

Lough Macrory Water Treatment Works

state-of-the art automation for new NI WTW

by

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Lough Macrory Water Treatment Works, situated on the outskirts of the small village of Lough Macrory in County Tyrone, Northern Ireland, produces an output of 12ML/d of potable water supplying the town of Omagh and surrounding rural area. The existing plant is now approaching the end of its asset life and that, together with the requirement to increase the output demand and to improve final water quality to meet current EEC standards, led to the need to replace the existing plant with a new plant rated at 18ML/d.

The new plant is being built on the site of the existing plant with space being provided for the new works by the removal of existing wash water lagoons. After completion of the new plant the existing works is to be demolished and the area landscaped. Temporary centrifuge facilities have been established to deal with the existing works waste wash water until such time as the new plant has been taken over.

Partnering

A joint venture partnership of Earth Tech Engineering Limited and Farrans Construction Limited was appointed by the Department for Regional Development (DRD) Water Service NI as the preferred contractor for the design development phase in February 2002.

This design and development stage, involving all parties and stakeholders working together under a partnering team ethos, lasted for a period of four months. During this consultation phase the design was optimised and developed to take into account, safety, buildability, whole life costing, operational requirements etc. This team approach enabled all parties to be involved in the initial development period to "buy in" to the final solution, enabling the project to move rapidly forward into the detailed design and procurement phase.

Following successful completion in July 2002 of the design development phase, *Earth Tech/Farrans* were awarded the main contract for design and construction of the plant. The Contract was placed on a Target Cost reimbursable contract based on NEC Conditions of Contract option C.

The design and build work is being undertaken in partnership with the Client *DRD*, the Client's Project Managers *Delap & Waller Ltd* and the joint venture partnership between *Earth Tech Engineering and Farrans Construction Limited*. *McAdam Design* is undertaking civil design. The project is being put forward as a demonstration project under the Movement for Innovation and Rethinking Construction (M4I) umbrella, with particular emphasis on the Respect for People Initiative and site safety.

Process outline

The new works is designed to produce between 6 and 18ML/d of potable water. Raw water to the works is received from two sources; a pumped supply from the adjacent Lough Macrory reservoir and a gravity supply from Lough Fingrean located some 1.8km from the site. Both raw water sources will be blended in Lough Macrory before being pumped via a new raw water intake pumping station to the new works for treatment.

Raw water from these sources has moderate levels of colour (average value 70° Hazen, occasional peaks of iron and manganese and a moderate level of alkalinity (25mg/l as CaCO₃) and low levels of turbidity. In addition, relatively high levels of TOC have been measured in the raw water from Lough Macrory.

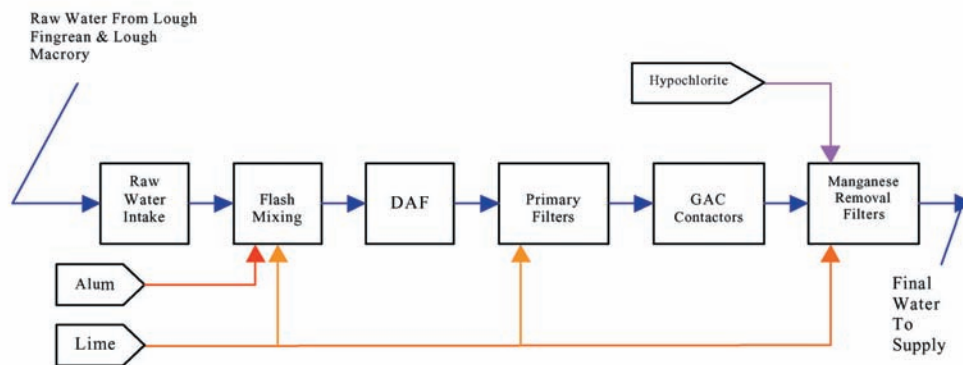


(courtesy Earth Tech Engineering Ltd)

The process considered and adopted as the most appropriate for this application is a 4 stage process consisting of a front end coagulation stage using dissolved air flotation (DAF) followed by 3 stages of rapid gravity filtration. (See process flow schematic).

The treatment stage consists of the following stages:-

- * raw water intake pumping station;
- * inlet flash mixing where chemical conditioning is provided by dosing aluminium sulphate and lime for the main coagulation process with further lime dosing downstream prior to primary filters and manganese removal filters to optimise pH;
- * a clarification stage comprising four parallel streams of flocculation and Dissolved Air Flotation cells;
- * five rapid gravity primary filters for removal of residual aluminium, provided with 1000mm depth of dual media comprising 16/30 sand and anthracite, which is suspended on a plenum floor fitted with CADAR filter nozzles;
- * interstage pumping to five granulated activated carbon (GAC) contactors for removal of taste and odour and reduction in THM precursors. GAC contactors are provided with a 1200mm depth of granulated activated carbon;
- * five iron and manganese removal filters provided with a single 1000mm layer of 14/25 sand;
- * disinfection of treated water is provided by on site generated hypochlorite, which is dosed prior to the manganese removal filters to oxidise the manganese for removal. A final trim dose of hypochlorite is provided downstream of the manganese removal filters prior to water going into supply;
- * two existing clear water tanks on site of the existing plant



Main Process Flow Schematic

(courtesy Earth Tech Engineering Ltd)

- are to be refurbished with the inclusion of baffle curtains to increase chlorine contact time;
- * orthophosphoric acid dosing into final water for plumbo solvency control;
- * ammonium sulphate dosing for chloramination into the final water for prevention of THM formation;
- * clean backwash washwater facilities are provided for the filters with dirty washwater collection in four dirty washwater settlement tanks. Supernatant is discharged to river with the settled washwater passed forward for dewatering;
- * dewatering of the DAF float and settled washwater is being achieved by blending in an agitated storage tank with onward thickening via two WRC thickeners with further dewatering in a single membrane press with thickened cake disposed off site.

Intelligent Motor Control Centre

One of the unique aspects of this project is the use of state of the art 'Intelligent' Motor Control Centres incorporating the use of intelligent starters where the status of plant drives and instruments throughout the plant are transmitted to the PLC control system via a duplex 'Profibus' DP communications network. Plant status and indications are to be made available via Human Machine Interface Devices (HMIs) fitted on the ICA section of the MCCs.

Extensive on line Water Quality instrumentation is incorporated into the design to monitor and control the plant at various process stages to allow it to run in automatic operation with minimum operator intervention. Plant status will be available on SCADA systems via two PC Hardware terminals located in the plant control room and on the HMI devices at the MCCs. Group and common alarms will be made available for transfer to a telemetry station giving remote access and control of the plant.

Progress to date

Initial activities on site, commenced in July 2002, involved dewatering and removal of wastewater from the existing lagoons and the diversion of existing overhead power lines. This released the site to allow bulk excavation to commence and building foundation work to begin.

The main civil construction activities are now well advanced with the main plant building foundations, substructure and reinforced concrete process tanks substantially completed with building finishes work now (May 2003) in progress on site.

Early delivery of mechanical and electrical plant has commenced on site with delivery of chemical storage tanks and the sludge press and associated equipment. Main mechanical and electrical installation works are scheduled to commence in early August 2003, with construction completion anticipated in January 2004, allowing process plant commissioning to commence with operational plant takeover (water into supply) scheduled to be completed on programme in August 2004.

There is no doubt that partnering and close working relationships that have been developed and the open book approach taken by all parties involved in the project to date has enabled the design, procurement and construction to be developed in a fast track structured manner.

Based on progress to date, it is anticipated that the project will be completed successfully on time, will meet the requirements of all parties involved and provide a cost effective modern automated water treatment plant for the benefit of the whole community.■

Note: The author of this article, Paul A Townson, is Project Manager with Earth Tech Engineering Limited.



WDR & RT TAGGART

As one of the largest multi-disciplinary Practices in Ireland, we are pleased to be involved in the Project Management of the civil works for the Lough Macrory W.T.W.

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