

Fring WTW

Nitrate Reduction Project

by
Dirk Binns and Graeme Whitby

Fring is a small village located to the north east of Kings Lynn in northwest Norfolk; the treatment works is located between the villages of Fring and Great Bircham. Although possessing a church, Fring has limited amenities, such as no street lights, and no village hall. It is largely populated by retired people and seasonal holiday goers. The village has a Parish Meeting body that looks after the interests of the local residents.



Site view of Fring WTW during commissioning

Courtesy of the @one Alliance

The need for the improvement works

The wholesome water supply network comprises three borehole water sources, Fring, Osier Carr and Great Bircham. Laboratory testing has shown a gradual rise in the amount of nitrate present in the raw ground water. While the current wholesome water supply meets the stringent water quality standards, investment in additional water treatment was required to ensure future compliance.

The designed throughput at Fring Water Treatment Works (WTW) is 81 litres/second (7 Megalitres/day, combined abstraction licence of the borehole sources) and is able to withstand an instantaneous flow of 100 litres/second. With flow blending, an output of less than 43 mg of nitrate per litre of wholesome water is produced. Raw ground water is drawn from the three borehole sources, treated and pumped to Docking and Inmere Reservoir sites and supplied to customers in the Heacham and Docking network zones, some circa 12,000 people.

A solution was agreed, based on capital and operational assessments, using 'Risk and Value' principles, to provide an ion exchange plant with flow blending. The plant has been designed to give best value and efficiency by analysing the needs to achieve nitrate levels of less than 43 mg/l thus ensuring future compliance.

Undertakings

The work was undertaken by the @one Alliance, a collaborative organisation comprising Anglian Water Engineering, Balfour Beatty Utility Solutions, Barhale, Biwater Treatment Ltd, Black & Veatch, Grontmij and Skanska-Aker Solutions, which was set up in 2005 to deliver a large part of Anglian Water's AMP4 capital investment programme.

The union of these companies brings together a wealth of experience, which is being used to enhance and increase Anglian Water's assets and infrastructure, providing innovative and sustainable solutions and the best value to customers. By doing so, the @one Alliance is helping Anglian Water fulfil its current supply and treatment obligations as well as make provisions for the increase in demand expected in the future.

Challenges and timeline

Through a very sensitive planning process, which included a Public Drop In Session in Fring Church, the project dealt with a number of issues raised by the local residents. Through a relocation of the site, with environmental and archaeological provisions put in place, many of the local issues were resolved. With continuous communication

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throughout the life of the project, the programme continues to be within target. The project is also registered with the national Considerate Constructors Scheme.

Construction commenced 25 July 2008, commissioning started April 2009 with a target Into Supply date of August 2009.

Description of components

The permanent Works includes:

- Localised raw and treated water mains
- Ion exchange plant (designed throughput 4.0 megalitres/day, 3.0 megalitres/day providing the blending flow) complete with salt saturator and brine waste stream
- Reinforced insitu concrete chlorine disinfection contact tank
- High lift pump station fitted out with two pairs of duty/standby vertically mounted pumps (supplying Docking and Inmere Reservoirs)
- Chlorine gas and orthophosphate dosing system
- Water quality sampling instrumentation
- Standby generator complete with fuel storage tank
- Waste pump station
- Three Motor Control Centres
- Low voltage power and control cabling
- Associated process ductile iron, stainless steel and plastic above and below ground pipework, cable ductwork/draw pits
- Security provisions including intruder alarm systems
- Loss Prevention Council security-rated access hatches and fencing
- Concrete access road and localised landscaping, hedge and tree planting.

Together with field easements works, off-site fibre optic and hardwired cabling has been installed from the new Fring WTW to each of the three borehole sources. This allows communication and control to provide full automation and monitoring of the completed works. Off-site cabling provisions are backed up by low-powered radio systems.

The ion exchange plant comprises booster feed pumps (Duty/Duty/Standby), two 100% capacity vessel skids (incorporating 20 resin vessels per skid), water softening plant, brine waste transfer pumps (Duty/Duty/Standby), water quality and nitrate monitoring instrumentation measuring raw, blended and treated water, associated process stainless steel and plastic pipework, Motor Control Centre, low voltage cabling, level and pressure instrumentation.

Standard products

The plant comprises a number of standard products that have been developed by the @one Alliance and its downstream suppliers to provide efficiencies in design, procurement, construction, commissioning and operation. These include:

- Arrangement of plant within the ion exchange building
- Design and construction of contact tanks
- Arrangement of chlorination plant
- Use of standard orthophosphoric acid dosing plant
- Standard Motor Control Centre designs

Results

Fring WTW is automatically called to deliver on water demand from both Docking and Inmere Reservoirs' water level signals and the borehole source(s) will be automatically selected to deliver a preset flow to Fring WTW. At the treatment works, the ion exchange plant will automatically start, water will be treated, chlorinated, orthophosphate dosed and then transferred into the wholesome water network for forwarding on to customers via Docking and Inmere Reservoirs.

Brine waste generated from the ion exchange plant will be stored on site within a glass-reinforced plastic tank and is automatically transferred via duty/standby pumps through a 125mm outside diameter medium density polyethylene main to Ringstead WTW and onto Heacham Sea Outfall for disposal.

Note: *The Editor and Publishers wish to thank Dirk Binns and Graeme Whitby of the @one Alliance, for preparing the above article.* ■



Iron exchange plant room

Courtesy of the @one Alliance