WHAT'S IN A BOX: SLUDGE DE-WATERING?

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ABSTRACT

Similar to many small and medium sized sewage treatment plants, Cowra Council has an issue with the de-watering of sludge.

Over the last few years, Council has looked at many different ways of de-watering our sludge; investigating various technologies from a range of operators and companies who all profess to have the perfect solution to our problem.

After many hours of sorting through cost, efficiency and usability, we decided to look outside the box.

We learnt of a small company in Texas, USA who developed their own system. One of their boxes was imported to Australia and hired on a trial basis by Cowra Council; the first of its kind to be used in Australia. The simplicity and efficiency of the system is the key - no high electricity costs, no belts, pulleys, bearings or bits, just a mixer, delivery pump, poly unit, the box and a truck.

The system could be used across many industries in different applications. Facts and figures from the trial de-watering of one five megalitre sludge lagoon are presented in this paper and by the time of the conference more data will be available.

1.0 INTRODUCTION

A new activated sludge treatment plant was opened in Cowra in November 2011 to enable Cowra's Wastewater treatment to comply with new legislative requirements and to reduce expensive licence fees.

In the original plans, the three proposed sludge lagoons were designed as a combined sludge lagoon and drying bed with a sand filter and under drainage system. Dried sludge was proposed to be removed by a long reach excavator. For various reasons, this system proved to be ineffective so alternative de-watering solutions were investigated. Options considered were separate drying beds, geotubes, sludge reducing bacteria and various mechanical devices.

As time progressed, all three available sludge lagoons filled and the plant struggled to meet EPA licence requirements. A short circuiting issue in lagoon three reduced retention time further.

Two of the three lagoons were fitted with the original under drainage system and had to be manually emptied using excavators to remove the sand filter (see Figure 1). This proved to be very expensive, time consuming and messy! Supernatant and sludge was pumped to old drying beds until the consistency was too thick to pump. Temporary clay ramps were built to allow access for a steel tracked, thirty tonne excavator without damaging the concrete lagoons. A smaller fifteen tonne rubber track excavator was used to deliver the sludge and sand to the larger excavator which had the reach to load trucks. The biosolids were stored on-site allowing them to dry out before being taken to landfill.

Figure 1: ***Emptied Lagoon Sand Filter and Underdrainage Removed***

2.0 DISCUSSION

As waste activate sludge (WAS) builds up in sludge lagoons, the supernatant return builds up in phosphates, nitrogen and ammonias which creates a return that is outside the plant's design parameters. This effectively creates our own trade waste problems placing excessive demands on the plant and risking a breach of EPA licence conditions.

The pros and cons of various de-watering techniques were discussed with other Council's operators at regular Centroc Operators Group site visits. Some of the biggest issues were getting technicians for these devices to rural areas for support and servicing. When the machines worked they where great, but when they didn't, operators found themselves doing crash courses in fitting and mechanics, all the while sludge relentlessly built up.

A local waste treatment contractor was on-site doing some unrelated work. He had recently returned from America where he was investigating solidification processes and had seen a system used to de-water septic and grease trap waste. Information available on the internet was promising but due to patents on the system it could not be replicated without risking legal action. An agreement was reached between the contractor and Council for the contractor to import the system under licence and for Council to trial the process.

Whilst waiting for the system to arrive from the USA, interim jar testing was done to optimise polymer types and dose rates.

2.1 Trial Begins

The trial was for a proposed twelve week period with terms and conditions set in the contract. It was decided not to decant the supernatant as the consistency of sludge through the box was unknown. It was found that the box handled whatever was thrown at it; if you could pump it, the box would de-water it!

With only one box (see Figure 2) time had to be allowed for the bin to dewater and while emptying and cleaning, the pumps were idle and wet weather hindered progress.

However, the system was working; the biosolids were shrinking whilst adjustments and optimisation continued, see Figures 3 and 4. Variations of contact times and polymer dose rate were used to test the effectiveness of the box.

Figure 2: ***The Box Arrives***

Figure 3: ***Supernatant Return and Sludge Samples***

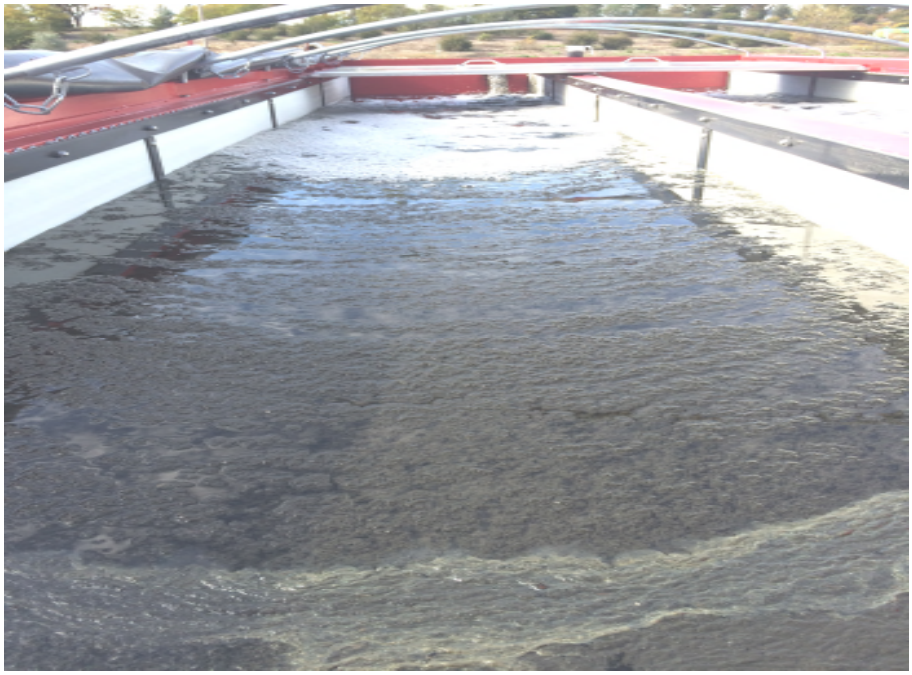

Figure 4: ***Poly Working Well***

Tables 1 and 2 present some of the results from the trial.

Table 1: ***Supernatant Return Characteristics***

Compound	Supernatant return from Box	Cowra Raw Sewage Characteristics
pH	7.73	7.66
Suspended Solids	12	329
Ammonia	184	72.8
Total Nitrogen	187	91.8
Total Phosphorus	10	11.8
Oil and Grease	<1	39
BOD	14	302
Coliforms (Presumptive)	2	24000000
Coliforms (Confirmed)	2	24000000

Table 2: ***Some facts and figures***

Duration	Ten weeks
Lagoon Capacity	4.5 Megalitres
Tonnes of solids	400 tonnes @ 10% solids (approx.)
Dry Solids	40 tonnes dry solids (approx.)
Polymer used	500 litres @ 0.4% solution
Supernatant return	3.5 Megalitres (approx.)
Pontoon mixer	1800 L/min delivery
Box capacity	18 m3

2.2 Open Day

On 2 September 2015, an open day was organised through the Centroc Operators Group. More than twenty visitors from various councils and private contractors attended the presentation and demonstration. Other interested parties have also visited, including DPI Water and EPA representatives. The system has since been used to de-water a saleyard lagoon at another shire with great results.

2.3 What's Ahead

In mid-February we will be de-watering another sludge lagoon and a trial will commence on water treatment plant sludge. Four more boxes are being fabricated and with a new hook truck design it is hoped to significantly reduce the time and optimisation of the system. In the long term it is planned to have boxes permanently on site to have a cost effective and efficient de-watering process in place.

3.0 CONCLUSION

We think we have found a long term solution to our sludge management issues that is versatile and cost effective. This process can be used in the treatment of a large variety of waste materials including but not limited to Activated Sludge, Septic, Grease Trap, Sale Yards Lagoons, industrial waste and Water Treatment Sludge. There could also be applications in agricultural industries.

4.0 ACKNOWLEDGEMENTS

I would like to thank our managers and contractors for their support without which this could not have happened.

5.0 REFERENCES

Environmental Guidelines Use and Disposal of Biosolids Products (EPA)