



The Durban water tank system

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WITHIN SOUTH AFRICA, two approaches to water supply are most commonly found. The first is a full pressure supply to each house, coupled with the provision of water-borne sanitation. To provide this level of service costs approximately US\$200 to install the reticulation and US\$200 to provide the connection from the house to the main in the street. The full pressure supply method is found mainly in formalised townships. It is not, however, affordable to households earning less than US\$350 per month. At the other end of the spectrum is the use of standpipes at spacings of approximately 200m to provide water to communities. Standpipes are most commonly found in informal areas. The cost of the reticulation in this case is approximately US\$80 and the cost of providing the tap approximately US\$20. We have found that families earning less than US\$110 per month will not walk more than 100m for water if they are expected to pay for it. The standpipe system leads to very low levels of payment, if one is successful in achieving payment at all. For such a system to work, a stable water committee and a stable community is vital. We have found that communities within informal settlements are fairly mobile and with political tensions that exist, these two requirements are often not met. As a consequence, standpipe methods of water supply lead to high levels of water wastage.

From discussions with these developing communities, we have found that the women spend enormous amounts of time each day carrying water and this effectively prevents them from seeking formal employment. The method of carrying water using containers is also far from satisfactory and research has shown that the bacterial contamination of this water is high, with the result that these communities suffer from poor public health.

The need for an alternative

We found the need for a solution to the water supply problem which lay between the two options described previously, in order to supply water to poor communities living in shacks (or what are known in South Africa as "informal settlements").

Discussions led to the idea of a tank of water being provided at the front door of each shack which could be filled once a day with clean drinking water. The intention of this solution was to deal with the following issues:-

- Provide an acceptable quantity of clean drinking water at an affordable price, that is, at approximately US\$2 per month per household.

- Deliver water directly to each shack or informal dwelling unit so as to do away with the need to carry water long distances.
- Provide water supply infrastructure at a low cost and in a manner that is flexible so that it could be removed or relocated in the event of the township being formalised.
- Control of volume of water supply each day, rather than controlling the price per month which was to be paid, using a system of prepayment for water supplied to avoid the incidence of bad debts.
- Provide infrastructure in a manner which would create employment and work opportunities within the community on an on-going basis rather than just at the time of construction of the scheme.
- Reduce administration costs to the lowest level possible.
- Provide an assured supply of clean drinking water.
- Provide infrastructure in a manner which made it difficult to connect illegally to the water system and at the same time reduced water losses or unaccounted-for water.

It is our view that the Durban tank system has met many of these objectives. A description of the system now follows.

Description of the Durban tank system

The system is shown diagrammatically on Figure 1 and may be described as follows:

Water is reticulated using small diameter (less than 25mm in diameter) polypropylene piping, which is laid along the major access routes or tracks located within the informal area. At appropriate intervals, connections are made to this reticulation and a manifold, which allows approximately 20 houses to connect to the water main, is installed. This manifold system is in two parts. In the first chamber there is a supply meter and a shut-off valve. In the second chamber there is a method of controlling the water supply to each of the twenty households connected to the particular manifold. The householders then lay 20mm diameter mains from the manifold connection point to their shacks. At a suitable location adjacent to each shack, a 200 litre water tank is installed on a plinth made either of concrete blocks or used car tyres filled with stabilised earth. To prevent the tank from overflowing when it is being filled, the inlet to the tank is controlled using a float valve. The outlet from the tank similarly has a valve which prevents the tank from being emptied whilst it is being filled. The tank itself is sealed to prevent pollution of the water.

Within the community, we appoint water bailiffs to control approximately 10 sets of manifolds. This means that a bailiff is responsible for 200 customers. In addition, he is entitled to install a standpipe on his property, which is metered, from which he may sell water to those residents of the area who are not able to afford the costs of the tank system. Water from the standpipe is sold at a price which encourages the bailiff to promote the use of the tank system rather than the buying of water from him at the standpipe. By providing the standpipe at the water bailiff's house, the possibility of theft and non-payment for water is considerably reduced.

At the end of each month, each customer pays an amount of approximately US\$2 in order to remain connected to the manifold for the following month. On payment, the customer is given a card which entitles him to the water.

At the beginning of each month, the customers hand to the bailiff the cards issued by the water authority. In the cases where no card is received, supply to that particular house is disconnected until the card can be produced. The bailiff in turn returns the cards to the water authority and is paid a royalty of approximately US\$0,50 per card returned, per month.

At a fixed time each day, the bailiff then proceeds to open the main supply to each manifold and thereby fill the tanks through the manifold and the small diameter pipes which connect them to the main supply. This process is relatively quick and is usually completed in less than one hour (that is, for 200 customers).

The advantage of this system is that it delivers a relatively small quantity of water to each site and this is usually within the capabilities of the environment to be disposed of, without creating public health problems. In conjunction with this method of water supply, VIP toilets are most commonly used.

Problems which were faced

The following problems have been experienced during the past five years we have used this system in Durban.

Initially, we found that whilst the tanks were being filled, customers would open the outlet tap in attempt to drain water and thereby obtain more than 200 litres of water per day. They would then sell this water to those members of the community who had not yet connected to tanks. A valve was designed and installed on the outlet tap which prevented water from being withdrawn from the tank whilst it was being filled. Our subsequent experience has shown, however, that once trust is built up as to the reliability of the system, the practice of draining the tanks ceased and, in fact, we now find that the full

quantity of water is often not used each day, particularly if the family is relatively small.

Not everyone in a community can afford to pay for such a tank system, which costs approximately US\$40 to install. By providing a standpipe at the water bailiff's house within a reasonable walking distance of his customers, we found a way of providing water to the whole community, whilst at the same time ensuring payment for the water used.

Initially the tanks were made from a blue plastic material. We found that during the hot summer months the temperature of the water in the tanks reached 40° C, which was unacceptably hot. By painting the tanks white, the maximum temperature reached dropped to 25° C. The tanks are now made using a two-layer process, with the outer layer of the tank being formed from white plastic. This design change has dealt effectively with the problem of high water temperatures in the tank.

Certain communities expressed the fear that the tank was too accessible and could be poisoned, which has been overcome in many ways, such as by providing locks on the top of the tanks or by installing the tank on a high plinth or, as has been seen in some cases, by installing the tank within the structure of the house itself.

There was an initial concern that the turnover rate of the tank would be insufficient and that the quality of the water would deteriorate. Tests have shown that the turnover rate is more than adequate and no adverse bacteriological results have been found, despite continuous testing over the last five years.

Certain customers indicated that 200 litres per day was inadequate. This problem has been solved by allowing customers to pay for and install more than one tank at their property. Therefore, in the case of schools and public facilities, one finds up to four tanks installed at a single building. Of course, in allowing more than one tank on a property, it is necessary to ensure that the sullage water is disposed of efficiently.

Conclusion

The Durban Tank System was developed in response to a particular need. It has gained wide acceptance because of its flexibility and the fact that it meets the needs of communities for the supply of reliable, affordable water at people's houses.

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