NEWSOIL, VALUE ADDING

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ABSTRACT

Biosolids are produced at Waste Water Treatment Plants (WWTP) as a by-product of the waste water treatment process. The Victorian EPA "*Guidelines for Environmental Management – Biosolids, Land Application*" advises that biosolids should be viewed as a potential resource that can be beneficially utilised in the agricultural, horticultural and municipal sectors, rather than as a waste product requiring disposal.

To enable the use of biosolids, the EPA Guideline outlines the requirements from both a Treatment and Contaminant perspective. The uses for the biosolids are restricted depending on the level of treatment or amount of contaminants identified through sampling. Only biosolids with a T1/C1 classification are able to be used without restrictions.

As many biosolids are impacted by one or more metals leading to a C2 classification, this has caused a number of issues for water utilities to find ways to beneficially use the biosolids in an affordable and sustainable manner. As a result, there is an enormous amount of biosolids of varying qualities, stored in stockpiles at WWTPs while their owner looks for a sustainable use.

North East Water has been fortunate to be able to identify and then work in partnership with a local foundry that also has a waste product - sand used in the mould castings. This sand has been classified as inert and when blended with biosolids, produces a T1/C1 product. This is an exciting outcome for both organisations as two waste products have been able to be combined to form a new product now known as "Newsoil", which meets the EPA Guidelines allowing unrestricted use. This paper describes the processes to verify the raw product and then post blending that are undertaken to achieve this outcome.

1.0 INTRODUCTION

1.1 EPA Biosolids Guidelines

Beneficial use of Biosolids produced as a by-product of the treatment of waste water has always been an issue within the water industry. The Victorian EPA "*Guidelines for Environmental Management – Biosolids, Land Application*" provides a framework for sustainable land application of biosolids.

Classification of biosolids is based on two independent factors, namely the contaminant concentrations in the biosolids and the microbiological quality post treatment. The classifications within these factors are Contaminant Grade (C1 or C2) based on biosolids contaminant concentrations and Treatment Grade (T1, T2, T3) based on the treatment technology utilised, microbiological criteria and measures used to inhibit bacterial regrowth, vector attraction (such as insects or vermin) and odour.

Biosolids can be generalised as 'unrestricted' or 'restricted' quality, with unrestricted grade material achieving both the C1 and T1 classifications. Provided the Treatment and Contaminant Grade in the guidelines are met, this allows exclusion of schemes utilising biosolids from EPA works approval and licensing provisions.

Trying to find a cost effective and sustainable option allowing the unrestricted use of biosolids has been difficult.

1.2 North East Water – Wodonga WWTP

North East Water is located in the north eastern part of Victoria with Wodonga the biggest city and largest Waste Water Treatment Plant. The plant treats a total of 3,550 ML of wastewater per annum and from this, approximately 2,000-3,000 m^3 of biosolids is produced annually. Testing of the biosolids has classified it as a Treatment Grade 1 and Contaminant Grade 2 (T1-C2) product in accordance with the EPA Guidelines. The reason it is classified C2 is due to elevated levels of copper and Zinc.

The wet sludge from the belt press is trucked into a drying pan on site where it is air-dried to approximately 75% solids and stockpiled ready for use (Figure 1).

In the past biosolids have been utilised at sites that have a site specific approved Environmental Improvement Plan. This can be a costly exercise depending on the location of the site where the biosolids are to be used. Due to the cost, North East Water staff began looking into alternative methods and opportunities for the beneficial use of biosolids from Wodonga.

Figure 1: ***West Wodonga WWTP drying pans***

2.0 DISCUSSION

2.1 Biosolids Sampling and Results

In accordance with the EPA Biosolids Guidelines, to meet the T1 classification, testing of every 500 m^3 of biosolids must be undertaken to determine the level of pathogens including bacteria and viruses. The C1 process is similar where every 500 m^3 is analysed for a range of metals and contaminants. In the North East Water situation, the most common results from are that the biosolids are high in copper and zinc due to the copper and galvanised pipes in houses (Table 1).

Table 1: ***Biosolids Laboratory Results (prior to blending)***

Test	T1-C1 Limits	Biosolids Stockpile	Number of viruses per 10 grams
Arsenic	20	7.7	
Cadmium	1.0	0.3	
Chromium	400	33	
Copper	**100**	**148**	
Mercury	1.0	0.25	
Nickel	60	21.0	
Lead	300	18	
Selenium	3.0	1.9	
Zinc	**200**	**328**	
OC Pesticides	0.05	0.01	
Reovirus	<1		<1
Enterovirus	<1		<1
Adenovirus	<1		<1
E. coli	<10		<10

The results indicate that the biosolids are classified T1-C2 due to the elevated levels of copper and zinc. The elevated metal levels meant that North East Water needed to find a solution to reduce the levels of these two metals for the biosolids to meet the guidelines for C1 allowing unrestricted use.

2.2 The Blending Product and Process

In Wodonga there is a foundry that has a by-product in the form of sand that has been used in the mould castings. This waste product, which has been classified as inert, has previously been used by earth moving contractors as a base for pipe laying and road construction. North East Water has been able to obtain the sand at a minimal cost and it can be blended with the biosolids to reduce the overall contaminant load to achieve an affordable product within the C1 limits. The blending process is depicted in Figure 2. Once blended, a product that meets the T1-C1 Guideline values is made which has no restrictions on its end use. Two by-products have been combined to make a high value product that has the potential for high value and demand which we have called Newsoil.

Figure 2: ***Screen used for the Biosolids and Sand Blending Process***

The results below indicate that after the blending process at a 50-50 ratio, the biosolids meet the guidelines for T1-C1. The final product has been analysed for its nutrient levels and has been valued by an agronomist at around $70 to $80 m^3. The results also show that the blending ratio can easily be altered to produce different quality products for different applications (Table 2).

Table 2: ***Laboratory Results for Biosolids after Blending***

Test mg/kg	C1 Limit	Biosolids Stockpile	Sample 1 Blended	Sample 2 Blended	Sample 3 Blended
Arsenic	20	7.7	4.8	4.0	2.1
Cadmium	1.0	0.3	<0.01	<0.01	<0.01
Chromium	400	33	<0.01	<0.01	<0.01
Copper	**100**	**148**	**14.8**	**12.8**	**13.0**
Mercury	1.0	0.25	<0.1	<0.1	<0.1
Nickel	60	21.0	<0.01	<0.01	<0.01
Lead	300	18	5.6	5.9	<5
Selenium	3.0	1.9	< 2	< 2	< 2
Zinc	**200**	**328**	**37.4**	**36.7**	**27.1**
OC Pesticides	0.05	0.01	N.D.	N.D.	N.D.
PCB's	0.2	0.1	N.D.	N.D.	N.D.
Total N			3959	4334	3202
Calcium			776	772	926
TKN			2459	2459	1952
Nitrate + Nitrite			1500	1875	1250
Total P			4846	4462	3846

3.0 OPTIONS

Creating a product that meets the EPA Biosolids Guidelines for unrestricted use has opened up a suite of opportunities for the final product. A presentation was made to the North East Water Executive and Board to determine their position in relation to the product. The feedback was that it is a great concept and all market options should be investigated.

The main queries regarded whether to focus on wholesale or retail markets or should the blended product just be given away. A working group with the relevant staff from within North East Water was established to investigate ideas to allow the project to move forward. The working group determined that the best way forward was to run a trial to obtain feedback on the use of the product, to determine what its real benefits were and what application the Newsoil product would be best utilised for.

Figure 3: ***The Potential Options in the Supply Chain***

4.0 CONCLUSION

This process has turned a liability product into an asset. The cost to use the T1-C2 biosolids in agriculture would be approximately $40-$75 m^3 depending on the distance travelled from the waste water treatment plant to the reuse site. Depending on which final option the business decides to utilise, it is likely that North East Water will break even or even generate a profit from the Newsoil product.

North East Water produces approximately 2,000-3,000 m^3 per annum of biosolids. When the waste sand is added to this at a 50-50 blend, around 4,000-6,000 m^3 per annum of Newsoil will be available for use in-house or for sale. Figure 3 above shows the options that are available and the potential worth to the business, so the big question is where should we position the organisation in the supply chain?

After the trial has been completed and the benefits that Newsoil can add are fully understood, North East Water will be in a position to move forward with the preferred option.

5.0 REFERENCES

Victorian EPA – Publication 943 - "*Guidelines for Environmental Management – Biosolids, Land Application (2004)*"