INNOVATIVE SEWER BLOCKAGE MANAGEMENT TECHNIQUES; THE BENEFITS, GREATER IMPACTS AND BETTER OUTCOMES

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ABSTRACT

Sewerage networks are a vital part of any Water Authority's asset base. To guarantee public safety significant capital and human resources are invested in the operation and maintenance of sewerage networks to ensure their efficient and effective operation. In Victoria the Essential Services Commission (ESC) is the economic regulator for the Victorian Water Industry and one of its roles is to approve and monitor service standards. A key service standard that is measured is the number of sewerage blockages per year with the unit of measure being number of blockages per 100KM of main.

Sewer blockages caused by tree roots is a common problem and can have a major impact on service standards and escalate public health risks. According to the ESC 75% of Yarra Valley Water's sewer blockages were caused by tree root infiltration. Traditionally a combination of preliminary cleaning techniques via jetting and cutting has been used in association with chemical treatment via foaming. To improve current practices with the focus on value for money and the environment Bartlett's Waste Management and Central Highlands Water have undertaken an extensive trial utilising new innovative technology to treat root intrusion.
The patented technique combines CCTV with a spot spray process that effectively targets areas affected by root intrusion. This paper outlines the technique, its benefits and discusses the results to date of the trial undertaken by Central Highlands Water and Bartlett's Waste Management at Maryborough.

1.0 INTRODUCTION

Bartlett's Waste Management (Bartlett's) is a family owned and operated company based in Geelong. Bartlett's provides a range of specialised services to a diverse customer base with strong relationships with a number of Victoria's Water Authorities. A key service provided to Water Authorities is the maintenance of sewer systems.

Sewerage service reliability is a key performance measure that is monitored by the Essential Services Commission (ESC). The ESC is the economic regulator for the Victorian Water Industry and one of its roles is to approve and monitor service standards. A key service standard that is measured is the number of sewerage blockages per year with the unit of measure being number of blockages per 100km's of main.

Tree roots intrusion has been identified as one of main causes for the significant increase in the number of sewer blockages. The recent climatic conditions and low rainfalls experienced across Victoria have further contributed to this as the tree roots are extremely effective at searching and sourcing a supply of water and nutrients to sustain growth. Town sewer reticulation systems provide an excellent environment for tree root growth. Figure 1 provides a summary of the sewer blockage rates experienced throughout Victoria. Both Yarra Valley Water and Barwon Water advised the ESC that the majority of sewer blockages were caused by tree root infiltration.

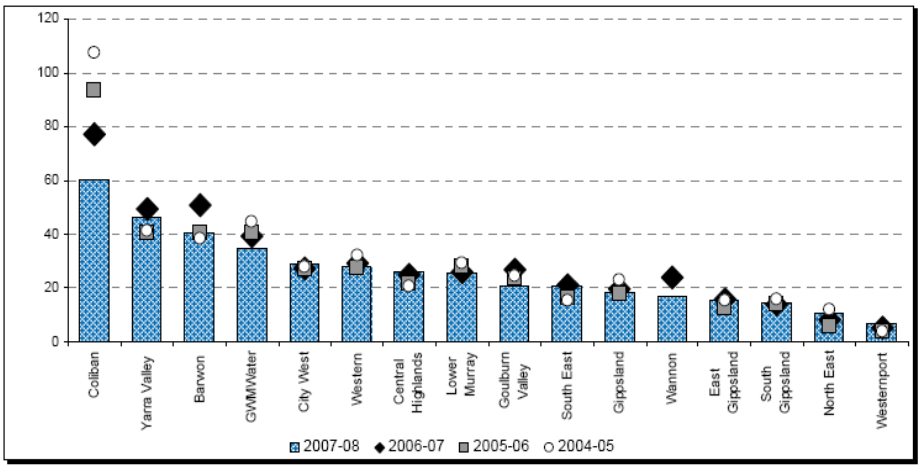

Figure 1: ***Sewer Blockages (per 100 kilometres of sewer main (source ESC Water Performance Report, Mar 2009)***

The methods commonly used to clean and prevent sewer blockages are well practised and the level of effectiveness can differ depending on a number of variables. A common method used to remove and control root intrusion has been the use of root cutting techniques with a combination of root foaming.

Bartlett's has used this combination technique on a number of occasions and have found that the technique works well but found that the foaming process can be spasmodic. The foaming process was dependent on three critical components being, operator's skills and knowledge of the process, the retraction speed of the jetting hose and the correct mixing ratios of the chemicals used. During the foaming process it is difficult to know if the root foam completely fills the conduit being treated and that the foam had indeed made contact with the root affected areas.

1.1 Process Development

In 2007 Bartlett's identified that an opportunity existed to develop an innovative new technique to control root growth in sewers. Through research and testing a system was developed and patented by Bartlett's that combines CCTV with a spot spray applicator for chemical root treatment. Through research by Bartlett's it was recognized that there was no tree root treatment process currently in use where actual visual footage of the treatment taking place was available and that this process could be combined with CCTV reporting of the asset.

The spot spray process combines the use of the CCTV tractor with a spray arm fitted to the underside of the tractor for the purpose of spraying any tree root intrusions. A separate spray line delivers the herbicide to the spray arm that feeds out from the back of the CCTV van. The spray line delivers the herbicide at the speed CCTV tractor is travelling through the sewer main. The camera operator is in control of delivering the herbicide to the spray arm as required via a motorised solenoid switch mounted beside the camera controls within the van. Figure 2 shows the camera van and on board control room with spray controller.

The chemical used for spot spraying contains the active constituents Metham Sodium and Dichlobenil, a wetting agent is combined with the herbicide to create adhesion to the areas treated within the asset.

These chemical are the same chemicals commonly used in the root foaming process. The foam generation is required to ensure the herbicide makes contact with the upper area of the asset where the majority of root intrusion occurs, the spot spray process overcomes this issue via its application process.

All chemicals used for the process are mixed prior to being on site in a controlled environment and then transferred into the spot spray unit ready for application. This process completely alleviates the need for operators or the general public to be in contact with any of the chemicals whilst performing the spot spraying function on the worksite and therefore reduces health and environmental risks.

Figure 2: ***Camera van and on board control room showing dosing switch***

2.0 DISCUSSION

In partnership with Central Highlands Water (CHW) an extensive trail of the spot spray process was undertaken at Maryborough, Victoria.

2.1 The Problem

The township of Maryborough is situated 50 kilometres North of Ballarat. The towns sewer system comprises of 81.4Km's of 150mm to 450mm sewer mains. Through the CHW Asset Management System it was identified that in 2007 the frequency of sewer blockages throughout the Maryborough network was 122.9 blockages per 100km's. This blockage frequency was significantly higher than the ESC performance target of 25.4 per 100km's.

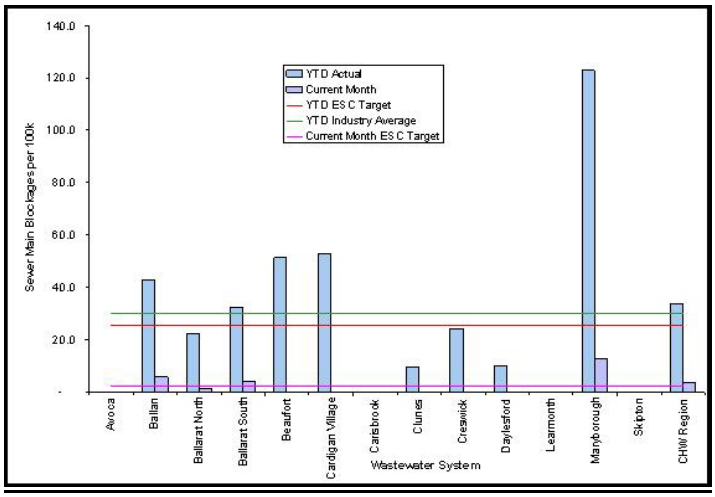

Figure 3: ***CHW and Maryborough sewer blockage rate***

Figure 3 provides an overview of the CHW sewer system and highlights the issue of very high sewer blockages in the Maryborough system. It was identified that over 90% of these blockages were being caused by tree root infiltration. To improve the performance of the sewer network an extensive planned maintenance program was schedule with the requirements being rooting cutting and chemical treatment.

The Maryborough Water Reclamation Plant (MWRP) that services the sewer network currently provides recycled water to local farmers for growing crops, the irrigation of the Maryborough golf course and public open spaces. The biological treatment process is susceptible to system failure if significant concentration of chemicals used for sewer cleaning reach the plant. It was therefore identified that as part of the planned maintenance project that a beneficial environmental solution was required to be implemented. The solution had to ensure that minimal volume of chemical was used to manage the risk of treatment plant failure and also ensure the quality of recycled water produced was not compromised.

The issue of recycled water quality from water reclamation plants has gained increased focus. Recycled water is now considered a valuable resource and is used for a wide range of end uses. Contractual agreements also stipulate that recycled water quality must be maintained.

2.2 Trial Outcomes

It was identified from field demonstrations that the spot spray process could potentially provide an opportunity for CHW to meet their regulatory, business and environmental requirements in the Maryborough region. CHW also showed willingness to trial new innovative technology and engaged Bartlett's to undertake the work.

The scope of works included the cutting and chemical treatment and visual inspection of approximately 50km's of sewer main. The work program was commenced by Bartlett's in May 2008.

One of the major attractions of the spot spray method to CHW was the predicted reduced volume of chemical to be used. Based on the actual volume of chemical used versus the predicted volume used via the traditional root foaming method a reduction of over 97% was achieved as shown in Table 1. Environmentally the spot spray process provided a significant reduction in the volume of chemical used and therefore maintained recycled water quality requirements at the MWRP.

Table 1: ***Chemical Use Data Comparison (based on mixing requirements of concentrated chemical for a 150mm sewer)***

	Root Foaming	Spot Spray
Concentrated Chemical/m (mls)	9	0.185
Distance treated (m)	50,000	50,000
Volume of Chemical used for 50Km (L)	**450**	**9.25**

Since undertaking the trial a number of follow up visual audits have been undertaken. The audit inspections have shown that there has been significant continual degradation of treated areas as shown in Figure 4.

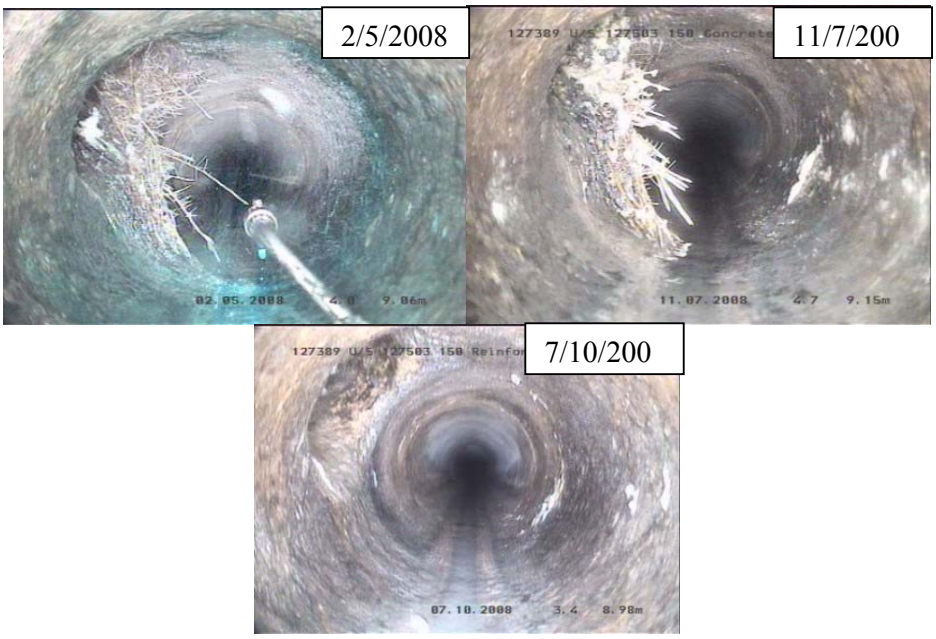

Figure 4: ***Spray arm applicator showing spray process from application in May 2008 and root breakdown at a connection point.***

From recent data the frequency of blockage rates has drastically reduced from 120 per 100km to 12 per 100km as shown in Figure 5. This is well below the ESC performance targets and has indicated that the spot spray process is highly effective.

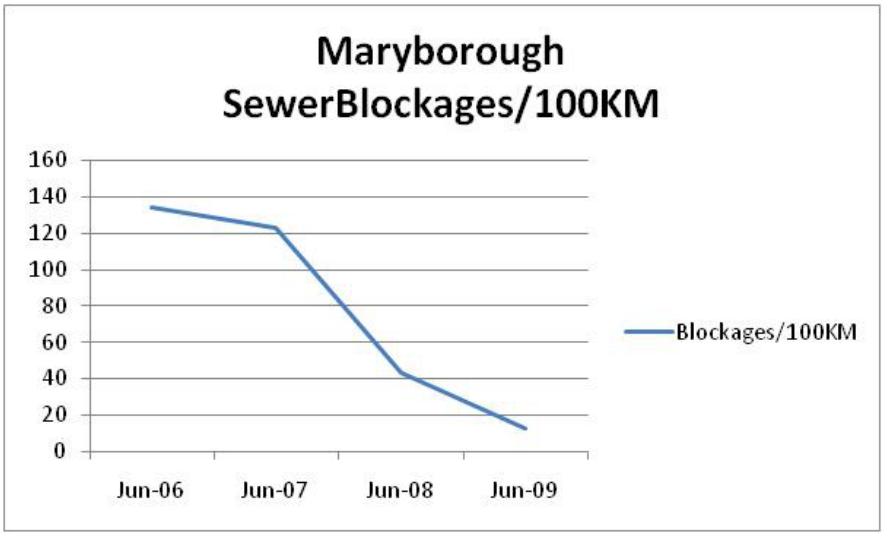

Figure 5: ***Maryborough Sewer Blockage Rate 2006 to 2009***

The spot spray process provided CHW with a visual network condition report using WINCAN reporting system. The CCTV also provide a visual quality control check of the spot spray effectiveness and has assisted in identifying problems caused by house block connections that may need rectifying by property owners.

The spot spray system has the benefit of being able to provide a valuing adding service by combining CCTV and chemical treatment. This can therefore provide potential cost benefits to asset managers.

3.0 CONCLUSIONS

From the data collected and quality control follow up audits undertaken to date the results from the spot spray process has been very pleasing. The benefits reported by CHW have been,

- A significant reduction in sewer blockages in the Maryborough network exceeding ESC prescribed performance targets
- Reduction in the amount of chemical used thus reducing the risks of treatment plant failure and degradation of recycled water quality
- A network condition report combined with a visual audit of the work undertaken
- The ability to combine two techniques being CCTV and chemical treatment therefore providing financial savings
- A reduction in Environmental and OH&S risks through the reduction in chemical use.

4.0 ACKNOWLEDGEMENTS

The initial idea and subsequent invention and implementation of the spot spray process was developed and now patented by Bartlett's Waste Management, in particular Darren Bartlett, Rob McKenzie, Cameron Porter and Justin Wilkens. The successful proving of the technology would not have been possible without the support and forward thinking of Central Highlands Water. Acknowledgement and thanks must go to:

- Central Highlands Water- Jon Gooding, Mark Barby, Greg Marshall, Denny Anderson, Steve Bethune, Bryce Rawlings, Daan van Riel
- Coliban Water- Neville Pearce.

5.0 REFERENCES

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