Sorbster®

Ecologically Effective Contaminants Adsorption

Case Study 2

Sorbster® Media Treatment of Cooling Tower Water

Problem

A western USA power plant cooling system was experiencing undesirable levels of copper. Corrosion inhibitors were employed for maximum corrosion protection but undesirable copper levels persisted in the cooling system. The blowdown water typically contained 0.15 mg/L of soluble copper and this was going to exceed pending new permit discharge targets. Plant personnel were looking for a simple solution at minimum capital expense. Sorbster® was asked to investigate copper removal using adsorbent medias on the blowdown water. Two different adsorbent media products, each with a high proficiency for copper removal, were evaluated. Sorbster® MM-1 is a highly functionalized alumina product in a 1/8" granule size and Sorbster® Cu-1 is a promoted alumina product in a 1/8" granule size.

Evaluation

Two flow-through column tests were performed under the conditions detailed below with Sorbster® MM-1 and Sorbster® Cu-1 using a 30 minute water-to-media contact time.

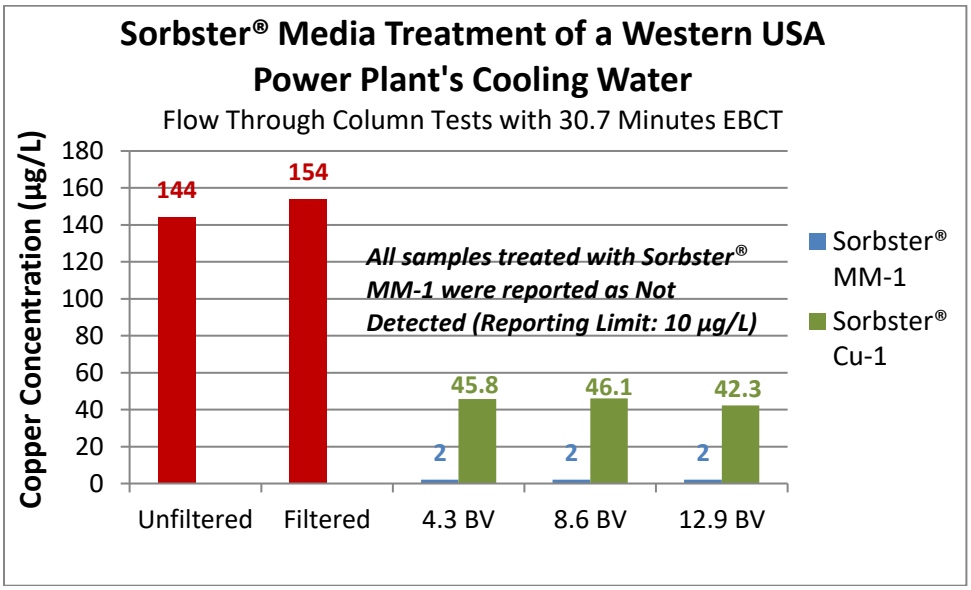
Column Conditions	Test 1: Cooling Tower #1 Water Treatment with Sorbster® MM-1	Test 2: Cooling Tower #1 Water Treatment with Sorbster® Cu-1
Column Dimensions	1" diameter x 36" high	1" diameter x 36" high
Primary Media:	449.6 g of Sorbster® MM-1	364.7 g of Sorbster® Cu-1
Media Volume per column	466 cm^3	466 cm^3
1 Empty Bed Volume per column	466 mL	466 mL
Bed Volumes Treated	12.9 BV (6.0L)	12.9 BV (6.0L)
Flow Rate	15.2 mL/min	15.2 mL/min
Empty Bed Contact Time (EBCT) per Column	30.7 minutes	30.7 minutes
Pretreatments	Filtration through 1 µm (nominal) bag filter prior to pumping	

Water Quality:

- Appearance: Clear with black particulates
- pH: 8.15
- ORP: 210.5 mV
- Total Alkalinity: 108 mg/L as $CaCO_3$
- Reactive Silica: 34 mg/L

- All analysis performed by an EPA and NELAC certified laboratory
  - Cu by ICP (Method E200.7; Reporting limit for Cu: 10.0 µg/L)

Sorbster® Media Results



Removal of copper is shown for both Sorbster® MM-1 and Sorbster® Cu-1 media types. Sorbster® MM-1 achieved a >93% removal rate and Cu-1 a 72% removal rate. Sorbster® MM-1 demonstrated sustained copper removal to single digit ppb levels and met the plant target of <0.01 mg/L.

- Sorbster® MM-1 is the preferred adsorbent to treat this water based on copper removal performance. At a 30 minute contact time, it achieved copper levels for all points tested to below the analytical method detection limit of <10 ppb (<0.01 mg/L) and consistently below new permit targets.
- Sorbster® Cu-1 media also demonstrated proficiency for copper removal at a 72% removal rate to 0.04 mg/L copper. Since Cu-1 is a lower cost media, additional considerations for cost to treat and acceptable copper levels should be discussed with your Sorbster® representative before finalizing the media selection.
- Using Sorbster® MM-1, with the plant in compliance, we are working to evaluate copper levels at increased water flow rates to enable optimization of the contact time.
- Phase 3 will determine if Sorbster® Cu-1 can be used at increased contact time, and generating a cost savings, while still meeting discharge permit targets.
- The media life of Sorbster® MM-1 based on projections from the removal rate curve is estimated to be a minimum of 6 months.
- Sorbster® MM-1 is expected to also provide removal of additional metals that maybe present in this water (see MM-1 technical bulletin or Sorbster® website for additional metal removal information)