

THE STANDARD OF ON-SITE WASTEWATER TREATMENT FOR DOMESTIC RESIDENCES

A Personal Overview

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Abstract

The perception of the role of septic tanks in the community has changed and continues to change quite rapidly over recent times. Through the experience of a practitioner and Chairman of the Standards committee on the draft of Australian Standard 1547, the perceptions of the community, government and the on-site wastewater management professionals, these changes are recognised as the driving force for performance based standards.

The innovation in the on-site wastewater industry can be judged by the range of alternative systems of domestic wastewater treatment and subsequent liquid disposal. Not only are there improvements in the on-site systems but as the new Standard will be performance based, there will be opportunity for new and innovative systems to be judged by their performance.

Keywords

Australian Standard, AS 1547, AWTS, composting toilets, disposal, irrigation, on-site, sewage

1 Introduction

We are all here for the next few days representing various groups of our industry and all hoping to go home having gained something. The very title of the Conference makes the clear statement, at least infers it, that there will be an On-Site 2001, an On-Site 2003 and so on. Everyone in Australia that is involved in on-site systems has been talking about launching a conference for ages: and thankfully, Dr Bob Patterson has made it a reality. From now on the momentum will build up to make this happening an ongoing thing. As has often been said we are really quite a small group of people who derive our livelihood from the activities of on-site treatment. However, the impact of our activities is rapidly attracting wider scrutiny.

As an engineer, to tell someone you were a sewerage engineer was reasonably amusing: but to say you were involved with septic tanks was always quite a joke. However, today major established consulting engineers will contact us seeking the specialist advice our experience can offer. It is gratifying to see our industry – the on-site domestic wastewater treatment industry – gaining some standing in the profession and community at large.

We look forward to watching On-Site '99 and future versions enjoy the level of respect and following of our U.S. colleagues' prestigious American Society of Agricultural Engineers Conferences. They held their 8th On-Site Wastewater Treatment Symposium in March, 1998. It is a great honour to have with us for this most important inaugural event, several of our U.S. colleagues who are leading international lights in this field. They have become personal friends to me and have always been extremely generous, beyond all bounds of expectation, in the sharing of technical information.

2 The Progress

Where did it all start? The true answer is with the beginning of man's inhabitation of the earth, and most particularly, his decision to settle. Anyhow, let us jump to my own life's experience. In the 1950's, if you lived in a town/city, you might have been fortunate enough to have the opportunity to connect to a sewer main, which ultimately ran into the municipal sewage treatment plant. This scenario was then established in time to be the ultimate goal for everyone.

So, over the following 20 odd years, the priority of government was to make funding available to work towards the "desirable" ultimate goal. Even for quite small communities where the economics were much less favourable, the traditional engineering solution of a full sewerage scheme became the norm. It did not take much to convince the average home-owner that it was worth paying an annual sewerage charge on the property to completely eliminate all the problems associated with a septic tank installation.

What was the typical septic tank installation of the 1950's and 1960's? In a word, small – small septic tanks and short trenches. Why? Because the daily flows were much less and often the authorities sized trenches on the minimum for favourable soil conditions and the assumption that more can be constructed if necessary, if sewerage didn't come first. It always amused me, when I first joined Standards Association of Australia on the Septic Tank Standard Committee in the late 70's, that AS Int. 350 – 1951 was still the current Standard for the design of septic tank absorption trenches and transpiration areas; yes, 1951. Progress was still slow in this field of study. Parochialism, rules-of-thumb with limited, if any, scientific basis, and very little interchange of information (very few conferences and meeting between people from far-flung areas) was the order-of-the-day – no modern information technology. Every local authority and every state had their own ideas: and there was no consistency between them. Yes, you might say some input of local knowledge is most important; but the variability defied logic.

Drawing from personal experience, it is important to point out what is happening on sites with low permeability clay soils. It would seem that however large the disposal area is, it will still show signs of failure ie. the surfacing of effluent. At least we know that in recommending design loading rates that result in larger areas is a move in the right direction – even if the land developers complain vehemently. Standards or Codes of Practice must produce realistic answers, not optimistic results.

Speaking as one who has been as long with a statutory authority as I have been a practitioner, it is not out of order to make the observation that aerated wastewater treatment systems (AWTS) raise the level of amenity for a group of housing in an extremely low – permeability clay soil area, admittedly it is at some, extra cost. It improves the amenity in two ways:

1. It enables relatively innocuous effluent to be distributed onto garden areas – grassed area or landscaped garden area ie. to be used to some positive benefit without any unpleasant odours; and
2. It virtually overcomes the characteristic odour that is detected in a septic tank community under certain meteorological conditions such as in the evening when the air is still - no wind - and an inversion layer establishes. The re-circulation of secondary effluent back through the primary treatment chamber can maintain aerobic conditions on the surface of this chamber greatly reducing odour from primary treatment.

This assertion is made with the full knowledge that the authorities can produce the evidence that the AWTS cannot satisfactorily meet effluent standards. This is another issue.

3 The Standards

Throughout the 1990's we have witnessed an accelerated pace in the production of regulatory documents on the subject of on-site treatment and disposal. On-site systems are here to stay. The

environmental legislation of the various states of Australia is identifying unsewered sites as a potential source of pollution to both surface waters and ground water ie. unsewered sites are under the “spotlight” with the consequent licensing, fines, and legal action associated with compliance (or non-compliance) with set discharge standards. A failing or inadequate on-site system can no longer be ignored. The consequences of such an action are grave and costly. An interesting twist to this issue is the case where the home owner is taking the local authority to task as a result of the costly ramifications of incorrect or ill-informed design advice given by the local authority.

All regions of Australia can make claims to publication of relevance and significance: Western Australia (a recent workshop), South Australia (the yellow books), Northern Territory (code), Victoria (code), Tasmania (Institute of Environmental Health Code), New South Wales (the Silver Book), Qld (Code of Practice) and Australian Capital Territory (Site trials and patented new technologies).

The next Australian Standard on the subject, *On-Site Domestic Wastewater Management AS 1547* is scheduled for publication by the end of 1999. This document is already reasonably well-known by the active players in our industry and is not expected to cause any major waves. Due to the controversial nature of some of the matters covered in the document and real time constraints on the contributors and authors of the various sections, it has suffered a long gestation period. So long, that some States have had to take some interim measures in support of new legislation.

What the drafting period for the next Australian Standard has done is provide the catalyst for more active debate on the issues and helped result in more mature solutions. The debate has been “healthy” and never dull. It has forced new and stronger linkages between the various sectors of our industry. Obviously there will be some overlap and some conflicts between the Standard and certain of the various State documents as they have been developed separately. The philosophy of the committee in drafting AS 1547 is that it be a “living” document and a performance-based document: in order that new information can be applied as it becomes available without contravening the requirements of the Standard.

4 Future Trends

What innovations are emerging? In the composting area, there are a few movements of interest. The wet-composting process, about which there is not much detail in the technical literature, has attracted interest. As most in attendance would know, it is offered as a process to receive all household waste, both liquid and solid including all kitchen scraps and paper. The liquid effluent from the process is not suitable for surface irrigation. The solid waste would not need removing from the unit for several years and will be required to meet the same pathogen levels as the product from waterless composting toilets (WCT). This system had been developed to allow a flushing toilet to be used with a form of composting system.

A system has been developed in North Queensland with a non-flush type toilet connected to a water-based treatment system with an extremely long detention time and a claimed effluent quality to meet the bacterial limit. This system is for toilet waste only, as it does not include normal household greywater)

Another development in the composting arena is a device that centrifugally separates the solid matter from the liquid matter: thereby enabling the conventional dry-composting process to operate more efficiently. The liquid component of the human waste from the composting toilet is then U.V. disinfected to meet the requirements for disposal.

The passive treatment option is being considered by the consumer as an alternative to the AWTS. The advantages to the home-owners are that it offers a consistently high quality effluent, which keeps the local authority off their backs and it is a lesser-cost option in the long-run due to lower operating costs and minimal routine maintenance and servicing requirements. One of the developments in the passive area is the recognition and harnessing of the natural soil to treat primary effluent – it happens beneath a conventional septic tank effluent trench but has never been of particular interest.

The most burning question is: “What is the next significant technological move to happen for AWTs’s. Over the last fifteen years we have seen many variations to the general theme. I think NSW Health Department had approximately 15 approved systems, with each individual manufacturer claiming a superior effluent quality. Most systems have provided a chamber for the primary sedimentation and the anaerobic digestion of the settled solids. However, there are a few designs where the raw sewage is discharged directly to the aeration compartment (conventional extended activated sludge). There is no trend towards this style of system in general.

Because of a certain perceived incapability of AWTs to meet effluent standards, there seems to be a push from some of the statutory bodies for fixed subsurface irrigation. It is my view, that this would be an extreme stance to take. There are still ways to reduce, to an acceptable level, the risk from direct contact of effluent without losing the benefits of an irrigation system offering flexibility in use. Fixed subsurface irrigation is the most expensive for the home-owner. Apart from the health issue, there is the issue of which approach to irrigation gives the most favourable environmental outcome. The issue of spray irrigation of AWTs effluent is not clear-cut.

As we are aware, there are certain potentially pathogenic micro-organisms that are extremely resilient to the standard methods of primary treatment, secondary treatment, and disinfection by tablet chlorination. So, what do we do about these? As some precautionary advice, if serious uncontrolled reuse of effluent from a municipal sewage treatment plant was being planned today, the equivalent of Advanced Wastewater Treatment (AWT) comprising a minimum of coagulation and sand-filtration of the disinfected secondary effluent would be provided.

In the spirit of what has just been mentioned, there are some statutory authorities requiring some form of effluent polishing unit following an AWTs if the house owner wants to spray irrigate the effluent.

5 The Challenges

The challenges before us are truly formidable. Here are some that come to mind:

- A justification for the pursuit of on-site treatment and re-use in the context of overall management of our rare and precious resource, water;
- The formulation of the legislative and regulatory framework for the on-site treatment and reuse of household wastewater in the sewer areas of the towns and cities;
- The demonstration of reliable and robust (fail-safe) systems for incorporation in the context above;
- The involvement of the relevant academic disciplines to ensure that the degradation of the irrigated land does not occur unnoticed – the multi-disciplinary approach; and
- Encouragement of the pursuit of more sophisticated systems to address the salt-levels in the effluents – together with campaigns to use “safe” washing and cleaning agents for the home.

On-Site '99 is the best forum at which to identify and prioritize challenges such as these. Please give the matter some thought over the days we are together and perhaps the organisers can give some time during the proceedings for your views to be voiced.