



Power & Water

Purification through Innovation



CASE STUDY

Mining & Groundwater

Safe pH neutralisation of Acid Mine Drainage
- Removal of Iron, Lead, Zinc and Cadmium



Client: Natural Resources Wales (NRW)

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Introduction

Wales has the unenviable record of being home to 9 of the 10 worst metal-mine polluted catchments in the UK, and overall has more than 1300 abandoned metal mines which impact 67 waterbodies and over 600km of Welsh Rivers.

Natural Resources Wales is responsible for tackling metal-mine pollution and over the years we have earned the reputation for developing innovative and cost-effective solutions for dealing with the issue."

Peter Stanley

Water & Contaminated Land Technical Specialist

Background

Ranked among the top ten most polluting mines in Wales, the Cwm Rheidol mine complex is situated 15km east of Aberystwyth, Ceredigion, and comprises the combined workings of four separate metal mines, each connected underground and discharging at the two adits situated on the steep banks above Afon Rheidol.

The heavily contaminated and highly acidic water from these extensive workings drains into the river via a passive filter bed, but this has proved to be an inadequate method of removing the heavy metals, which include lead, iron, cadmium and zinc.

Solution

Soneco[®], Power & Water's (P&W) Sono-electrochemical water treatment system, is an innovative combination of Electrolysis and Ultrasound in a highly effective package plant which efficiently electro-generates water treatment reagents directly into the process stream, ensuring maximum precipitation of contaminants. This novel, fast and controllable treatment system uses a state-of-the-art, in-house designed Power Control System (PSU) to ensure fine-control of the system and its ancillaries, and its rugged design, small footprint and an optional online-operating facility make it ideal for use on remote sites such as the Cwmrheidol mining complex.

In-line pH monitoring equipment controls the levels of reactive reagents that produce the outstanding removal rates recorded during the project, so the pH from the acid mine drainage was rapidly corrected (average pH levels being around 2.0) and the high levels of heavy metals were efficiently removed using specially selected electrode materials from Soneco's unsurpassed water treatment range.



Results

Independent laboratory results confirmed the Soneco system's success at treating this problematic minewater, with 87% metal removal in unfiltered samples, while filtered samples achieved 99.5% removal.

The results of this pilot trial would be easily replicated when the Soneco system is scaled-up, with the highly-controllable PSU constantly adapting the treatment to suit the quality of the discharged water, and remote-access operation allowing total control.

Benefits

- Sono-electrochemical pH neutralisation, removing any H&S / Environmental concerns;
- Low operational / maintenance requirements;
- Small footprint, yet capable of high flow rates;
- Robust design tolerates rugged upland locations;
- Remote access allows performance monitoring, control and automation;
- Low voltage, low carbon systems can operate using renewable energy sources.

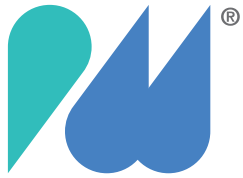
Next Steps

Based on the unqualified success of this pilot project, Power & Water has taken steps towards the design and proposals for a full-scale active treatment process which will finally alleviate any further contamination of Afon Rheidol and the nearby reservoir.

It is rewarding to know that the combination of Power & Water's Soneco Process with its pH adjustment that doesn't require chemicals, its high removal rates of heavy metals, and the possibility of incorporating renewable energy from solar and hydro power means that the full scale system will allow the scars of the valley to heal once and for all.



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“Power & Water is a UK water technology company specialising in sono-electro chemistry. We aim to deliver Circular Economy solutions allowing recovery of waste products, and to produce clean, safe water for drinking, re-use or discharge back into the environment.”



The company knowledge and expertise is founded on more than 35 years' experience in the Water and Environmental industries. Our in-house expertise includes engineering, power electronics, software and MEICA.

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