

Monkton Colliery Wastewater Treatment Works

Reed beds provide £300,000 green solution at former colliery

by
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Monkton Colliery Wastewater Treatment Works (WwTW) is situated to the east of the village of Royston, about 6.5 kilometres from Barnsley in South Yorkshire. Coal was produced at Monkton from the 1880s until the reserves were exhausted and the site was closed in the mid-1960s. The WwTW was built to serve the colliery community and was designed to treat a flow of 250m³ a day. In 1970 part of the site was reopened by British Coal as Royston Drift Mine, but this closed in 1989, which left the works massively oversized. It now serves just a handful of homes and a day care centre, with a population equivalent of 59 and receives flows of just 17m³ a day.



Aerial Photo showing remote location of the site

courtesy Yorkshire Water

Dilapidated

The former Monkton Colliery WwTW was taken over by Yorkshire Water and is now isolated so the works had become dilapidated and a target for vandals. Yorkshire Water had been preparing to abandon the existing works and the plan was to transfer the flows to the nearest sewer. However, a new solution was sought when it came to light that the nearest sewer was more than a kilometre away.

Watermark, a joint venture between *MWH*, *MWH Constructors* and *Black and Veatch*, was asked by Yorkshire Water to look at the different options and find the best solution. The standard solution would have been to install a Submerged Aerated Filter (SAF) plant, but this would have required a significant investment in bringing power to the site and using energy to operate it, in addition to the Capital investment in the plant.

Most cost effective solution

Watermark and Yorkshire Water agreed that the most cost effective

and sustainable solution would be to provide treatment with a septic tank arrangement and reed beds connected to the existing outfall. The septic tank would provide primary treatment, removing the solids. The flow would then pass to the reed bed, which would break it down biologically, with the effluent going via the existing outfall into a watercourse leading to Barnsley Canal.

Watermark's solution at Monkton Colliery involved demolishing the existing works and building the septic tank and reed bed. This fitted neatly into the site footprint of the original works. In keeping with the green approach, all the redundant materials were re-used. The metal was sent for recycling and the building rubble was used as backfill for access roads. The filtered media from the existing biological filter tank was re-used as reed bed media or as backfill in the new sustainable works.

Watermark worked with sub-contractors ARM Ltd, one of the UK's leading reed bed design and construction companies. Established



Mature Reeds grow up to 2m in height

photo courtesy ARM Ltd

in 1947, ARM has worked for the past 20 years in collaboration with the University of Birmingham's School of Chemical Engineering to develop new techniques to meet new challenges in waste treatment.

Reed bed technology

Reed bed technology relies on the ability of the common reed *Phragmites australis*, to transfer oxygen from its leaves, down through its stem, and out via its root system, creating an oxygen rich environment around its roots. Further away from the roots, both anaerobic and anoxic zones can be found. Thanks to this diversity of environments a wide range of micro-organisms is supported, relying on the nutrients present in the effluent being treated for their survival. In addition to biological treatment, both filtration and sedimentation of solids takes place within the reed bed. Hence, wastewater moving through a mass of reed roots is treated in a similar way to conventional sewage treatment works, but without the equipment and its associated energy use.

It is essential that reed beds become effective quickly, so ARM has developed techniques to ensure this happens, including growing reeds from seed rather than cuttings and methods of increasing the speed of propagation of the root system.

Reed beds can be used for both the secondary and tertiary stages of

the sewage treatment process and have now been developed by ARM for the treatment of sludge. Yorkshire Water have used reed beds for tertiary treatment, but Monkton Colliery WwTW is only their third installation using this system for secondary treatment. The reed bed system needs no power and is completely sustainable. In the past the site has become a target for vandals, but the solution adopted means there is virtually nothing to damage or take.

In this case low technology was the right solution, requiring no energy, little maintenance and providing a cost effective, green solution.

Work started on site in October 2007 and the £300,000 'Green Solution' was completed in February 2008.

The Project Team

Client: Yorkshire Water

Design & Construction Partner: Watermark MWH, (MWH Constructors & Black and Veatch).

Principal Contractor: MWH Constructors

Sub-Contractors: ARM Ltd

Note: *The Editor & Publishers wish to thank the author Bethany Gardner, Design Leader with Watermark (MWH UK Ltd) for producing the above article for publication.* ■