taken to position the centrate return at a location where inlet flow measurement would not be affected. The ammonia results significantly improved after this small change.

2.2 Future Faecal Coliforms Licence Limits

Existing challenges at the plant to achieve future Faecal Coliforms licence limits

The UV treatment system has limited control and alarms for the operators to respond to potential issues. The UV lamps operate at 100% dose at all times, and there are difficulties in achieving the UV design limit of 150 CFU/100mL FC. As such, it appears it may have been undersized.

The UV is fed from the catch pond by a multistage effluent pump. The effluent pump was fitted with a VSD that could only be controlled locally by a licenced electrician. As a result, the pump was not responding automatically to changes in flow. Subsequently, the catch pond would overflow at the same rate as the decant flowrate, hydraulically overloading the UV.

The UV is controlled by a local control panel. Feedback from this panel to the main SCADA used to be very minimal leading to erratic performances. This made it difficult to respond to alarms at night given that no remote reset was possible and limited information was provided in the alarms appearing on SCADA. In normal operation, there was no feedback on SCADA to confirm that the UV was operating.

Finally, the channel downstream of the UV is an open channel that allows weed growth. The compliance sample location is collected in a distribution chamber to the ponds, and is located directly downstream of this open channel. This growth in the channel and the distribution chamber may affect Faecal Coliform results.

The improvements to UV disinfection

Veolia, in conjunction with Hunter Water, recognised the need to improve the control and feedback to SCADA for the effluent pump and UV. A workshop was organised between Veolia and Hunter Water to scope out the required changes.

The effluent pump control was automated based on operator adjustable flows for different levels in the catch pond. For example, the pump is run at 35 L/s when the catch pond level is between 55% and 70%.

The pump run time has been increased 2 to 2.5 times, whilst the flowrate has been decreased by the same amount. As a result, the retention time through the UV is now a lot longer, improving disinfection performance.

As part of the control table, a minimum flow set point for each frequency has been set. A high priority alarm is raised if the minimum flow is not achieved to detect possible pump chokes. In addition, if storm mode is triggered in the IDEA, effluent pump control is operated at the operator adjustable “storm mode speed”. This is typically set at the maximum pump flow.

UV control was improved by linking the local control panel to the main plant PLC, and bringing detailed information and alarms such as individual lamp operation, intensity and dose to SCADA. The SCADA display was also improved. The UV now has basic features such as the ability to remotely adjust the target dose, as well as set points to start and stop the assist bank.

Veolia has altered the preventative maintenance schedule to include cleaning of the downstream channel fortnightly and to drain and clean the distribution chamber monthly (or more if required). Additional monitoring was added directly post the UV to assess the impact of the contamination downstream of the UV which confirms that performances immediately downstream of the UV are better than in the distribution chamber.

3.0 CONCLUSION

The new licence has demanded a greater focus on the plant operation. By setting more stringent operational targets to achieve the new ammonia requirements, the operators are monitoring the plant more closely, and making more regular process adjustments. They also have better control over effluent pump and UV operation, and have improved alarms to ensure timely response to any issues. Finally, this is supported by increased preventative maintenance and shorter response time to breakdowns.

However, to consistently achieve the licence conditions in the medium to long term, a number of CAPEX upgrades are required. From a biological treatment point of view, increased control is required to better respond to load variations. As a minimum, the upgrade should implement automatic aeration control. Aerators need to be fitted with VSDs with speed controlled by multiple DO probes. Ideally, online ammonia and nitrate probes would help early detection of process deviation. Control of the IDEA storm mode should also be reviewed.

Finally, extra capacity and redundancy could be addressed by reinstating the second IDEA, and constructing a new sludge holding tank. A standby effluent pump would allow more consistent flow to the feed UV, reducing the frequency of catch pond overflows. This would require a full redesign and upgrade of the effluent pumping station. An upgrade of the UV is required in the event that faecal coliform limits are applied, as the UV appears to be undersized and does not have standby capacity.

4.0 ACKNOWLEDGEMENTS

I would like to thank the following people for the support and help for allowing me the opportunity to present this paper and taking the time and trust in allowing my input working together in achieving the new limits with the Tanilba plant limited controls:
Marie Jourden, Paul Coffey, Liam Kilcullen, Brock McPhee, Paul Dixon from Veolia and Mark Bucci, Angus Seberry, Bob Jennar, Steve Marks and Steve McAleer from Hunter Water Corporation.