HOW WELL DO YOU KNOW YOUR WATER STORAGE TANKS? - MANAGING THE EVIDENCE TRAIL

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ABSTRACT

With the introduction of Water Quality Management Plans (WQMP) and the required monitoring of control points, the inspection and maintenance of water storage tanks is critical in the delivery of safe drinking water to consumers. For a condition assessment program to be balanced and relevant, four key areas need to be focused upon; site security, water quality, OH&S and structural issues. Managing the evidence (information collected in the field) is the next logical step in the process. A data capture and storage program should include specialised templates, a colour coded priority system, a library of photographic evidence and a detailed search function to enable decisive actions to be taken. A register that tracks responsibilities and procedures when carrying out maintenance projects is the final part of the system, as it closes the 'loop' between the initial inspections and the final sign off of any works completed.

1.0 INTRODUCTION

Sometimes the tanks in a distribution system are the 'forgotten asset'. As long as they keep on delivering water - no questions are asked. But what is the reliability and quality of the delivered product? With the experience of over 5000 tanks inspected, common issues have been identified that can have an effect on the performance life of the structure and an impact on the water quality contained within. It is necessary to establish a baseline and identify maintenance issues that will preserve the structural integrity of the tank and most importantly, to prevent contamination events from occurring.

2.0 DISCUSSION

2.1 The Inspection Process

It is a requirement of any WQMP, to understand the risks and hazards to the water supply, and an inspection process is essential to identify the future needs and maintenance costs of the storage.

The process is not without difficulties and there are many levels of experience and expertise to consider. Outcomes can be hampered by a lack of knowledge of what to look for, how to consistently rate the findings and where to store the data.

The key to a good inspection program is to use industry approved templates with defined ratings to standardise the assessments. If the priority ratings are also colour coded, the items inspected are easier to scan with the eye and compare, than by working with numbers alone.

Priority		Description
0		Item requires immediate attention
1		Item is in poor condition or otherwise non functional
2		Item is to receive precedence during maintenance.
3		Item is functional but deteriorated.
4		Item is in good condition.

Figure1: ***Example of priority ratings***

Knowing what your outcomes need to be, and then collecting the information to suit is most important. The four key areas of Site Security, Water Quality, OH&S and Structural issues offer a balanced program and often interrelate at times. For example, there would be a greater risk to water quality contamination if a tank is prone to vandalism activities and the hatches are not sealed or secured. A heavily corroded internal ladder will impact on water quality through reduced disinfection residuals, while at the same time posing a risk to the OH&S of the personnel using it.

Using these four categories, ensures that the data can be sectioned out and used by personnel with differing areas of interest and not just thrown together into a filing cabinet, where the effort of accessing it outweighs the benefits.

Industry accepted terminologies should be agreed upon between the inspectors and end users of the information, and all inspection commentary should be detailed, concise and provide reasoning for the downgrading of ratings scores.

A library of photographic evidence is another essential component (see Figure 2 and 3), as it can reinforce the written information and allow others with an alternative focus and experience, to make their own informed 'judgement calls'. A set list of images (plus those of any defects noted) will allow the inspector to gather all information required at the time, and not be drawn to obvious defects only.

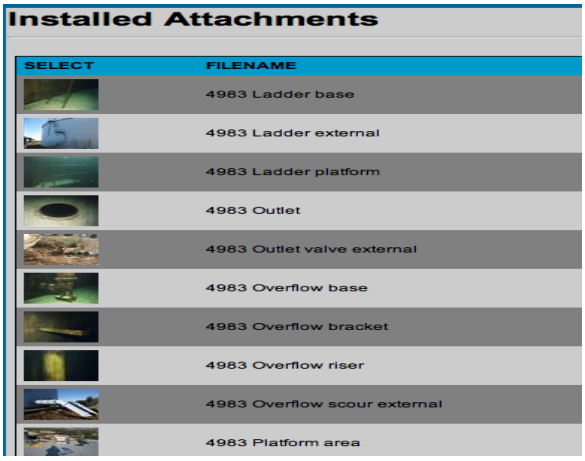

Figure 2: ***Photographic library***

Figure 3: ***Roof defect***

Inspection program frequencies should to be driven by the WQMP and any site specific evidence and past experience of the storage. A tank in a heavily treed environment, prone to vandalism or with vermin entry issues, will require more frequent inspections than one in a clean and secure location. Checking for structural damage after a storm event, may prevent a 'failed' water quality monitoring result from occurring later on.

2.2 How the Data is Stored and Processed

Most existing management systems rely on spread sheets with key words, diary entries, or even information that is still inside the operators heads. To be effective the inspection data needs to be stored in a web based asset registry system that has the ability to separate information into different areas of interest, and still be available to a wide variety of staff from different departments. Any results should be easily retrievable in the form of a search capability and through the generation of detailed reports, to suit all of the end users. The more accessible the information, the more useful it will be to an organisation. Having access at any time out in the field via smart phones and iPads, will be a powerful tool for operational staff carrying out essential maintenance.

Data entry is the last critical controlling point in achieving accurate outcomes. This should only be done by an experienced asset inspector, who has the ability to make informed judgements and to challenge any unusual or 'questionable' information gathered out in the field. Inexperienced personnel, with no asset or inspection experience, will merely transfer information, even if it is flawed with inaccuracies. The end users need to have confidence in the reliability and quality of the data for it to be effective.

Area	Priority	Status	Comments
Compound	2	F	There is a compound around the external ladder, but it will not keep out determined persons - there has been dumping activity around the site so regular checks are required
Vandalism	3	F	Graffiti is an ongoing problem with this site, as it is used as a parking and dumping area
Walls	2	A	There is concrete spalling under three of the rafter connection areas - a more detailed structural inspection should be carried out and repairs made as necessary
Ladder External	4	D	Appears to be in good order
Entry Hatch	1	A	The hatch cover is sealed but the roof is draining in under the hatch frame area, where the roof sheets join the platform
Roof Platforms	1	A	There is an open area under the platform where it sits on top of the wall - this needs to be sealed off ASAP to stop possums from entering the tank
Roof	1	A	Water is ponding and draining back into the tank, where the roof joins the entry hatch frame - a gutter flashing needs to be fitted to drain the water away
Handrails	4	D	Appears to be in good order
Davit	Na	Na	There is no davit fitted
Ventilation	4	D	Appears to be in good order
Bird Proofing	0	A	Possums have been entering this tank on a frequent basis - the area under the platform, where it sits on top of the wall has been identified and needs to be sealed off ASAP

Figure 4: ***Example of condition report***

2.3 Managing the Evidence Collected

Once the inspection data is categorised and assessed, it can drive the maintenance requirements in different ways.

Short term projects are for the 'easy to fix' issues – the simple 'housekeeping' jobs carried out by operational staffs, such as securing compound fences, applying new locks as required and cleaning gutters and platform areas of leaf debris and other contaminants.
Medium term projects will require more detailed planning, funding and the use of external contractors. They can be 'batched' together so that resources such as taking the storage off line and crane usage can be pooled. These types of maintenance items include replacing corroded ladders, renovating defective hatches, securing roof sheets, replacing ventilation mesh and sealing off vermin ingress areas.

Longer term projects such as external and internal recoating, and the replacement of defective structural items will necessitate thorough planning and extensive budgets if the outcomes are to be guaranteed.

Logistics may require supplying the distribution system from an alternative means while the storage is off line for a length of time.

An 'Actions' register that tracks responsibilities, timelines and procedures for these projects is the final part of the process as it ensures all the essential steps are completed, work stages are recorded and are not delayed or forgotten along the way. Having this register ensures that if an incident occurs for whatever reason, there is an evidence trail for auditors, inspectors and management to show that issues have been noted and projects have been actioned and/or delivered. This is important in today's working environment as it allows for a project succession plan to be in place, for staff turnovers, budgeting deficiencies and changing organisational structures. It closes the 'loop' between the initial inspections and the final sign off of the works completed.

3.0 CONCLUSION

A regular inspection program can be the forgotten task in any organisation, until an incident occurs. A structured process which uses templates to identify key issues, coupled with a defined rating system, a photographic library and an effective data storage system, will allow a valuable base line of information to be collected and shared within an organisation. Without this evidence, the performance and functionality of our water storage assets can expose the community to serious risks. The common excuses of: "We have the information somewhere!', "I think it was done some time ago", or "It's not in a readily available format" are no longer acceptable.