



*A COMMERCIAL APPLICATION OF
VIROMINE™ TECHNOLOGY*

**CASE STUDY
COAL AUTHORITY,
UNITED KINGDOM**

Results from applying ViroMine™ Technology at all six mine sites clearly indicates that the technology was successful in treating a range of metals and acidity

Virotec treated coal wastewaters with ViroMine™ Technology at six Coal Authority sites in the United Kingdom: 1) Fender coal mine wastewater with a neutral pH of 6.5; 2) Clough Foot coal mine acid drainage with a pH of 4.2; 3) Cwmrheidol lead mine acid drainage with a pH of 3.6; 4) Parys Mountain copper mine acid drainage with a pH of 2.6; 5) Blenkinsopp coal mine wastewater with a pH of 5.4; and 6) Horden coal mine wastewater with a near-neutral pH of 6.3.

A ViroMine™ Technology filtration system was designed and applied to optimise treatment outcomes and a variety of contaminants were measured, including iron, aluminium, copper, zinc, and manganese. In all cases, acidity was effectively neutralised; for heavy metals, a range of outcomes were observed, including those presented in Table 1.

VIROMINE™ TREATMENT OUTCOMES FOR FOUR COAL AUTHORITY COAL MINE SITES IN THE UNITED KINGDOM

Parameter	Dam Before Treatment	After Treatment with ViroMine™ Technology
Fender Coal Mine		
pH	6.5	8.0
Manganese (mg/L)	1,050	<5.0
Clough Foot Mine		
pH	4.2	8.5
Manganese (mg/L)	2,170	<5.0
Cwmrheidol Lead Mine		
pH	3.6	8.6
Aluminium (mg/L)	6,100	100
Iron (mg/L)	12,000	10
Zinc (mg/L)	21,000	50
Parys Mountain Copper Mine		
pH	2.6	8.0
Aluminium (mg/L)	72,000	60
Copper (mg/L)	34,000	18
Iron (mg/L)	280,000	10
Zinc (mg/L)	71,000	3,690
Blenkinsopp Mine		
pH	5.4	8.0
Aluminium (mg/L)	6.8	<1.0
Iron (mg/L)	900	<1.0
Manganese (mg/L)	20	2.0
Horden Mine		
pH	6.3	8.0
Iron (mg/L)	170	<0.05

Results indicate that all ViroMine™ Technology treatments were successful in adjusting pH and removing metals. Results for Fender coal mine indicate that manganese was reduced from 1,050 mg/L to <5.0 mg/L, a >99.9% reduction; similarly for Clough Foot coal mine manganese was reduced from 2,170 mg/L to <5.0 mg/L, a >99.9% reduction.

Results for Cwmrheidol lead mine aluminium decreased from 6,100 mg/L to 100 mg/L, a 98% reduction, iron decreased from 12,000 mg/L to 10 mg/L, a >99.9% reduction, and zinc decreased from 21,000 mg/L to 50 mg/L, a 99.8% reduction, while as Parys Mountain copper mine, aluminium decreased from 72,000 mg/L to 60 mg/L, a >99.9% reduction, copper decreased from 34,000 mg/L to 18 mg/L, a >99.9% reduction, iron decreased from 280,000 mg/L to 10, a >99.9% reduction, and zinc decreased from 71,000 mg/L to 3,690 mg/L, a 95% reduction.

Similarly, for Blenkinsopp coal mine, iron decreased from 900 mg/L to <1.0 mg/L, a >99.9% reduction, and at Horden coal mine, iron decreased from 170 mg/L to <0.05 mg/L, a >99.9% reduction.

The average percentage removal for metals was 99%, except zinc which was 95%. Acidity was raised slightly at the Fender, Blenkinsopp and Horden mines and was effectively neutralised at the other three coal mines.

CONCLUSION

The results from applying ViroMine™ Technology at all six mine sites clearly indicates that the technology was successful in treating a range of metals and acidity. The fact that these various applications used a passive filtration system for the treatment of mining wastewater is also of relevance. This system has shown to be very robust in the face of a variety of treatment applications where pH can be low to near-neutral and metals can range from just a few parts per million to many hundreds of thousand parts per million.