GEOBAGS - THE SOUTH GIPPSLAND WATER EXPERIENCE

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ABSTRACT

This paper reviews the experience of South Gippsland Water (SGW) in the use of Geobags for the dewatering of water and wastewater sludges.

This method of dewatering sludges has proved to a low cost and simple method of dewatering wastewater sludges for small plants.

It has also proved to be effective in significantly increasing the solids contents of alum sludges to reduce the transport costs of sludge removal.

KEY WORDS

Geobags. Sludge, De watering, Water, Wastewater

1.0 INTRODUCTION

South Gippsland Water is a small Victorian regional urban water authority. It operates nine water treatment plants ranging in capacities from 0.5ML/day to 20ML/day. It also operates nine waste water treatment plants typically serving communities of 2,000-5000 persons.

Sludge handling has proved to be a problem at various sites related to effective dewatering and drying. This paper looks at SGW's experiences in using Geobags for sludge handling at several sites for both sewage and alum sludges.

2.0 KORUMBURRA WWTP

This plant is a conventional biofilter plant with final treatment in lagoons. All sludge is pumped to an anaerobic digester and then dried in sludge beds.

This site had five sludge beds. Due to the wet climate the sludge beds had been covered with a glass roof to keep rain off the drying sludge.

The problems were:

- The glass roof was coming to the end of its life and causing an OH&S risk due to broken panes falling on the sludge bed. Extensive refurbishment of the roof was urgently required;
- The roof prevented the use of mechanical equipment for sludge removal;
- The relatively small volumes of sludge meant mechanical sludge dewatering was unlikely to be cost effective;
- Without the roof the existing sludge beds were of inadequate size.

2.1 Initial Trial

A 3.6m dia x 17.3m Geobag was purchased and installed on a flat part of the site. No ground preparation was undertaken although the area drains to a sludge lagoon. The size was based on the size of an existing drying bed. The bag could be filled by gravity from the digester.

The bag was filled a total of six times over a six month period in late summer. The bag on each occasion inflated rapidly and then dropped over the next few weeks. When the bag could no longer be filed by gravity it was left to dry over the winter months. After six months of drying a sample of sludge from the centre of the bag had dried to 13% solids. On cutting open the bag it was clear that sludge close to the edge of the bag was considerably drier with the surface having a flaky consistency. Cracking of the sludge to a depth of approximately 50mm was evident. On cutting open the bag there was no slumping of the sludge although some dried sludge broke away along the edge.

Over the following three months the sludge has continued to dry maintaining the shape formed by the bag which facilitates rainfall runoff. 158m^3 of wet digested sludge has been drained into the bag. The volume of sludge as of mid March 2003 is 70m^3.

Tests for microbiological quality of the sludge indicated:

- Salmonella - Not Present
- *E.coli* - Less than 100 orgs/mg

<u>**Figure 1:**</u> ***Initial bag at Korumburra approximately two weeks after opening with second bag still filling in background***

2.2 Ongoing Trial

Following the encouraging results of the first trial a second bag of 4.40m dia x 21.3m was installed. The site was next to the first bag again without any action to improve the site drainage. This has been installed for approximately 12 months during which it has been filled at monthly intervals.

It has been possible to fill the bag to a higher level than the initial trial bag. The final capacity of wet sludge for this bag is yet to be determined. In walking on the surface of the bag it is apparent that 10-14 days after filling the sludge on the top surface becomes dry and brittle.

By mid March 246m^3 of wet sludge had been drained to the bag and reduced to a volume of 130m^3. Filling is expected to continue for at least a further month.

3.0 LEONGATHA WWTP

This plant is a conventional biofilter plant with final treatment in a lagoon. All sludge is pumped to a two stage anaerobic digester and then dried in sludge beds.

This site had five sludge beds. Due to the wet climate three sludge beds had been covered with a glass roof to keep rain off the drying sludge.

The problems were:

- The roof prevented the use of mechanical equipment for sludge removal;
- The relatively small volumes of sludge meant mechanical sludge dewatering was unlikely to be cost effective;
- Without the roof the existing sludge beds were of inadequate size.

3.1 Installation

Two redundant concrete tanks have been used for location of the bags. The tanks drain to a pump well with a pump that can return flows to the head of the plant. A 5.8m dia x 21.3m bag was chosen for this plant as this just fitted in the tank. Modifications to the tank consisted of removal of a section of wall for later sludge removal and spreading of a layer of 25mm gravel for drainage.

Figure 2: ***Leongatha Geobag after approximately six months of use***

3.2 Progress to Date

The bag has been in operation since September 2002 with a digester desludging of 30m^3 occurring on a monthly basis. On desludging the initial separation of supernatant from the sludge occurs rapidly with liquid being observed running off within a few minutes. Over the next few weeks more water appears to be lost by evaporation with the sludge becoming quite solid. Although the bag is in operation and no definitive moisture contents are available it appears that the solids content could be in the range 20-25%

To March 2003 the bag has reduced 214m^3 of wet digested sludge to a volume of 80m^3. The bag is approximately 40% full.

4.0 FISH CREEK WTP

Fish Creek is a relatively new water treatment plant consisting of a clarifier and rapid sand filters, the capacity is 20L/sec. Initial sludge management was by collecting all backwash water and sludge in a wash water tank. From this tank it was pumped to a sludge thickener with the addition of a polyelectrolyte. Supernatant was returned to the raw water storage with the sludge passed to a sludge holding tank. Supernatant from this tank can be returned to the wash water tank.

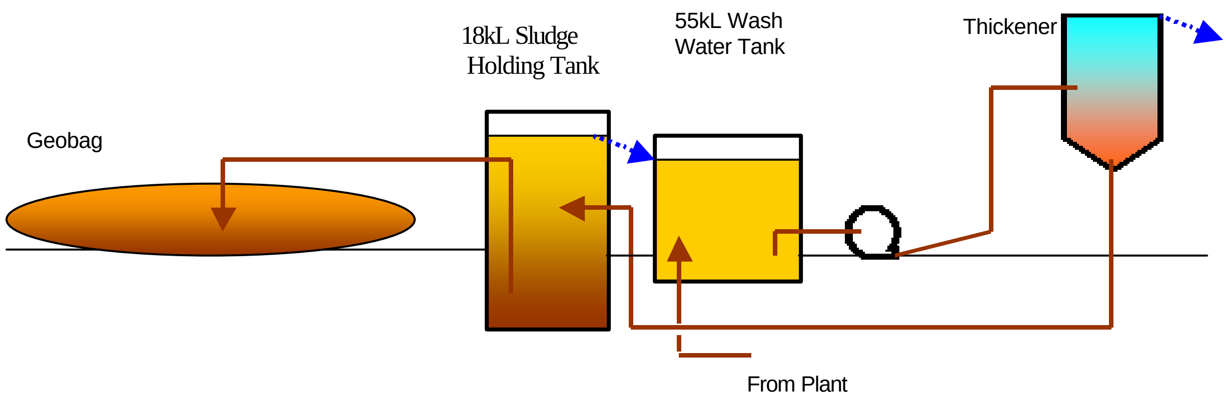
Problems:

- Poor concentration of sludge in holding tank;
- Frequent desludging of holding tank at high costs ($14,000 per annum);
- Limited space on site

4.1 Trial

A shallow bed was constructed approximately 0.3m deep the bed was lined with an impermeable membrane and covered with gravel. The bed was sized to hold the 3.6m dia x 13.00m Geobag. The bag was filled by gravity from the desludging point at the base of the sludge holding tank.

Figure 3: ***Fish Creek WTP Process Diagram***



Use of the bag commenced at the start of October and the bag has operated through the summer months. The bag fills during the operation of the sludge thickener and then falls again over the next few hours. Supernatant loss is both by seepage through the bag and evaporation. Keeping the surface of the bag clean seems to aid water loss by seepage. Water run off from the bag is clear with turbidity below 5NTU being recorded.

Approximately 420m^3 of sludge has been discharged to the bag which has concentrated the solids to a volume of 60m^3.

Figure 4: ***Fish Creek Bag during initial filling Sludge holding tank in background***

5.0 FUTURE GEOBAG INSTALLATIONS

Geobags are being installed at the Foster WTP during May 2003.

Figure 5: ***Prepared bed at Foster WTP with first Geobag in place***

6.0 SUMMARY OF EXPERIENCE GAINED

- The Geobags have proved effective at dewatering sludges based on an intermittent filling and drying cycle.
- Using a bag with a larger surface area provides for better dewatering between filling cycles, this improvement is believed to be by evaporation rather than from initial seepage.
- The shape of the bag and the fabric sheds rainwater avoiding re-wetting of the sludge.
- The shape of the sludge when the bag is opened results in water continuing to run off the bed.
- Although the bags can be used on unprepared ground a gravel bed improves dewatering.
- The run off from bags containing alum sludge is off high quality once the bag has been used for a few days. This is probably due to a combination of the sludge deposited on the internal surface of the bag and the filtering effect of the fabric.
- The process has been odour free.

7.0 CONCLUSIONS

The Geobags have proved effective in dewatering both anaerobically digested sewage sludge and alum sludges. They have a low capital cost compared with mechanical dewatering and are simple to operate. This makes them particularly suitable for use at small water and wastewater treatment plants

8.0 ACKNOWLEDGMENT

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