

Case Study: Urine diversion technology

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THE BASIC LEVEL of sanitation service in South Africa has been defined by the Department of Water Affairs and Forestry (DWA) as a well-constructed VIP toilet (DWA 1996). Many community sanitation schemes have been successfully implemented utilising this technology. Unfortunately, others have failed, usually due to poor design and construction practices or to social factors such as lack of community buy-in, or a combination of these. New or unknown technologies are often viewed with suspicion or rejected out of hand. Some cultural beliefs and practices may also make it difficult to introduce alternative technologies into a community. Attempts have been made to find simple, universally applicable solutions to sanitation problems; however, these often fail because the diversity of needs and contexts is ignored. Urban needs usually differ from rural needs, the technological options offered are limited and often inappropriate, and critical social issues such as behaviour are either ignored altogether or badly handled (WSSCC 1995). Furthermore, the scope of environmental protection becomes so broad that the main purpose of sanitation provision, i.e. the management of household excreta, is often lost. Current approaches also tend to stifle innovation.

As with any sanitation system, VIP toilets are not without their problems. Geotechnical conditions, such as rocky ground for instance, often mitigate against the choice of this technology. In other cases, non-cohesive soils will require a pit to be fully lined in order to prevent collapse of the structure. Pits should also be avoided in areas with shallow water tables. Full pits are a further problem: in many cases the owners will not be in a financial position to empty them, despite the toilets being constructed with this in mind. While there may be plenty of available space in rural areas to dig further pits, this will seldom be the case in high-density urban areas. Some other solution should be sought in these cases.

If a dry toilet is designed and constructed in such a way that the faeces receptacle can be quickly, easily and safely emptied, then one of the biggest operation and maintenance problems associated with these toilets will be obviated. If the excreted products can also be productively used, for example in agriculture, the technology will become even more attractive. In South Africa, where many communities rely on subsistence agriculture, often in poor soils, this is an important aspect. The technology of urine diversion, or "dry box" toilets, where the urine is diverted at source by a specially designed pedestal and is not mixed with the faeces, and where no pit is required, is deemed to satisfy these criteria.

South Africa's first urine diversion project

Early in 1997 the CSIR's Division of Building and Construction Technology concluded an agreement with the Eastern Cape Appropriate Technology Unit (ECATU) to build a number of experimental urine diversion sanitation units in three rural communities. It was agreed that the CSIR would direct all technical and social research aspects, and also design the units, while ECATU would finance the construction, provide the required building and supervisory personnel and assist with community liaison. Main research objectives were to test the basic acceptability of the technology among the communities and to determine the potential for resource reuse.

The social and technical process

It was deemed essential that this pilot project be implemented with the full participation of the target communities. Previous research carried out by the CSIR, particularly in water supply and sanitation projects, proved community participation to be a major factor in the sustainability of these services. While many community projects in the country have given the residents a choice of service, tailored to the needs of that community, the implementation of the projects has remained firmly in the hands of professionals or external agents. This meant that, while the communities were consulted and were involved in the process (such as digging trenches, laying pipes, building toilets, etc), the decision-making and control of resources were handled by outsiders. Thus the concept of self-help, local decision-making and control over services and resources - the essence of empowerment - lay elsewhere. Involvement and consultation is only the first step towards full participation and empowerment of the community (Duncker 1999).

Three villages were selected by ECATU for the pilot project. These were Sinyondweni, Gwebinkundla and Manyosini, all a short distance from the city of Umtata. A total of 45 toilet units were planned to be built - 15 in each village. The first stage, workshopping the concept with the communities, was organised with the assistance of ECATU's social worker. Community meetings were held in each village during which the project was proposed. The conceptual aspects of urine diversion technology were introduced in order to facilitate an understanding of the operation and maintenance of the toilets. Figure 1 was used to illustrate the concept to the communities. The process of the proposed project was also discussed in detail. Questions were asked by the community and problem areas were clarified.

Cultural taboos and beliefs which needed to be addressed during the implementation of the project were brought to the project team's attention. For example, one of the most important operational aspects of the dry box toilet is that no personal cleaning material should be put into the faeces receptacle, as it hinders dehydration of the contents and will generally not degrade. Recommended practice is to collect the material and burn it. However, the people considered it unacceptable to burn the cleaning material because they believed that they would get anal infections if they did so. This belief was incorporated into the project design by making available a plastic bucket with a lid, kept inside the toilet, for storing the used cleaning material, which could then be buried at regular intervals.

Another important point was that the residents of these particular communities were not keen to collect the urine for fertiliser, but did not seem averse to the concept of utilising the desiccated faeces as soil conditioner. This was somewhat surprising to the project staff, as the opposite was actually expected; certain other communities in the country had already indicated that, while cattle manure was perfectly suitable for agricultural purposes, human faeces was definitely taboo. This was an interesting lesson in how cultural beliefs and practices can differ between various tribal peoples, and that each case should be carefully assessed on its own merits. It was therefore arranged to lead the urine into soakpits instead, with the option of converting to collection at a later stage, should the people be willing to try it.

The meetings progressed into a planning session with CSIR, ECATU and the community members making the decisions together. The proposed project plan was tabled and revised according to the needs of all the parties involved. As there were only sufficient funds to build 15 toilets in each village, and not for all the residents, the

communities decided who the beneficiaries of the experimental toilets would be, as well as when and where construction should start. Options regarding the type of brick, colour of paint, type of faeces receptacle, the urinal and locations of the toilets were all decided by the communities. Regarding the type of faeces receptacle, the communities were given the following choices, with all opting for the second alternative, probably for ease of handling:

- Allow the faeces to accumulate on the concrete floor in the chamber below the pedestal, where the older faeces could be raked aside from fresh additions, thereby enabling proper desiccation of older faecal material to take place; or
- using two containers beneath the pedestal: one in which to collect the faeces; then when this container was full, to keep it to one side for the contents to desiccate completely while the second container was used.

While very little in the way of building skills existed in the villages, the communities nevertheless offered to assist the appointed builders wherever they were able to do so. Each toilet owner was also required to look after his or her own building materials. The standard of workmanship was initially found wanting, but this improved with time. Figure 2 shows a completed toilet unit, while figure 3 illustrates the type of plastic urine diversion pedestal installed in the structures. These were designed by the CSIR and assembled by a plastics manufacturer in Pretoria.

Before the toilets in each village were completed and handed over to their owners, a training session on operation and maintenance aspects was facilitated by ECATU. This was supplemented by a workshop in primary health and hygiene, which was designed by CSIR and implemented in the villages by ECATU. As there is no formal

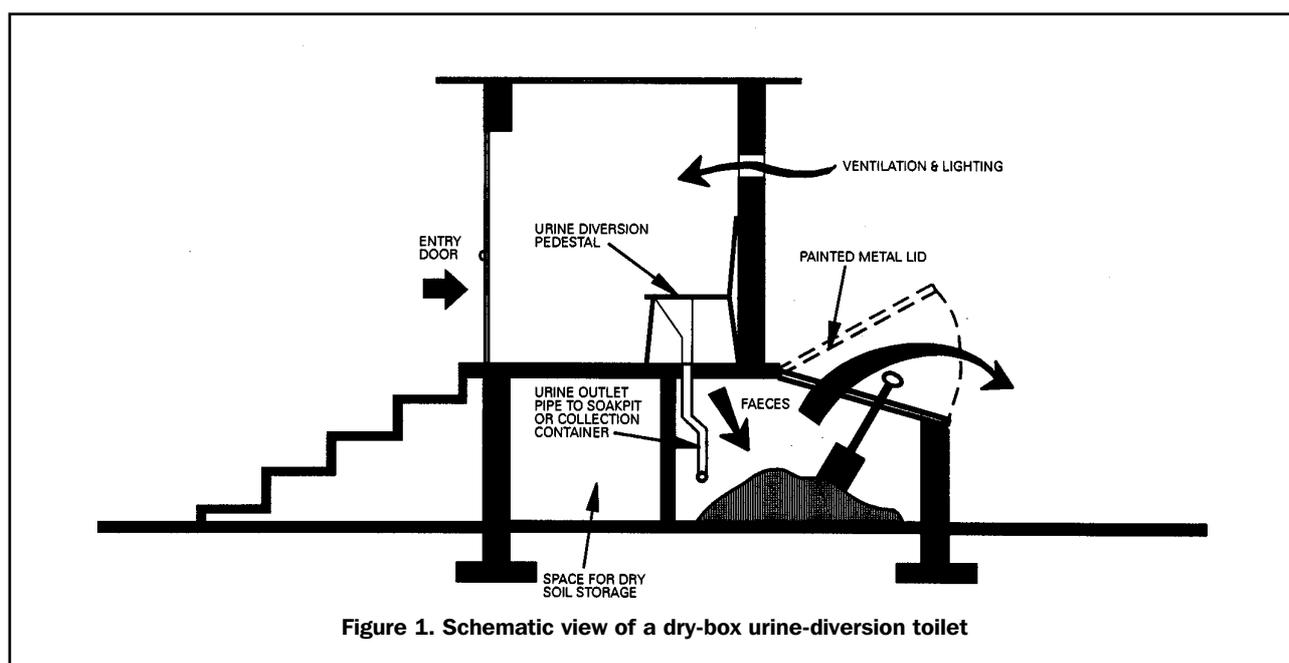


Figure 1. Schematic view of a dry-box urine-diversion toilet

water supply in the villages and the people have to walk some distance to fetch water every day, it was realised that basic health aspects like washing of hands needed special arrangements for water. A small ferrocement container (300x300x300 mm) with a tiny outlet hole which could be blocked by a twig, was attached to the outside of the toilet structure and filled with water when necessary. The thin stream of water emitted by the container's hole is sufficient for hand washing purposes, and the amount used is thereby also kept to a minimum.

Preliminary evaluation and conclusions

The project is now in the monitoring phase. Each beneficiary has taken full ownership of the toilet and is exceptionally proud of it. Their responses to questions were that dry-box toilets are far better than pit toilets or even VIPs. The toilets are close to their dwellings and can be used in privacy and safety. Furthermore, the toilets are kept spotlessly clean and the beneficiaries find the operation and maintenance an easy task. The rest of the community members in the villages indicated that they are also interested in building one of these units in their yards, as they could see the advantages of obtaining a toilet without having to dig a pit.

A full evaluation of the use and acceptance of urine diversion technology is now in the process of being carried out. The evaluation will include the social as well as the technical aspects of the project, with emphasis on the sustainability of the technology. Microbiological tests are

also currently being performed to determine the rate of pathogen destruction.

Certainly, from what has been observed thus far, the project must be regarded as a success. The key factor was the full participation of the beneficiaries. Correctly operated, the toilets have no odours or flies, even though there is no vent pipe. The ash which is sprinkled over the fresh faeces after each bowel movement absorbs the inherent moisture in the faeces and also deodorises it, thereby eliminating the need for a vent pipe. The faeces desiccate rapidly to closely resemble an innocuous-looking soil. The villagers have already started using it in their maize and vegetable patches, and the results can be seen.

Communities in various areas of the country can be expected to react differently, and may thus require different approaches. Other attitudes to the reuse of urine and faeces will also be found. Further training regarding primary health awareness needs to be implemented to raise the general hygiene level of the people in these villages. However, this is likely to be the case in many areas of the country.

The implementation of this technology is still in its infancy in South Africa, and much still remains to be learned. Two very important conclusions can, however, be made at this stage, namely:

- The technology of urine diversion sanitation works well if properly implemented, and is likely to become more popular and widely used.



- Technology on its own, no matter how good, is not sufficient to ensure the success of a sanitation project. Experienced social scientists and community workers are an indispensable part of the project team.

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