

# **CASE STUDY: BIO-AUGMENTATION OF DRU POINT WASTEWATER LAGOON AT MARGATE, TASMANIA**



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## 1.0 INTRODUCTION

The Dru Point wastewater lagoons are located at Margate in the Municipality of Kingborough, Tasmania.

Kingborough is located south of Hobart with Margate situated as a satellite township around 10 km below the main Civic Centre of Kingborough.

## 2.0 PLANT DESCRIPTION

Margate is a township of approx 1500 persons connected to the treatment plant. The current median flow is 0.31 ML/d and is projected to increase to 0.57ML/d in 2010 and up to 1.4 ML/d by 2030. These figures indicate that the Margate catchment is growing very quickly and council have to look at short term and long term augmentation to optimise the performance of this plant. Currently the Effluent from this plant is discharged into the mouth of North West Bay River that is very shallow with the outfall only 30m long.

The plant consists of:

- Mechanical screen with 6mm aperture holes.
- Mechanical dewatering of screenings and offsite disposal to landfill.
- Lagoon treatment system consisting of a 10m x 50m aeration lagoon, 90m x 50m primary lagoon and a 100m x 50m secondary lagoon (divided in two). The lagoons are nominally 1.5 m deep with clay-lined base and sides, and a concrete wave margin.
- The lagoon cells are separated with a combination of sheet piling and poly vinyl hung curtains. All flow between lagoons is via overflow weirs.
- First stage of the primary lagoon is fully aerated with 4 x 4 kW aspirator aerators.
- The second stage of the primary lagoon has 1 x 4 kW aspirator aerator to reduce solids settling in dead zones and to reduce algae growth.
- The secondary Lagoon is in 2 zones to reduce algae growth and for disinfection from UV (sunlight and wind action).

The lagoon system has not performed very well for the last 12 months. The average results month by month are shown in Table 1 and indicate the plant's performance.

We were having trouble controlling algae and sludge settling in the primary lagoon. The sludge was floating to the surface and the wind was pushing it into the corners of the lagoon where it was causing an odour source.

We tried a mixer aerator with some success but this only seemed to move the problem around. The lagoons are surrounded by a dog exercising area and a community park with b-b-q facilities. The nearest house is only 200metres away and odour complaints were becoming frequent (about once a fortnight depending on wind direction).

The floating sludge was contained in the primary lagoon as the outlet is protected by an overflow weir.

**Table 1:** *Treatment Performance Results Oct 2007 to Sep 2007*

| <b>Date</b> | <b>BOD (mg/L)</b> | <b>TSS(mg/L)</b> |
|-------------|-------------------|------------------|
| Oct 06      | 64                | 74               |
| Nov 06      | 57                | 59               |
| Dec 06      | 69                | 92               |
| Jan 07      | 54                | 63               |
| Feb 07      | 47                | 48               |
| March 07    | 79                | 89               |
| April 07    | 77                | 38               |
| May 07      | 53                | 63               |
| June 07     | 56                | 52               |
| July 07     | 53                | 49               |

*(License conditions are <40 BOD & <60 TSS).*

The algae readings were elevating the BOD & TSS results way above the license conditions of the Treatment plant. It was decided to trial the Bioamp system by Chemsearch. The council has been using the Bioamp technology at other treatment plants and sewage pump stations with good results.

### **3.0 THE BIOAMP SYSTEM**

Bioamp is a programmable self contained unit that automatically dispenses live bacteria into the wastewater stream. The Bioamp system is a combination of two unique parts. The Bioamp GT unit, developed and patented by NCH (the parent company of Chemsearch) is an automated, computer controlled delivery system for a unique biological product called Freeflow.

The bacteria are activated and grown in the unit for 24hrs then dosed into the wastewater stream at a programmable desirable time which would be at the low flow to optimise the performance of the bacteria.

The five species of bacteria that are contained in the Freeflow pellets are:

- *Bacillus subtiles* (aerobic) can degrade sugars, fats, oils etc.
- *Bacillus licheniformis* (facultative) as above + cellulose (paper, vegetables etc)
- *Bacillus thuringiensis* (facultative) as above + proteins (sauces) carbohydrates (beer) etc
- *Pseudomonas fluorescens* (aerobic) multiple wastes (most organics)
- *Pseudomonas putida* (aerobic) multiple wastes (most organics)

### **4.0 DRU POINT LAGOONS**

The Bioamp system was installed in October 2007 after consultation with Chemsearch Major Account Executive of Tasmania, Mr Peter Bennett.

Under the direction of Peter we purchased 100L of “Super Chemzyme IV plus” to pour around the edge of the lagoons to kick start the process. The first noticeable change at the lagoons was mainly the appearance. The aeration section looked healthier and the odour freshened. Within two months, the primary lagoon had less floating sludge and algae mats.

We undertook an extensive DO profiling of the lagoon system and found we were able to turn off one aerator and then after a further month a second. With the lack of floating sludge and algae mats in the primary lagoon, we could turn off the aerator mixer a month later. This helped settle out the sludge quicker and in a smaller area of the lagoon

The Bioamp is working well and we have not had any problems with the system in the ten months it has been installed. It is a very reliable dosing system.

The algae and the microorganism “euglena” problem have eased to some degree.



**Figure 1:** *Chemsearch’s Peter Bennett explaining the operation of the Bioamp to Council Treatment Plant operator Marcus O’Reilly. The Bioamp installed inside inlet screen room at The Dru Point Wastewater lagoons 13/10/07*



**Figure 2:** *Top end of Primary Lagoon showing algae and floating sludge on day of installation of Bio Amp (13/10/07). This was indicative of all of the primary lagoon. The floating sludge and algae settled in the corners of the lagoon depending on the wind direction. This caused odour*

*problems.*



**Figure 3:** *Top end of Primary Lagoon showing a marked improvement of lagoon with no floating sludge 4/02/08.*

Figures 2 & 3 above show a marked improvement in the appearance of the lagoon. The floating matter has disappeared which indicates the Bioamp is working on reducing the sludge level of the lagoon system. This will reduce the capital costs to remove excess sludge from the system. I believe we need to continue to use the Bioamp system as it is a very effective low cost solution to improve the effluent quality that is being discharged into very sensitive receiving waters

The overall performance of the lagoon system has improved. We have been able to turn off the aerator mixer in the second cell of the primary lagoon as we are able to keep the desired DO levels throughout the lagoon.

The sludge build up has decreased throughout the system as it is settling out sooner. We remove sludge at the outlet of the aeration lagoon via a Pump truck once a week.

The sludge is sucked from the floor of the primary lagoon after the aeration section of the primary lagoon. The operator has informed me that the sludge is thicker and easier to locate and pump.

Table 2 below demonstrates that the lagoon system is performing better with a more stable quality being discharged. We believe the Bioamp has been beneficial to the overall condition of the lagoon system.

**Table 2:** *Table of Average monthly BOD and TSS Oct 2006 to Jul 2008*

| Date     | BOD (mg/L) | TSS(mg/L) | Date   | BOD (mg/L) | TSS(mg/L) |
|----------|------------|-----------|--------|------------|-----------|
| Oct 06   | 64         | 74        | Oct 07 | 40         | 40        |
| Nov 06   | 57         | 59        | Nov 07 | 35         | 31        |
| Dec 06   | 69         | 92        | Dec 07 | 44         | 36        |
| Jan 07   | 54         | 63        | Jan 08 | 43         | 65        |
| Feb 07   | 47         | 48        | Feb 08 | 50         | 64        |
| March 07 | 79         | 89        | Mar 08 | 87         | 72        |
| April 07 | 77         | 38        | Apr 08 | 50         | 34        |
| May 07   | 53         | 63        | May 08 | 43         | 56        |
| June 07  | 56         | 52        | Jun 08 | 43         | 45        |

|         |    |    |        |    |    |
|---------|----|----|--------|----|----|
| July 07 | 53 | 49 | Jul 08 | 43 | 49 |
|---------|----|----|--------|----|----|

## 5.0 BIOAMP INSTALLATIONS WITHIN KINGBOROUGH

- **Peppermint Bay Hotel Grease Trap** - the Bioamp was installed to try and control the grease and oil being delivered to the receiving sewage system. The results from this installation have been reasonable good with good reduction of O&G, less pump outs of the grease trap and very good results in reducing odours.
- **Howden sewage pump station**- this Bioamp was installed to control odours in the 2 km rising main from the pump station. The receiving treatment plant is located in the middle of the North West Bay Golf Course and we were having a few complaints of odours emanating from the inlet system of the treatment plant. Since installing this system we have not received an odour complaint (approx 2 years).
- **Taroona Treatment Plant**- the Bioamp was installed into the inlet section of the Taroona Trickling Filter Treatment Plant to control G&O build up in the small inlet pump well, to augment the operation of the sludge digester, and to help in the reduction of BOD & TSS of the effluent. It is very effective in reducing the scum build up on the walls of the pump well, controlling odours at the plant, helping with the digestion system and in the reduction of BOD & TSS of the effluent.
- **Blackmans Bay Sewage pump station**- this is the largest pump station that feeds the Blackmans Bay wastewater treatment plant with a 4km rising main. The rising main has two vent pipes on it that cause a problem of odour relies on some occasions. The Bioamp was installed to help in the reduction of grease and scum build up in the wet well of the pump station and the reduction of odour causing sulfites in the pipe work. This has been effective in both cases. The build up in the wet well has reduced and the odours from the rising main vents have been controlled.
- The operators of all the plants that the Bioamps are used are happy with their performance. The Maintenance time in cleaning sewage wet wells has dramatically reduced (from once weekly to every 3 months and that is mainly to remove grit and rocks via a Vac Truck).
- Council Management are happy with the Bioamp system as it is a cost efficient way to reduce maintenance costs and an added benefit that they help in the reduction of BOD & TSS helping to prolong the operation life of the treatment plants.

## 6.0 ACKNOWLEDGMENTS

Chemsearch  
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