WALKING THE TIGHTROPE BETWEEN PRODUCING EFFECTIVE AWTS AND SATISFYING THE REGULATORS

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Abstract

This paper charts the history of the development of the aerated wastewater treatment system (AWTS) and compares it with its overseas counterparts. It also shows that the management of on-site disposal regulations has been less than satisfactory. This has meant that the rural population of NSW has missed out on being able to develop land for residential use. It also means that there has been and will continue to be unnecessary expenditure of taxpayers' money to provide sewage treatment plants to cater for the urban sprawl.

This paper primarily discusses the situation in NSW and particularly the Sydney Basin, as that is where the majority of AWTS are installed and it is where most manufacturers are situated. It also discusses the NSW On-site Disposal Guidelines for Single Households and the NSW Health AWTS Accreditation Guidelines.

The necessity to publish the On-site Disposal Guidelines is the result of the lack of Government enforcement of its own regulations. There is an urgent need to ensure that houses without sewerage facilities do not pollute the environment. However, these regulations are not the way to achieve that outcome. Bureaucrats who have little or no experiences of living without sewerage have produced them without "genuine" public and industry consultations. The regulations are trying to rectify the mistakes of the last fifteen years in one attempt instead of implementing a gradual upgrading of on-site disposal methods. In this way alone they will fail.

Keywords

accreditation, aerated wastewater treatment systems (AWTS), IFAT'99, NSW Health guidelines, on-site disposal, regulations, re-testing, reuse of resources, STP

1 Introduction

There has been on-site wastewater disposal in this world for hundreds of years but it was not until the population explosion at the end of the last century that modern society decided that it had to be regulated in some form. Early this century, various regulations regarding septic tanks were drafted and septic tanks were the popular disposal method until the early 80s. At that time because of the increasing density of rural dwellings, there became a need to improve on-site sewage treatment and the first aerated wastewater treatment system (AWTS) was installed in 1982.

Lack of understanding and training of the council inspectors who must implement the regulations is now producing far worse environmental conditions than before the regulations.

Properly functioning aerated wastewater treatment systems or other on-site disposal systems allow the beneficial reuse of a valuable resource rather than the disposal of a waste product.

Sydney will run out of fresh water some time early next century. Properly controlled reuse of treated effluent by on-site systems can reduce the need to use a failing resource (fresh water) and save tax payers millions of dollars in building sewerage treatment plants and laying sewer lines.

2 The AWTS industry and the AWTS Manufacturer's Association

In the early 1980s the lack of a reticulated sewerage system in parts of Sydney was preventing the

further development of residential land. Councils were not keen to allow sub-division of land when the only disposal method available was either a septic tank or a pump out system.

The first AWTS of the current era was installed by Envirocycle. The industry grew fairly quickly and by 1986 there were about five companies selling AWTS systems:

BioCycle	BioTreat	Clearwater
Envirocycle	SuperTreat	

Other manufacturers had obtained approvals to satisfy NSW Health requirements, but were not active in the market place. By 1994, AWTS systems were being installed in every State of Australia. Business was booming, but all was not well. There was extreme animosity between the companies, salesmen maligned competitors products, removed advertising signs and even threatened violence to one another.

In 1994, a meeting of interested parties in the AWTS industry met at Penrith. This consisted mainly of Council officers, NSW Health, NSW Environment Protection Agency (EPA) and one AWTS company was invited to attend. Fortunately one Council officer thought that there should be a wider industry representation and informed the author, who arranged for himself and Fred Seymore from Envirocycle to attend.

At that meeting, NSW Health explained that AWTS had been approved as a temporary method of sewage treatment until a reticulated sewer was available (Neil Shaw, *pers comm*). Needless to say this information came as bit of a shock to those members of the industry that were present. A few months later the AWTS Manufacturers Association came into being with Armen Mesrobian from Envirocycle, who had installed the first system in NSW, as the founding President.

When it started the Association was comprised of nearly all the NSW companies. NSW Health was invited to address the members and it recognized the Association as representing the industry. Codes of ethics and practice were established and it publicized its existence as much as possible using a part time remunerated executive officer.

Many achievements have been documented:

- The antagonistic attitudes between the companies have been replaced with a better standard of professional service.
- A single point to contact the majority of the industry.
- Each Council in NSW was invited to identify any system with which they were having difficulties. The Association then enforced its code of practice on the relevant member.
- A common buying group was able to exploit better economies of scale.
- An AWTS test site has been established at the Moss Vale STP, to test members AWTS for Accreditation. This may become the forerunner for a replication of the American NSF in Australia.

The Association continues to grow and after the re-testing of member AWTS it will seek the wider use of AWTS.

3 Report on IFAT 99 – with a comparison of Australian and European AWTS

Every three years, the International Trade Fair for environment, wastewater and waste disposal, the world's largest wastewater and waste management exhibition and conference, is held in Munich, Germany. Over 2000 exhibitors, some of whom have spent between $250,000 and $500,000 to mount

their exhibition, attended this year.

During IFAT 96 in 1996, the author observed four or five manufacturers of domestic wastewater treatment systems, mostly AWTS. This year, the number had doubled to about ten or twelve manufacturers.

It is the author's opinion that Australian AWTS are probably as good as, if not the best in the world. The overseas' treatment methods are similar to Australia's, mostly activated sludge, submerged fixed filter beds, trickling filters and rotating bacterial contactors. They use both concrete and fibreglass vessels, but the size of the vessels is much smaller than those used in Australia. It seems that smaller vessels are able to treat much larger volumes than in Australia, even though Australia has a higher annual ambient temperature than Europe.

One exception to technological differences was that aeration chambers are much smaller in Europe, a trend in the research that is emerging here.

A striking difference between Australian and European AWTS is that European systems do not provide any means of disinfection. In 1996, the few manufacturers approached by the author were amazed disinfection was required in Australia. This year, disinfection was being offered as an optional extra by a few manufacturers as there were some areas that required it to be included. The only system that had disinfection in its display model was an Italian system. The chlorinator consisted of a channel roughly cut out of fibreglass into which the chlorine tablets were placed, this system made the crudest Australian system look like Star Wars technology.

The other comparison that will amaze Australian regulators, which has not changed since the 1996 visit was demonstrated in the many scale models of houses with AWTS attached that showed both surface spray and subsurface disposal. After disposal in the house garden, there was always some form of overflow or surface runoff that was discharged into the local stream or river. All of the manufacturers took it as a matter of course that the ultimate destination of the treated water was the local waterway. No European system had any form of nutrient reduction or removal other than the normal nitrification process of a standard AWTS.

The major variation for the Australian AWTS industry is the vast difference in the retail price of an AWTS system. The standard price for an AWT system in Europe was equivalent to A$9,000.00 not including delivery, installation or disinfection.

The normal delivered price for an AWTS in the Sydney Basin is just under A$5,000. The rural dwellers of Australia can not only buy one of the best quality AWTS in the world, but they do so at half the equivalent cost to their European counterparts.

It was difficult to gain a reliable understanding of the effect of the regulations just from discussions with manufacturers. However Germany appeared to have the tightest regulations that require three services annually. Mention was made of fines and regulatory reprisals if the analysis was not supplied to the Local Government or if the system failed the test. Manufacturers did not consider the regulations to be a problem to business because there appeared to be little follow up for systems that failed. England had less severe regulations.

The European discharge requirements, varied from country to country, but are not as restrictive as Australia's:

BOD_5 - between < 25mg/L - < 40mg/L
TSS - between < 35mg/L - < 80mg/L
FC - usually not required

It is proposed to reduce even further the faecal coliform (FC) requirements below 30 cfu/100mL in Australia. Perhaps Australia should concentrate on getting *all* treatment systems to the *existing standard* before spending additional resources on bureaucratic goals.

One of the major complaints in Europe was that although the regulations existed, they were seldom enforced, which of course is what happens in Australia.

4 The NSW On-site Disposal Guidelines

4.1 The implementation process

The NSW Government should be congratulated for at least doing something rather than nothing to improve the lot of rural dwellers. However, will the guideline really achieve what the Government intended or what rural dwellers want for on-site sewage management? Most householders want an effective treatment system so that they can reuse their water in order to preserve freshwater. However, there has been very limited opportunity for stakeholder input to the guidelines.

It is acknowledged that the Government issued a draft document for comment (DLG, 1996), and held a one day meeting of a limited number of interested parties. The 'draft document' then became the published version. After a biblical sized transformation – 90 pages became 190 pages and whole new sections appeared.

Presumably the current document (DLG, 1998) was never released for comment before publication – because the publishers were afraid of the reception it would receive. Many negative comments have been expressed by experienced geo-technical engineers about the flawed science in the guidelines, and it is significant that its publishers have never once scientifically defended the document.

When the 'guidelines' were published, very few Council officers had any understanding of on- site disposal. The 'guidelines' became the regulation i.e. flick through the book, find a useful number and approve installations so long as they have those numbers in the application. The result has been that all AWTS magically have a final effluent quality of 37mg/litre of nitrogen. This value has been used in the worked example in the 'guidelines' and it has unilaterally become the value with which to decide the size of a disposal area.

Implementation of the 'guidelines' around Sydney has produced confusing results. Some Councils have established specific rules for disposal, a process to be commended as it makes everything very clear for local householders and the industry. However, four *adjacent* Councils near Sydney have interpreted the 'guidelines' differently and require these disposal areas:

- Liverpool - $400m^2$
- Camden - $1400m^2$
- Wollondilly - $300\text{-}1500m^2$ depending on block size
- Wingecarribee - $200m^2$

Obviously, the 'guidelines' are not sufficiently clear in that they do not 'guide' Councils to a similar result.

4.2 A dangerous backward step

There has been a significant increase in the number of pump-out systems forced upon new householders since the arrival of the guidelines. Even though the guidelines state that 'pump-out systems are not usually viable in the long term' (DLG, 1998, page 135), there has been a very large increase in Wollondilly, which is the largest inhabited local government area in the Warragamba catchment area (Sydney's water supply). Using the guideline's own water flow calculations a pump-out system will cost a family of five $95 per week in Wollondilly. The need to spend 25-35% of after tax income on wastewater disposal will mean that many householders will be tempted to discharge illegally, thus increasing the burden on the environment.

Over a century ago the night soil man was a common sight. Today pump-out tankers, which are the twentieth century equivalent of the night soil man, are becoming an increasingly common sight. Society does not seem to have progressed very much under these guidelines.

4.3 Water Quality Criteria

Even though the On-site Guidelines (DLG, 1998) were marketed by the Government as a complete and holistic document regarding on-site disposal, they fail before publication. Of the 190 pages, only a few lines are given to the quality of the wastewater available for disposal. With regard to an AWTS, only a line on Page 45 requires that the Council should have a monitoring program that includes "checking of performance to specifications of various on-site systems". Page 46 requires that "details of on-site sewerage treatment devices that do not comply with accreditation requirements or that regularly fail, should be reported to NSW Health".

An AWTS of an approved type that conforms to its approved specification should produce correct specification water. Treated water of the correct specification is easier to dispose of than below-specification water. It is the author's view that very few Council officers have understood that it is part of their job to check that treated effluent should be of the correct quality, before disposal. This checking means ensuring that the AWTS conforms to its NSW Health Accreditation.

The AWTS Manufacturers' Association knows of, or has reported to NSW Health and the relevant local councils the following illegal installations:

- 35 illegal copies of the Super Treat system installed in the Yass and Yarrowlumla Shires.
- A considerable number of systems purporting to be Clearwater systems installed over a long period of time in the Wagga Wagga area.
- Systems with undersized blowers or no bacterial support media in Wollondilly and Penrith.
- Systems installed in Camden using unapproved glassfibre tanks. The tanks were later approved by NSW Health months after they were installed when the Council was taking action to have them removed.

All these systems are still operating years later with the full knowledge of NSW Health and the Councils.

5 Re-Testing of AWTS

The NSW Government retesting of AWTS is an expensive exercise that will not prove that an AWTS will treat household effluent. Under the NSW Health AWTS Accreditation Guidelines (NSW Health, 1998), an AWTS seeking NSW Health accreditation must install a test system to treat wastewater from the STP influent channel.

AWTS are designed to treat domestic wastewater directly from a house. They are not designed to treat municipal wastewater entering a STP. The test protocol requires the AWTS to be subjected to shock loads, the like of which it will never experience in its working life. However, it is never actually tested under its 'normal' working conditions.

The average house connected to an AWTS may have a party or other similar function that will increase the load on the AWTS, maybe for one day or even a weekend. Except in the minds of the authors of the AWTS guidelines, the "average" house does not have a party using the high volumes of water specified in the test protocol for *five consecutive days*.

A more appropriate test would be to have a larger number of systems of the same model tested under varying loads in a situation similar to a domestic house. If there is a larger number of samples, then any test result anomalies can be discounted. Alternatively, *all* AWTS seeking accreditation should be tested at the *same* location. In this way, each system acts as a 'control' for the other. If all the AWTS receive exactly the same effluent, then they should produce similar results. Unfortunately, NSW Health was unable to understand the scientific importance of a 'control system' in a test.

The American NSF system seems to be a fair method of testing. One Australian regulator has visited their test establishment and presented an excellent report on his return. So we have the knowledge to replicate that system here. There would be a financial bonus for the first State to build a similar facility in Australia.

Curiously, the new 'draft' guidelines for grey water systems (NSW Health, 1999) requires the greywater treatment system to be tested in a residential house in which resides a baby with a mother who uses cloth nappies, probably not easy to find in today's society. Here the reverse situation to the AWTS test occurs, but with a similar outcome, i.e. the test is not a true replication of operating conditions. The system is tested treating an influent that it is unlikely to meet in normal operation. More importantly if it is a biological system, it will receive huge doses of carbon based compounds from the nappy laundry, to create a good fauna, the like of which it will seldom see in greywater from the average house.

Again the Greywater Treatment System Guidelines (NSW Health, 1999) which have probably been in production since at least 1995 have been formulated without industry input. There were only a few weeks for interested parties to offer comments on the final draft. It is suspected that only a few people will bother to comment on a *fait accompli.*

The current NSW guidelines allow little scope for the implementation of modern scientific research, as a treatment system must conform to some 'pet' requirement of a bureaucrat who thinks it is 'a good idea', or because 'it has always been done that way'. An example of head-in-the-sand regulation is where the NSW AWTS Accreditation 'Guideline' (NSW Health 1998) (read regulation) requires 1000 litres of freeboard within the AWTS in the case of irrigation pump failure. It was pointed out by the industry that the installation of a standby pump could achieve the same result. NSW Health would not countenance the idea.

A 1000 litre overflow capacity will not be sufficient to *guarantee* no cross contamination before pump replacement. A standby pump is a recognized *fail-safe* method in sewage pumping stations so why not in an AWTS? Of course it was pointed out that a standby pump would not operate during a power failure. For many households that have on-site disposal systems, the freshwater pumps do not work during a blackout so there is no flow to the AWTS. Also power blackouts, nowadays, rarely last more than a few hours. A standby pump has these advantages:

- It is about the same price to install as the surcharge chamber
- It is cheaper for the home owner as they would not have to pay a service call-out charge to replace the broken pump
- The broken pump could be replaced at the next service

If we produce AWTS that have to be better than STPs, maybe we should replace STPs with AWTS.

The septic tank industry implemented QA a few years ago. The current result is that, of approximately 72 septic tank manufacturers in NSW a few years ago, only 40 still exist today, with Victorian figures being 48 and 20 respectively (Geoff Clark of QAS, *pers comm.*). Within 100 kilometres of Sydney, only seven manufacturers remain.

The change that QA has made to the septic tank is an increase of $100 per tank, with no improvement to the service provided. The product itself has barely improved, they still leak at exactly the same rate as before. The author has seen tanks leaking over their entire surface *and* through the QA Standards mark. Compared to European concrete septic tanks, Australian septic tanks are inferior. Unlike an Australian AWTS, our septic tanks would not be acceptable in Europe. If the regulators require quality assurance, they should demand the assurance of *good* quality.

The 'last' version of the AWTS Accreditation Guideline (1998) appeared in September 1998 with a requirement to be on test by 31st March 1999.

Several manufacturers could not comply with the September guideline in a crucial area and so an 'interpretation document' had to 'change' the guideline before the development of systems for test could proceed. This resulted in less than four months to develop, design and construct a test system after the latest set of 'confirmed' guidelines were available in December 1998. It should be understood that directors of manufacturing companies would not be acting diligently if they committed funds for system development without a confirmed set of requirements.

Unrealistically, BOD_5 and TSS are to be sampled at the clarifier – before the completion of the treatment process. Or in motor car analogy, emission standards need to be met at the engine manifold rather than at the outlet of the exhaust pipe.

The theory behind this criterion is that should the regular quarterly maintenance not be performed and there is no chlorine in the system, then NSW Health can be assured that there will not be high levels of BOD_5 and TSS being discharged onto the disposal area. If the chlorine is not replenished, the amount of BOD_5 and TSS that will be discharged will be inconsequential in comparison to the vast numbers of pathogens discharged in the wastewater.

Ensuring that the quarterly servicing is performed is a function of the regulator, the local council. The manufacturer cannot force the householder to have the system maintained. Again, NSW Health would not accept that chlorine was part of the treatment process even though BOD_5 reduction using chlorine is a recognized method in the literature. (Metcalf and Eddy,1991)

6 AWTS Compared to STP

STPs are regarded by many as the best method of wastewater treatment. The author disputes this assertion

On a household basis, an AWTS can be purchased for about $5000 in rural NSW and $4000 in rural Queensland. The developer service charge paid by the Government to connect the same household to the new sewerage scheme in 1999 in Picton NSW is $13,500 (Sydney Water, Trans Utilities Consortium, Alan Parks, *pers. comm*.).

However, the real benefit of AWTS is on the freshwater not the wastewater side of the equation. An AWTS allows water to be used twice, a sewer allows water to be used only once. Fortunately, Councils may no longer be able to force householders to disconnect their on site disposal system and connect to the sewer, if a house has an approved disposal system it may not have to connect to the sewer, (The District Reporter, 1999). So there may be a lot of environmentally conscious householders choosing to keep their AWTS and not discharge to the sewer.

7 Conclusion

The AWTS industry is in a worse position than the motor car at the turn of the century. After the first motor car accident killed a pedestrian, the regulators made a man walk in front of them (waving a red flag) to warn of their approach. Nobody at that time could see the incredible benefit that the motor car would have to the development of mankind.

There is no recorded instance of an AWTS injuring a person and if pollution of the environment is caused by an AWTS then it has never been separated from pollution caused by other disposal methods such as STPs, septic tanks or illegal discharges from pump-out systems. Daniel Martens, (Martens D.M., 1991) showed that run off from AWTS sites at The Oaks, NSW was less than from sewered areas and far less than from septic trench disposal areas.

The restraints on the use of AWTS and the reuse of treated AWTS water are akin to the man with the red flag. Until they are relaxed their full benefits for the community will never be realized because there is no point in spending money on better systems if the regulators are going to restrict or prevent their implementation.

However it must be emphasized that no member of the Association wishes to see the irresponsible installation of AWTS. Quite often a client is told to install a pump-out system, because an AWTS is not suitable. For this reason a number of AWTS manufacturers who have their own tank factories also make pump-out tanks.

Australian designed and manufactured AWTS are among the best in the world. Perhaps the regulators need to follow suit and raise their standards regarding professional knowledge, industry experience

and actually upholding the regulations. Without the development and advances in the position of the regulators, the rest of the world, which at present is behind Australia, will catch up and overtake the Australian AWTS industry.

There has been a constant improvement in the quality of AWTS and their operations by manufacturers since 1996. This has been brought about by peer pressure created by members of the AWTS Manufacturers' Association Limited who exchange information to achieve a better product and service for their clients.

The regulatory management of the domestic wastewater treatment industry has reached a point where it needs to be upgraded from being controlled on a part-time basis by health officers without specialized knowledge of wastewater treatment. It must be said at this point that the industry has always enjoyed a cordial and courteous relationship with NSW Health. However, the industry can only develop and improve the protection of public health by the appointment of tertiary-trained wastewater engineers to monitor the industry and assist Councils to uphold the regulations.

Members of the industry have requested a place in the regulation setting process. It was suggested to us that the Association would have involvement with the Wastewater Management Advisory Committee, but that membership has not been forthcoming. In order for the industry to invest money in research and development to improve the industry, it is essential for the government and industry to work together.

There is a need to develop AWTS accreditation and disposal regulations that will allow new and improved AWTS to be built in Australia.

References

Department of Local Government, 1996. *On-site Wastewater Management Systems for Domestic Households*.

Department of Local Government, 1998. *Environment and Health Protection Guidelines, On-Site Sewage Management for Single Households*, January 1998.

Martens, D.M., Warner R.F., 1991. *Evaluation of the Environmental Impacts of Aerated Wastewater Treatment Systems*, May 1991, page 49.

NSW Health, 1998. *Aerated Wastewater Treatment Systems (AWTS), Accreditation Guidelines* (September 1998)

NSW Health, 1999 *Draft Domestic Greywater treatment Systems, Accreditation Guidelines* (April 1999).

Metcalf and Eddy, 1991. *Wastewater Engineering Treatment, Disposal and Reuse, Third edition*, 1991, page 755.

The District Reporter, 31st March 1999, page 7