FINDING A SOLUTION TO THE McKENZIE HILL ODOUR ISSUE

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ABSTRACT

The objective of the paper is to outline: the issues faced in finding a solution to the long standing odour issue at McKenzie Hill and discuss the influence of customer communications from the planning phase to the completion stage of the project. Residents living near a break pressure pit at McKenzie Hill experienced odour issues since early 2000. Various solutions that were trialled with varying but with limited levels of success were: direct Oxygen injection, Oxygen injection with U-tube dissolver and Calcium Nitrate dosing, installation of a bio-filter and a vent stack at the pit and dosing of Magnesium Hydroxide Liquid (MHL) into pump stations

The paper briefly outlines the various outcomes of the qualitative investigations that were undertaken to analyse the shortcomings of the previous solutions and quantitative analysis outcomes which highlighted the risks involved with the proposed solutions. It then discusses in detail how the issues identified as part of the investigations contributed towards moving to a design and construct project that enabled the final solution to evolve towards using a combination of Oxygen and Sulfox® (a proprietary odour control chemical) and positive influence of customer engagement and communication on this project.

The summary of the paper includes the lessons learnt in delivering the solution to the McKenzie Hill odour issue along with the summary of the final proof of performance test results and the customer feedback.

1.0 INTRODUCTION

For more than twelve years customers living around the McKenzie Hill Break Pressure Pit (BPP) in Castlemaine have experienced offensive gases leaking from it. The BPP receives sewage pumped from Maldon and Newstead townships via two separate 12.4km and 11.2km long rising mains which are 225mm in diameter. From the BPP effluent flows under gravity for a distance of 2km to the Waste Water Treatment Plant.

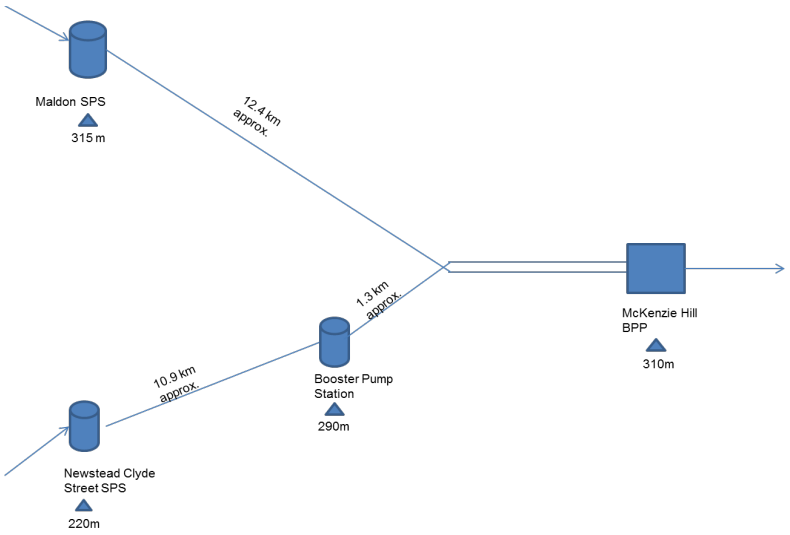

Figure 1: ***Schematic System Diagram***

Various solutions have been trialed since early 2002 and they all have had only limited successes. However, the odour issue persisted and customers continued raising their concerns to Coliban Water and the Environmental Protection Authority (EPA); who issued a Pollution Abatement Notice in 2005 to rectify the issue.

As a result Coliban Water commissioned consultant studies one in 2005 and other in 2007 to find a comprehensive solution to eliminate the odour at the BPP.

One recommendation from the consultant report was to construct a gravity pipeline from the BPP to the Castlemaine Waste WWTP. Whereas another consultant report recommended installing Oxygen dosing systems at specified locations at specified dose rates.

2.0 DISCUSSION

The prime objective in implementing a successful solution has been identified as the review of the different recommendations made by the consultants and choosing an appropriate recommendation to be the scope of the project.

2.1 Project Initiation and Desktop Investigation

The project commenced with a kick-off meeting with the project team members, who had the capacity to review, make appropriate decisions and recommendations on the scope of the project.

After finalising the team roles and responsibilities, the project moved to the next stage of gathering facts and information from past projects files with the objective of understanding what were the initial assumptions made in implementing those projects and why have they failed to meet the objectives in the end. However, the majority of the project files only had the investigations and implementation details but had only minimal or no investigations carried out on the reasons why the solution/s had failed.

The issues identified as part of this qualitative analysis has then been compared against the two newly proposed solutions by the consultants and presented to the project team's review and recommendation. As part of this detailed review process a collective decision was made to proceed with the oxygen dosing system.

Subsequently, the customers and the EPA were contacted and informed that the project would be moving to the delivery phase with a new oxygen dosing system.

2.2 Detailed Investigation

After deciding to proceed with the oxygen dosing systems; further detailed investigations were carried out in collecting information: as constructed drawings of the pipe lines, pump run hours, pump installation manuals and as constructed information and planning model data for the system.

The collected data along with the information from earlier desktop research have been utilised to check whether the recommended scope is deliverable. The detailed analysis demonstrated the locations and the dose rates proposed in the report will not be able to eliminate the odour at all. As the selected locations did not have enough static head to dissolve the required doses of oxygen.

Therefore, the system required further analysis and modelling to establish suitable locations and to assess overall feasibility of the option. The detailed models suggested that the location of the new oxygen dosing system for the Maldon line may be located where the old decommissioned system was and for the Newstead line a location near booster pump station.

But, the model also had its limitations in regards to the assumption made in regards to the typical quality of the sewage of each of the systems; however the model demonstrated that if the quality of effluent is worse than the assumed levels then subsequent oxygen addition will also be required to eliminate the generation of Sulphides along the line. The modelling results were presented to the project team along with the assumptions and risk rating of the options. The project team decided to proceed with the implementation of the project along with the model findings to the implementation phase.

2.3 Towards Project Delivery

Lack of detailed design information and specification meant that an appropriate project delivery method had to be selected that will clearly outline the level of risk items and the arrangement in which the risk will be shared. Lack of detailed information and achieving final objective has been transferred to the contractor; the risks involved with obtaining various permits had been shared with the contractor and Coliban Water. Therefore, Design and Construction under AS 4300 had been chosen as the project delivery method for this project.

The tender documents clearly outlined that the primary requirement of the contract is for the contractor to demonstrate through proof of performance tests that oxygen levels in excess of 1mg/l is achieved at the BPP for both the Maldon and Newstead lines.

The tender documents also prescribed a detailed proof of performance testing regime that needs to be undertaken to achieve practical completion of the project.

The parameters that the contractors needed to test pre and post implementation of the project were: Dissolved Sulphides, Sulphate, Biochemical Oxygen Demand, Dissolved Oxygen, Temperature, Oxygen Reduction Potential

2.4 Project Delivery

A Tender was advertised publicly and after review and approval it was awarded to the successful tenderer Aeramix Pty Ltd.

After detailed investigations were completed as required by the contract the system designs demonstrated that the oxygen dosing only at the chosen locations would not be able to achieve the objectives due to the lack of static heads at these points. Therefore, to meet the objectives specified in the contract further addition of oxygen along the line was required to achieve the contractual obligations.

However, the option of installing additional oxygen dosing points along the lines also have been ruled out due to the perceived risk of not being able to obtain permit from Vic Roads to install additional infrastructure along the road reserve. As a result of this constraint the project demanded and innovative solution that could meet the project objectives while also having a lower risk in regards to implementation.

The designer, Mr Phillip Dack from Sulfide Control Pty Ltd, who worked on behalf of the contractor proposed to dose Sulfox® along with oxygen at those locations to supplement oxygen addition. The aim of adding the Sulfox® was to reduce the demand on the pure oxygen, and allow oxygen residuals to be maintained at the BPP.

Although, this combination had only been trialled in the laboratory previously, the designer provided a performance guarantee that it would perform to meet most of the objectives set in the contract. Further, internal desktop research carried out also demonstrated that the active ingredients in Sulfox ® would be utilised once oxygen was consumed.

Coliban Water reviewed and approved the proposal to proceed with the modified scope. Thereafter, detailed designs were completed and appropriate permits were obtained to install the infrastructure at the proposed locations.

2.5 Customer Relationship

From the inception of the project, a successful customer relationship with open and timely communication was identified as one of the key objectives of the project.

Therefore, once the contract was awarded for delivery, a project kick off meeting was scheduled with the customers living around the pit along with the staff from Coliban Water, the contractor and the designer- Mr. Phillip Dack. The team explained the details of the project to the already sceptical customers and encouraged them to ask questions as part of the implementation strategy to improve customer perception about the overall project and in effect Coliban Water.

Nearing the completion of the project, one of the affected customers has informed Coliban Water that they are having a wedding function at their premises during one of the weekends. This issue had been discussed with the project team extensively due to the risk of approximately two hundred attendees of the wedding experiencing obnoxious gas escaping form the pit. Therefore, as a part of the discussion process there were two primary options identified as feasible solutions.

One is to trial the oxygen systems that were scheduled to commence a week prior to the wedding. However, as the Sulfox dosing systems were not ready to be installed at this point of time; it has been resolved to monitor the level of odour from the pit continuously through the period of the week leading to the weekend when the wedding was scheduled with the Odaloger installed near the BPP. This monitoring had also been supplemented with frequent visits by operations staff to the location. The affected customers have also been consulted frequently during this period to ascertain if they are experiencing any odour emanating from the pit.

However, in the in the worst case scenario a second option has also been developed; that was to shutdown both Maldon and Newstead pump stations that pump into BPP and cart effluent during the period of the wedding.

As the monitoring of the first option and customer communication has demonstrated that customers did not experience any offensive odours escaping form the pit. In the end, no incident occurred on this date and instead customers were appreciative of the consultation process and the success of the system.

3.0 CONCLUSION

The following typical sewage and gas sampling results indicate how the project objectives at the BPP have been met, as well as showing that minimal dissolved sulphides are now being achieved.

3.1 Initial Investigation Results at BPP

Table 1: **Typical Newsted line results**

Date	Time	pH	Temp ^{0}C	ORP (mV)	Sulfate (mg/l)	BOD (mg/l)	Sol. Sul. (mg/l)
16/12/11	N/A	7.1	22.6	-300	<1	320	6.5

Table 2: **Typical Maldon line results**

Date	Time	pH	Temp ^{0}C	ORP (mV)	Sulfate (mg/l)	BOD (mg/l)	Sol. Sul. (mg/l)
16/12/11	N/A	9.3	19.5	-360	<1	400	8.1

3.2 Proof of Performance and Results

Tables 3 and 4 provide some typical monitoring results from samples taken at the BPP.

Table 3: **Typical Newstead *rroof of performance BPP results***

Date	Time	Oxg. On (Y/N)	Sulfox® On (Y/N)	pH	Temp C	ORP (mV)	Sulfate (mg/l)	BOD (mg/l)	Sol. Sul. (mg/l)	D.O. (mg/l)
30/4	10.40	Y	N	6.7	18.0	-330	<1	590	1.44	0.58
17/05	10.15	Y	Y	6.8	16.6	-155	<5	360	0	1.09

Table 4: **Typical Maldon *proof of performmance BPP results***

Date	Time	Oxg. On (Y/N)	Sulfox® On (Y/N)	pH	Temp C	ORP (mV)	Sulfat(mg/l)	BOD (mg/l)	Sol. Sul. (mg/l)	D.O. (mg/l)
30/4	10.25	Y	N	7.0	18.5	-280	20	480	0.061	0.6
17/05	10.00	Y	Y	6.8	17.1	+6	<5	340	0	13.4

Figure 2 shows the effect of both oxygen and Sulfox® on gaseous hydrogen sulfide levels at the BPP. Previous levels without any dosing were much higher.

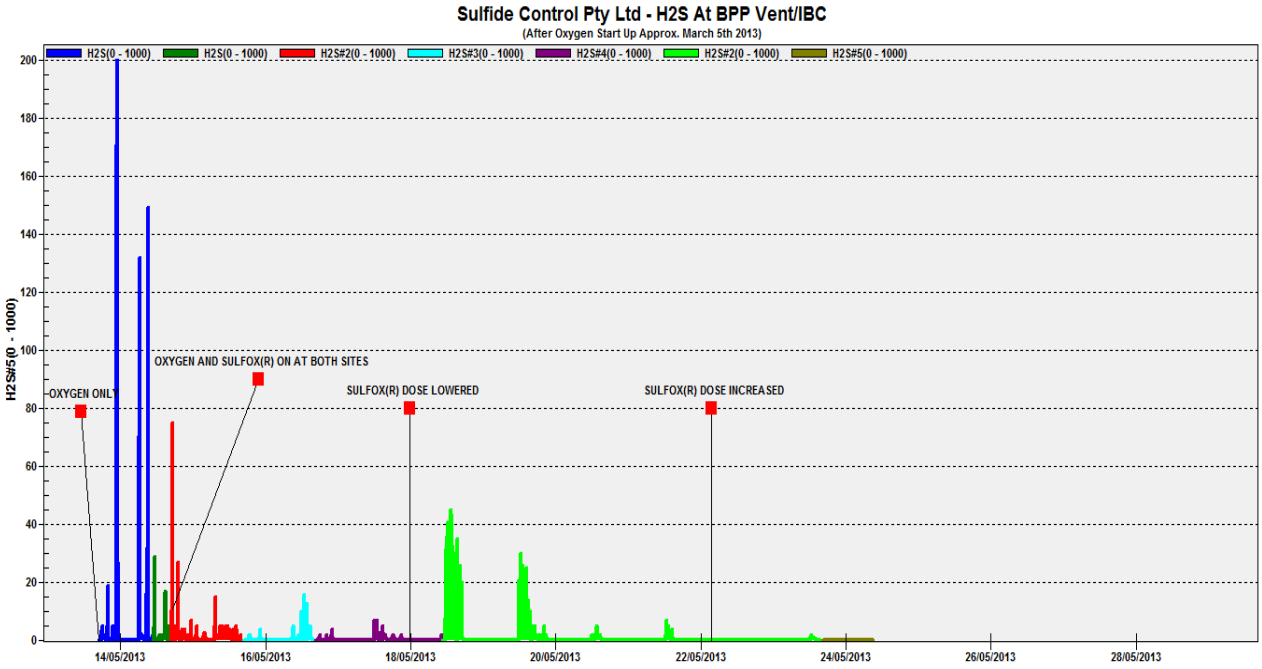

Figure 2: ***Hydrogen Sulphide monitoring results***

3.3 Lessons Learnt

Success of the project indicates:

- The importance of setting up correct project teams at an early stage of the project along with staff with appropriate levels of experience, expertise and delegation.
- The importance of investigating and ensuring that project scope will meet the ultimate objectives of the project.
- The importance of reviewing the scope at appropriate stages of the project and confirming whether it is on track to achieving the final objectives.
- The importance of closing out the project subsequent to completion and comparing it with the initial objectives to confirm whether the targets have been met.

4.0 ACKNOWLEDGEMENTS

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To Coliban Water Project Team members who contributed immensely towards this project.

5.0 REFERENCES

United States Environmental protection Agency, *Design Manual*: *Odour and Corrosion Control in Sanitary Sewerage Systems and Treatment Plants*: EPA/625/1-85/018 (1985)

Geelong and District Water Board, *Corrosion and Odour Control Interim Report: Volume 1 (November 1987)*