

Thames Water Network Improvement Project

extensive Victorian mains replacement underway in the Capital

by Simon R Johnson BSc, CEng, MICE, MCIWEM

Thames Water's Network Improvement Project has been pivotal to the effort to control leakage in London and the Thames Valley since 2002. Leakage savings of 145Mld from Network Improvement (134Mld delivered to date) have supported the unremitting day-to-day detect and repair effort and bought the company time to establish its extensive programme of Victorian mains replacement now underway in the Capital.

In October 2001, Ofwat expressed concern at the pattern of increasing leakage at Thames Water and the consequent impact on supply-demand balance*. A set of Agreed Steps were announced with the following objectives all related to recovery of security of supply for customers:

- * to bring leakage back to economic levels;
- * to establish a robust Water Balance;
- * to produce a plan to recover target supply-demand headroom.

Thames Water quickly established Network Improvement as a key element in the company strategy to achieve these objectives and rapidly gathered together a team of engineers with appropriate specialist experience to implement the strategy. No time was lost in responding to the challenge, and by April 2002 the first leakage benefits from this programme were recorded.

* REFERENCE (above)

Leakage and the efficient use of water (Ofwat 2000-2001) report.

The 946Mld reported leakage for 2003/4 represented the end of the upward trend in leakage at Thames Water and subsequent reported annual leakage has shown progressive reduction. Reported leakage for 2006/7 met and exceeded the Ofwat target for the first time this century and, at the time of writing forecast leakage for 2007/8 is also on target.

Nature of the work

The Network improvement project comprises two distinct types of scheme. Pressure Management and Zonal Reconfiguration. Both of these deliver reduced leakage through lower and more stable network pressures.

Pressure Management is well established across the UK water industry. A pressure-secure boundary is formed, usually from valves already closed to make the Zone or DMA (District Meter Area) boundary. The pressure into the PMA (Pressure Managed Area) formed thus, is then controlled with a PRV (Pressure Reducing Valve). Typically a traditional PMA is similar in size to a DMA, containing 3000-5000 properties. Although some PMAs are smaller and other PMAs cover several DMAs or whole Zones.

Zonal Reconfiguration is a complete rethink of the structure of a pressure zone. Boundary valves are verified and modified as necessary. Anomalies between the modelled behaviour of the zone and that experienced in the field are identified and eliminated. Transmission routes across the zone are reviewed and where possible the control of flows and pressures through these routes are improved. PRVs or other pressure control devices are also installed, but unlike traditional pressure management, these devices tend to be much larger, operate on critical trunk mains and potentially affect larger populations.

The Leakage Control Toolkit

There are three principal measures with which the water undertaker can control leakage:

A sustained and continuous effort is required to detect and repair leakage. Thames Water's network infrastructure is nearing the end of its useful life. It is inevitable that leaks will break out and that the rate of breakout will continue to increase until the water mains are replaced. To minimise the resultant loss of water, maintained vigilance and focus on detect and repair activity is fundamental.

Secondly, it is imperative to deal with the root cause of the problem long term. Thames Water's ongoing programme of Victoria mains replacement (VMR) works in London, involves the replacement of water mains from the whole DMAs, prioritised according to their existing pattern of leakage. **This is the highest rate of water mains renewal ever undertaken worldwide.** However, even at this unprecedented rate of capital investment, VMR leakage savings are not expected to exceed those achieved from Network Improvement before 2010.

By improving the way we operate the network, stabilising the pressures and facilitating calm operational regimes, Network Improvement effectively extends the life of ageing infrastructure assets. As well as delivering immediate leakage reductions, Network Improvement reduces the rate of bursts and leakage breakout preventing infrastructure failure. Network improvement is a medium term programme that Thames Water has implemented to keep leakage and other symptoms of infrastructure failure in check prior to the bulk of VMR.

Challenges

Cultural Change:

The Network Improvement project represents a shift in approach internally for Thames Water. Prior to 2002 'Detect and Repair' was the primary means by which leakage was controlled. The long term process of asset investment was not often linked to immediate issues such as rising levels of leakage or more frequent mains bursts.

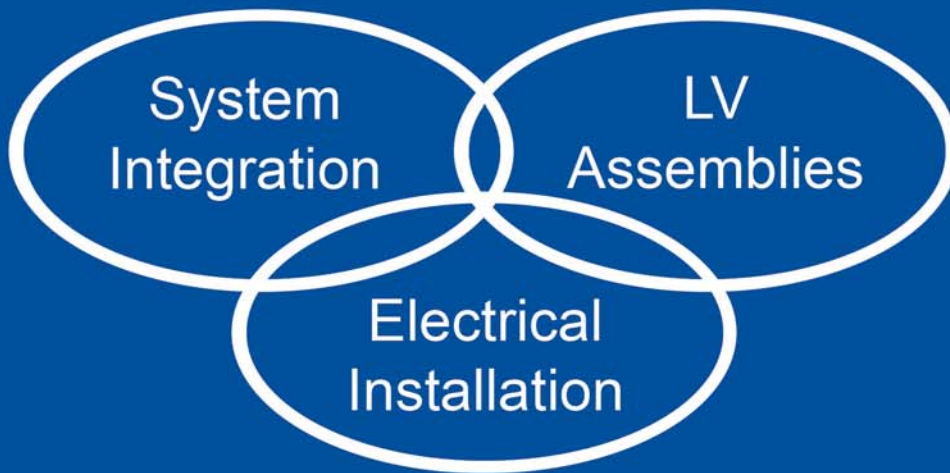
For a project such as this which constantly requires interventions into the live water distribution system, the support of the front line operations team is critical. In order to catch the attention of these key stakeholders, the early project strategy was to rapidly implement successful Pressure Management opportunities and then to communicate the cost-effective nature of the sustainable leakage benefit achieved. Once this had succeeded a broad church of stakeholders came together ensuring the continued success of the project through cross-departmental co-operation. Company initiatives on leakage now comprise Network Improvement contributing towards securing company leakage targets, alongside VMR, Active and Visible leakage effort.

Tall Buildings

Changing network pressure regimes as part of Network Improvement has revealed service expectations from owners of tall buildings, in terms of mains pressure provision, which go beyond legislative and regulatory obligations placed upon the water undertaker.



Business is a Partnership



Partnering our clients for the complex integration services demanded for AMP4 / AMP5

- *Single Source Supply Chain*
- *Single Point, Project Management*
- *Efficient merger and deployment of resources*
- *Maximum innovation and added-value*
- *Maximum benefit realisation*

www.adsystanord.co.uk
sales@adsystanord.co.uk

The Water Act required mains water to be supplied to a height in a building to which it would reach under gravity from an appropriate service reservoir. In practice the Act is of little significance for the majority of London as system pressures are generally dependant upon pumps for positive pressure and if the pumps were to be switched off to allow water to flow entirely under gravity, most of the network would run dry. This usually leaves the Target Level of Service (TLOS) pressure set by Ofwat for the Water Industry in England and Wales as the minimum acceptable water pressure. TLOS is set at 10m head at a flow of 9ltrs per minute where the main crosses the property boundary and this generally ensures all floors of a two or three storey domestic dwelling receive an adequate supply.

The majority of building owners understand and accept that they need to provide pumps if they wish to reliably supply water to floors above this level. However, in London a number of influential building owners, including some London Boroughs, have received significantly higher mains pressure for some time enabling them to supply floors well above the usual level without the need for pumps. Consequently building owners have taken the position that, when the water company proposes lower pressures to protect the water mains network, the water company should contribute to pumps that the building owner then needs to provide for residents of upper floors. Extended negotiations on this subject with London Boroughs and representative bodies such as the Association of London Government and the Greater London Assembly resulted in significant delays to parts of the project.

Whilst there is clearly no obligation through legislation or regulation, Thames Water has in the spirit of goodwill, agreed to fund 50 per cent of the cost of pumps for Tall Buildings. If this agreement had not been reached, implementation of the project could have led to water supplies being curtailed to residents of upper floors - a course of action the company was not willing to consider.

Subsequent to the agreement on costs for tall building pumps, 100

pumps have so far been installed and the delayed construction work has now been completed.

Towards the future

This project presented a number of unusual challenges.

A great deal of modelling and analysis work was necessary to define what was required. Much of the resultant implementation involved non-constructional field-work associated with DMA and Zone boundaries and construction tended to be surgical, such as valve installation or modifications to connections. No large scale replacement took place.

The following important learning points have been drawn from this approach:-

- * cross functional cooperation is a key to successful improvement of water supply networks, together with the management of associated leakage and asset deterioration;
- * effective leakage control requires a balance of short, medium and long term measures in the form of Active and Visible leakage activity. Pressure Management, other network improvements and ultimately replacement of the failing asset (ie VMR);
- * The success of projects such as Network Improvements, which directly affect the customer experience (eg pressures), is dependent upon the early engagement of external stakeholders (such as tall building owners).

For AMP5 and beyond, further integration is planned between Network Improvements and Victorian mains replacement. We should see Zonal Reconfiguration evolve into configuration (design) prior to renewal of network infrastructure as a whole.

Note: The Editor & Publishers wish to thank Simon R Johnson, Thames Water's Principal Project Manager, for Pressure Management & Water Efficiency, for producing the above article for publication. ■