Case Study B

DEMAND MANAGEMENT IN APIA URBAN AREA

Sharon Wendt
Asset Manager, Coordination Division
Samoa Water Authority
P O Box 245, Apia, Samoa

INTRODUCTION

Water shortage has never been a problem in the past for the most part of Samoa – with its many rivers and abundant rainfall. Coupled with the religious belief that water is from God, this has created a mindset in the majority of the Samoan population, that water is free and also plentiful. This mindset has continued to prevail even with the introduction of piped treated water supply into homes and has presented many a challenge to the Samoa Water Authority in addressing the resulting high (and excessive) rates of water consumption. This has become even more of a challenge with the expectancy by Government of the Samoa Water Authority (SWA) to become financially independent (in accordance with the Economic Strategy for Samoa 2000).

SCOPE OF CASE STUDY

This Case study looks at the development of initiatives within the Samoa Water Authority (SWA) aimed at reducing demand or water consumption from 1995 until present day. It will focus only on the Apia urban area, as this is where the emphasis has been placed owing to the majority of customers residing here. Particular attention will be focused on the metering of domestic customers in this area.

BACKGROUND

The Apia urban area (population of about 40000, 2001 Census) is currently supplied from three Water Treatment Plants (WTP) and three Raw Water intakes. The population of Apia consists of both low and high income households (ST$2400/annum – ST$80,000/annum) and also the Central Business District.

When the Treatment plants were first constructed in 1989 under the Apia Water Supply Project, these were designed to supply the entire Apia Urban Area (AUA) with treated water at a rate of about 200 l/c/d. However, because of the wastage and leakage, the supply from these Treatment Plants were insufficient which necessitated the re-commissioning of the 3 raw water intake supplies to supplement the supply from the Treatment Plants.

The lack of accurate maps of the distribution systems (the practice was to carry out construction with little emphasis on as built information) meant that isolation of raw water from treated water supply (from the WTPs) was difficult and hence became mixed in most areas. In some cases, the supplies needed to be mixed in order to attain the required operating pressures in the system. However, the increasing of pressures in the system only compounded the leakage problem further. As a result about 70% of Apia received either raw or mixed (treated and untreated) water up until 1999.

In 1993, a mission (by an overseas consultant) was carried out, which identified the need and terms of reference for a consolidation project to ensure the sustainable operation and maintenance of the capital facilities (the 3 Water Treatment Plants) created by the Apia Water Supply Project. This led to the Apia Water Supply Consolidation Project AWSCP (1999 – 2001). The main objective of this project was to provide safe and reliable drinking water in sufficient quantity and quality on a sustainable basis. To meet this overall goal, it concentrated on a range of issues including general management, demand management (primarily through metering and tariff), creating a mapping database, hydraulic modeling, operation and maintenance processes and practices. It was through this project that a major metering program in the AUA was implemented.

DEMAND MANAGEMENT APPROACH

There is no formal Demand Management Strategy as such in the SWA, however actions addressing aspects of demand management are undertaken as the need arises. Metering and leakage repairs were the main focuses of these initiatives in the early stages of the establishment of the SWA in 1994. They were considered to be the most critical issues as they directly impacted on the quantity of water supplied.

The Apia Water Supply Project (1985-1889) had a component for metering however this component was never implemented, as there was then (1989) no legislation regarding water tariffs. In 1995, legislation was formulated and approved and soon after the first water meters were installed. These were mainly to commercial customers (because of volume of usage) and a small test area of domestic customers. The metering was limited to the supply of meters on hand, which had been transferred from the Apia Water Supply Project.

Soon it became evident that the test area, which had been supposed to be supplied with treated water, was in fact not and the metering program was put on hold until the system could be verified with the assistance of the Apia Water Supply Consolidation Project.

METERING METHODOLOGY

Metering was seen to be the quickest and most effective way to try and reduce the consumption to minimize wastage and also equitably distribute the costs of supplying potable water to consumers, the only prerequisite being that the supply had to be treated i.e. supplied from one of the Treatment Plants.

In the case of the AUA, however, the demand far exceeded the production from the 3 Treatment Plants, therefore in order to achieve 100% treated water coverage, consumption had to be reduced so that the Treatment Plants could meet the demand of the entire Apia area as originally designed. The methodology adopted then was to verify and isolate sections/areas, which could be hydraulically supplied by treated water and meter these areas first (whilst the remaining areas continued to be supplied by raw or mixed water). As the meters influenced and reduced the demand, these areas would gradually be extended until eventually the entire Apia area was supplied by treated water.

The process of metering used by the SWA in conjunction with the AWSCP during 1999 involved 3 main steps.

1. Target Areas

The first step was to designate an area that could be isolated and supplied with treated water.

The main difficulty in this was the inaccuracy of the maps that were in use. Most of the information on exact location of underground assets remained in the memory banks of the plumbers (most of whom had been working several years in the SWA) – and considered it to be a source of “power” (the old information is power mentality). This confirmed the need for a mapping database (which had already been included in the project Terms of Reference) and this was addressed by the AWSCP through acquisition of computer hardware and software and hiring of a short-term mapping specialist. This specialist set up the system and provided training for the SWA staff involved.

In the meantime, using the existing maps as a basis, some information was diplomatically extracted from SWA staff and verified. Minor modifications were made to the networks as necessary and selected areas were tested to confirm that it could be isolated and supplied with treated water to required pressures.

2. Awareness and Acceptance of Meters

Once such an area was established then public awareness consultations were commenced. An European Union Public Awareness Project (EUPA) aimed at increasing public awareness of water conservation issues and costs of providing clean water, was also in progress at the time metering was re-introduced (by the AWSCP) and this project had also already set up a Public Relations Unit (PRU) within the SWA. This unit with the assistance of a Project Advisor had launched a full-scale media campaign both on radio and television prior to the metering process that continued during the installation. This project also conducted general awareness programs for the public regarding conservation and other issues relating to water usage and delivery services and laid a great foundation on which more specific consultations relating to metering were subsequently based on.

The PRU were tasked with carrying out the consultations with the customers in the designated villages. The main aim was to explain to them the entire metering process and to gain their acceptance of meters. A range of approaches were used by the PRU but the most effective method in gaining the acceptance of an entire village was a consultative meeting with the village “matai” or high chiefs. If these “matais” gave their consent, the entire village would be metered. Sometimes there would be resistance and consultations would then involve the General Manager and the Minister of Works and would take weeks and sometimes months. When negotiations seemed ineffective, the SWA would explain to the village that they would be left with no choice but to disconnect their water supply. This seemed to work in the most extreme cases, and no further action was usually needed. It was only when these villages gave their consent that the next step would be taken.

3. Installation and Reading of Meters

The fabrication of water meter connections was undertaken by staff in the workshop before transported and installed on site. This method was adopted as it was quicker and standardized the installations. A valuable lesson learnt from the meters installed in the mid-1990's led to a modification in design to make the meters approximately 600 mm above ground (to make them more visible and less prone to damage and easier to read).

A 3-month grace period was given for new meters with the first meter reading taken after a month. Those with excessive consumptions were checked for internal leaks (and repaired) and counseled by SWA on ways of reducing wastage through conservative usage practices e.g. using buckets for hand washing rather than leaving the tap running. Meters would also be read during the second month of the grace period and the same procedure repeated as necessary. They were then also warned that the next meter reading would result in a bill to be paid.

Generally, it was during these monthly readings and awareness sessions with individual customers, that the greatest reductions in demand were seen. After the grace period, the meters were read and billed quarterly.

At the completion of the AWSCP in 2001, the coverage area of metered treated water in the AUA was approximately 80% and the consumption reduced from approximately 600l/c/d in 1999 to approximately 350l/c/d in 2001.

ANALYSIS OF RESULTS 1999 – 2002

It may be too early to accurately measure the real success of metering in reducing consumption (in the long run, especially with the metering errors) but all signs indicate a definite decline in consumption. On the other hand, a few valuable lessons have been learnt which can be used to modify and continually improve the process.

Awareness and Community Involvement

The most important aspect in the metering process is the awareness consultations and communication with the prospective meter recipients. The installation of meters (and ultimately successful implementation of the program) hinges on the acceptance of meters by these customers and this acceptance relies heavily on the communication of the appropriate information in the most effective manner. The approach currently used by the PRU revolves around the Samoan traditional customs in that they communicate using the traditional village groups (e.g women's committee and also through the Church. This has proven to be quite effective in getting information across to a large audience in a short period of time. The ultimate acceptance of meters in villages where the village council of matai system is strong the acceptance will be dictated by these matai – making the job easier (if accepted) and much more difficult (if not). This method does not take into account suburban areas where the traditional village bureacrady does not exist. Fortunately these areas usually comprise of educated, middle – high income families who do not seem to oppose metering.

Community involvement in this process has been mainly in the latter stages with the actual installation of meters. Perhaps there is a need to involve stakeholders earlier on in the process (when the infrastructure is in the design phase) in order to reduce likelihood of acceptance of the proposed metering programs and also to ensure that stakeholders are willing and able to pay for these new services.

There may also be a need to conduct customer surveys (or any other such method) to get a clearer indication of the impacts on customers and especially any changes in attitudes towards water delivery issues that the metering program may have had. This would be especially important and useful in light of the on-going infrastructure developments being discussed and the funding that is being provided for the Water Sector by various donor agencies e.g European Union.

Meter Installation, Reading and Maintenance

As mentioned earlier, the meter connection was re-designed as a result of experience with an earlier design (underground). This new design improved access by the meter readers which meant this process became more efficient and reduced possible human errors in the readings.

Currently there are still a number of instances of inaccurate readings either caused by human error or faulty meters. These are normally handled by estimating a possible consumption (based on previous meter readings) and the balance rewarded as a discount, and the meter replaced if faulty.

Delivering bills is costly at present since each bill has to be hand delivered (no postage or address system) and there are complaints of not receiving bills or late receipt.

This entire procedure seems to be working well at the moment, but may need to be monitored and reviewed especially with the prospect of an influx of new metered customers with the completion of another Water Supply Scheme funded by the EU – initially another 2000 customers.

The customer base and records of metered consumption also needs to be kept for monitoring purposes for future planning. All these are computerized and still in the pilot testing stage.

FUTURE IMPROVEMENTS AND ACTIONS

Tariff Structure (Cost Recovery)

The tariff structure was designed to coincide with the legislation in 1995 and was a progressive one (logarithmic scale). The actual values were not based on cost recovery (and indeed did not!), the main objective being to just reduce consumption.

The nature of this tariff structure whilst it does support demand reduction is not straight forward and sometimes confusing for customers. This may have contributed to some confusion resulting in resistance to meters, although this has never been verified.

It also does not have a "free" allocation for low-income families who cannot afford water for basic needs. More importantly it is not based on cost recovery measures.

For these reasons, a new tariff structure has been proposed (which is still under review by Cabinet) to address some of these factors in accordance with the move towards full financial independence. This new tariff considers the different categories of customers currently being supplied by SWA (commercial or domestic, metered or non-metered, treated, raw or borehole supply) and also allows a free water entitlement portion ($0.5m^3$/c/d) for domestic customers. This is in line with the World Health Organization standards for basic subsistence quantity of water. This tariff is initially for a period of 5 years followed by a review and was designed to meet Operation and Maintenance costs (100%) only (initially). An Implementation Plan for this new proposed tariff has already been drafted to be actioned, should Cabinet approve the proposal.

Operation and Maintenance

A lot of the old pipelines still in use are either Asbestos Cement or Galvanized Iron and due to rocky ground conditions (lava), a lot of these pipes were laid aboveground. Problems with vandalism, sub-standard plumbing repairs, lack of appropriate fittings and tools, corrosion (especially along the coast) and lack of accurate maps (resulting in accidental damage by other service providers excavating in same area) have led to a leakage rate roughly estimated at 40%. Operation of the system also is not optimal owing to a myriad of factors including high technical staff turnover, financial restraints, inadequate planning and excessive water demand. All these issues (and others) have been and continue to be addressed with assistance from the Institutional Strengthening Project (AusAID 1997 – 2003) and the AWSCP (1999-2001). Some of the key initiatives include training, acquisition of equipment, policy and procedure formulation, corporate strategic planning and working with expert advisors.

The improvement of this area of the SWA service will contribute greatly to reduction in operating costs, increasing the useful lives of physical assets and also improving the public image of SWA. Ultimately, from a customer perspective, this should translate into better quality water and fewer interruptions to supply. Perhaps, further down the line, this may also lead to reduction in tariff rates.

Demand Management Strategy/Asset Management Strategy

Whilst metering has been successful in reducing demands and improving operation and maintenance practices will contribute to reducing leakage, there are still other aspects to be considered in a holistic manner in managing both customer demands and unaccounted for water (to continually improve efficiency and effectiveness of SWA services).

A typical process of formulating high level Demand Management Strategy (supported by management) and which is translated into a practical Action Plan needs to be formalized. There is an Asset Management Strategy and Action Plan in existence which addresses most of the same issues – leakage detection, operation and maintenance practices, monitoring system performance, disaster (drought) management to name a few. Perhaps a supplementary document to address the issues not covered in this Asset Management Plan is all that is needed.

Some of the key issues that may need to be addressed is the unaccounted for water (UFW) relating to theft (illegal connections, fire hydrants) and also better data collection measures. Currently, UFW can only be roughly estimated owing primarily to lack of system meters and inaccurate maps. In order to improve the decision-making process for long term planning, the relevant information needs to be gathered, recorded and analysed on a continual basis, and an action to address this should be included in the action plan.

CONCLUSION

Although there has been a noticeable reduction in demand since the metering program, it would be premature to say that the demand is now 'manageable'. The population and demand projections used for the design of the 3 Treatment Plants (GKW Consult 1985) estimated that by 2002, the total production from these 3 plants would still be sufficient to supply the total population of Apia at a consumption rate of 188l/c/d. Beyond 2002, the plants would be expected to operate at more than 100% to supply the population at even lower consumption rates. At present, the Treatment Plants are all operating at more than 100% of their design capacities although the actual population growth is less than projected.

On the other hand, other water losses have to be considered to ensure that Demand Management is approached in a holistic manner. All these issues would need to be addressed in light of an overall Demand Management Strategy, (which takes into account the resources required and other programs/projects also in progress).

The proposed tariff has started the process towards cost recovery. Other measures to reduce operating costs (smaller pumps) have been introduced as well although other measures e.g chlorination does not. All these will need to be monitored and regularly reviewed to ascertain actual impact on costs, and necessary modifications.

Community participation and involvement may need to be introduced earlier in decision-making process and consultation processes may need to be improved.

All these actions will require additional resources which highlights a challenge for SWA in acquiring (and maintaining) the relevant technical expertise considering the limited number of qualified local professionals in this field. In addition to this, there will soon be an influx of more customer meters and in effect a doubling of the current number of system assets with the completion of the EU Rural Water Supply Scheme later this year.

Clearly, there is still a lot of work to be done to ensure that Demand (and sources of losses in the system) is managed effectively not only to ensure that the supply of water to the customers is of a safe drinking standard and the quantity is sufficient to meet basic human needs at a cost which is affordable by the customer, not only for now but also into the future.