PERFORMANCE OF ROTARY FAN PRESS FOR SLUDGE DEWATERING

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ABSTRACT

Jimboomba and Flagstone wastewater treatment plants, located at Logan South, are maintained and operated by Logan City Council. Jimboomba wastewater treatment plant is an SBR type biological process. The sludge processing facility at Jimboomba wastewater treatment plant includes two sludge lagoons and portable rotary fan press. Flagstone wastewater treatment plant is an AAT/IOC type biological process. The sludge processing facility at Flagstone wastewater treatment plant includes one sludge lagoon and portable rotary fan press. The portable rotary fan press is used alternatively for two months in each plant. During 2011-12 financial year, 834 ML of wastewater was treated at Jimboomba wastewater treatment plant. At the same time, 1293 ML of wastewater was treated at Flagstone wastewater treatment plant.

This paper will discuss the process involved and the performance of the portable rotary fan press and analysis of dewatered sludge consisting of 12-13% of solids. The concentration of TN, NH_3, and TP in dewatered sludge is 46000 mg/kg, 930 mg/kg and 70000 mg/kg respectively. Quantitative analysis of generated Biosolids, Operational experience, including advantages and disadvantages, on this dewatering facility will be presented in this paper.

1.0 INTRODUCTION

The Jimboomba STP was built in 1992 as a SBR (Sequencing Batch Reactor), with two sludge lagoons with a total Volume of 1 ML storage, and one effluent lagoon with a total volume of 20 ML of storage. This site utilises 100% reuse of the effluent water to land.

The Flagstone STP was constructed in 2004 as a SBR process with one sludge lagoon total volume of 716 kL and an effluent lagoon upgraded to store a total of 28ML. This site also has 100% reuse of effluent to land.

Both STP’s had no biosolids treatment systems in place. Since 2008 when Logan City Council received the Jimboomba and Flagstone STP's as part of the State Government reform project, research and optimisation of the biosolids process has been undertaken. During this time Logan South operators started removing the Sludge by tanker to an off-site Treatment Plant in the Logan area for processing.

1.1 Project Background

- In June 2010 a biosolids management strategy was completed for the existing Wastewater Treatment Plants (WWTPs) within Central District.
- The biosolids management strategy considered short to medium term options only. A recommendation from the biosolids management strategy was to operate sludge lagoons with a six month retention time at Flagstone and Jimboomba WWTPs (to produce Stabilisation Grade B biosolids) and dewater biosolids from both sites instead of transporting the wet sludge to LWPCC for further treatment.

Further review determined that mobile dewatering should be adopted.

This option will require a bunded concrete area with filtrate returns back to the inlet works at each site. High operating costs are incurred by trucking wet sludge from Jimboomba WWTP and Flagstone WWTP to Loganholme WPCC, where it is thickened and dewatered prior to transport to a landfill site in Toowoomba.

2.0 DISCUSSION

2.1 Selection Process

For the project, the team of treatment operations and maintenance worked on what would be best concept to look for in a dewatering system.

1. Low energy cost
2. Low maintenance cost
3. Low though put (flow) control
4. Best delivery system to unit
5. High safety standard
6. Capability of future extension .

The biosolids concept chosen for the Flagstone and Jimboomba STP's implemented a mobile press unit which could be relocated to any site when needed for dewatering as the best and lowest cost alternative. Safety also had to be at a high standard.

The trailer and rotary fan press came about when we were looking at the market to source a mobile press. Most of the other concepts researched during that time required either high capital cost or high operating cost (high maintenance and high transport cost each time it would need to be relocated from site to site).

As these site are small STP's treating less than 1ML of influent and do not have a large budget we needed to keep costs down for ongoing operational, maintenance and transport for this project. We also needed to keep in mind the effects on the process from the filtrate water as filtrate water contains TN, TP and pH that could be detrimental to the treatment process at a small Plant. The dewatering process needed to ensure that the dewatering of bio-solids did not produce large amounts of filtrate that could potentially upset the system.

By utilising the existing sludge lagoons as storage and ensuring a low flow through the press, we could control the amount of filtrate returned to the SBR during each process cycle. The lab results after running the rotary press for some time have showed little effect on the treatment plant process.

We then did tests on the biosolids to see what the reuse capability could be. According to the NSW biosolids guidelines, we have Grade A for stabilisation and Grade B for contaminants in biosolids from the samples done from the two STP's. These tests confirm where the biosolids can be reused.

2.2 Rotary Fan Press

The rotary fan press is simple to operate for dewatering biosolids and slurries. It works on the principle that water will seek the path of the least resistance which occurs in the rotating screen or filter plates.

As it pumped under low pressure into the dewatering channel, water begins to leave through the filter plates concentrating the solids as they travel though the system towards the pneumatically adjustable restrictor, which causes a back pressure on the solids forming a plug of dewatered solids.

The performance of the press is effected by:

- polymer selection
- polymer dosing rate
- mixing of polymer with sludge
- sludge age
- the though put speed and pressure of the sludge pumped into the system
- rotation speed of the filter plates (screen); and
- the amount of restriction applied to the cake solids.

A balance of these factors should result in consistent performance that will help in minimises polymer usage to maximises output and capture rates.

Different material's to be dewatered require different time/pressure profiles for optimum dewatering efficiency. Simple and effective equipment like the rotary fan press give us flexibility that can maximize the throughput capacity of the product. The rotary fan press offers the flexibility of time/pressure profiles within the press controls for the adaptability of various raw products.

When dewatering a raw product consideration needs to be given to foreign materials such as plastics, hair, rocks, metals, etc. which could cause plugging or damage to the dewatering system. We have added a filter to the feed system to remove all these items before the dewatering unit.

Figure 1: ***New Dewatering Building system at Jimboomba.***

2.3 Trial Outcomes

Table 1 shows the trial results with different polymers on the lagoon sludge, which had 8 months retention time during this trial. As observed older sludge would not form floc and would not dewater as easily as younger sludge. The challenge for the polymer products was to dewater the sludge and to form a strong floc at any stage.
The highly structured polymer worked best for this sludge age and a redirection of the

injection point was also successful. The redirection of the injection allows more contact time for the polymer to mix with the sludge before entering the dewatering system.

Table 1: ***Dry solids/LPM of product/Poly LPM***

Polymer			Rotary Fan Press			
Product Name	Date	Flow (LPS)	Flow Meter (LPM)	Press Speed (%)	Retention gate (psi)	Cake Solids (%)
EM640MEB	14-Nov	0.8	34	20	15	11.0%
EM640MEB	15-Nov	0.7	45	20	15	10.1%
EM640TBD	15-Nov	0.9	38	20	Lower?	11.0%
EM640TBD	15-Nov	0.8	34	15	15	11.0%
EM640TBD	15-Nov	0.8	34	15	15	11.8%
EM640TBD	16-Nov	0.8	34	15	15	12.0%
30ml coagulant FL4440 into concrete storage tank	26-Nov					
EM640TBD	26-Nov	0.5	26	60	25	10.14%
EM640TBD	26-Nov	0.2	26	60	25	11.65%
9:49am Another 30ml coag into tank	27-Nov					
EM440HIB	27-Nov	0.3	26	53	20	13.53%
EM440HIB	27-Nov	0.3	26	50	20	13.01%
2:02pm Another 40ml coag into tank	27-Nov					
EM640TBD	27-Nov	0.3	26	54	22	13.88%
71300	5-Dec	0.5	33	45	25	14.2%
71300	5-Dec	0.5	34	45	25	16.4%
71300	5-Dec	0.5	33	45	25	17.1%
71302	6-Dec	1	34	45	27.5	14.2%
71302	6-Dec	1	34	45	27.5	14.4%
71302	6-Dec	1	24	45	27	14.6%
71302	6-Dec	1.2	31	70	27	13.2%
71300	7-Dec	1.9	31	51	27	14.1%
71300	7-Dec	1.9	29	51	27	16.16%
71300	7-Dec	1.9	29	51	27	17.50%
71300	18-Mar	1.9	27	58	27	14.20%
71300	19-Mar	2.1	30	58	27	14.80%
71300	19-Mar	1.9	27	59	26.5	13.54%

2.4 Delivery System for the Press and Holding Bay Setup

Logan Water and the Logan Water Alliance designed and constructed two dewatering buildings in which the portable press unit and biosolids receival bin could be housed.

The concrete pad size was designed to hold the press unit, bin, control board and holding tank. The delivery pump from the lagoons can also transfer solids from one lagoon to the other when need. The dewatering area is bunded and returns supernatant to the head of the STP. The holding tank holds 2000L and has level control systems to prevent overflows. A high pressure cleaning system helps with the cleaning of the area, equipment and any poly spills.

3.0 CONCLUSION

3.1 Dewatering System Performance Outcomes

During the commissioning and polymer trials we learnt a lot about the new equipment. The press has a high level of safety for the operators. The equipment is fully enclosed which means no spray drift, no punch areas, no catch areas for the operators to injure themselves or become sick from any mists or sprays. The equipment is easy to operate with touch screen PLC controls. Recycled water can also be used for the poly make up system and internal wash sprays for the screen for those sites located in remote areas. This also saves the use of potable water .

The polymer make up system on the press can block up if not operated for a few days. If poly is left in the system it will not run. This is the only problem we have found so far with the press.

The outcome of the polymer trials found that forming floc with high sludge age was difficult but not impossible. We had to make some changes to the injection point for the polymer to allow more contact time. This increased the dry solids results as shown in Table 1 over the last 11 results. For these result we were dosing the polymer 2m away from the original injection point on the press unit. The results in Table 1 were with the polymer injected at the head of the press giving us less contact time. We found that with older solids, more contact time was needed along with better mixing of the polymer and the sludge. This will increase the dry solids result in most cases.

4.0 ACKNOWLEDGEMENTS

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5.0 REFERENCES

Aim Water (Supplier and Training of the Rotary Fan Press)