

Sutton Hall Water Treatment Works

water quality improvements, Ellesmere Port, Cheshire

by Bill Porter WTWCEng, MICE

As part of United Utilities AMP3 programme Sutton Hall WTW was upgraded to achieve an improved water treatment standard. This included the provision of enhanced coagulation and second stage filtration to reduce the risk of cryptosporidium breakthrough, reduction in manganese levels and improvements to disinfection whilst maintaining the plant's ability to remove occasional pesticides. This £15million capital project provided a new/refurbished water treatment works of 120MI/d capacity to serve a population of 500,000 on the Wirral Peninsula.



Sutton Hall Water Treatment Works

courtesy: Atkins Water

Galliford-Costain JV as Southern Area Framework Contractor for United Utilities, commissioned *Atkins*, *OTVB* and *Ondeo Degremont* to provide tender target cost, detailed design and construction services for provision of a new water treatment works facility.

Sutton Hall site

Raw water extracted from the River Dee is pumped up to the raw water reservoir on the Sutton Hall site. This water is then processed through a gravity fed multiple phase process that comprises pH correction, coagulation, micro flocculation, clarification, GAC filtration, pH correction, second stage sand filtration, chlorination and phosphate dosing.

Detailed design of the new water treatment facilities undertaken by *Atkins* included, civil, structural, geotechnical engineering and architectural services comprised of the following:

- * enhanced coagulation with a three stream *Actiflo* micro-flocculation and clarification;
- * associated sand separation building, sand silo and MCC room;
- * 10 first stage rapid gravity filters using GAC media with covered pipe gallery;

- * filter control building with blower room, clean water backwash tanks, associated pumping stations and MCC room;
- * interstage lime dosing chamber;
- * lime water make-up, storage tanks, pumping station and dosing facilities;
- * conversion of existing rapid gravity filters into second stage sand filters for manganese removal;
- * clean water backwash tanks and pumping facility for second stage filters;
- * site process pipework up to 1200 mm diameter DWI approved fusion bonded epoxy carbon steel pipe work;
- * service water, reclaim water, surface water, foul water and sludge drainage facilities;
- * chemical trench and containment system, sample lines and cable duct facilities.
- * highways, footways and hard landscaping;
- * refurbishment of reclaim water and sludge storage facilities

Team approach

A fully integrated team approach was adopted between *United Utilities*, *MWH* and *Galliford - Costain JV* to enable the project to

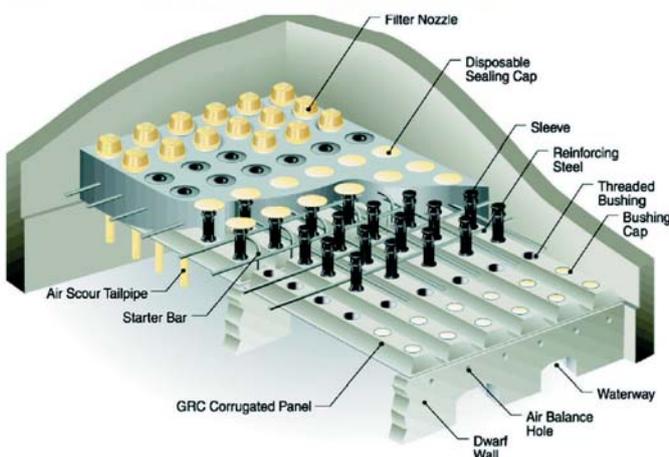


Sutton Hall WTW under construction

courtesy: Atkins Water



Monolithic Filter Floor

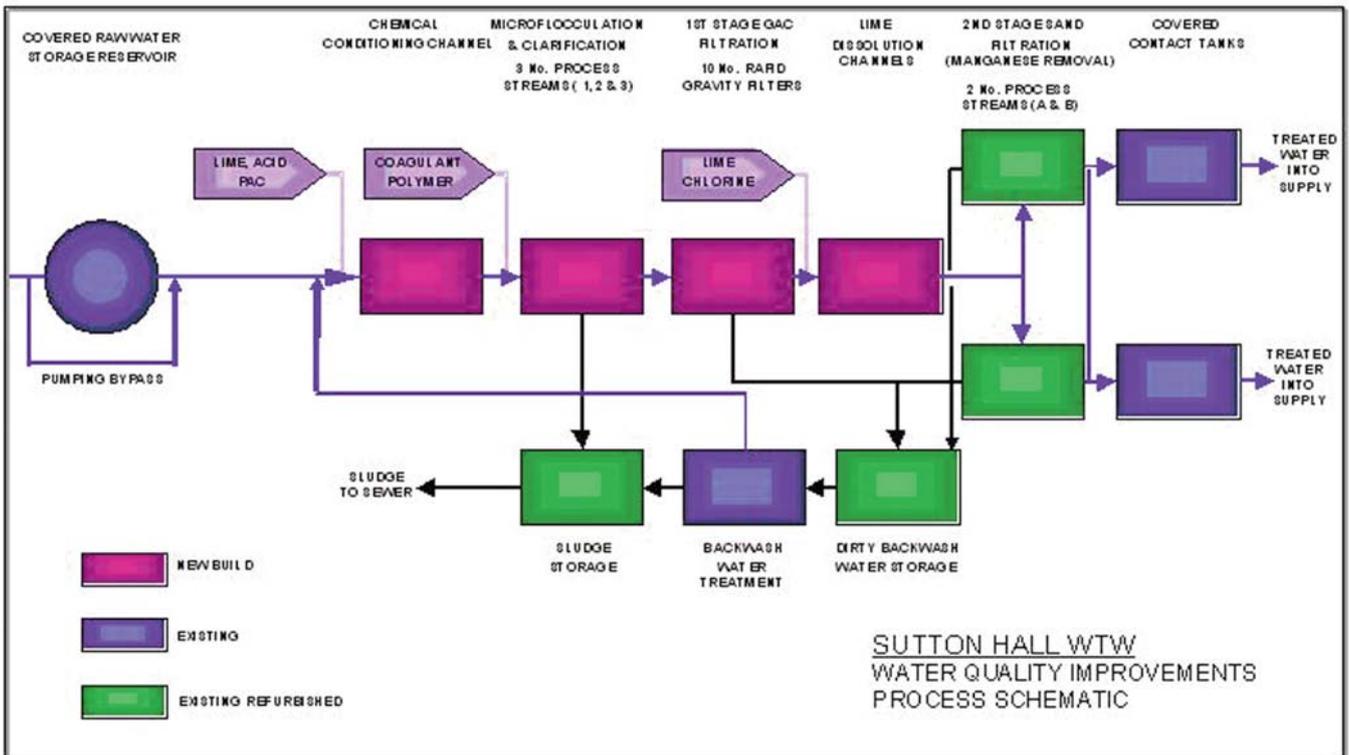


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- Compatible with any filter dimensions and adjustable on site
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- Low cost, simple installation
- Long term savings on maintenance costs and media loss prevention
- Ideal for new or retrofit
- Proven worldwide



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courtesy: Atkins Water

be fast tracked. The Atkins design team was co-located with Galliford-Costain JV and their M & E partner Ondeo Degremont in Warrington. A pro-active approach to value engineering and buildability workshops encouraged innovation and “thinking outside of the box” to develop the design. The open door policy within this multidisciplinary team allowed a flexible design approach to minimise the civil construction period and thereby reduction in project costs while enhancing constructability and safety aspects.

The project was developed to be environmentally considerate as access into the plant was made through an adjoining housing estate. Transportation of plant and materials was optimised, site excavated material was removed and wastage was reduced to minimise the impact on the neighbours that included a primary school.

Atkins were responsible for designing and detailing assorted forms of pull out rebar cases and permanent soffit shuttering to concrete pours utilising glass reinforced and precast concrete and glass reinforced plastic products. Extensive use of site manufactured pre cast concrete with cast in lifting anchorages was employed to speed up the construction process of many repetitive components within the modular rapid gravity filters.

Typical pre cast units included 220No. 325kg beams. Further pre cast concrete components were manufactured to reduce the risks associated with working at height within the Actiflo structure. The largest pre cast units manufactured on site were three particularly complex 3 dimensional units, each weighing 28 tonnes.

Various pipe materials were identified for the numerous deep and shallow gravity and pressurised pipelines. Extensive use was made

of fusion bonded epoxy carbon steel pipework for buried and aboveground process water pipework in lieu of the more traditional heavier ductile iron material. Structured wall plastic pipework was selected for shallower gravity sewers where appropriate in lieu of heavier concrete and clayware products that were specified for use at greater depth. The structured wall pipework was ideal for the construction of external backdrops to large diameter pipelines. Plant overflow and sludge pipelines were integrated into the bulk excavations to reduce the requirement for successive laying of deep pipelines in competent sandstone bedrock.

The enhanced coagulation, micro flocculation and GAC first stage filtration plant was commissioned during the third quarter of 2004. The new plant was operated as a stand alone water treatment works whilst both banks of the original first stage filters were taken off line to be overhauled and converted into second stage filters. The second stage manganese removal filters were commissioned and brought back on line at the end of September 2004. **Each phase of commissioning successfully achieved the specified output dates and the project as a whole was delivered in advance of programme and under cost.**

This project has been acknowledged as having an exemplary construction safety record exceeding 500,000 man hours worked without any lost time accidents. The Galliford-Costain JV have also achieved a ‘Safety in Design Award from United Utilities and recognition from the HSE for this contract as a prime example of the correct application of CDM. ■

Note: The author of this article Bill Porter is Project Manager, Atkins Water.

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