

Farmoor WTW

DAF upgrade

by
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As part of Thames Water's spending in AMP4, a number of sites of strategic importance were upgraded. Farmoor WTW, located just outside Oxford, provides potable water to Oxford and the surrounding area. The scope was to upgrade the existing DAF cells and overcome existing issues associated with poor mixing and low DAF recycle rate. The previous poor mixing performance was characterised by the streaming of coagulant and this led to major differences in floated water quality between each lane, hence greatly increased coagulant dosing to compensate. Furthermore, poor desludging of the cells led to floc carry over onto the RGFs.



DAF Saturator vessel and new recycle pumps

photo courtesy of Enpure Ltd

The existing DAF recycle system was based upon a nominal recycle rate of 5%. Due to proposed upgrades within the works at Farmoor the challenge was to upgrade the existing DAF cells so that the original flow of 80Mld could be increased to 120Mld without loss of performance, together with an increase in recycle rate from 5% up to 12%.

The design of the upgraded DAF plant was jointly developed by Enpure and Thames Water based upon their combined experiences of using DAF on algae laden water supplies.

New chemical mixers were installed to ensure optimum process chemistry through the plant. Modifications to the design of the flocculation tanks were carried out to reduce short circuiting and improve floc formation. Enpure utilised its experience of high rate DAF processes (DAFRapide®) and incorporated a new recycle system based upon twin saturated water headers. The split header system allows the DAF plant to receive combinations of 33%, 67% and 100% of the recycle saturated water, depending upon the flow rates through the DAF cells. In addition Enpure incorporated its in-house design DAF nozzle in order to meet the stringent bubble size requirements.

The full scope of supply included new recycle pumps, associated recycle headers in stainless steel, saturators, flocculation units and recycle control system. Other works being undertaken include new actuated control valves instead of the existing penstocks, valves, weirs, dispersion plates, instrumentation and associated control panels and cabling.

Construction

Enpure were engaged initially by Thames as their pre-contract designer and then subsequently by Costain as lead designer and MEICA subcontractor to provide the design, supply of equipment, installation & commissioning of an upgrade to the existing DAF process. Total contract value for the project was approximately £2.7m with the Enpure value being £1.4m. Costain undertook the Main Contractor/Principal Contractor role and provided all site facilities, associated civil works and substantial access platform arrangements with Enpure providing all process and MEICA works.

Contract award for the project was March 2007, with detailed design completed by May. The first phase of site work included the installation of a new in-channel Statiflo mixer and following on from this there was a rolling programme of upgrades to each of the five DAF cells.



DAF Saturator Vessel being offloaded at site

photo courtesy Enpure Ltd

The upgrades had to be carried out sequentially to one lane at a time to avoid turning down the output from the works. Similarly careful programming was required to minimise the number of works shutdowns. Planned outages had to have programmed float to ensure aborted shutdowns did not have a critical impact on project completion and required very close liaison with Operations.

Due to time constraints and the tight deadline of completion by January 2008, the first three DAF cells were upgraded with new headers, dispersion plates, nozzles and control valves - however, they were initially run off the old recycle system. The upgrade of nozzles and headers gave immediate water quality improvements dropping peak turbidities down from 0.5NTU to 0.3NTU. After installation of new saturator, recycle pumps and associated pipework the fourth DAF cell was fully upgraded and this, plus the three previously upgraded cells were transferred on to the new recycle system which-in-turn resulted in even further improvement with outlet turbidities dropping down to 0.2 NTU.

The final DAF cell upgrade was completed before Christmas 2007 with all outstanding work complete on programme in early January 2008.

Conclusion

The scheme was fast track and is another example of Enpure providing cost effective solutions derived from process knowledge

and innovation. By careful planning and working closely with Thames operations, together with the professionalism of the excellent site, the number of originally planned shutdowns were dramatically reduced resulting in less water production loss and reduced risk.

The completed improvements now ensure consistent coagulant dosing and mixing across all 5 lanes. Improvements in flotation are very visible with even formation of the floc 'mousse' across each lane, and efficient shedding of the mousse during desludge thus minimising water losses both in the DAF and RGFs.

As well as the obvious water quality improvements associated with the DAF upgrades the project has led to further improvements across the Farmoor site. The efficient flocculation and associated mixing has resulted in lower chemical costs, and Rapid Gravity Filter run times have improved by as much as 20% resulting in reduced backwash water requirements and increased water production.

The project was brought in on time and 9% under original budget. The excellent team spirit between Thames, Costain and Enpure has resulted in a very good working relationship which has now resulted in further work being undertaken at the Farmoor site.

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