



Industrial Water Division

ProMoss™ Trial at Corning Inc.

Corning, NY



Introduction

Corning Inc Diesel Manufacturing Facility in Corning, NY has an innovative Site Energy Manager who continuously searches for the most effective and sustainable water treatment for the facility. Working with WaterWise Inc., Rochester, NY and Creative Water Solutions LLC, Plymouth, MN, Corning conducted a three month test of ProMoss™ in one of their kiln cooling towers.

Scope and Objectives Corning Cooling Tower Trial

- Determine and compare effectiveness and benefits of ProMoss™ on a kiln cooling tower
 - Scale
 - Corrosion
 - Biological (bacterial counts and organic contamination)
 - pH, conductivity, calcium hardness
 - Operating costs/savings
- Compare results with a tower on traditional chemical water treatment and another with an electro-precipitator with no chemical water treatment

Corning Inc. Criteria for Success System Performance

Desired Outcome	Acceptable Outcome
<ul style="list-style-type: none"> ● Corrosion <ul style="list-style-type: none"> — Mild Steel <3 mpy — Copper < 0.2 mpy 	<ul style="list-style-type: none"> ● Corrosion <ul style="list-style-type: none"> — Mild Steel < 5 mpy — Copper < 0.3 mpy
<ul style="list-style-type: none"> ● Scale formation <ul style="list-style-type: none"> — Improved heat transfer — Reduced visible scale and no additional visible scale 	<ul style="list-style-type: none"> ● Scale formation <ul style="list-style-type: none"> — No additional scale formation
<ul style="list-style-type: none"> ● Microbiologic populations <ul style="list-style-type: none"> — Aerobic bacteria - <10⁴ CFU on dip slide — Algae – no visible algae 	<ul style="list-style-type: none"> ● Microbiologic populations <ul style="list-style-type: none"> — Aerobic bacteria - < 10⁵ CFU on dip slide — Algae – no visible algae
<ul style="list-style-type: none"> ● Conductivity/pH <ul style="list-style-type: none"> — 100% compliance with specified tower range 	<ul style="list-style-type: none"> ● Conductivity/pH <ul style="list-style-type: none"> — 75% compliance with specific tower range
<ul style="list-style-type: none"> ● Corrosion products <ul style="list-style-type: none"> — Fe < 1.0 mg/l — Cu < 0.2 mg/l 	<ul style="list-style-type: none"> ● Corrosion products <ul style="list-style-type: none"> — Fe < 2.0 mg/l — Cu < 0.5 mg/l
<ul style="list-style-type: none"> ● Water use <ul style="list-style-type: none"> — Lower water use than baseline 	<ul style="list-style-type: none"> ● Water use <ul style="list-style-type: none"> — Similar water use as baseline

<ul style="list-style-type: none"> ● Energy <ul style="list-style-type: none"> — Lower energy consumption than baseline <ul style="list-style-type: none"> ● Energize pumps ● Energize chemical feed pumps ● Energy to operate non-chemical system 	<ul style="list-style-type: none"> ● Energy <ul style="list-style-type: none"> — Similar energy consumption as baseline <ul style="list-style-type: none"> ● Energize pumps ● Energize chemical feed pumps ● Energy to operate non-chemical system
<ul style="list-style-type: none"> ● Supports and enhances Corning’s corporate sustainability goals 	<ul style="list-style-type: none"> ● Neutral with respect to Corning’s sustainability goals
<ul style="list-style-type: none"> ● Decreased maintenance from baseline 	<ul style="list-style-type: none"> ● No change in maintenance from baseline
<ul style="list-style-type: none"> ● No down time for tower function 	<ul style="list-style-type: none"> ● No increase in down time for tower function

Selection of Cooling Tower for ProMoss™ and Chemical Treatment

Corning Kiln Tower #2	Corning Kiln Tower 1-3 & 4
<ul style="list-style-type: none"> ● No chemicals 	<ul style="list-style-type: none"> ● Sulfuric acid for pH control
<ul style="list-style-type: none"> ● ProMoss™ 	<ul style="list-style-type: none"> ● Scale and corrosion inhibitors
<ul style="list-style-type: none"> ● Increase cycles of concentration by 20% 	<ul style="list-style-type: none"> ● Dual biocides for bacterial control
	<ul style="list-style-type: none"> ● Baseline cycles of concentration



Corning Trial Plan

- Existing water data and operating conditions of the system were taken prior to trial start date and periodically for 3 months
- Current treatment program was discontinued on trial start date
- Plant personnel inspected the kiln #2 tower prior to installation of the ProMoss™ contact chamber
- New corrosion test coupons were installed at the time of ProMoss™ start up
- Bacteria dip slides were taken every other week and the results were recorded after 24 hours and 48 hours

Results

Corning Kiln Tower #2

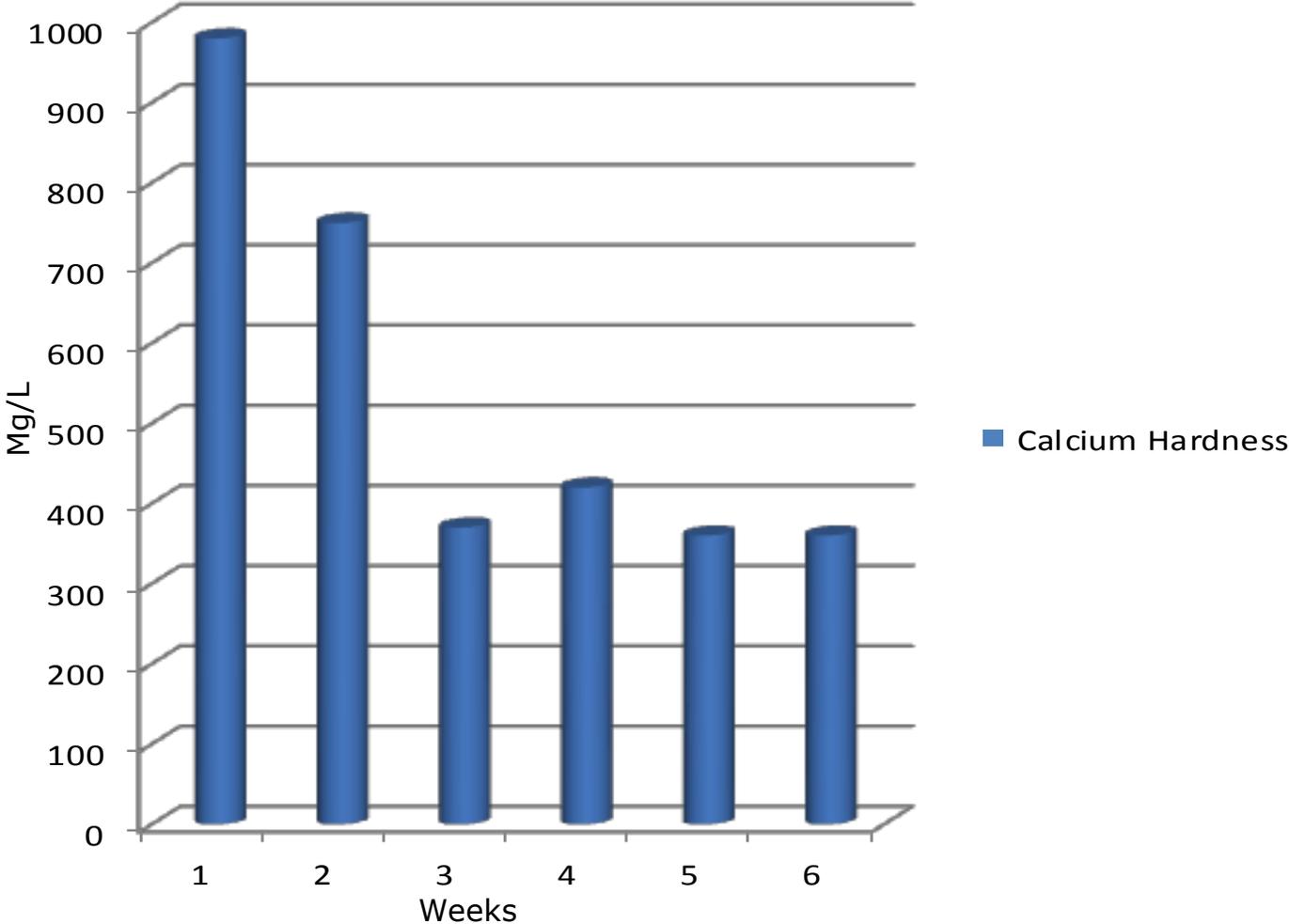
- Operating data on traditional chemical program
- Cycles of Concentration 4.03
- LSI = 0.82 (corrosive)
- Operating data on ProMoss™
- Cycles of Concentration 4.87
- LSI = 1.93 (non-corrosive)
- Algae on water surface is gone
- Calcium hardness decreased by 51%

- Cycles of concentration based on conductivity, increased by 19.8% after 90 days on ProMoss™ with no change in blow-down settings
- pH stable without acid below 8.7
- No tower down time or maintenance issues

Water Chemistry Data from ProMoss™ Tower (Kiln Tower #2)

	6/4/2015	6/26/2015	7/17/2015	8/6/2015	9/5/2015
Ca Hrdn	750	370	420	360	360
Total Hrdn	1129	769.5	872.1	1060.2	1060.2
Cond	2100	1800	1900	2200	2200
Cl		300	300	330	305
pH	7.8	8.5	8.4	8.7	8.7
M-Alk	140	460	420	340	480
P-Alk	0	0	0	0	0
Fe	0.4	0	0.4	0	0
Si	40	40	40	40	40
vss	1	0	0	0	0

Calcium Hardness



Water Savings	Tower Conductivity	City water Make Up	Cycles of Concentration
Pre Moss	1818	451	4.03
With Moss	2200	451	4.87
Percent Increase			19.80%
Water Usage (June –Aug. 2014)			1,015,364
Calculated Savings over 3 Months of Trial			203,073 gallons



Bacterial Dip Slide Data from the ProMoss™ Tower

	24 hour	-	48 hours
6/24/15	<10 ²		<10 ³
6/26/15	<10 ²		<10 ³
7/8/15	<10 ²		<10 ³
7/17/15	<10 ²		<10 ³
8/6/15	<10 ²		<10 ³
8/14/15	<10 ²		<10 ³
9/4/15	<10 ²		<10 ³

Corrosion Coupon Data from the ProMoss™ Tower

Date	7/24/15	8/27/15	10/5/15
Mild Steel /mpy	1.0868	3.6282	1.1411
Copper / mpy	0.2719	0.3223	0.3039

Conclusions

- ProMoss™ met or surpassed all “desired” criteria except for copper corrosion where it was just above the acceptable limit
- ProMoss™ has been placed on all cooling towers at the Diesel facility
- ProMoss™ is now recommended for use at other US and international Corning facilities
- Other applications for ProMoss™ water treatment, such as process water, water softening and RO pre-treatment are under discussion and in the planning stages

Creative Water Solutions

Contact Information

Creative Water Solutions

13809 Industrial Park Blvd.

Plymouth, MN 55441

Phone (763) 398-0141

Fax (763) 551-2572

info@cwsnaturally.com

www.cwsnaturally.com

