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## 30th WEDC International Conference, Vientiane, Lao PDR, 2004

### PEOPLE-CENTRED APPROACHES TO WATER AND ENVIRONMENTAL SANITATION

# The Design and Development of a Sanitation Hand Washing Dispenser: A South African Case Study

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*South Africa is a country of extremes where many people in rural areas still lack basic services such as water and sanitation. It is estimated that 5 million South Africans do not have access to basic water services, while 17-18 million lack basic sanitation services. South Africa launched the WASH programme with one of the aims to increase the incidence of hand washing at the right times such that it results in a significant decrease in the incidence of water-related diseases. This paper looks at hand washing behaviour in villages in two municipalities in South Africa and shows the technology development which evolved out of the difficulties being experienced by households in the country to meet these basic hand washing requirements.*

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## Introduction

South Africa is a country of extremes with a high level of technology in some areas while others, especially rural areas, still lack basic services such as water and sanitation. At present, it is estimated that 5 million people in South Africa do not have access to basic water services, while 17-18 million lack basic sanitation services (Kasrils, 2003). Perhaps the most concerning water service sector issue relating to sanitation is that in 2001 there were 4.7 million households with inadequate sanitation, and at least 1.5 million households (approx. 5.7 million people) without any form of sanitation facility (Statistic South Africa, 2003). Those who have inadequate sanitation facilities have bucket systems, unimproved pit toilets or use the bush.

Sanitation services in the South African context means three things, namely, provision of a toilet facility, health and hygiene education and correct management of domestic wastewater and rubbish. The three are required to be intertwined in a sanitation programme to ensure sustainable sanitation service provision. To ensure that sanitation services are delivered to un-served rural households, government has made provision in the form of a subsidy.

South Africa already has a number of significant programmes concerned with the delivery of water supply and sanitation, including the Community Water Supply and Sanitation programme (CWSS) of the Department of Water Affairs and Forestry (DWA). The government is now taking an active role in promoting health and hygiene through its WASH (Water, Sanitation and Hygiene for all) programme. The focus of WASH in South Africa is less about broad level advocacy and rather concentrates on niches and leverage points that support existing sanitation initiatives. As such, WASH has taken up water, sanitation and hygiene issues in such a way that it complements other activities. The programme focuses on washing hands with water and soap.

This paper looks at hand washing behaviour in villages in

two municipalities in South Africa and shows the technology development which evolved out of the difficulties being experienced by households in the country to meet basic hand washing requirements.

## An Investigation of Hand Washing in the Mpumalanga Province of South Africa

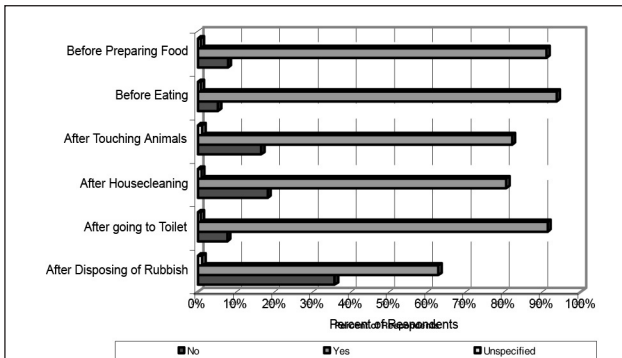
Two District municipalities in the Mpumalanga Province of South Africa were investigated during a baseline assessment for a sanitation programme that was being initiated in these areas. Data were collected from five villages in the Nkomazi Municipality and from Msogwaba village in the Mbombela Municipality. More than a thousand households were interviewed on issues relating to water and sanitation service provision, disease and hygiene behaviours. Data were analysed using SPSS.

A questionnaire was administered and respondents were asked questions relating to hand washing behaviour, which included: Whether they washed their hands:

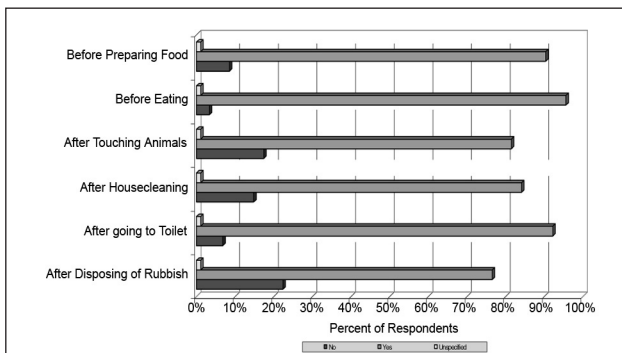
- Before handling of food and food preparation?
- Before eating?
- After visiting the toilet?
- After housecleaning work?
- After disposing of rubbish?

Keeping in mind that there were no sanitation interventions in either of these areas at the time of the assessment, and thus no health and hygiene education programme had been carried out in the villages, one could expect that a low percentage of households washed their hands after these activities. However, Figures 1 and 2 show that between 60% and 95% of respondents indicated that they washed their hands before/after carrying out the activities listed above. However, researchers quickly realised that these

figures do not reflect whether hand washing actually takes place, but rather people’s knowledge that they should wash their hands.



**Figure 1. Hand Washing Behaviour of Respondents in Msogwaba village of Mpumalanga Province**  
Source: CSIR, 2003a



**Figure 2. Hand Washing Behaviours in five villages in Nkomazi Municipality of Mpumalanga**  
Source: CSIR, 2003b

A study conducted in Zaire where results of direct observation of hand washing behaviour of mothers were compared to survey results, support the above assessment. The study concluded that mothers generally over-report desirable behaviours (FANTA, 1999). The problem is clear: interviewees tended to answer according to what the interviewers expect, and do not always reflect the truth. Aldemom *et al* (1997) also notes the private nature of these activities and the constraints that it presents to evaluation.

In the Mpumalanga study, hand washing behaviour was linked to the availability of sanitation facilities within the yard, availability of potable water for hand washing on a daily basis and the availability of hand washing facilities at household levels. The survey results are shown in Table 1 below. Clearly, most households did not have adequate sanitation services or hand washing facilities and at the same time, did not receive potable water on a daily basis. Water supply to a source i.e. yard or street taps was intermittent with households usually only receiving water once or twice a week. This has created a culture of water storage in South Africa.

**Table 1. Sanitation & Water Service Provision and Availability of Hygiene Facility in the Nkomazi and Mbombela Municipalities**  
(CSIR, 2003a & 2003b)

Service	Msogwaba Municipality (% of Respondents)	Nkomazi Municipality (% of Respondents)
Respondents with No Toilet Facility	33%	49.2%
Respondents with a Toilet in Backyard (Pit latrines)	63.2%	49.7%
Respondents with Intermittent Supply of Potable Water	80.6%	66.2%

Although the South African WASH programme focuses on promotion of good hand washing practices, in an assessment of the availability of hand washing facilities to carry out these activities, more than 65 % of Msogwaba respondents and over 80% of Nkomazi respondents did not have hand washing facilities (CSIR, 2004). This same assessment found that most sanitation programmes in South Africa did not make provision for the supply of hand washing devices to support the hygiene behaviours programme. Devices that were being used in these programmes included:

- A bucket with a wine tap attached (Photograph 1)
- A Built-in hand washing facility
- An open basin or bucket (see Photograph 2).

One of the key findings of research undertaken in South Africa by the WASH programme was that the reasons that people do not wash their hands is because they do not have easy access to water after going to the toilet (CSIR, 2004).



**Photograph 1. Bucket and Wine Tap Hand Washing Device in South Africa** (CSIR, 2004)



**Photograph 2. Open Basin Hand Washing Facility in South Africa (CSIR, 2004)**

### The Design and Development of a Hand Washing Device

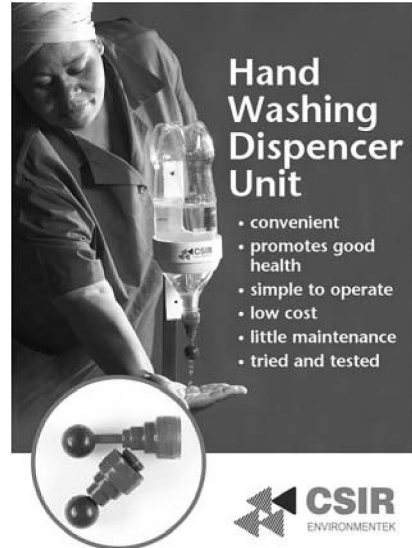
In South Africa, there is limited experience with hand washing devices in terms of the development of devices and the introduction of devices to sanitation projects. There was an urgent need to test these devices, to learn from experience with their implementation to date and to look at their application within school and household sanitation programmes.

Operating from the understanding of the need for hand washing devices and good sanitary hygiene behaviour in South Africa, the CSIR (Council for Scientific and Industrial Research) embarked on an initiative to design and develop hand washing devices that would be suitable for rural sanitation programmes. The devices needed to be developed to provide householders with a cheap and hygienic source of water for washing hands.

Since the South African government through the WASH programme was focused on addressing health and hygiene behaviours through awareness and education programmes, the CSIR had to provide the financial resources for the design and development of the hand washing device. These resources were significant (Table 2) but it was felt the initial capital costs would be outweighed by the long-term benefits of each householder having hygienic hand washing facilities attached to their toilet structure.

Table 2. Initial financial outlay required for the design and development of the CSIR hand washing dispenser	
Activity	Cost (Rands)
Patent Search	R10 000-00
Patent	R11 000-00
Hand Washing Cap Mould	R50 000-00
Mould for the Hand Washing Bracket	R40 000-00
Human Resource Cost for Design	R100 000-00
<b>TOTAL</b>	<b>R211 000-00</b>

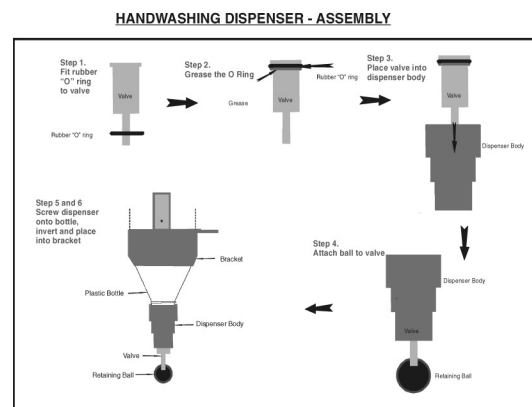
The system operates thus: the dispenser, while attached to a 2-litre bottle, releases sufficient water to enable large number of people to wash their hands (Photograph 3). The dispenser attaches, via a screw thread, to a two-litre plastic cold drink bottle, containing clean water. This hangs upside down on a bracket attached to the wall of the toilet.



**Photograph 3. Example of the CSIR hand washing dispenser**

The CSIR developed the hand-washing dispenser to address the following criteria:

1. **It was inexpensive:** although the design costs of the hand washing dispenser were relative high, the device can still be sold for very little (approximately \$1 US). This would allow householders to afford additional devices if they chose to install more than one.



**Figure 3. Assemble of the CSIR hand washing dispenser**  
Source: CSIR

2. **Simple to operate:** the device is so simple to assemble that the householders themselves can put them together. Figure 3 shows the assembly process. The CSIR felt that the assembly could be done at a village level, which could encourage entrepreneurs to set up a small business around the assembly and distribution of the devices.
3. **Has no tap but limits the flow to levels sufficient to complete the hand washing process:** the device operates with an inverted plunger. To release water the householder has to push this plunger up with their hands and once enough water has been released, by removing their hands, the plunger falls back into place and seals the bottle. This removes the problem of people washing hands in the same water as is done when using a hand basin or bucket. It also ensures that very little water is wasted, which is a key concern in South Africa where householders have to walk long distances to collect water for household use. The Msogwaba and Nkomazi sanitation baseline study showed that householders were collecting 183 and 124 litres per day respectively at a distance of between 103 to 155 metres when municipal water systems were not operational.
4. **The Household Hand Washing Dispenser was designed on the principle of reducing the infection and spreading of waterborne and sanitation related diseases:** the device allows for the release of water for each hand washing without actual contact with the main water source in the bottle. This prevents cross-contamination of hand washing water.

The main advantage of a system like this one is that the dispenser is small with only one moving part, enabling the product to be inexpensively manufactured and hence the purchasing and replacement price is very low.

Since this system is one of a kind in South Africa, large numbers of the devices have been installed in sanitation programmes across the country. Householders are trained on how to operate the dispenser and how to maintain the system to ensure the long-term operation of the device. Sanitation programme agents are presently purchasing the hand washing devices as part of the R300 subsidy allocation that is made available to householders for health and hygiene awareness and education. The total cost of the device and a

bracket for attachment to the toilet structure is just over \$2 US. The device is usually attached outside the toilet facility (Photograph 4).

## Conclusion

Although the South African government is promoting hand washing as part of good sanitary hygiene behaviour, no guidance is given as to the devices that could be installed to assist with provision of clean water for hand washing. The CSIR hand washing dispenser is a device that has been developed to assist rural households with washing of hands with clean water. This is one option available to householders. Hopefully, the development of this device will stimulate the design and development of other such devices, which could be offered as alternative options to rural householders.

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**Photograph 4. CSIR Hand Washing Dispenser installed outside the sanitation facility (CSIR, 2004)**

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