DRY SANITATION TECHNOLOGIES - CAN THEY BE SUSTAINABLE?

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Contents

Summary

For many developing countries the acceleration of sanitation delivery towards meeting the MDG targets, has led to a surge of activities. As part of their strategy for ensuring that basic sanitation is provided, many recommend a Ventilated Improved Pit Latrine (VIP) or a dry sanitation derivative as the basic minimum requirement in the form of a sanitation technology. This is especially the case in the continent of Africa and in the example of South Africa the policy recommends VIPs as a basic minimum level of service. The up-scaling and delivering of sanitation in many cases in the form of VIPs and its derivatives, as well as Urine Diversion technology are beginning to pose many technical challenges in South Africa and these experiences are relevant to the rest of the world. The principles on which they have been designed are not always being observed in practice. As a result, many systems are filling up much faster than expected and the lack of good scientific knowledge provides no solutions. Recently completed research has found that the breakdown in the feces is not happening as would be expected in an anaerobic reactor, and that the drying of feces in humid conditions, even with the use of drying agents, is not optimum. These problems which are being experienced in the field have long term repercussions on the sustainability of sanitation provision. This paper aims to share these experiences and findings of research, and the impact it may have on the Sanitation MDG goals.

1. Introduction

The Millennium Development Goals (MDGs) are a set of targets to extend the benefits of development to a substantially increased proportion of the world's poor. At the

World Summit on Sustainable Development in 2002, the extension of sanitation to the poor was added to the MDG targets. Accordingly, the MDG target was to halve the proportion of people in the world not having access to basic sanitation by 2015.

This commitment was important as it ensured that national governments and international agencies raised the priority of and the funding for sanitation. Recent estimates note that 2.6 billion of the world's population lack access to basic sanitation. At the current rate of water and sanitation development the world will miss the MDG target (to halve, by 2015, the proportion of people without access to basic sanitation) by 1 billion. The impetus created by the MDG target has set in motion an upsurge in sanitation provision around the world. In South Africa, there is a strong political will and the necessary fiscal backing to eradicate the sanitation backlog which was inherited after the years of apartheid. In 2005 the Minister for Water Affairs and Forestry, Buyelwa Sonjica, said that around 16 million South Africans remain without access to hygienic sanitation facilities, 3.6 million citizens with no access to safe drinking water, and a further 5.4 million who had a source of safe water, but more than 200 meters from their homes.

2. Challenges Posed in the Up-scaling of Onsite Dry Sanitation Systems

Many VIP latrines have been built with permanent superstructures. In designing a VIP the main component is the sizing of the pit, which is based on the volume of fecal waste that accumulates per person per year ($r = 0.05$ m^3/person/year), the number of users (P) and the design life of the pit ($n =$ usually 10years). *Pit working volume* $= rPn$ (m^3). The same formula is used for sizing alternating twin Pit systems. Field experience in South Africa has raised the following concerns:

- Pits are filling up much faster than their design life
- There is conflicting advice on what should be put into pits to keep them operating well
- A variety of undesirable non-degradable objects are introduced into pits which may complicate pit emptying exercises
- A range of disinfectants are used which may negatively affect stabilization processes in the pit
- Emptying of pit contents poses significant health risks and organizational difficulties
- Poor construction results in problems with structural integrity, flies and odors
- Grey water is frequently added to the pit as there is no other mode of disposal, under certain circumstances this can lead to groundwater pollution.
- There is a tendency to use pits for the disposal of household waste, much of which is non-biodegradable.
- Despite education programs which strongly advise against this, many users are in the habit of dosing their pits with disinfectants to reduce odors and poison such as sheep dip to reduce fly breeding.
- There is a lack of the necessary anaerobic activity in the pit or break down in the material.

The implications of these developments are profound and will have a huge impact on the sustainability of the technology and sanitation in general.

- Shorter lifespan mean an increase in maintenance costs should the desludging of pits be required. This is expensive and becomes very difficult if the pits and superstructures are not designed to allow for desludging.
- Should desludging prove difficult, the other option is to build new VIPs or sanitation facilities, which is expensive and contributes to the sanitation backlog.

Thus it is a matter of urgency that a thorough understanding of the technology is determined so that the technology can be influenced to be more effective. To date little research has been carried out on understanding the degradation mechanism or processes occurring in VIP latrines. We have come thus far with the understanding and assumption that the mechanism in pits is predominantly an anaerobic degradation process. This is further compounded by the emphasis in many initiatives put mainly on the civil engineering (that is the aesthetics and safety) and project management (putting bums on a seat) elements of delivery. Specifically, there is limited understanding of the:

- Physico-chemical characteristics of pit contents at different points in the pit;
- Biodegradability of pit contents at different points in the pit;
- Methanogenic activity at different points in the pit.

The majority of the material in a VIP pit is not exposed to oxygen (either directly to oxygen gas or through diffusion through water). Thus if any biological degradation is to take place in the bulk of the pit, it must do so anaerobically. Unlike engineered wastewater treatment systems, there is no mechanism in a VIP pit to select and retain or recycle specific types of micro-organisms, further there is no generally applied inoculation or seeding mechanism to ensure that suitable micro-organisms are present. Furthermore, the comparison of the contents of different VIPs is found to be very non-homogeneous.

Recent completed research by the WRC has developed a scientific base to understand the VIP technology and find ways to mitigate the current experiences and develop solutions. These being:

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Bibliography and Suggestions for further study

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Biographical Sketch

Jayant Narsee Bhagwan, is the Director of the key strategic area of Water Use and Waste Management at the South African Water Research Commission, covering the management of water and wastes in the domestic, mining and industrial sector. He has been instrumental in creating the portfolio of research related to water supply and sanitation. He completed his Masters Degree in Tropical Public Health Engineering from Leeds University, his thesis looking into then evolving institutional options for water supply and sanitation delivery in South Africa. With his knowledge and experienced gained in implementation of rural water and sanitation projects, he has played and participated in the shaping of national water policy and legislation. He held the posts of the President of the Water Institute of Southern Africa, Chairperson of the Minister of Water Affairs and Forestry Water Advisory Committee, as well as international advisory positions with the Water Supply and Sanitation Collaborative Council, IWA-Global Development Agency and UNEP. He continues to be actively involved in a broad range of areas in the field of water supply and sanitation, with current focus being on franchising of O&M in water services and improving the sustainability of dry sanitation systems.