

CASE STUDY

COOLING TOWER INFRASTRUCTURE CLEANING USING CLEARITAS®

INTRODUCTION

Blue Earth Products® is the leader in innovative approaches to improve water quality in both commercial process and drinking water applications. Our products work in conjunction with existing primary disinfectants to eliminate organic and inorganic scale from any water surface in a cooling, process, or potable water system.

In evaporative cooling tower systems, the makeup water can vary widely and is often “scaling” in nature. As the cycles used increase in these systems, the scaling problem is exaggerated and can lead to mineral scale and organic film formation throughout the system.

This scale buildup results in two confounding problems: First, the scale produces thermal barriers in the system, lowering the tower’s overall cooling performance. Over time, the scale can become so bad that portions of the system must be replaced. Secondly, the scale formation provides a breeding ground for bacterial growth, often harboring deadly *Legionella* which can lead to a host of health and safety issues. Also, organic films can significantly contribute to thermal conductivity loss.

In conjunction with Puckorius and Associates, Inc., Blue Earth Products has demonstrated that Clearitas has been effective throughout the United States at removing accumulated scale, preventing further scale buildup, thereby, controlling bacterial growth.

Two systems were studied: an HVAC cooling tower in a Las Vegas casino was treated, as well as an evaporative condenser (that was scaled to the degree that it was decommissioned) at a food processing facility in Texas.

In both systems, Clearitas dosing was started at a level to aggressively descale the systems quickly (the dosing was adjusted for the first few days to maintain the oxidation-reduction potential (ORP) approximately 500mV above makeup water). Once significant descaling occurred, a maintenance dose was applied (approximately 100mV ORP above makeup water). In both cases, no intentional blow down was performed, and all other chemicals were removed during the initial descaling period.

	Mg	Al	Si	P	S	Cl	Ca	Fe	Zn	Carbon
Evaporative Condenser Scale wt% (Texas)	3	3	23	5	1	1	50	4	10	~20
Cooling Tower Scale wt% (Las Vegas)	<1	<1	1	1	1	<1	96	<1	<1	~20

Table 1 - Scale composition by weight % from SEM/EDX analysis

RESULTS

Prior to the application of Clearitas, small amounts of scale were scraped from the two systems and analyzed using SEM/EDX to determine inorganic content. Additionally, loss of ignition analysis was completed to determine approximate organic content. Table 1 shows the results from both of these analyses. Makeup water

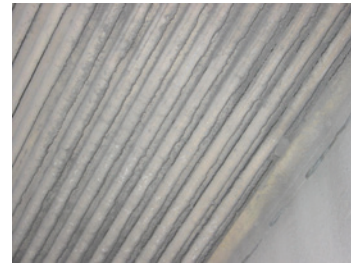
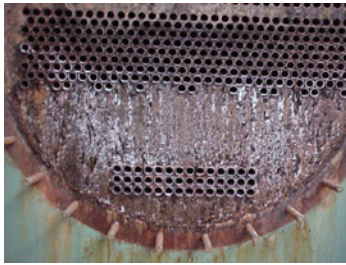
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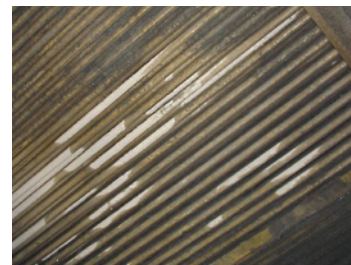
clearitas®
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analysis was completed and confirmed the high presence of silica in the Texas water system. Figure 1 shows portions of both systems before and after the application of Clearitas.

BEFORE



AFTER



(A)

(B)

(C)

Figure 1 - (A) Chiller tubes in Las Vegas, (B) Cooling tower media in Las Vegas, (C) Condenser tubes in Texas

DISCUSSION

Two very distinct systems were effectively descaled using a two-step Clearitas dosing. The initial cleaning dose removed large amounts of scale very quickly. This was followed by a maintenance dose that continued to remove small amounts of scale and prevented further scale formation. In the Las Vegas system, the majority of the inorganic scale was from calcium, while the Texas system was comprised of "mixed" scale from a variety of inorganic components.

In both systems, organic carbon was present in the scale, as determined by ignition analysis. In previous laboratory experiments (described in the Blue Earth Labs' document "Getting to Know Clearitas"), we have demonstrated that Clearitas acts as an effective descaling agent by oxidizing the organic nucleation sites in scale that act as the "glue" holding the inorganic components together. Thus, for any cooling tower type application, Clearitas should be effective at removing scale if the makeup water used has some amount of organic material present even at trace levels, including bacteria.

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