

2,230km of Rehabilitated Water Mains

Dwr Cymru Welsh Water on track to beat this target

by
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Dwr Cymru Welsh Water's AMP3 commitment to improve potable water quality throughout Wales and Hereford, through the removal of iron from the water mains network, is to deliver 2,230km of rehabilitated water mains. This forms part of the company's 5 year AMP3 investment programme between 2000-2005, as part of its DWI Section 19 undertaking.



River Taw: Laying of twin 500mm mains within river bed

courtesy Dwr Cymru Welsh Water

The programme is divided into three 'milestone' periods:

- * Milestone 1 – Apr 2000 – Dec 2001;
- * Milestone 2 – Jan 2002 – Dec 2003;
- * Milestone 3 – Jan 2004 – Dec 2005

Programme target was to deliver 1645km of rehabilitated water main by 31st December 2003 (end of Milestone 2, with 645km of rehabilitated water main delivered by the end of Milestone 1, leaving 100km of water main to be rehabilitated by the end of Milestone 2. The programme target of **One Million Metres** in Milestone2 was achieved on 10th December 2003 ahead of programme.

How was this achieved?

Partnering

The key partners, *Laing Utilities, United Utilities Operational Services and Chandler KBS*, on behalf of Dwr Cymru Welsh Water, are delivering the programme as members of the Welsh Water Capital Alliance. This is a strategic partnering team, made up of specialist engineering, construction and cost management companies, which was formed to deliver around 60% of the company's Capital Investment Programme during the AMP3 period.

Success of the business is centred on the values of the Capital Alliance Partnering ethos, founded on working within a framework of honesty, trust, cooperation, openness and understanding. Furthermore, team collaboration, sharing risk and recognising achievement has helped to realise these goals.

Design process

Fundamental to the project success has been the development of a comprehensive design process providing 'whole life solutions'. The key design objective has to arrive at the optimum design through a detailed investigation and interrogation of the network, including mathematical modelling and site investigation. A Network Improvement Group (NIG) consisting of representatives from the Capital Alliance Partners takes into consideration future potential development within the network area as well as optimisation of existing assets. This process involves close collaboration and dialogue with the other fund holding partners to ensure that the Capital Alliance delivers solutions which meets with Dwr Cymru Welsh Water's long term strategy.

Consultation

Key consultees involved in the feasibility, design and construction

process would include the Environment Agency, Countryside Council for Wales, Archaeological Trusts, Wildlife groups and Local Authorities. The Capital Alliance ensures that these groups are proactively involved at an early stage in the scheme development, as they can be influential in determining the final design solution. The Design Team also employ archaeological and ecological consultants to assist and advise on optimum routes and prepare relevant documentation, as required by the governing bodies, which demonstrates the Capital Alliance's commitment to delivering sustainable engineering solutions.

In determining the final design, a number of construction techniques are considered and the final solution will be dependent upon a number of factors, including the structural integrity of the water mains, ground conditions and geographical location.

During the AMP3 period, the following techniques have been utilised:

- * open-cut – replacement of water main by use of open trenching;
- * directional drilling – replacement of water main by drilling beneath the ground, displacement of the ground to allow a new water main to be drawn through (eg. under carriageways, rivers, fields etc.);
- * pipe bursting – replacement of existing water main by bursting and pulling through a new main of similar diameter;
- * relining – a system used to reline the existing water mains using an epoxy resin system. The system has been recently improved by the introduction of a PolyUrethane (PU system), a rapid-setting material which brings the water main back 'on line' in a shorter period of time, thus benefiting the customer.

The network operator, United Utilities Operational Services, is an integral part of the design process in arriving at a cost effective solution with minimum network disruption. All parties, prior to proceeding with construction, agree the final design solution.

Furthermore, the network operator plays a key role during the network investigation and construction phases of the scheme in shutting down sections of the live main, through valve closures, to allow the contractor *Laing Utilities*, to proceed with the rehabilitation work. Coordination meetings are held regularly between operator and contractor to agree programming of the works and valve closure procedures. In addition, systems are often modelled to determine the effect of a proposed procedure on velocities within the main and, where there remains a risk of discolouration, through increased velocities in the system, these concerns are raised at the Customer Management Plan meetings.

Laing Utilities and United Operational Services work together in close partnership and success of the project is a result of their close cooperation.

Quality

The majority of the schemes involve work on live networks, which presents a number of design, construction, water quality and operational challenges. In order to mitigate customer disruption, for example through discolouration of water and failure of water supply, it has been necessary to develop a comprehensive risk mitigation plan. Each scheme is assessed and procedures are put in place to deal with any type of emergency, and customers are contacted in writing, through the customer liaison group, to advise of possible discolouration and what alternative sources of water will be made available.

In addition, to achieve high standards of bacteriological compliance, a dedicated Water Quality Team from *United Utilities Operational*

Services has been established to monitor site procedures and practices. As a consequence, water quality standards have consistently improved.

Construction

Construction teams operate within 6 geographical regional areas in Wales and Hereford. A number of teams have diverse technical skills and experience in the range of rehabilitation techniques utilised, creating a flexible and efficient workforce. The teams are motivated via a range of company incentivisation schemes promoting the continual improvement, focus and delivery of outputs relating back to Key Performance Indicators (KPIs).

Benchmarking

Each scheme is target costed and is built from first principles and application of individual scheme risk. Each scheme is benchmarked against "Best in Class", industry wide rates for delivery of individual aspects of work. This ensures tight financial control and accuracy of forecasting. The target cost approach presented the team with an incentive to deliver schemes as efficiently and effectively as possible, as all partners share in the pain/gain mechanism. The Business Plan attached to delivery of the Section 19 programme for mains rehabilitation, was set at a very challenging figure to meet the requirements of both OFWAT and Dwr Cymru Welsh Water. This presented the delivery team with a tough challenge, which was further compounded by a number of high cost low production schemes within the AMP3 programme.

Case studies: Llangunnor – High Cost/Low Production

The team was tasked with laying 200m of pipe work in the back gardens of a number of properties in Llangunnor, Carmarthenshire. The properties are approximately 100 years old, the majority of which have well established trees and shrubs. In addition, the topography of the area is such that the houses stand at varying levels and the existing pipeline in some locations are in excess of 2m in depth. Gaining access to the gardens with plant and machinery that would ordinarily be used proved to be extremely difficult. Therefore, the only viable option was to open cut or mole underneath the gardens. After approximately 18 months of planning, preparation and negotiation with customers, the work was finally undertaken and the team were able to mole underneath all the gardens and managed to complete their task within three weeks as per the planned programme. At all times, customers were kept informed of progress following Capital Alliance guidelines and the likely disruption that would be caused to their water supply. This is a clear example of a typical high cost but low production scheme.

Case Study: Crai Trunk Mains, Swansea Valley

In contrast, the Crai scheme involves the rehabilitation of approximately 70km of trunk main which delivers water from Crai Reservoir to Townhill and Cockett Service Reservoirs, serving 30,000 customers in the Swansea Valley.

It was recognised from the outset that the level of iron deposition in the main would restrict the operation of valves and changes of flow. These operational difficulties would make re-zoning of the supply, in a manner that did not impose a significant risk of introducing discoloured water into supply, a defining factor in determining rehabilitation strategy. As a result, a Risk Management and Customer Management Team were established to manage this risk.

Set procedures have been established, whereby letters are sent out to the customers most likely to be affected by any potential discolouration and the Call Centre Managers are advised in advance of the proposed work, in the event of customer queries.

The team ensure that the appropriate construction method statements, network operations overview, operational water quality risk mitigation, environmental risk statements, customer management

Water Treatment & Supply

plans and programme of works are prepared and agreed between the relevant Capital Alliance partners before any work takes place.

The scheme has been developed from a conjunctive use strategy, to utilise water from the Felindre system, creating a more flexible and reliable water network.

Under-pressure 'tees' were installed, following factory trials, along sections of the main, which were operating under high pressure, to avoid shutting down the network and disrupting customer supply.

Environmental issues have centred around the Brecon Beacons National park, through which a section of the twin main runs, and an ecological report was prepared by specialist consultants, which influenced the final route. The sensitive nature of this special site, which included a site of Special Scientific Interest (SSSI), also affected the construction programme.

DWI have also complemented the team on the Risk Management Plan.

Summary

Key Performance Indicators (KPI's) are used to monitor the performance of Capital Alliance Partners. These are quantifiable measurements, agreed in advance, that reflect the critical success factors of an organisation. As a result, the Capital Alliance partners have assisted Dwr Cymru Welsh Water in improving their ranking within the Water Industry, measured by the Operational performance Assessment (PA) from 7th to 2nd position during this AMP3 period. This further supports the Capital Alliance's aspirations to become a 'World Class Strategic Alliance'.

The future challenge now is to deliver the remaining AMP3 metreage of 585km by March 2005. ■

Note on the authors: *Rozy Tejrar is Communications Co-ordinator and Mike Hogan Project Manager with the Welsh Capital Alliance's Water Team. the Capital Alliance is Dwr Cymru Welsh Water's strategic partnering team delivering the majority of its Capital Investment programme.*
