



INVESTIGATION INTO THE SOUTH AFRICAN APPLICATION OF CERTAIN ALTERNATIVE TECHNOLOGIES FOR DISPOSAL OF SANITATION SYSTEM WASTES

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SUMMARY

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SUMMARY

INTRODUCTION

The essence of the dissertation is as follows:

1. A broad introduction is given to the general sanitation situation in South Africa and some other developing countries, particularly among the poorer sections of the population. It is argued that there is a need for other appropriate technologies to address specific problems.
2. The development of a new type of interceptor tank for use in settled sewage sanitation systems is described. This tank is able to desludge itself automatically by means of a siphonic-type outlet mechanism.
3. The research, development and current status of urine diversion sanitation technology in the world is set out. The implementation of South Africa's first project utilising this concept is also described.

SANITATION: GENERAL ASPECTS DISCUSSED

A background to the general sanitation situation in South Africa and the developing world is presented in this dissertation, with particular emphasis on the poorer population groups. It is shown that existing systems and available resources are inadequate to deal with the serious problems which exist, and that the situation will not improve unless there is a significant change in the manner in which sanitation systems are chosen, designed and implemented. Vast amounts of improperly-managed faeces and untreated sewage contaminate the living environments of millions of people worldwide. These environmental problems, in turn, undermine the process of development.

Sanitation approaches based on flush toilets, sewers and central treatment plants cannot solve this problem. Pit toilets or septic tanks with soakpits are also not the solution in high-density urban areas. Sanitation systems must be appropriate for a particular project and circumstances. It is therefore important to look beyond the current restrictions for innovative ways and means of bringing adequate sanitation to the millions of people currently without access to proper facilities. Research and development for a wide range of cultural and environmental conditions is required, a demand for systems which reuse or recycle human excreta should be created, dependence on systems which use large amounts of potable water should be reduced, and systems should be promoted which are simple, reliable and easily maintained.

THE “SLUDGE SIPHON” SELF-CLEANSING INTERCEPTOR TANK FOR SETTLED SEWAGE SYSTEMS

Interceptor tanks in a settled sewage system must be designed to cater for various functions, namely solids interception, digestion of settled solids, and storage of digested solids. Interceptor tanks are usually designed so that up to two-thirds of the volume may be taken up by settleable solids (sludge), so the longer the anticipated interval between desludgings, the larger the tank has to be to cater for this. This is associated with an increase in capital costs, not only for the tank itself but also for labour and excavation. Desludging of tanks is also an expensive process.

The “sludge siphon” system eliminates the need for vacuum tankers and maintenance crews to physically empty an interceptor tank. The accumulated sludge is automatically siphoned out of the tank and flushed, together with the normal effluent, into the settled sewage reticulation system. Once it has entered the pipeline, the sludge from a whole suburb or village can be hydraulically transported to a single easily-accessible settling tank for uncomplicated collection, or perhaps even be transported all the way to a treatment works, where the sludge can be handled in the conventional manner.

URINE DIVERSION SANITATION SYSTEMS

The shortcomings of VIP toilets, particularly in high-density urban areas, are explained. To address these shortcomings, it is necessary to think beyond the limitations imposed by traditional methods of providing dry sanitation. This need is substantiated by increasing awareness worldwide of the environmental issues associated with sanitation. Furthermore, pressure on land to produce more food to feed the ever-growing populations of developing countries has made it imperative to utilise natural resources, including human excreta, wherever possible. The concept of ecological sanitation, or “eco-san” as it is also known, is seen as an alternative solution to some of the problems associated with pit toilets, environmental degradation and food shortages.

The basic requirement of a urine diversion sanitation system is a toilet pedestal which prevents urine and faeces from being mixed together. It is essential that the faeces remain as dry as possible and that moisture is prevented from entering the collection chamber. The urine can be collected in any suitable sealed container if its reuse for agricultural fertilizer is desired. Alternatively, it can be led into a soakpit. The desiccated faeces is, furthermore, a good soil conditioner.



CONCLUDING REMARKS

The research and development of alternative on-site sanitation technologies described in this dissertation was aimed principally at tackling the most common operational problem associated with these systems, namely sludge disposal. Other benefits which accrue due to the application of these new technologies, for example certain environmental improvements, easy and safe reuse of excreta, or lower capital and operational costs, are additional advantages. By offering improved sanitation methods which reduce the operation and maintenance burdens on both users and local authorities, it is believed that a significant contribution has been made to improving the quality of human life across all sectors of society.

KEY WORDS

Dehydration
Desiccation
Dry toilets
Ecological sanitation
Fertiliser
Health
Interceptor tanks
Recycling
Sediment transport
Septic tanks
Settled sewage
Sludge
Small bore systems
Solids-free sewers
STED systems
Urine diversion



SAMEVATTING

INLEIDING

Die verhandeling bestaan hoofsaaklik uit die volgende:

1. 'n Breë inleiding tot die huidige algemene sanitasie toestand in Suid-Afrika asook sommige ander ontwikkelende lande, veral onder die arm bevolkingsdele, word uiteengesit. Daar word aangevoer dat ander toepaslike tegnologieë benodig word om spesifieke probleme aan te spreek.
2. Die ontwikkeling van 'n nuwe soort septiese tenk vir gebruik in besinkte-riool sanitasiesistelsels word beskryf. Die tenk word outomaties ontsyk deur middel van 'n hewel-tipe uitlaat meganisme.
3. Die navorsing, ontwikkeling en huidige status van urine-wegwending sanitasie tegnologie in die wêreld word uiteengesit. Die implementering van Suid-Afrika se eerste projek wat van hierdie tegnologie gebruik maak word ook beskryf.

SANITASIE: ALGEMENE ASPEKTE BESPREEK

'n Agtergrond tot die algemene sanitasie toestand in Suid-Afrika en die ontwikkelende wêreld word in hierdie verhandeling uiteengesit, met spesifieke verwysing na die arm bevolkingsdele. Daar word getoon dat huidige sisteme en beskikbare hulpbronne onvoldoende is om die ernstige probleme wat bestaan aan te pak, en dat, alvorens daar 'n betekenisvolle verandering intree in die manier waarop sanitasie stelsels gekies, ontwerp en implementeer word, hierdie toestand nie sal verbeter nie. Die omgewing van miljoene mense wêreldwyd word deur groot hoeveelhede fekale materiaal en riool besoedel. Hierdie omgewingsprobleme ondermyn weer op hulle beurt die ontwikkelingsproses.

Sanitasie benaderings wat op spoeltoilette, riole en sentrale suiveringswerke gebaseer word kan hierdie probleem nie oplos nie. Puttoilette of septiese tenks met sypelriole is ook nie 'n oplossing in dig-bewoonde stedelike gebiede nie. Sanitasiesisteme moet vir sekere projekte en omstandighede toepaslik wees. Dit is daarom belangrik dat daar verder as die huidige beperkinge gesoek word vir maniere en middele om voldoende sanitasiegeriewe vir die miljoene mense wat daarsonder is te verskaf. Navorsing en ontwikkeling vir 'n wye reeks kulturele en omgewingstoestande word benodig, 'n aanvraag vir sisteme wat menslike uitskeiding hersirkuleer behoort geskep te word, afhanklikheid van sisteme wat groot volumes drinkbare water gebruik moet verminder word, en sisteme wat eenvoudig, betroubaar en maklik onderhou kan word behoort bevorder te word.

DIE “SLYKHEWEL” SELF-REINIGENDE SEPTIESE TENK VIR BESINKTE-RIOOL SANITASIESTELS

Septiese tenks in 'n besinkte-riool stelsel moet vir verskeie funksies ontwerp word, naamlik opvang van vaste stowwe, vertering van vaste stowwe asook opgaring van vaste stowwe. Septiese tenks word gewoonlik ontwerp om tot soveel as twee-derdes van die volume vir slykopbouing te reserveer; dus, hoe groter die ontslykings tussenposes, hoe groter moet die tenk wees. Dit gaan gepaard met 'n toename in kapitaalkostes, nie alleen vir die tenk self nie maar ook vir arbeid en uitgraving. Die ontslyking van tenks is ook 'n duur proses.

Met 'n “slykhwel” sisteem word suigtenkwaens en onderhoudspanne nie benodig om septiese tenks te ontslyk nie. Die opgehoopte slyk word outomaties uit die tenk gesuig en, tesame met die normale uitvloeisel, in die besinkte riool retikulasiesisteem weggespoel. Sodra dit die pyplyn binnegegaan, kan die slyk vanaf 'n hele voorstad of dorpie na 'n maklik bereikbare besinkingstenk hidroulies vervoer word, waarvandaan dit sonder enige probleme verwyder kan word. Die slyk kan dalk ook hidroulies na 'n suiweringswerke vir konvensionele behandeling vervoer word.

URINE-WEGWENDING SANITASIESTELS

Die tekortkominge van VIP (“Ventilated Improved Pit”)-toilette, veral in digbewoonde stedelike gebiede, word uiteengesit. Om hierdie tekortkominge aan te spreek is dit nodig om verby die beperkings wat deur tradisionele droë sanitasie metodes gestel word te kyk. Die stelling word gestaaf deur toenemende wêreldwye bewuswording van omgewingsaspekte rondom sanitasie. Daarbenewens, die druk wat in ontwikkelende lande op grond uitgeoefen word om meer voedsel vir die steeds toenemende bevolkingsgroei te produseer het dit noodsaaklik gemaak om natuurlike hulpbronne, insluitende menslike uitskeiding, sover moontlik vir hierdie doel aan te wend. Die konsep van ekologiese sanitasie, ook bekend as “eco-san”, word as 'n alternatiewe oplossing vir die probleme wat met puttoilette, omgewingsdegenerasie en voedseltekorte gepaard gaan, beskou.

Die basiese vereiste van 'n urine-wegwending sanitasiesistelsel is 'n toiletpan wat vermenging van urine en fekalië verhoed. Dit is noodsaaklik dat die fekale materiaal so droog as moontlik bly, en dat vog nie die stoorkompartement binnedring nie. Die urine kan in enige geskikte verseelde houer versamel word vir hergebruik as landboubemesting, indien verlang. Dit kan alternatiewelik na 'n sypelput gelei word. Die uitgedroogde fekale materiaal is ook 'n goeie grondopknapper.



SLOTSOM

Die navorsing en ontwikkeling van alternatiewe "op-erf" sanitasiesistelsels, soos in hierdie verhandeling beskryf, is hoofsaaklik daarop gemik om die mees algemene operasionele probleem wat met hierdie sisteme gepaard gaan, naamlik slykwegdoening, aan te spreek. Verdere waarde wat deur die gebruik van hierdie stelsels verkry word, soos byvoorbeeld sekere omgewingsverbeteringe, maklike en veilige hergebruik van uitskeiding, of laer kapitaal- en gebruikskostes, word as addisionele voordele beskou. Deur verbeterde sanitasiesistelsels wat die operasionele las op beide gebruikers en plaaslike owerhede verminder aan te bied, word geglo dat 'n betekenisvolle bydrae tot die verbetering van mense se lewenskwaliteit in alle aspekte van die samelewing gemaak is.

SLEUTELWOORDE

Dehydration
Desiccation
Dry toilets
Ecological sanitation
Fertiliser
Health
Interceptor tanks
Recycling
Sediment transport
Septic tanks
Settled sewage
Sludge
Small bore systems
Solids-free sewers
STED systems
Urine diversion

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