

Fishmoor WTW Up-Grade & Improvements

Alliance 'design teamworking' leads way to major savings

by
John Tiplady

The original works at Fishmoor WTW, which lies to the south of the town centre of Blackburn, was constructed between 1961 and 1964 and has been in operation since 1964. The works were extensively refurbished between 1992 and 1994 and the filter internals were replaced. The works treats raw water from Fishmoor Impounding Reservoir (IR). The reservoir is in turn filled by river water from intakes on the River Ribblesdale. The maximum capacity of the existing process is 36 Ml/d. Treated water is distributed in the Blackburn area, with about 80% of the flow gravitating into the Ribblesdale. This is part of its current 5 years Asset Management Plan (AMP3) and in line with its regulatory drinking water requirements, United Utilities is developing a new 2nd stage filter building.



Fishmoor WTW - New 2nd stage filter building under construction

courtesy: HMB Alliance

Project purpose

The purpose of this project is to improve treatment performance at Fishmoor WTW. The water quality objectives are to ensure regulatory compliance by:

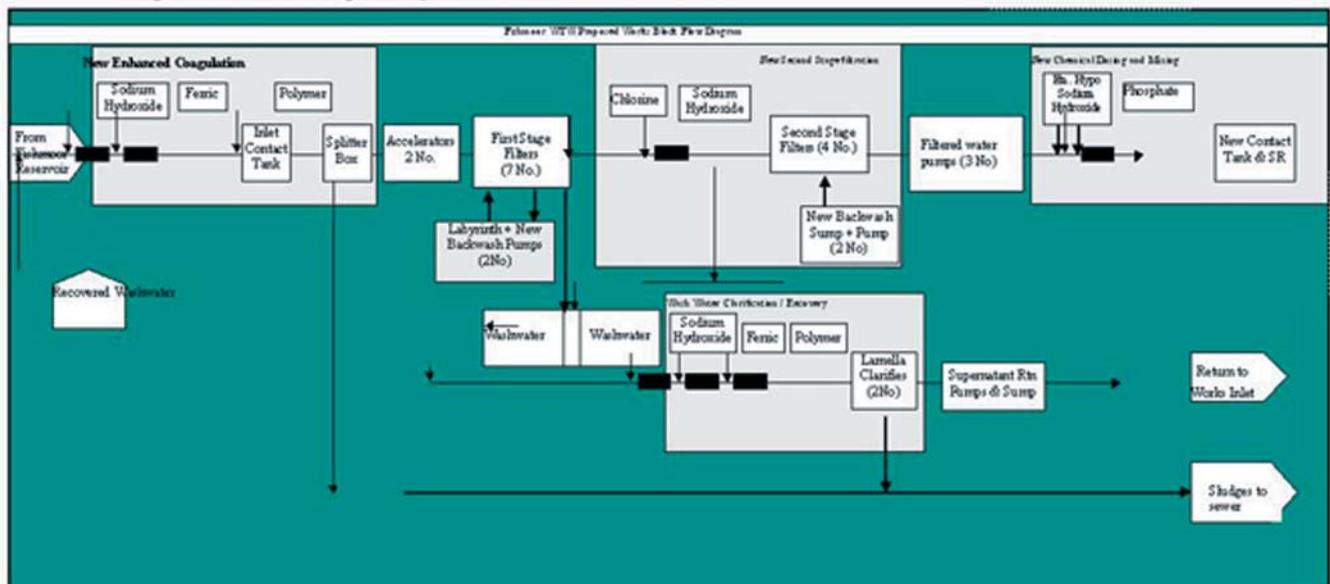
- * reducing the risk of Cryptosporidium entering supply;
- * reducing final water manganese concentrations.

Brief contract descriptions

Main works included within the project are:

- * modifications to the inlet area pipework to include enhanced coagulation process;
- * refurbishment of two existing Accelerator type clarifiers;
- * refurbishment and upgrade of first stage filters to include replacement of filter, air scour and backwash control valves, addition of new filter outlet pipework and flow meters and, new control and water quality instrumentation;
- * construction of new 2nd stage filter building, comprising of four 2nd stage rapid gravity sand filters complete with all ancillary equipment for the removal of manganese, chemical storage and dosing facilities for sodium hydroxide, sodium hypochlorite, sodium orthophosphate, emergency hypochlorite, 2nd stage clean backwash tank and pumps, dirty washwater sump and pumps, filtered water pumping sump and pumps and MCC room.
- * provision of lamella clarifiers;
- * modifications to dirty washwater handling facilities;
- * modifications to chemical dosing systems, sampling, standby power, PLC and SCADA system;

Figure 1.1 Schematic Diagram Proposed Process



- * provision of chemical dosing pumps and systems for ferric sulphate and polyelectrolyte;
- * replacement of existing first stage filter backwash pumps;
- * new standby power generation.

Design progress

Although an early award for design and mobilisation was made at the beginning of April 2003, the project was still over-budget at £8.212 million. United Utilities challenged the design team to “think outside the box” and find ways to reduce the Tender Target Cost (TTC). Early ‘optioneering’ identified a number of areas where the original design concepts and UU Asset Standards could be challenged. Without the need to produce too much detailed work, savings of c£0.5 million were quickly established and the Full Award for the project was received by HMB in mid-June 2003 at £7.715 million. Key to these early savings was a challenge to the conceptual hydraulic profile. A new appraisal of the profile allowed the structure of the new 2nd Stage Filter building to be generally reduced in depth, obviating the need for extensive temporary cofferdam works and anti-floatation measures.

Once full award had been made, the design team set to work to ‘fine tune’ the new hydraulics. At this stage the second and third main challenges came into play, namely a change to an HDPE filter block Underdrain system for the 2nd Stage rapid gravity filters, and a change to adopt 47% Sodium Hydroxide for pH correction in lieu of the original 27%.

The first challenge introduced the Design Team to *F.B. Leopold*, a USA based company that specialises in a number of water process related systems and designs. The Design Team evaluated and then selected *Leopold’s* Universal Type ‘S’ Underdrain HDPE block as their preferred solution and, following discussion with *Leopold* also elected to incorporate their newly developed, diamond-section, launder trough, fitted centrally within the filter shell. This major innovation enabled all four new filters to be fitted into the same footprint as only three of the original Asset Standard structures, and also eliminated the plenum floor arrangement, saving approximately 1m of reinforced concrete construction and nullifying the extreme tolerance requirements of a more traditional nozzle detail floor. The additional space was put to good use by amending the design of the Filtered Water 2nd Stage Backwash and Dirty Backwash water tanks, making the tanks shallower and wide. The second challenge required a policy change by UU Operations to accept 47% Sodium Hydroxide as a standard, which they speedily confirmed. With this amendment in place, the bulk

storage tanks were effectively halved in height, bringing about an equal reduction in the height of the new building superstructure. High level access walkways were also discarded, with simple ladder access only being required to the tanks for maintenance purposes. The savings in building construction costs have proved to be considerable.

Construction progress

Access to demolish the original service reservoir came in late July 2003 and design work had to be ‘fast-tracked’ to keep pace with construction activities. Major sub-structure works were completed by end-November, and superstructure works were advanced sufficiently by early December to allow substantial erection of the 2nd Stage Filter Building steel framework by the Christmas 2003 break. Cladding works commenced in fairly poor conditions in January 2004 but a substantially weather tight building was available by the first week in February to allow chemical dosing installations to commence.

Thanks largely to the efforts of the Design Team and the considerable changes that had been discussed, agreed and detailed at some speed, a 3 month saving in build period for the new 2nd Stage Filter Building has been achieved. The project is well set for an early completion a number of weeks ahead of UU’s regulatory date of 31 December, 2004 for compliance.

Teamworking success

The success of the project to date is principally due to the strong spirit of ‘teamworking’ amongst the Design Team that has allowed major design challenges to be made and carried through quickly. Strong working relationships between *UU*, *UU Operations*, *Montgomery Watson Harza*, *HMB* and *Carl Bro Group* were established very early, fuelled largely by the early ‘optioneering’ successes, but with the momentum being maintained by UU’s willingness to embrace change. This positive approach has allowed HMB and Carl Bro the flexibility to use their respective construction and design knowledge and experience gained from previous projects to the full.

Projected final out-turn cost for the project is now close to £6.2m at the time of this report, a first class endorsement of the ‘teamworking’ ethic that has resulted in an almost 25% saving on the original Tender Target Cost. ■

Note: The author of this article, John Tiplady, is HMB Project Manager.