

Emergency Treatment of Acid Mine Drainage at the Leviathan Mine with the Rotating Cylinder Treatment System (RCTS™)



Timothy K. Tsukamoto & Felipe Vásquez
Ionic Water Technologies, Inc. - USA

Abstract

A mobile RCTS™ treatment system was rapidly mobilized for emergency treatment of Acid Mine Drainage (AMD) at the Leviathan Mine in California, USA. The winter of 2005/2006 was particularly wet which resulted in containment ponds filling prematurely with a combination of AMD and snowmelt. The goal of this project was to prevent untreated water from overflowing from the containment ponds to nearby Leviathan Creek.

Methodology

AMD Type	Dates Encountered	Description of AMD	Average Treatment Rate	Iron	Aluminum
Initial AMD (Ponds Stratified)	April 14 to May 8 (21 Days)	Low acidity Low metals	514 lpm up to 2800 lpm	Mostly ferrous iron (1 to 21 mg/L)	2 to 310 mg/L
Surface Overflow and AMD Siphoned from Pond 1	May 9 to July 4 (58 Days)	High acidity High metals	125 lpm	Mostly ferrous iron (21 to 910 mg/L)	310 to 490 mg/L
AMD Siphoned from Pond 1	July 5 to July 10 (5 Days)	High acidity High metals	315 lpm up to 1250 lpm	Mostly ferric iron (up to 1000 mg/L)	Up to 490 mg/L

Table 1. Characterization of the three types of AMD encountered on site.

The ponds at the mine are used to contain water contaminated with AMD. These ponds collect water during the winter months which is then treated in the summer months. Ponds 1, 2 North and 2 South drain into Pond 3. When Pond 3 is full it overflows to Leviathan Creek.

During this treatment more than 28 million liters were treated over 85 days.

The AMD varied in composition over time. Table 1 shows the characterization.

The treatment system consisted of an RCTS-30HS™ unit, two to three 1.900 liter lime slurry tanks and an IWT lime metering pump.

Introduction

The most commonly used method to treat AMD is lime precipitation. IWT applies a lime precipitation process to treat AMD with the RCTS™. This system utilizes a shallow trough that contains a rotating cylinder which transfers oxygen and agitates the air/AMD/lime mixture. Emergency AMD treatment consisted of attaining a pH between 7 and 9 and removing metals. The Leviathan Mine site is located 2100 meters above sea level with no permanent power source.

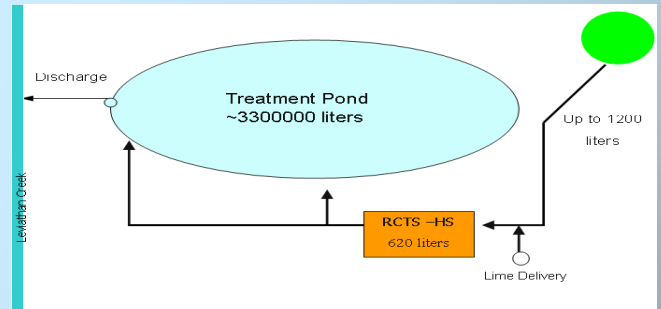


Figure 1. 2006 RCTS-HS Treatment process on Pond 3.

Results

Treatment began on April 14, while uncontrolled overflow of treated or partially treated water continued between April 14 and April 20. Following April 20, all water was discharged actively at a pH between 7 and 9.

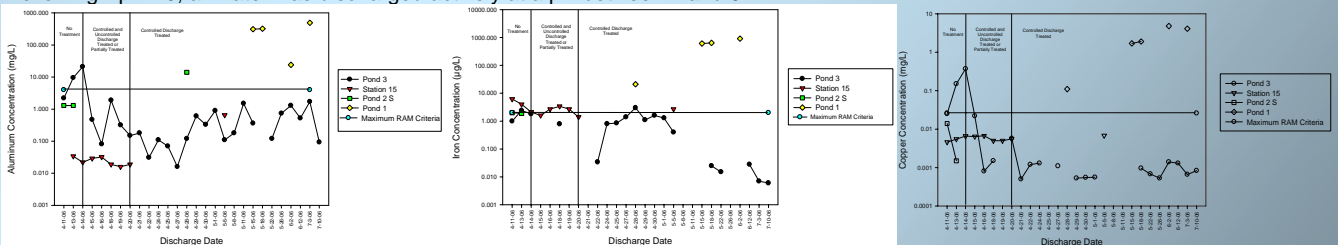


Figure 2. Graphs showing concentrations of Aluminum, Iron and Copper before and after treatment.

pH values at Leviathan Mine

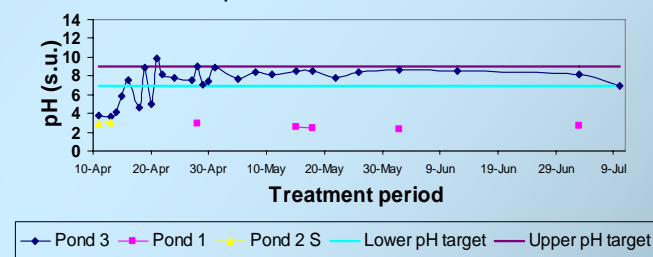


Figure 3. Graph showing pH values before and after treatment.

Conclusions

The system was effective treating water between pH 7 and 9.

- The system was effective in reducing metals under the discharge criteria.
- The complete system (RCTS™, mixers and lime pump) operated on less than 3500 watts of electricity.
- The RCTS™ system operated in a footprint of 3m by 10m.
- System was mobilized rapidly for emergency treatment with success.