Power & Water

ACID MINING DRAINING: CWM RHEIDOL

CASE STUDY

Wales bears the unfortunate distinction of hosting 9 out of the 10 most heavily metal-mine polluted areas in the UK. Additionally, the country grapples with over 1300 abandoned metal mines, exerting their influence on 67 waterbodies and over 600 kilometres of Welsh Rivers.

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BACKGROUND

Located 15 kilometres east of Aberystwyth, Ceredigion, the Cwm Rheidol mine complex in Wales holds a notorious position among the top ten most polluting mines in the region. It encompasses the combined operations of four distinct metal mines, interconnected underground, with their discharge points situated at two adits on the steep banks overlooking Afon Rheidol.

Unfortunately, the vast network of these mines yields heavily contaminated and highly acidic water, which ultimately drains into the river through a passive filter bed. Regrettably, this filtration system has proven to be inadequate in effectively removing the presence of various heavy metals, including lead, iron, cadmium, and zinc.

SOLUTION

Introducing Soneco®, Power & Water's (P&W) innovative solution for water treatment. The Soneco® system combines the power of Electrolysis and Ultrasound in a compact package plant, generating water treatment reagents directly into the process stream for maximum contaminant precipitation. This advanced treatment system boasts a state-of-the-art Power Control System (PSU), developed in-house, ensuring precise control over the system and its components. With its robust design, small footprint, and optional online-operating feature, it proves to be an ideal choice for remote locations like the Cwmrheidol mining complex.

To achieve exceptional removal rates, the Soneco® system incorporates in-line pH monitoring equipment, which effectively regulates the levels of reactive reagents. This pH correction process swiftly addresses the acid mine drainage issue (with average pH levels around 2.0). Furthermore, the system efficiently eliminates high levels of heavy metals using carefully selected electrode materials from Soneco's unparalleled water treatment range.

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BENEFITS

The Soneco system offers a range of benefits that address various aspects of pH neutralisation, health and safety, environmental considerations, operational efficiency, and sustainability. These advantages include:

• Sono-electrochemical pH neutralisation, ensuring the elimination of any health and safety as well as environmental concerns.

• Low operational and maintenance requirements, reducing costs and workload.

• Compact footprint, despite its ability to handle high flow rates, making it suitable for space- constrained areas.

• Robust design that can withstand harsh conditions in upland locations.

• Remote access capability, enabling easy performance monitoring, control, and automation.

• Low voltage, low carbon systems that can be powered by renewable energy sources, promoting sustainability.

With these features, the Soneco system presents a comprehensive solution that addresses multiple concerns while promoting efficient and environmentally friendly water treatment practices.

RESULTS

Extensive testing conducted by independent laboratories has unequivocally validated the efficacy of the Soneco system in treating challenging mine water. The results showcased an impressive 87% removal of metals in unfiltered samples, while filtered samples achieved an astounding 99.5% removal rate. These outstanding outcomes from the pilot trial demonstrate the system's potential for successful replication upon scaling-up.

The Soneco system's remarkable adaptability is facilitated by its highly controllable Power Control System (PSU), which continuously adjusts the treatment process to suit the discharged water's quality. Moreover, the system's remote-access operation grants complete control, ensuring seamless monitoring and management from any location.

Table 9: Cwm Rheidol Trial 2 Plant Dissolved Metal Removal Rates Summary

Contaminant	pH	TSS	Fe	Pb	Cd	Zn	Al	Mn	Mg	Ca	SO4
		(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Untreated	3.1	<5	17.4	0.79	0.041	17.77	4.05	0.79	11.67	28.7	223
Treated	7.6	10.1	1.79	<0.01	0.004	1.65	0.51	0.30	31.22	28.2	222
Removal rate	-	-	90%	99%	90%	91%	87%	62%	-	-	-

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NEXT STEPS

Building upon the resounding success of the pilot project, Power & Water has taken significant strides towards designing and proposing a comprehensive active treatment process. This forthcoming full-scale system holds the promise of finally eradicating any further contamination of Afon Rheidol and the adjacent reservoir.

It is truly gratifying to recognise that Power & Water's Soneco Process, with its liquid chemical-free pH adjustment, remarkable heavy metal removal rates, and the potential to integrate renewable energy sources such as solar and hydro power, will be instrumental in enabling the complete restoration of the valley's scars. This holistic approach ensures that the full-scale system will facilitate long-lasting healing and rejuvenation.

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