Cumbria & Ribble area UV plants
part of United Utilities massive 2000-2005 investment

by
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United Utilities (UU) is the UK's leading multi-utility company, supplying electricity, water. gas and telephone services to millions of people in Britain and around the world. In the North West of England it serves a population of 7 million providing water, wastewater and electricity services. It manages and maintains more than 600 wastewater works and more than 100 water treatment works, together with 80,000 kilometres of pipes and sewers in the north west. UU has the largest investment programme of all the water companies in the UK, amounting to some £3 billion between 2000-20005.

Windermere Wastewater Treatment Works; new UV Channel & control building *(courtesy Mott MacDonald & United Utilities).*

As part of this investment work in its Northern Area Framework Region, a number of UU sites required the provision of ultra violet (UV) disinfection to achieve legislative compliance with the European Bathing Waters Directive.

This tertiary form of treatment uses UV light within a particular range of frequencies to react with the micro-organism's DNA, disabling it from reproducing or generating life sustaining protein products after being discharged into receiving waters. These receiving waters are usually used for bathing.

AMP3 programme

For the AMP3 programme UU employed *Montgomery Watson Harza (MWH)* as programme manager to carry out tender designs for the entire UU network and project manage the implementation of each scheme. The AMP3 programme of work has been divided into three geographical areas, and detail design and construction work was tendered on a framework basis for each area.

Framework suppliers have been set up to supply plant and materials for each framework. This has provided consistency in supply resulting in savings from bulk purchasing as well as efficiencies from operation and maintenance over the long term.

HMB Alliance was appointed to carry out work on the Northern Area Framework in partnership with *United Utilities* starting in 2002 and finishing in 2005. The Alliance is made up of two joint ventures working together to deliver complementary design and build services.

The first joint venture is formed from three contractors, *Harbour & General, Morgan Est and Barhale* - creating the *HMB JV.* The second joint venture is between *Carlbro and Mott MacDonald* forming the *Carlbro Mott MacDonald design JV.* The Alliance operates on a target cost 'New Engineering Contract' with all parties on a pain/gain share arrangement.

The Northern Area Framework, covering the Cumbria and Ribble area has over 200 individual AMP3 projects valued at approximately £430 million involving £170m combined storm water overflows and £260m water and wastewater treatment works.

The *HMB Alliance* has now been running for just over a year and Mott MacDonald as part of the design JV has been involved in a large number of UV projects. Each individual UV project is relatively small, but the number of them has resulted in savings from efficiencies gained through design standardisation and experience. The projects so far have all been programme driven to meet tight effluent discharge consent dates as set by the Environment Agency. As a result, fast turn around of design and efficient construction methods have had to be achieved.

Nine UV plants

In the first six months of the frameworks there were nine wastewater treatment works which required UV plants to be installed at the following sites:

* Windermere * Askam * Millom
* Silloth * Newbiggin * Near Sawrey
* Ulverston * Allonby * Grange-over-Sands

Each wastewater treatment works had its own individual requirements but standardisation resulted as all the UV plants were supplied and installed by UU Framework supplier *Wedeco.* All sites required concrete UV channels to be constructed. The length, width and number of channels was dependent on the influent characteristics of each works i.e. UV exposure time required and flow rate. *Wedeco* provided its civil requirements for each site and *Mott MacDonald* incorporated these into the overall civil design.

Pumping stations

In addition to the UV channels five sites required pumping stations to feed the UV channels as there was insufficient head available to accommodate the channels using gravity flow. The pumping stations were all of the submersible type and formed from manhole rings for the wet well and a standardised valve chamber.

Each UV installation also required a control kiosk to house the MCC units, drain down points and lifting facilities to remove the lamp units. At Windermere it was necessary to house these MCCs inside a random rubble/stonework building for planning requirements, as shown in the photograph.

For some sites it was an Environment Agency requirement to install standby generators to maintain electrical supply to the UV channels when power is lost. At Silloth, sand filters and a sand filter back wash clarifier were also designed and constructed as part of the scheme.

Windermere and **Ulverston** required chemical cleaning for the UV tubes as both sites have processes upstream that involve ferric dosing, which causes a film to build up on the tubes reducing their effectiveness. This chemical cleaning is carried out with phosphoric acid and compressor driven rubber rings which wipe the tubes clean - facilities were provided to store and receive the phosphoric acid.

The *HMB Alliance* has been using *UU project extranet,* supplied by *BIW Technologies.* This has proved to be a very effective management tool which has helped the alliance, framework suppliers and United Utilities communicate in a very methodical and highly effective way including issuing, commenting on, and approving drawings to raising and answering technical queries.

Close and open relationships have been forged between the client, designers, contractors and suppliers to maximise the benefits of the partnering arrangements. Regular meetings and frequent daily contact have enabled a high degree of buildability and operability to be incorporated into the design minimising construction costs and increasing speed of construction to help meet the time effluent discharge deadlines and to deliver effective engineering solutions.

All nine sites have now been constructed successfully and are operating effectively. Further designs for UV channels on a number of other wastewater treatment works have been carried out within the Cumbria and Ribble area applying lessons learnt from these earlier UV projects.■

Note: *The author of this article, Graham Mortimore, is an engineer with Mott MacDonald*