

Seagahan WTW

new plant constructed within existing slow sand filter

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Seagahan Water Treatment Works is situated in County Armagh, Northern Ireland, approximately 20 km south of the city of Armagh. The works is located adjacent to Seagahan dam and draws raw water by gravity from the Seagahan impounding reservoir. The source is high in colour and turbidity, particularly after a period of heavy rainfall and is subject to high spikes of manganese and periods of high algae content. The works provides 14 megalitres per day of potable water to some 50,000 consumers in County Armagh.



Overall Site View

Courtesy of Northern Ireland Water

The original works was constructed in the mid 1920s and has undergone several subsequent extensions, the last being in 2004 when six granulated activated carbon (GAC) adsorbers were added. The existing process comprises five slow sand filters, interstage pumping, GAC filtration, disinfection using chlorine gas and orthophosphoric acid dosing for plumbosolvency control.

Early in 2008 Northern Ireland water awarded a £7m design and build contract to the Joint Venture partnership of AECOM Design Build (previously Earth Tech Engineering) and Farrans (Construction) Ltd. to upgrade the works to meet the requirements of The Water Supply (Water Quality) Regulations (Northern Ireland) 2002.

Location of New Plant

Seagahan is one of Northern Ireland Water's key treatment works and no reduction in output from the plant could be tolerated during the construction of the new works. One of the major problems facing the project team was to maintain the works water quality and output during the construction phase.

Since the existing slow sand filters occupy large areas of land there was little space available within the confines of the site to construct the new plant. The most suitable location for the new treatment plant was adjacent to the existing GAC building in the area occupied by one of the slow sand filters. However to remove this from service would entail a reduction in works output. The solution adopted by the project team was to design and construct a temporary prefabricated treatment plant capable of treating up to 4 megalitres per day. This would then allow Northern Ireland Water to remove the slow sand filter from service to allow the construction of the new plant. The new water treatment plant was designed such that it would fit within the foot print of one slow sand filter. The remaining filters to be maintained in operation throughout the construction period.

Temporary Plant

A Flofilter unit was selected as the most suitable temporary plant due to its small foot print, ability to be fabricated off site and ease of operation. The Flofilter unit comprises a flocculation tank

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Andritz Ltd are pleased to continue their association with Northern Ireland Water via Aecom in an ongoing series of projects for some of the largest and most advanced filter presses ever built.

Seagahan WTW is currently installing and commissioning a 2M x 2M membrane filter press complete with automatic cloth washing machine which is capable of processing more than 10 tonnes of dry solids per week during the waste ferric-alum sludge dewatering process.

Andritz are also installing one of the world's largest and most advanced 2M x 2M side bar filter presses at the Altnahinch WTW. The press is capable of processing considerably more than 3 Tonnes of dry solids per cycle.

There are additional plans on the drawing board to extend this record series of presses yet further. Paul Baggaley the Andritz Lead Sales Manager is currently working on plans to extend into more fully automated large volume filter presses as Andritz Ltd continue to grow their range and push the boundaries of automated filter press technology.



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View of Manganese Contactors and Filter Gallery

Courtesy of Northern Ireland Water

followed by a dissolved air flotation (DAF) stage with rapid gravity filter (RGF) below. Raw water fed by gravity from the reservoir is conditioned by dosing with aluminium sulphate before entering the flocculation zone. The facility to dose sulphuric acid for pH control is also available if required. Treated water from the Flofilter is blended with water from the slow sand filters before being pumped to the existing GAC adsorbers, chlorinated and passed into supply.

The Flofilter was constructed from prefabricated steel units which were sized in order to be transportable by road. The units were delivered to site and erected on pre-prepared reinforced concrete base slabs. It is Northern Ireland Water's intention that at the end of the contract the Flofilter unit can be decommissioned, dismantled and transported to another site for re-erection.

Sludge from the DAF process and dirty wash water from the RGF drain to an existing dirty wash water tank on the site before being pumped up to a lamella thickener. Two new lamella thickeners were provided as part of the project but one was procured early to treat the waste stream from the Flofilter. During the commissioning stage of the main works the lamella will be re-positioned in its final location.

Similarly two air scour blowers were provided under the project but one was procured early to provide scour air to the Flofilter.

Following commissioning, daily operation of the Flofilter unit was taken over by Northern Ireland Water allowing one of the slow sand filters to be taken out of service for construction of the new plant. The temporary unit is sized for a maximum output of 4 ML/day. Average output is in the range 2 - 3 ML/day which represents approximately 25% of the works flow.

Main Plant Process

The location of the new plant within the confines of one slow sand filter required a compact design. A four stage process was adopted, comprising DAF, RGF, GAC adsorbers and manganese contactors. The plant was designed for a maximum capacity of 16.3 ML/day.

The main plant processes are as follows:

- Chemical conditioning of raw water with aluminium sulphate and sulphuric acid

- Flocculation
- Dissolved air flotation
- pH adjustment with lime followed by rapid gravity primary filters. The filters contain sand and anthracite media supported on a plenum floor fitted with CADAR filter nozzles.
- Granulated activated carbon adsorbers. The existing adsorbers will be integrated into the process and the GAC will be regenerated.
- Chlorination and pH adjustment with lime followed by manganese contactors. These comprise circular stainless steel tanks containing sand media supported on a steel plenum floor fitted with CADAR filter nozzles.
- Final trim chlorination dose
- Orthophosphoric acid dosing

Final water flows into two existing clear water tanks before being passed into distribution.

All plant is housed within a steel frame superstructure clad with steel profile sheeting. Translucent roof panels have been installed to provide natural lighting within the building.

Waste Streams

Sludge from the DAF process and dirty wash waters from the RGF, GAC and manganese contactors are collected in an existing tank before being pumped up to two new lamella thickeners. The supernatant from the thickeners will be returned to the head of the works and blended with the incoming raw water. All wash water used in the process will be recycled in this way and returned to the head of the works. The thickened sludge at approximately 4% DS will be transferred to an existing storage tank.

In December 2008, Northern Ireland Water awarded a further contract to the AECOM Design Build / Farrans Joint Venture for the design and construction of a sludge press facility on the Seagahan site. Under this scheme the thickened sludge will be drawn from the storage tank and dewatered in an Andritz filter plate press to produce a press cake of 25% DS which will be disposed of to a licensed land fill site. The filtrate will be returned to the dirty wash water tank to be recycled through the lamella thickeners.

The facility has been sized to allow sludges from two adjacent water treatment works to be imported to the Seagahan site for dewatering.

Progress

The project team consists of Northern Ireland Water (the client), AECOM Design Build (process contractor), Farrans (Construction) Ltd (civil contractor) and McAdam Design (civil designer). Construction work commenced on the Seagahan site in May 2008 and the temporary plant was commissioned and put into service in August 2008. This allowed one slow sand filter to be removed from service and construction of the main plant to commence. The building superstructure was completed in March 2009. Commissioning of the main plant and the press facility is programmed for Autumn 2009 with service commencement in December 2009.

Note: The Editor & Publishers thank John Thompson, AECOM Design Build Project Manager and Bob McGarvey, Northern Ireland Water Project Manager. ■