

# Burncrooks WTW

## alternative to secondary treatment plant saves millions

by  
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**B**urncrooks WTW is located near Strathblane on the outskirts of Glasgow and is fed by a series of reservoirs including Burncrooks which is some 2km away. It serves a population of more than 50,000. It was identified that the WTW had PCV failures for E Coli, coliforms, chlorine and manganese. There have also been turbidity and crypto failures. The project team was challenged with developing an alternative to the construction of a secondary filtration plant for soluble manganese removal given the financial constraints under both Capital and Operational budgets.



*The ResMix device is prepared for lifting into place*

*Courtesy of Scottish Water Solutions*

### Approach

It was identified that for four to five months of the year manganese was present in the raw water from the series of feeder reservoirs at a level around the regulatory limit for water into supply. The normal answer to this problem would be to build a manganese removal plant. This was designed at high level and a budget cost of £6m was estimated.

For seven to eight months of the year this plant would not be necessary for treatment although it would have to operate in 'tick-over' mode to keep it viable thus incurring an operational cost. Given capital and operating budget constraints the design team investigated alternative solutions.

One consideration was whether the manganese could be removed at source rather than at the treatment plant. A low oxygen level at the bottom of the reservoir enables manganese to dissolve into the water.

While there are many examples of reservoir aeration to reduce manganese levels these require high pressure aeration and the placement of aeration equipment on the reservoir bed.

### Solution

Through extensive research the team reviewed a wide variety of systems that focus on dealing with the issue at source rather than having gone through the treatment process at the works.

The Wears ResMix system, which incorporates an innovative large axial flow pump which operates at low flow velocities and consequently at low power consumption, was chosen.

The system uses a draft tube to force top to bottom exchange of water and can eliminate problems related to reservoir stratification and dissolved oxygen gradients. As a result of this the problems of dissolved metals such as manganese can be all but eliminated.

**Reduction in project costs**

Construction of a secondary filtration plant was considered by the team during the optioneering stage of the project. The initial estimates were £300,000 for the design of the system and £5.7m for the construction. The entire cost for the design and installation of the alternative ResMix system was £280,000.

The annual operational cost of a secondary filtration plant specific to Burncrooks WTW was estimated at £125,000/year compared against an operational cost of £4,000/year for the ResMix system. Interstage pumping would also have been a requirement for the secondary filtration plant option and would result in every litre of water being pumped within the process prior to supply whereas at present the plant operates by gravity.

The initial capital cost of the ResMix system is less than 5% of the secondary filter option. The ResMix system will have paid for itself in 20 months on operating costs alone. This includes the initial £83,000 investment to provide a permanent power supply to the reservoir.

**Reduction in project timescales**

The design of a secondary filter plant would have taken an estimated four months to deliver and the construction of the plant a further 12 months.

The ResMix system was purchased almost 'off the shelf' following an initial design consultation with WEARS. Including shipment from Australia, the design and installation period was around two months. As the solution came under 'Permitted Development' rules, planning permission also did not need to be sought.

Due to the isolated location of the works, the access for installation had to be surveyed including taking depth measurements of the reservoir up to the shoreline. As the shore line depth was found to be

not enough to safely float the unit out, a helicopter was used to place it in the reservoir.

**Increased quality and value**

In addition to the huge savings on CAPEX and OPEX, the ResMix unit is visually unobtrusive, sitting on the reservoir whereas the filter plant would be installed in a 10m high building which would detract from the surrounding area

**Environmental Benefits**

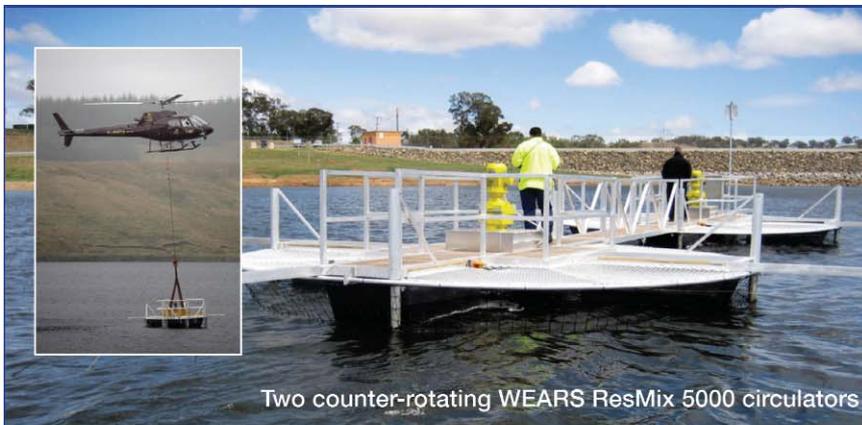
The ResMix system installed has a significantly lower carbon footprint than the alternative of a secondary filtration plant. The solution means there are no costs associated with interstage pumping, process pumping, building heating and ventilation systems.

It has also allowed the main flow at Burncrooks WTW to continue to run by gravity and uniformity of water will further optimise the existing process leading to reduced operational costs. A portable generator used to power an emergency shutdown valve at Burncrooks Reservoir has been dispensed with, as the new power supply can operate it.

The installation will also improve aquatic life in the reservoir and reduce the likelihood of an algal bloom which could lead to increased treatment costs.

The Burncrooks WTW project was delivered by GMJV working with Scottish Water Solutions. It was one of five upgrade projects at water treatment works to serve parts of Greater Glasgow and the Central Belt of Scotland with a total investment of £124.5m. It won the Encouraging Innovation award in Scottish Water's Capital Programme Awards.

**Note: The Editor and Publishers thank Toni Ferretti, Project Manager with Scottish Water Solutions, for providing the above article for publication. ■**



Two counter-rotating WEARS ResMix 5000 circulators

WATER TREATMENT PLANTS

Sustainable  
Source  
Management

Across the world, managers of water treatment plants (WTP) routinely balance a variety of concerns — water quality, financial budgets, reduction in carbon output, statutory regulation and consumer expectations. The WTP has become a high-tech, automated system designed to produce the highest standard of treated water. While the focus has been on treatment within the WTP, the raw water has become progressively more difficult and costly to treat due to increasingly stringent regulation and consumer expectations.

Developed by WEARS Australia, the ResMix system provides high-volume, low-velocity Broad Flow Circulation (BFC) in storage reservoirs providing Sustainable Source Management, which results in less work required at the WTP to produce the expected treated product. After 12 years in operation, the ResMix top-down BFC has successfully proven effective at eliminating aged water as well as reducing or eliminating iron, manganese, nutrients, BGA and taste and odour forming compounds thereby enabling significant OPEX savings at the WTP through less chemical dosing and filter backwashing. The ResMix system comes in 3 models suitable for reservoirs of less than 2,000 Ml to 150,000 Ml or greater with multiple close-coupled units.

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*The ResMix is lifted from the reservoir shore*

*Courtesy of Scottish Water Solutions*