



Sorbster

Ecologically Effective Contaminants Adsorption

Case Study 1

Copper Removal from Cooling Tower Blowdown Water Comparison of Different Sorbster® Medias

Problem

An Eastern cooling system was discharging blowdown water containing copper levels up to 0.2 mg/L, higher than water discharge permits allowed. Water reuse opportunities in-plant were limited so the plant requested assistance from Sorbster® Inc. to mitigate the copper problem. Analysis indicated that the blowdown water contained an average of 191.5 µg/L of total copper and this level of copper was also present following one micron (nominal) bag filtration, an indication that the copper was in a soluble form. The plant was treating for copper corrosion, both in their copper alloy heat exchangers and cooling system piping. The treatment consisted of azole based corrosion inhibitors in the presence of low molecular anionic polymers (PAA, PAA/copolymers), phosphate containing products and biocides. The use of Sorbster® adsorbent media to treat the blowdown stream would be an “easy to implement add-on” to the current treatment program. Sorbster® could be deployed in standard tanks designed to accommodate all or a portion of the blowdown stream at the point of discharge.

The cooling tower blowdown water was treated with four Sorbster® medias to evaluate copper adsorption and removal toward a goal of reducing the copper level to <0.05 mg/L (<50 ppb). In addition, the plant had in internal desire to see a successful treatment at < 0.01 mg/L (<10 ppb). The study represented an opportunity to evaluate Sorbster® medias of varying chemistry and granule size for copper removal. Media performance can be influenced by factors such as water quality and the surface activity of other treatment chemicals. Selected for evaluation were Sorbster® MM-1 (a highly functionalized activated alumina, 1/8” granule size), Sorbster® Cu-1 (lower cost promoted activated alumina, 1/8” granule size), Sorbster® MM (functionalized activated alumina, 3/16th inch size) and Sorbster® XY-15 (an alternative functionalized activated alumina, 1/8” granule).

Evaluation

The medias were evaluated in flow-through column tests under identical conditions, summarized in the following table. Samples were collected over increasing bed volumes by pumping directly into samples bottles to minimize any contamination. A 20 minute water-to-media contact time was utilized.

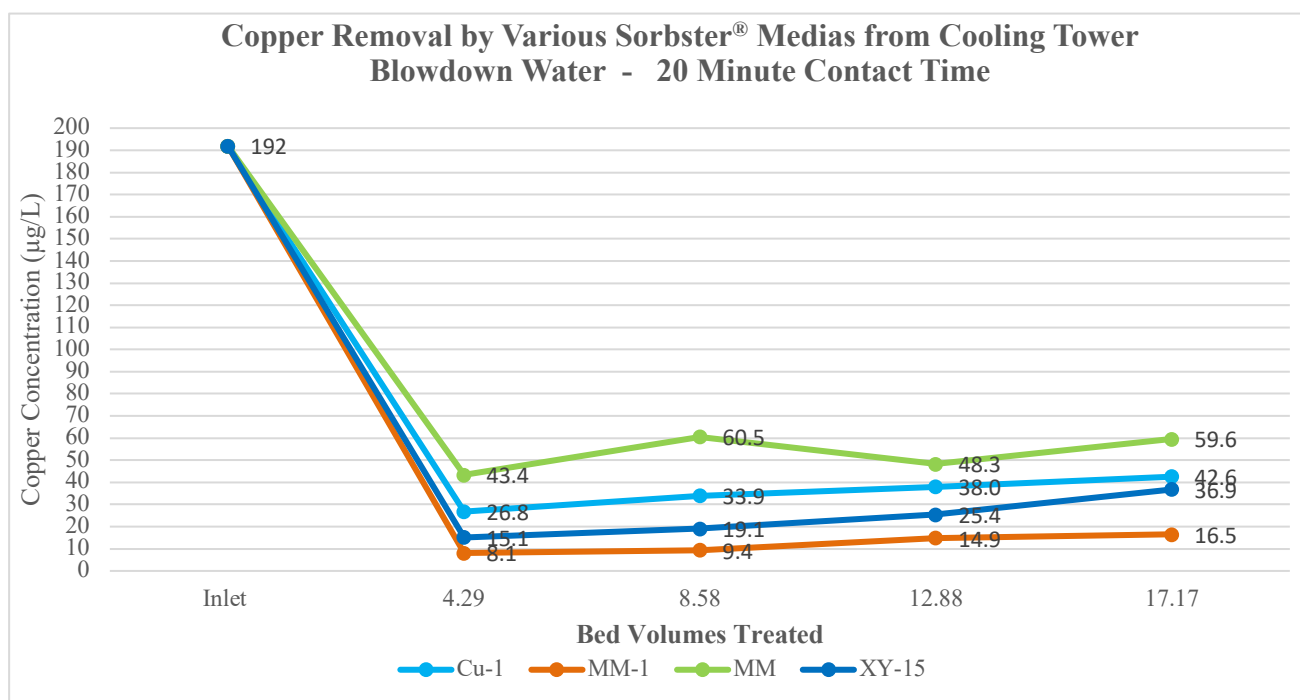
Sorbster

Ecologically Effective Contaminants Adsorption

Column Conditions	Test 1: Sorbster® Cu-1	Test 2: Sorbster® MM-1	Test 3: Sorbster® MM	Test 4: Sorbster® XY-15
Column Dimensions	1" diameter x 36" high	1" diameter x 36" high	1" diameter x 36" high	1" diameter x 36" high
Primary Media	365.2 g of lot# 15PA-0514H	435.1 g of lot# M-829133	381.3 g of lot# SP-A042412-1P	370.3 g of lot# LA-15-6326
Media Volume per column	471 cm ³	466 cm ³	466 cm ³	466 cm ³
1 Empty Bed Volume per column	471 mL	466 mL	466 mL	466 mL
Bed Volumes Treated	17.0 BV (8L)	17.2 BV (8L)	17.2 BV (8L)	17.2 BV (8L)
Flow Rate	24.0 mL/minute	23.1 mL/min	23.5 mL/min	23.8 mL/min
Contact Time per Column	19.6 minutes	20.2 minutes	19.8 minutes	19.6 minutes
Water ID	W151020-1 (1 of 2)		W151020-1 (2 of 2)	
Other Pretreatments	Filtration through 1 µm (nominal) bag filter		Filtration through 1 µm (nominal) bag filter	

Sorbster® Results

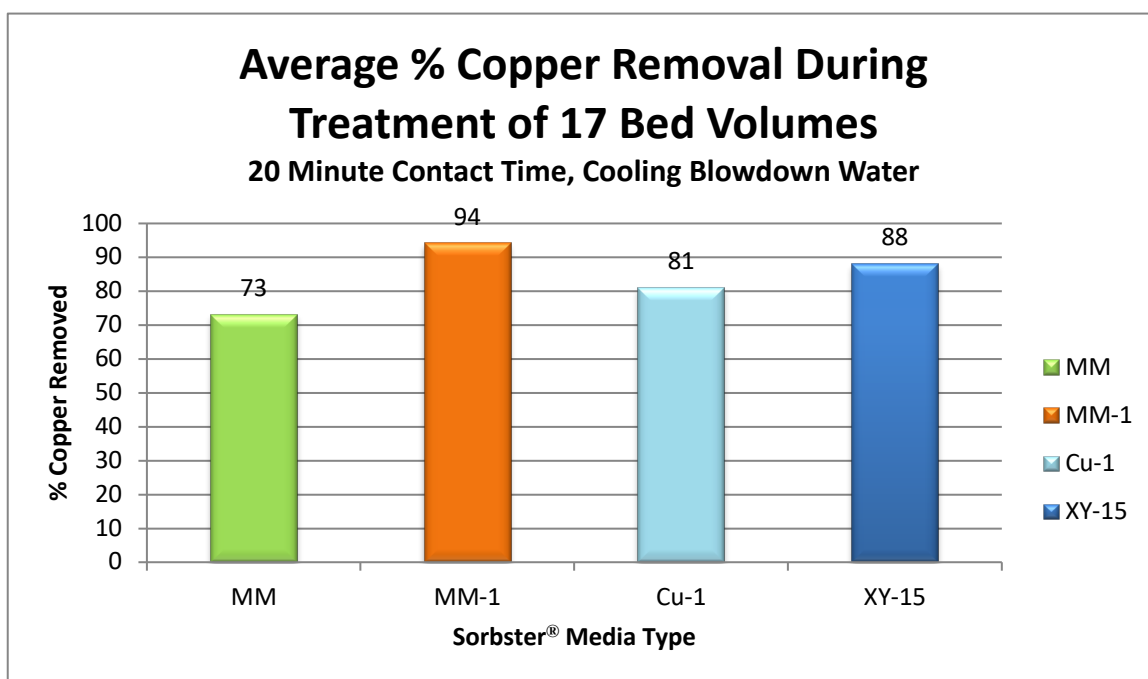
All four of the medias displayed a significant level of copper removal and were deemed to have good proficiency for copper reduction. Copper levels were reduced quickly from 192 ppb of copper to as low as 8 ppb. As a group, the Sorbster® medias achieved from 73% to 94% average reduction in copper levels. All of the medias approached or exceeded the goal of removal to <50 ppb. There were differences in the removal rate curves among the medias as shown in the graph below.



Sorbster

Ecologically Effective Contaminants Adsorption

Sorbster® MM-1 was the top performer and achieved copper concentration reductions to the client target of 9 ppb. Sorbster® XY-15 media was the second best performer, followed by the Sorbster® Cu-1 media. The largest size and least functionalized media, Sorbster® MM, reduced the copper concentration by the least amount to <60 ppb.



- All the Sorbster® medias demonstrated proficiency for copper removal.
- Sorbster® MM-1 was selected as the treatment of choice for this application.
- The use of Sorbster MM-1 enabled the blowdown water to meet, and exceed, the discharge permit level of <0.05 mg/L copper, well within the compliance margin
- Water reuse projects in-plant were now possible, saving a considerable sum in potable water purchases. Industry standard tanks were used saving approximately 50% CapEx versus competing technologies.

Contact Sorbster® Inc. to discuss your copper removal needs. We can supply the most effective adsorbent products for your water.