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 behavior 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 behaviors. Data were analysed using SPSS.

A questionnaire was administered and respondents were asked questions relating to hand washing behavior, 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.

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).
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 household having hygienic hand washing facilities attached to their toilet structure.

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.

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.

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![Photograph 2. Open Basin Hand Washing Facility in South Africa (CSIR, 2004)](image)

![Photograph 3. Example of the CSIR hand washing dispenser](image)

![Figure 3. Assemble of the CSIR hand washing dispenser](image)

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**Table 2. Initial financial outlay required for the design and development of the CSIR hand washing dispenser**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost (Rands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patent Search</td>
<td>R10 000-00</td>
</tr>
<tr>
<td>Patent</td>
<td>R11 000-00</td>
</tr>
<tr>
<td>Hand Washing Cap Mould</td>
<td>R50 000-00</td>
</tr>
<tr>
<td>Mould for the Hand Washing Bracket</td>
<td>R40 000-00</td>
</tr>
<tr>
<td>Human Resource Cost for Design</td>
<td>R100 000-00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>R211 000-00</strong></td>
</tr>
</tbody>
</table>
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.

**References**

- FANTA (1999) *Water and sanitation indicators measurement guide.* Food and Nutrition Technical Assistance, Academy for Educational Development: Washing D.C., USA.

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