

Aluminum Removal from Mine Discharge

Raymond Lovett

RL Environmental Solutions

Thanks to:

Global Material Technologies

Arch Coal, Inc.

Paul Ziemkiewicz

- Aluminum limits are site specific (translator)
- Aluminum limits are becoming stricter
- Lack of compliance is sporadic
- From pH 6.5 to 8.5 dissolved Al is low

Serendipitous Discovery

Al In, mg/L	Al Out, mg/L
0.126	<0.006
0.101	<0.006
0.014	<0.006
0.011	<0.006
0.013	<0.006
0.017	<0.006
0.079	0.007

Serendipitous Flow

- 2 gpm, volumetric flow
- 0.34 ft/min, linear flow
- 29 minutes residence time

Ziemkiewicz Studies

- Mixed water and sediment
- Exposure to sediment increased total Al
- Molar Al/Si ratio implicated kaolinite, illite

GMT Experiments

- Spike water to about 1 mg/L Al
- Introduce to container using peristaltic pump
- Analyze over time

0.018 lpm

43 Minutes Residence Time

#	Time (minutes)	Total Al Concentration (mg/l)	Total Al Concentration (mg/l)
Raw	0	0.7200	0.7200
1	60	0.0000	0.0000
2	80	0.0000	0.0000
3	100	0.0000	0.0000

0.216 lpm

2 Minutes Residence Time

#	Time (minutes)	Total Al Concentration (mg/l)	Total Al Concentration (mg/l)
Raw	0	0.7200	0.7200
1	60	0.0510	0.0000
2	80	0.0510	0.0000
3	100	0.0480	0.0000

Aluminum Removal from Mine Drainage WVMTF 2012



FIELD SITE

	Aluminum In, mg/L	Aluminum Out, mg/L
1	0.23	0.03
		0.03
2	3.23	0.13
		0.09
3	0.35	<0.03
4	0.23	<0.03

FIELD SITE

	Flow, gpm	Linear, ft./min.	Residence Time, min
1	1.1	0.056	42
	0.9	0.046	52
2	ND	ND	ND
	0.5	0.025	95
3	0.41	0.02	119
4	1.25	0.063	38

Flow and Residence Time for a 10' Diameter, 8 Foot High Tank

Flow, gpm	Linear, ft./min.	Residence Time, min.
15	0.025	316
30	0.051	158
45	0.076	105
60	0.101	79
118	0.200	40

Future Work

- Breakthrough? For drums
- Tank test with pump

Conclusions

- Media removes solids containing aluminum
- High flow possible
- No obvious clogging