
Treatment Systems for Drinking Water

Engineered Systems: Nitrate Removal

Case History: Sheeplands Water Treatment Works, UK

Background

The Sheeplands WTW at Wargrave, Berkshire, operated by Thames Water Utilities Ltd, is supplied by 3 boreholes and originally comprised GAC filters and chlorine contact tank for final chlorination. Due to increasing nitrate levels in the borehole water, Satec Ltd was awarded the contract by the Trident West consortium for the design, supply, installation and commissioning of an ion exchange plant to reduce the nitrate level in the product water.

The ion exchange plant was designed to treat a sidestream flowrate of 7.5 MLD borehole water with a projected nitrate level of 154 mg/l. The treated water from the plant was blended with the remainder of the borehole supply to give a final product flowrate of 18.2 MLD with a nitrate level of less than 44 mg/l.

The plant comprises bag filters followed by 4 x 33% ion exchangers operating in parallel with 3 units in service and 1 unit either regenerating or in standby.

Regeneration equipment comprises 2 no. 18 tonne capacity salt saturators, brine storage tank, duty / standby base exchange softeners, softened regeneration tank, rinse water storage tank, regeneration water and rinse water pumpsets.

The plant is designed to operate fully automatically and is controlled by an Allen Bradley PLC with PanelView HMI.

Equipment Installed

- Inlet Bag Filters : Bank of 3 PTI Technologies stainless steel filter vessels to PD 5500 Cat 2 code, design pressure 10 bar g, each with 6 no. 25 micron filter bags.
- Ion Exchangers : 4 No. carbon steel lined pressure vessels to PD 5500 Cat 2 code, design pressure 10 bar g, 2200 mm dia x 2800 mm tan / tan, containing 7200 litres Purolite anion resin A-520E, sized for a flow rate of 104 m³/hr and 8 hour service run. Salt usage per cycle : 1033 kg
- Regeneration Water Pump : 2 No. KSB Etablock horizontal centrifugal pumps in cast iron construction, rated 20 m³/hr at 3.8 bar g, fitted with 7.5 kW fixed speed drive
- Rinse Water Pump : 2 No. KSB Etablock horizontal centrifugal pumps in cast iron construction, rated 104 m³/hr at 1.8 bar g, fitted with 11.0 kW fixed speed drive

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- Regeneration Water Tank : Forbes 40,000 litre capacity, glass fibre laminate tank to BS 4997 : 1987 Cat 2, 3050 mm dia x 5680 mm depth.
- Rinse Water Tank : Forbes 30,000 litre capacity, glass fibre laminate tank to BS 4997 : 1987 Cat 2, 3050 mm dia x 4310 mm depth.
- Salt Saturators : 2 No. Forbes 18,000 Kg working capacity, glass fibre laminate tank to BS 4997 : 1987 Cat 3, 3050 mm dia x 4237 mm depth.
- Brine Service Tank : Forbes 3300 litre capacity tank in black polypropylene 1524 mm dia x 2100 mm depth
- Base Exchange Softeners : Duty / standby Eurowater model SML 2002-F base exchange softeners each containing 700 litres Purolite C-100E resin, sized to produce 20 m³/hr softened regeneration water.
- Salt usage : 105 kg per cycle. Softened water : 100 m³ per cycle.
Softeners supplied with 1000 litre brine service tank.
- Air Compressor Set : Duty / standby Compare reciprocating air compressors mounted on common 200 litre air receiver. Compressor duty : 335 l/min at 10 bar g.
- Control System : Allen Bradley Controllogix PLC PanelView HMI