

Rosebery Water Treatment Works intensified DAF process helps increase capacity

by Phil Jennings

Rosebery Water Treatment Works' existing DAF system has been, since it was completed in 1987, processing 30MI/d of raw water from the Gladhouse Reservoir, together with all the waste water recovered from the existing sludge treatment processes. The upgrade activity will increase the treatment capacity to 60MI/d, treating a mixture of raw waters from the Gladhouse and Megget reservoirs. The works, once upgraded, will be able to treat the full throughput of water from either source in the event that one of the sources becomes unavailable.

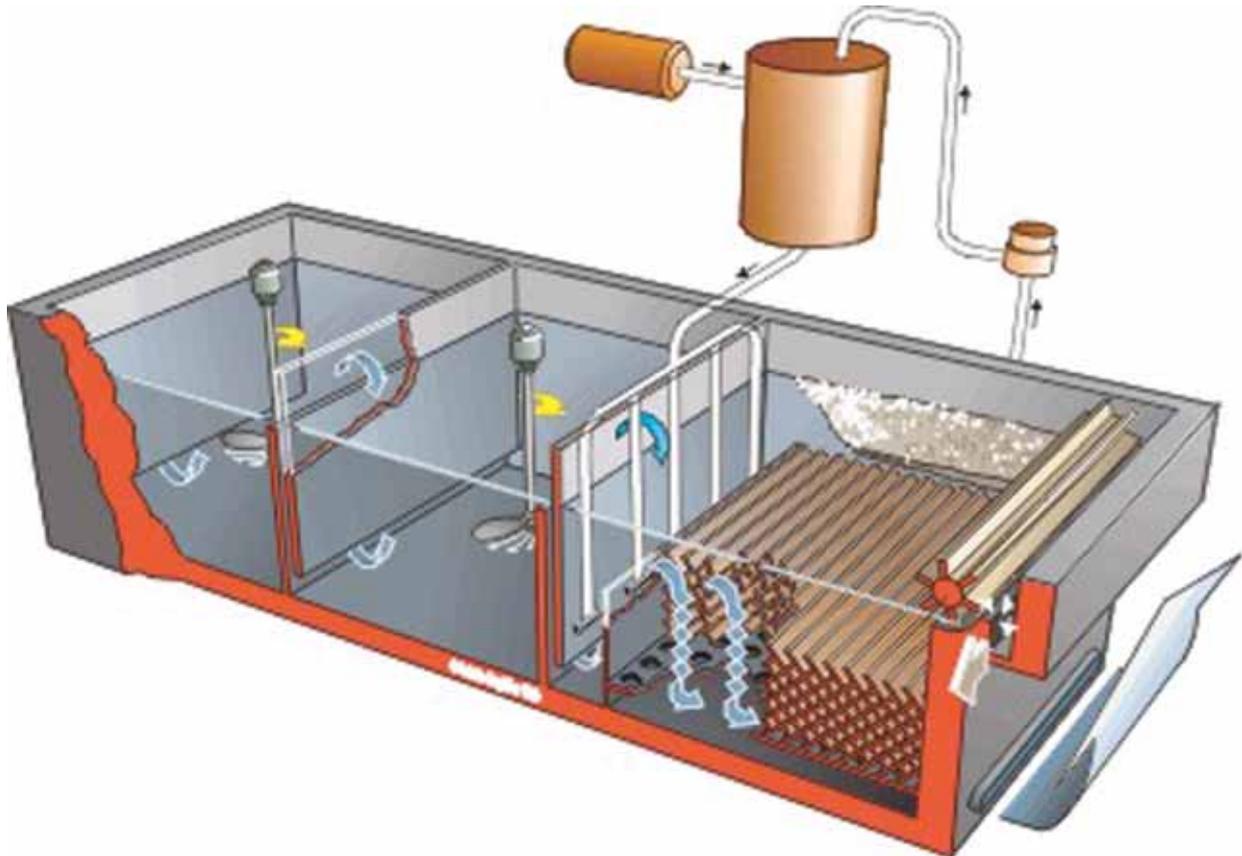


Diagram showing concept of DAFRapid®

courtesy: Purac Limited

The whole engineering upgrade was one of the initial projects to be undertaken by newly formed delivery consortium Scottish Water Solutions and the project valued at £8.2 million was awarded to in-house partners and main contractor *Gleeson Construction Services Ltd*, which includes the addition of a new Rapid Gravity Filter RGF plant, the uprating and refurbishment of the chemical dosing plants, the addition of a new sludge treatment plant and washwater recovery systems and the abandonment of the existing Slow Sand and Pressure Filter streams.

Within the initial stages of the project *Gleesons* identified the need to embrace the latest innovative options available within DAF technology and the advantage of working together with *Purac* to deliver the most cost effective solution to meet the Scottish Water Solutions project requirements.

This resulted in *Gleesons* awarding *Purac* a design, supply and install subcontract, within which *Purac* are responsible for the complete process, mechanical and electric design installation and commissioning of the intensified DAF process integration. This includes the Air Saturated Water DAF Recycle System using

clarified process water, two stages of flocculation, including changes to internal flow paths, thus extending the flocculation residence time, changes to the three DAF cells, including the siting and support of saturated water headers and nozzles, the in-tank system for removal of the floated sludge, including scrapers and beaches, input to the process design of raw water inlet mixing arrangements and the proposed chemical dosing regimes to ensure that the objectives are met with regard to the overall performance of the DAF plant, and input to the hydraulic design of the modifications to the raw water inlet system and the flocculation and DAF cells.

Historically, *Gleeson's* and *Purac* have formed a sound working relationship over recent years, working together in the development of challenging solutions to meet the design and delivery needs of a variety of clients and end users particularly within the water industry.

The Rosebery contract is not unique as the new works, by necessity has to be carried out on the 'live' plant and phased. It cannot be totally shut down to facilitate the upgrade, as production of

wholesome water into supply has to be maintained at all time. This has been facilitated by Scottish Water making arrangements for the short term utilisation of other water sources with *Gleeson's and Purac* working on one DAF cell at a time, ensuring the other two are functioning to provide the required supply into Scottish Water's distribution network.

The selection of the *Purac* DAFRapid® technology extends the conventional and generally accepted process envelope for dissolved air flotation. This is with particular reference to the flocculation retention and applied hydraulic loading rates, when treating water intended for potable supply.

The original *Scottish Water Solutions* concept for the upgrade was primarily by building three new and additional process units to increase the total to six. However, *Gleasons* identified the advances that *Purac* has made in DAF technology. This culminated in Scottish Water Solutions, *Gleasons* and *Purac* working together on the feasibility of the works by performing full scale high rate DAF trials at the Rosebery works.

At that time, the basis for the upgrade both in terms of capacity and flow rates through the DAF stage was given by way of evidence at trials and work carried out elsewhere. This work had effectively demonstrated that reduced flocculation times of 5 to 10 minutes and flotation loading rates of 20 to 40 metres per hour could be achieved without compromising water quality or production.

The trial concluded that the existing process units with defined modifications would satisfy the requirements. It should be noted that for Rosebery the DAF loading rate is a conservative 20 metres per hour.

As well as increasing the throughput of the DAF system to 60Ml/d.

copied with the demands on the system with ease, wastewater recovered from the new sludge treatment process will be returned to the inlet Mixing Chamber. Washwater from the extended RGF and sludge from the DAF plant will be combined in sludge balancing tanks and then fed to duty/duty thickeners where it will be treated with a polymer to thicken the sludge. Sludge presses will dewater the thickened sludge. The expressed water from the presses will be returned to the sludge balance tanks. The supernatant from the thickeners will be returned to the works inlet Mixing Chamber at a rate not exceeding 17.5 l/s.

Combined clarified water passing through the filtration stage from the DAF plant will conform to the specified quality parameters – Turbidity 95%ile <1.5NTU, Turbidity 100%ile <2.0 NTU, Soluble Aluminium <50µg/l, True Colour <5° Hazen.

The recycle system will be capable of delivering an adjustable air dose in the range of 7–10 g/m³ when the water temperature is in the range 1–20° C, via a high efficiency air saturation system.

Sludge will be removed from the surface by a bespoke sludge removal arrangement and the sludge constituent will not be less than 1% w/v.

The *Purac* element of the works is due to commence mid May 2005 with the installation of the saturated water recycle water system in the newly constructed DAF plant building, and the conversion of the first existing DAF cell. The remaining two DAF cell conversions being phased and carried out in August and November. *Gleeson* are due to complete the project in May 2006. ■

Note: The author of this article, *Phil Jennings*, is Project Manager with *Purac Limited*.

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mbc, a joint venture comprising Mott MacDonald, Jacobs Babbie and Carl Bro, was awarded a major framework contract by Scottish Water Solutions to act as national partner consultant for Scottish Water's £1.8 billion capital programme.

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