SUPERIOR COOLING SOLUTIONS

According to the U.S. Office of Energy Efficiency & Renewable Energy, installing a sidestream filtration system to cleanse cooling tower water will help maintain water efficiency across facilities. Although this applies to many types of applications and throughout industries, systems that are exposed to a large amount of airborne particulates are at a greater risk for compromised efficiency and system failure.

Cooling towers are an essential aspect of many refrigeration systems, providing temperature regulation for comfort in places of work, residences, and service centers. They also provide process cooling throughout a broad range of applications in the industrial sector including manufacturing and power generation. Cooling towers are located at the point in a cooling system where unwanted heat is released into to the atmosphere through evaporation.

Keeping the heat transfer surfaces of a cooling tower system clean is widely recognized as the best way to ensure efficient operation.

Because of the operating environment of cooling towers, and because of the nature of their technology, cooling towers are vulnerable to the elements. They are susceptible to a variety of particulates that are introduced by the wind. As air quality and wind conditions change, cooling towers undergo wide variations in particulate loading. Operation can be significantly affected by the quality of the water making up the system.

Atmospheric particulate matter can originate from dust storms, living vegetation, fires and industrial processes, which may all, at various times contribute to patterns of particle loading in cooling towers. The mineral dusts of airborne soils/sand, ash, cement etc. (comprised of oxides and carbonates) can all contribute to higher particle loading in cooling tower water.

It is commonly known that poor water quality (including high particle loading) can lead to the following common problems within an open-recirculating cooling tower system: corrosion, scaling, fouling and microbiological

activity. These problems are inter-dependent to the extent that prevention of one may help reduce the magnitude of the others.

COOLING TOWER FILTRATION

An effective filtration system lowers the particulate levels in the cooling water, which directly reduces fouling. Because microbiological organisms will feed on organic particulates, reduction of particulates also corresponds directly with a reduction in biological growth. It follows that filtration will prevent corrosion that occurs as a result of microbiological growth, and scaling which occurs as a byproduct of fouling and corrosion. The fact of the matter is simple: filtration minimizes all the risks associated with cooling tower operation. When designed properly, a filtration system will save on water, energy, time and money.

Cooling tower filtration systems pull water from the sump, filter out particulates, and return the cleaner water to the tower. This allows the system to function more efficiently, requiring less additional makeup water and chemicals. As stated, filtration is considered especially helpful if the cooling tower system is exposed to dusty atmospheric conditions.

ABOUT SUPERIOR INDUSTRIES

Superior Industries International, Inc. is one of the world's largest OEM suppliers of cast aluminum road wheels for the automotive industry. Superior operates five major manufacturing facilities. They employ approximately 4000 people in the United States and Mexico. Their facilities produce aluminum wheels for the vehicle platforms of automobile and light truck manufacturers.

SUPERIOR'S PROBLEM:

Superior's Fayetteville plant in Arkansas had a cooling tower exposed to dusty atmospheric conditions. They were precisely the type of conditions that make cooling towers susceptible to the introduction of unwanted particles. They needed a low-maintenance solution to remove and prevent further pipe scale debris from the open cooling tower. They needed to lessen their machine downtime due to water issues and improve their cooling ability.

An effective filtration system had to be designed to handle to the highest influx of particulate without creating a disruption to operation. The goal was to eliminate downtime and reduce maintenance while protecting the

downstream casting machines. With plans to expand the total number and production capacity of their casting machines, it was more important than ever to ensure system protection and automation.

At Superior's plant, the casting machines comprise a key component in the direct-chill casting process. With poor water quality leaving the cooling tower, the casting machines were vulnerable to cumulative buildup that steadily compromised their function. The machines had to be shut down for regular maintenance, and in the worst case could have potentially failed altogether.

The automated cleaning cycle, coupled with the ability to operate on system pressure alone, and a proven track-record made Forsta self-cleaning filters the best choice for Superior.

FINDING A SUPERIOR SOLUTION WITH FORSTA

Forsta Applications Engineer with 180 series filters.


Superior's Capital Improvement Project Manager with two B6-180 model filters.

With self-cleaning water filters, care must be taken to understand the upper levels of particle loading in the water source. The degree of filtration must be selected appropriately so as to set up the filter for success in its operating environment. In other words, the screen must be selected in correspondence with the upper value of inlet particle loading (TSS typically measured in ppm or mg/L).

Kyle Gunn was Superior's Capital Improvement Project Manager. He corresponded with Forsta engineers about Superior's operating environment and parameters, and together they settled on a goal to remove pipe scale and debris down to 50 micron. Gunn explained, "I was handed this project after having one of our other plants recommend Forsta, I did some research and was impressed with their track record and great product lines."

"Forsta self-cleaning water filters seemed like the ideal choice for cooling applications like ours. With aging pipes and cooling tower we wanted to stay ahead of any buildup." Gunn noted the comprehensive support he got during the design and quote phase.

IMPROVED OPERATIONS

Now at Fayetteville, from the cooling tower, water flows to a pump, through the Forsta self-cleaning filters, and then to the casting machines. The plant uses a total of three B6-180 model filters in parallel (with 50 micron screens) to filter the process and cooling water generated from their 5000gpm cooling tower. There is a main header that feeds three pipes. Each pipe has its own filter and feeds a different set of casting machines.

Gunn said, “Now, both of our plants that use these filters have less water problems in their casting machines, meaning more production and less downtime.”

There are a total of 18 casting machines at Fayetteville. According to David Hamm, onsite engineer at Superior, “Depending on the cycle at any one point, a different number of filters/amount of water will be flowing to the machines. The filters help keep the casting machines running flawlessly.” Each of the plant’s filters flow 350-400gpm of water at 125-155psi at a temperature of 76°F. Filters perform a backwash sequence once every 12 hours, and have a daily backwash volume of just 30-50 total gallons.

WATER ANALYSIS – BEFORE & AFTER FILTRATION

U.S. Water Services, Inc., otherwise known throughout the industry as U.S. Water, provides service to Superior’s Fayetteville plant. U.S. Water’s onsite representative oversees the cooling towers and boiler water management programs utilizing chemical, equipment, engineering and operational data to find – and remove potential problems and improve the overall conditions of these systems.

U.S. Water noted that “…effective filtration helps with overall water quality, decreasing the likelihood of deposits throughout the system.” U.S. Water collected and analyzed water samples both at the inlet of the Forsta filters and at the outlet of the filters. The samples were sent to U.S. Water’s in-house analytical laboratory specifically to assess the total suspended solids and particle size distribution as indicated in the analysis. The results yield a perfect opportunity to review the particle removal efficiency of the filters that Superior has in place. (Charts included at end of study)

With the 50 micron screens at Superior, TSS downstream of the filters was reduced from 28.53 ppm to 7.35 ppm. In the 50 micron+ size range, particle reduction was 100%, from 17.66ppm to 0ppm after filtration.

Not only were 100% of particles removed above the degree of filtration, but one can also see a significant particle reduction of 25-50% in the 5-50 micron size range due to “the filter cake effect.” The filter cake effect simply describes the fact that degree of filtration becomes finer as a screen accumulates dirt (as pressure differential increases). This explains the 25% reduction in particles at the 5-15 range, for example.

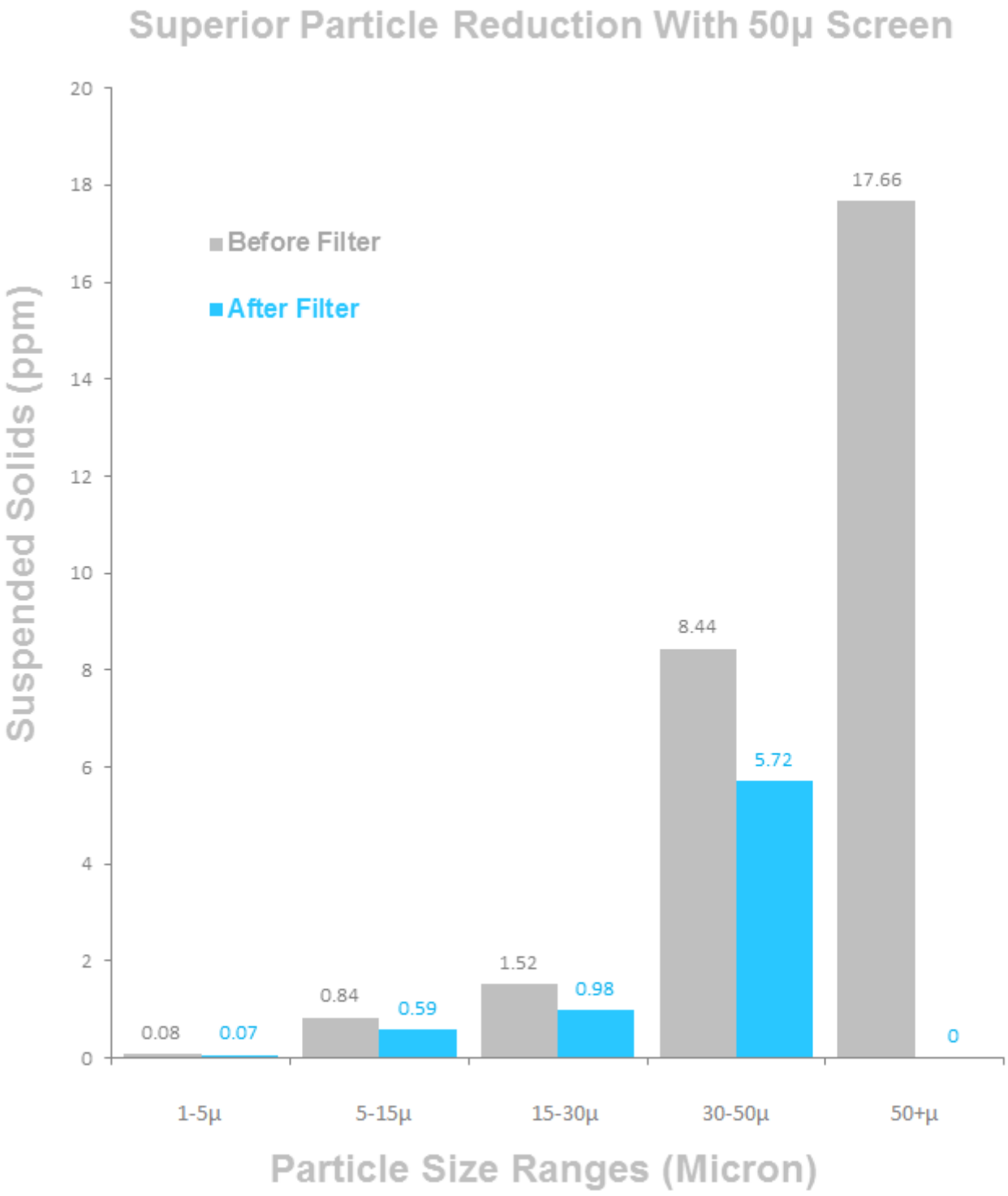
CONCLUSION

The positive onsite report from engineers at Superior combined with the compelling data collected by U.S. Water’s Analytical Department, shows that Forsta self-cleaning water filters are ideal for cooling water filtration applications.

Even a small amount of particles larger than 50 micron (17.66ppm) in cooling tower water drastically reduces the efficiency of a cooling system. Superior found automatic filtration to be the most effective and sustainable way of removing the harm caused by this unwanted dirt. Forsta cooling tower filters for HVAC and industrial cooling applications provide a robust, automatic and reliable technology in both full-flow and sidestream configurations.

Forsta Filters also provides efficient, reliable and sustainable solutions for industrial, irrigation and municipal applications. Self-cleaning filters are available from Forsta in a wide range of sizes, orientations, and to varying degrees of filtration in order to accommodate any demand. Forsta offers custom design solutions for unique applications.

Contact the author, Polly Stenberg at polly@forstafilters.com or 310-837-7177 x405 for more information:


Superior Particle Reduction With 50µ Screen
Suspended Solids (ppm)
Before Filter
After Filter
20
18
16
14
12
10
8
6
4
2
0
0.08
0.07
0.84
0.59
1.52
0.98
8.44
5.72
17.66
0
1-5µ
5-15µ
15-30µ
30-50µ
50+µ
Particle Size Ranges (Micron)

U.S. WATER SERVICES
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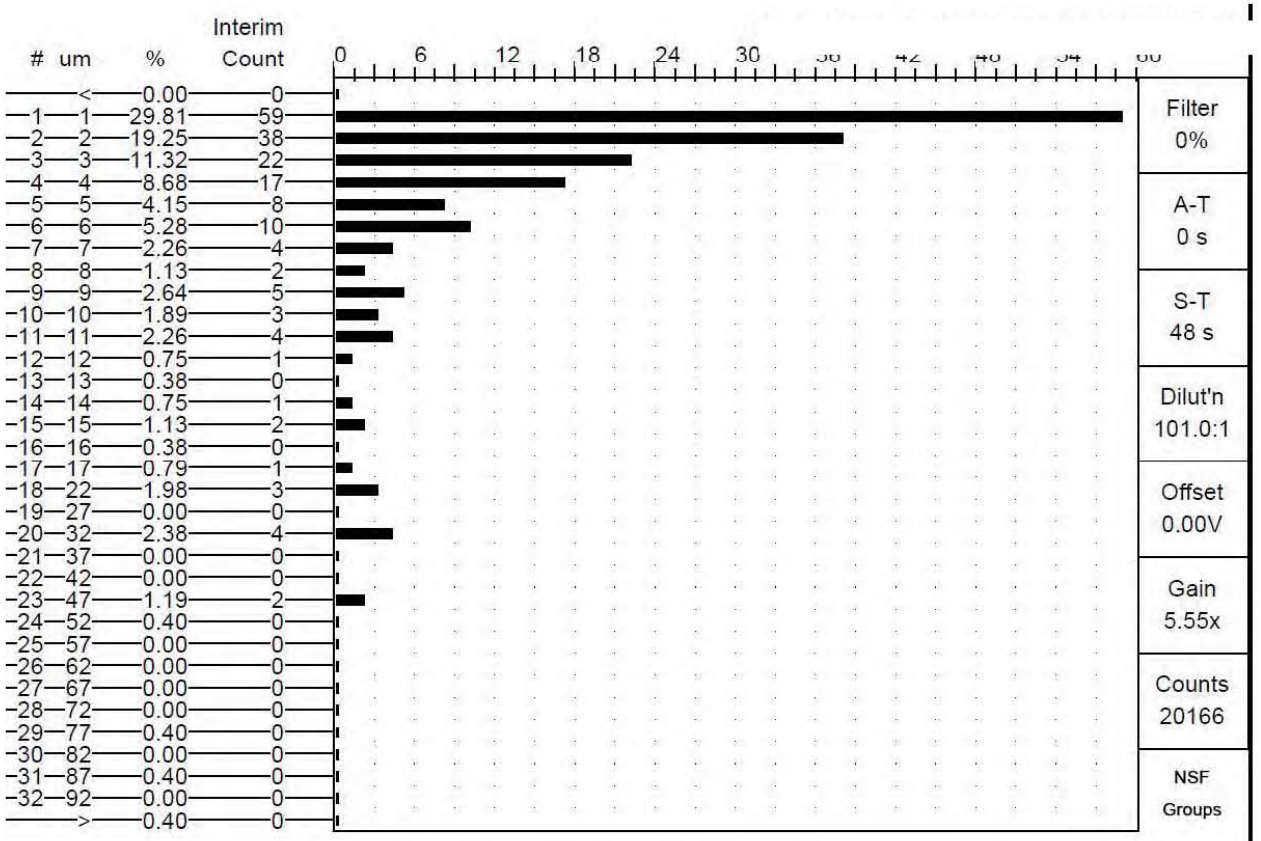
Laboratory Analysis Report

Report Date: 12/18/2014 | **Sample Date: 11/28/14**
Company Name: Superior Industries-Fayetteville, AR | **Laboratory Number: 145348**
Sample: Casting Deck A- Before Filter

Particle Size Analysis



NSF Class	Size	Total counts /cc	Counts percent	Surface area percent	Volume percent	Mass/bin ppm
#1	< 1	0.00	0.00%	0.00%	0.00%	0.0000
#2	1-5	13,925.95	69.06%	2.34%	0.29%	0.0828
#3	5-15	4,337.59	21.51%	9.93%	2.94%	0.8377
#4	15-30	863.71	4.28%	10.37%	5.32%	1.5175
#5	30-50	719.13	3.57%	34.10%	29.56%	8.4352
#6	50-100	239.71	1.19%	43.26%	61.89%	17.6591

Total counts: 20,166.00/cc
Total suspended solids: 28.53ppm (mg/liter)
Dilution factor: 101.00:1
Spec. gravity: 1.00
Mean size: 6.06um
Standard dev: 10.59um

US Water Services 12270 43rd Street NE St. Michael, Minnesota 55376
(P) 1-866-663-7632 (F) 763-553-0613 www.uswaterservices.com

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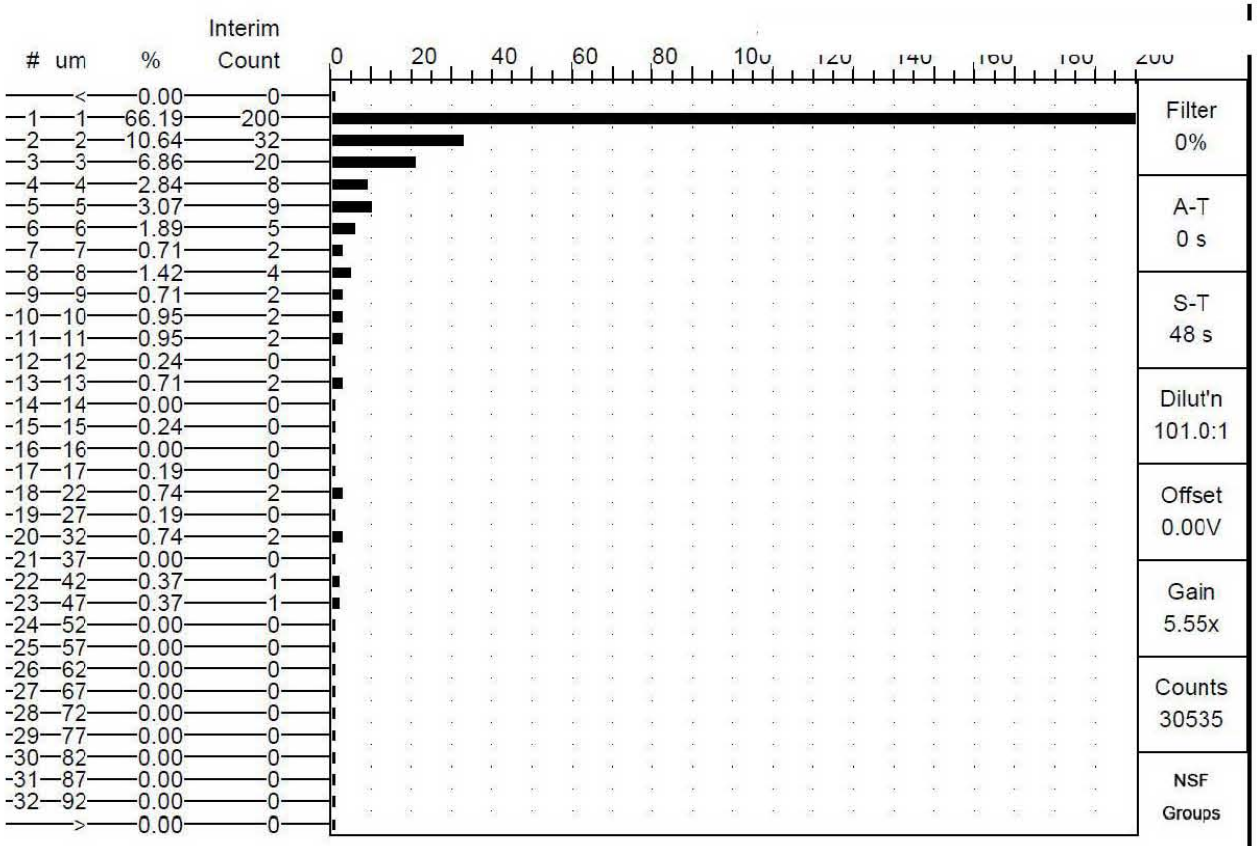

NSF Class	Size	Total counts /cc	Counts percent	Surface area percent	Volume percent	Mass/bin ppm
#1	< 1	0.00	0.00%	0.00%	0.00%	0.0000
#2	1-5	26,420.35	86.52%	5.76%	0.89%	0.0650
#3	5-15	3,248.40	10.64%	18.44%	7.97%	0.5853
#4	15-30	412.50	1.35%	16.07%	13.30%	0.9771
#5	30-50	453.75	1.49%	59.72%	77.85%	5.7203
#6	50-100	0.00	0.00%	0.00%	0.00%	0.0000

Total counts: 30,535.00/cc
Total suspended solids: 7.35ppm (mg/liter)
Dilution factor: 101.00:1
Spec. gravity: 1.00
Mean size: 2.86um
Standard dev: 5.41um

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