22nd WEDC Conference New Delhi, India, 1996

REACHING THE UNREACHED: CHALLENGES FOR THE 21ST CENTURY

Leakage detection study in Tamil Nadu

Andrew Smith, Andrew Wedgner and Lloyd Martin, UK

IMPROVING INDIA'S WATER supplies is undoubtedly one of the most significant challenges facing the overall economic development of the country. This report illustrates one important direction being taken in a number of Indian States at present, where water supplies are being improved by a significant reduction in water losses, rather than relying on capital investment in additional water production.

Anglian Water International undertook a leakage detection study in the Tamil Nadu cities of Coimbatore, Madurai and Salem between June and September 1993. The study formed part of the World Bank funded project, Study Of Unaccounted For Water (Leakage) - Reduction and Control Programme in Tamil Nadu. This was undertaken by Water and Power Consultancy Services (India) Ltd. (WAPCOS) on behalf of the Tamil Nadu Water and Drainage Board (TWAD).

The aim of the study was to reduce the level of leakage by:

- Establishing leakage zones.
- Undertaking a leak detection and repair programme within those zones.
- Training local engineers in both traditional and modern techniques of leakage management.

Background

Tamil Nadu's population of over 60 million people is growing at an annual rate of 2.5 per cent. The state has many demands on its capital resources and is hampered by receiving over 80 per cent of its rainfall during the monsoon. These problems, typical of the subcontinent, have led to severe restrictions in the water supply. Virtually all mains water supplies are provided on an intermittent basis, with the period of supply in some cases being as low as one hour per day. High levels of leakage have further reduced the effective water supply to the consumer by up to 50 per cent.

The main area of the study was located in a typical sector of Coimbatore, an engineering and textile city with a population of 3.5 million. The study area consisted of 1285 connections and 5440 metres of mains. Coimbatore was also our base of operations and the setting for a formal training course. The site in the ancient Tamil capital of Madurai was located in the heart of the old city, along the narrow streets adjacent to the Meenakshi temple and consisted of 203 connections and 917 metres of mains. Salem, by comparison, is a young city with an infrastructure under extreme pressure from its burgeoning population, which is growing at an annual rate of 8 per cent. The situation in Salem, where the study area consisted of 232 connections and 1185 metres of mains was made more difficult due to supply periods being less than one hour every two days.

Work undertaken out in a typical zone

Measuring the level of leakage in a zone which receives an intermittent supply essentially consists of plugging all the known outlets and then measuring the amount of water which enters the area during the leakage detection test. Whilst this was very labour intensive and time consuming, "conventional" methods of leakage control, used in the UK and other western countries, would have been at best inappropriate and at worst useless.

All leakage detection work is carried out in two phases, the preparatory works and the leakage detection test itself. The preparatory works included the checking of all mains records and, where necessary, excavating trial holes to check for cross connections etc. All service connections including PSPs (Public Stand Posts) within the zone were identified and boundary (Zone) valves were checked and repaired if necessary, to ensure that they were watertight. If practicable, the normal operational pressures and flows into the zone were recorded prior to undertaking the test. In a typical zone these preparatory works could take up to two weeks to complete.

Water for the tests was supplied either through the distribution system or from a series of water tankers via a small booster pump. This second method, which can only be used in comparatively small areas, was employed when the mains pressure was very low. Mains pressure equal to approximately 10m head of water (1 bar) is required to undertake effective leak detection work.

The flow of water into the zone under test was measured, in most cases with an ultrasonic flow meter, which was clamped to the exterior of the main. Pressures within the zone were measured using a pressure transducer, tapped into the main or connected to one of the service connections. All pressure and flow data was recorded using data loggers which could be down loaded to a laptop computer. This enabled the team to analyse the data at a later date and to produce graphical and tabular information for reporting.

Once pressures and flows within the zone had stabilised, leakage detection work commenced. This work consisted of "sounding" service connections and fittings using traditional wooden or steel listening sticks. For

each leak detected, the two man team would record the type of leak, its exact location, house number and street name in a test report.

Leak noise correlators and other electronic detection equipment was of limited use, mainly due to the low mains pressures and the confusing sounds caused by the presence of large number of leaks within a small area. The traditional methods of sounding and visual inspection picked up almost all the leaks easily and quickly.

Each test report was submitted to the relevant local authority. The repair of leaks often proved to be the most time consuming part of the study, as the authorities often did not have the resources necessary to carry out rapid repairs.

Once repairs were complete, the zone was retested in the same manner as before and the results compared to determine the reduction in leakage and to decide if further work was required. This process was repeated until the level of leakage had been reduced to an acceptable level which was typically equivalent to 10 per cent of the normal flow into the zone. This programme of work was essential to demonstrate that effective leak detection and repair measures could be undertaken in these areas, using local manpower and available resources.

Training undertaken as part of the study

The most important aspect of the study was the passing on of the skills and knowledge of the team to the local engineers and operations staff. During the preparatory works and leakage tests the local operations staff who were working alongside the team were instructed in traditional and modern sounding techniques, the use of leak noise correlators and ultrasonic flow meters.

Twelve of the local engineers attended a 9 day formal training course which consisted of classroom lectures in the morning and practical training in the afternoon. Subjects covered by the team included UK experience and its relevance to Indian leakage problems, instruction and demonstration in the use of modern equipment and selection of appropriate leakage detection techniques.

Six engineers who received formal training were selected to attend a two week training course held by Anglian Water at their training centre in the UK. The first week concentrated on leak detection, water distribution operations and water bylaws. The second comprised visits to different departments and areas around the company to examine how the subjects covered in the first half of the course were put into practise.

Conclusions

Leakage detection methods required for developing countries can be fundamentally different than those used in the UK. The team had to adopt a “back to basics” approach and in many cases devise new techniques. Sophisticated modern equipment may make certain tasks easier and require fewer people, but it is expensive and often inappropriate in a country where labour is plentiful and financial resources scarce.

Anglian Water believe that developing countries should place more emphasis on leakage detection work as a means of making more efficient use of their scarce water resources. As a result of detecting and repairing 364 leaks on mains and service connections, the level of leakage in our study area was reduced by a total of 37 l/sec, equivalent to the average daily water supply consumed by over 2000 people. In percentage terms, to level of leakage was reduced from 31 per cent to 18 per cent during the first phase of testing alone.

The training and demonstrations given by the Anglian Water team and WAPCOS to 20 Indian Engineers and a similar number of operations staff has created a core of people who are able to undertake leakage detection work. Perhaps the greatest achievement of the study is that more engineers, managers and politicians were made aware of the importance of leakage and how it can be successfully controlled.