



CASE STUDY

of a Confectionery Manufacturer's water treatment



The new era of nano-technology has made many advances in water treatment possible in residential as well as commercial applications. *NanoSoft* has proven to be very effective in both applications even at high temperatures and hardness levels. The *NanoSoft* System represents the superior alternative with respect to dealing with the symptoms of water hardness without resorting to ion exchange (salt or potassium passed systems). The commercial grade media is now available for residential consumers. What you will read in this story is an example of commercial water treatment using *NanoSoft* media. This represents an extreme case far beyond any residential demand or application the boiler/heat exchange is just a larger version of a residential hot water heater.

Boiler System

This stainless steel heat exchange is part of a boiler system in an industrial application. The energy source for the heat exchange is a steam generator whose steam heats the interior of the stainless steel tubing of the heat exchanger to 338 Fahrenheit resulting in an exterior surface temperature of 266 degrees Fahrenheit. The source water has a temperature of 52 degrees Fahrenheit. It travels through the heat exchanger pipe and is heated to 185 degrees Fahrenheit in seconds. The heated water then is supplied to a 13,000 gallon hot water storage tank that in turn supplies all the hot water requirements for the entire factory.

The History

The boiler system was new installed in August of 2002 with raw water treatment consisting of traditional water softeners (Duplex Fleck 2900 24.X72.). The system was operating in this configuration for the first 18 months.

Numerous Softener failures/service problems combined with the substantial operating cost (salt usage approaching \$45,000 worth per annum) and industrial discharge issues caused the owner to look for alternatives.

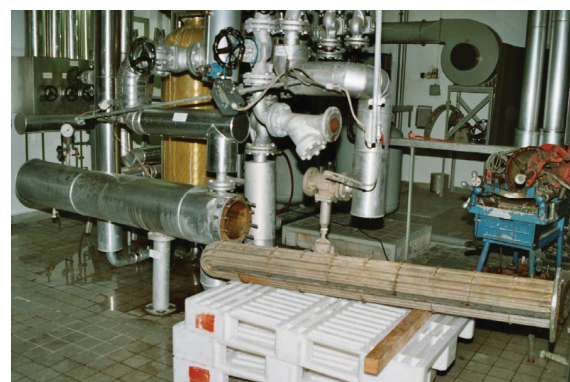
The first attempt was to try and get by without pre-treating the raw water at all; this proved to be disastrous. After only two and a half months the heat exchanger had scaled up to the point where the hot water supply to the plant had been reduced to a trickle. Pulling the heat exchanger for inspection

and cleaning proved to be no easy task. The unit had scaled up so complete that it required the use of chains attached to hydraulic presses to force the coil out of its housing. The scale so completely surrounded the core that it visibly consisted of a big lump of limestone in the cylindrical shape of the heat exchanger housing rather than looking at the stainless steel core. It took two days of careful cleaning with phosphoric acid to restore the heat exchanger to a normal operating condition.

Finally in the spring of 2004 a system using the *NanoSoft* was installed (Single tank, in/out in up flow operation). Ever since then, this boiler system has been in continuous service protected by no other water treatment but *NanoSoft*. Hot water usage in the plant averages 80,000 gallons per day, 6 days a week and 50 weeks per year. The water treated has a calcium hardness of 446 ppm (26 grains per gallon) and small traces amounts of iron. For the entire service life to date, there have been no variations or drop in the performance/efficiency of the boiler system.

At the time of these photographs, the boiler had already heated in excess of 80 million gallons of water in its service life. More importantly, the photographs show the heat exchanger after one year of uninterrupted service having heated in excess of 24 million gallons of water since the last annual inspection. This spring (2008) the annual inspections of the boiler were suspended indefinitely. Since the previous two inspections had not yielded any need for cleaning and the system was operating within specifications the owner chose not to bother going forward.

No service problem or failure resulting in down time for the plant, no capacity constraints and zero operating costs.



Introducing
SpectroSoft™

**Scale & Corrosion
Prevention**
with nano-technology

**NANOSOFT
(NS-Media)**

Coolabah Water - Proudly Australian

www.coolabahwater.com.au

111 Biroomba Lane (PO Box 1160) WAGGA WAGGA NSW 2650

P (02) 6925 8555 F (02) 6925 8588 E filters@coolabahwater.com.au

Scale Prevention to 99.6% and 99.9%

This media has been tested to meet the following:

German Standards

DW-9191

DVGW-W510

DVGW-W512

DVGW-W2700 and KTW assessments – hygiene testing

American Standards

NSF/ANSI-61 & 42

SpectroSoft™ [TAC]

Scale and Corrosion Prevention

NS-Media is based on nano-technology or Template Assisted Crystallisation. In this process atoms are placed in a special structure so that a template is created. Nano-technology is so effective, it requires a contact time of three seconds.

The media is used in an up-flow system, therefore only an in-out valve is needed. The media transforms the calcium ions into sub-micron sized calcium crystals which move in the water flow. These crystals so small, they are only visible through a microscope. They are completely stable and resist destruction by heat. These crystals do not aggregate or attach to any surfaces, resulting in the water as if free of calcium hardness. The media can be used in systems that run continuously. There are no capacity constraints and regeneration is not necessary.

NS-Media is very effective as pre-treatment for membrane filtration like reverse osmosis. It prevents the scaling of the membranes with calcium carbonate and has been successful in de-scaling fouled membranes within ten days.

Operating Principle

The NS-Media is operated in a fluidized bed. Due to the media beads “bumping into each other” and the shearing forces of the passing water by the media granules, the micro crystals are released into the water stream. The crystals being devoid of a charge (as the ionic charges of its building blocks, calcium and carbonate neutralize each other) now are suspended in the water travelling in the flow of the water unable to attach themselves to the plumbing surfaces.

ADVANTAGES

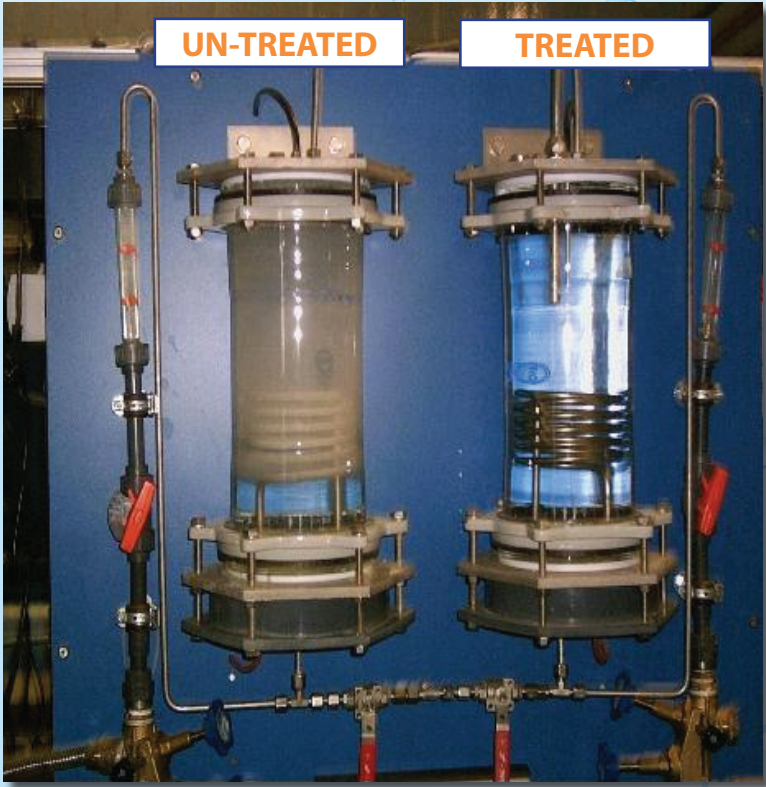
- 100% scale prevention for pipes and hardware
- 100% corrosion prevention
- Long lifetime
- Highly efficient
- Healthier water

TECHNICAL DATA

- Surface: Nano Surface
- Matrix: Special Core
- Size: 0.4 n 0.7mm
- Colour: White

APPLICATIONS

- Pipes
- Pre-treatment for RO membranes
- Cooling Towers
- Boilers / Heat Exchangers
- Beverage industry
- Municipal Systems

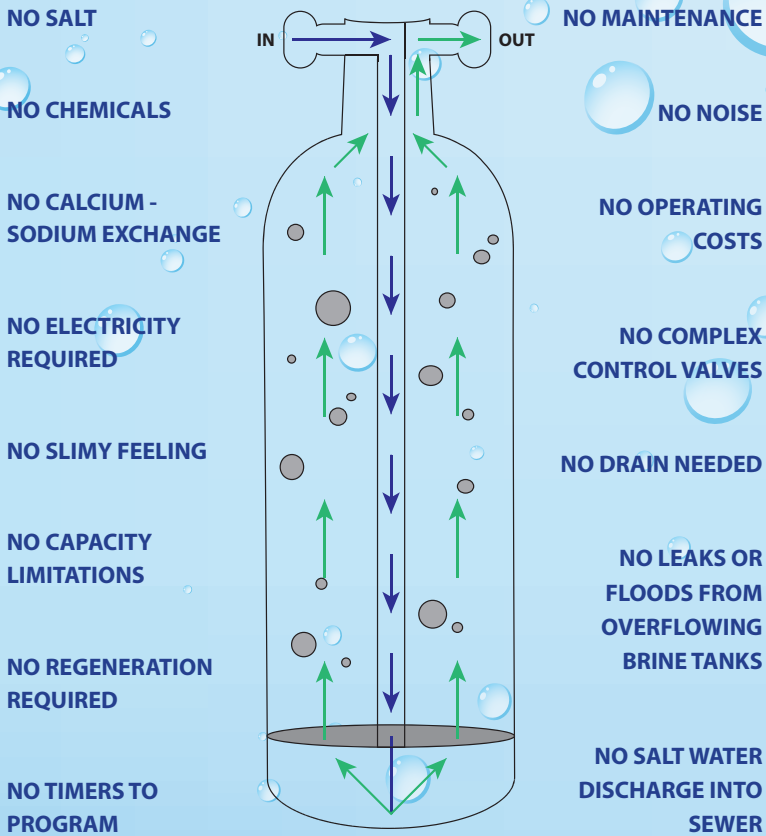


Nanosoft testing apparatus for scale prevention under DVGW W510 rules and Standards, Germany. Hard water is passing through the testing cells at a continuous flow where the water is heated at 80 degrees Celcius to raise the scale potential of the water even further. The test is designed to simulate the worst scenario with respect to water chemistry, this method simulates the water usage of the average German household over a lengthy time period. **The pass rate for this Standard is 80%**

The Standard DVGW W510 was established about 1997, and is the only Standard available for scale prevention testing in the world today. The USA Water Quality Association (WQA) has been trying to set up a protocol for over eight years.

The Test Cell on the left hand side is the untreated hard water. Scale formation and turbid water in this cell is clearly evident.

The Test Cell on the right hand side is water that is pre-treated through NS-Media. There is no evidence of any scale formation or turbid water.



Standards Testing

NS-Media was assessed in a warm water circulation system according to DVGW-process sheet W512 “Proceedings for the assessment of efficacy of water treatment system for the reduction of gravel congregation” (09/1996). This test report contains 4 pages. The following test results relate to both type examinations submitted on the 09.02.2012 and requirements and tests illustrated in DVGW process sheet #W510 and linked to DVGW-process sheet W512, paragraph 3. Requirements and tests according to DVGW-process sheet W512, Paragraph 3.

The Limescale Protection Device	
Test item	Limescale protection device
Product name (Type)	
Serial number	2011-09-21-101 and 2011-09-21-102
Type of assessment/test	Type-examination according to DVGW W510
DVGW-Az	11-0568-W (29.11.2011)
DVGW-Reg. No.	Applied
Test type/test stand	B Test No. 11
Test period	21.02.2012-13.03.2012

1	Properties of water sample according to DVGW-process sheet W512 Paragraph 3.1				
	Sample requirements	Tests have to include drinking water, which holds/exhibits a calcite precipitation capacity (calculated at 15 degrees C) of at least 30 mg/L CaCo3 in a not previously heated state. The total water hardness of the water sample has to have a minimum amount of 3.5mol/3 as sum of alkaline earths. To match the required calcite precipitation capacity, the used drinking water will be adjusted using deacidification procedures to the required value (results of analysis from 31.05.2011 and 28.06.2011).			
2	Test parameters (temperature, water flow rate, electrical work)				
	State of test B, Test no: 11, 21.02.11 – 13.03.2012				
		Boiler 1 = NS-Media	Boiler 2 = Blind	Boiler 3 = NS-Media	Boiler 4 = Blind
	Temperature (degrees C) +/-	80	80	80	80
	Duration of test [d]	21	21	21	21
	Water flow rate [L]	2.785	2.750	2.745	2.755
	Electrical work [kWh]	347.7	302.7	299.0	320.5
3	Results after analytical evaluation				
	Test stand/test type: B, Test no: 11, 21.02.2011 – 13.03.2012.				
		Boiler 1 = NS-Media	Boiler 2 = Blind	Boiler 3 = NS-Media	Boiler 4 = Blind
	Heating coil	0.001	0.260	0.000	0.188
	Container wall	0.000	0.058	0.000	0.001
	Residue >500pm	0.000	0.075	0.000	0.129
	Sum total (M)	0.001	.0393	0.000	0.318

During the assessment of the limescale protection device according to DVGW-process sheet W512, paragraph 3.1					
Product name (type)	NS-Media				
Serial No.	2011-09-21-101 and 2011-09-21-102	Test stand	B	Test – No.	11
The following physic-chemical water properties were calculated as well as the calcite precipitation capacity calculated according to DIN38404-10.					

Parameter	Sampled On	28.02.2012
Temperature	[Degrees C]	10.1
Electrical conductivity	[mS/m]	10.1
pH value		7.56
Acid capacity KS to pH 4.3	[mol/m3]	5.16
Base capacity KS to pH 8.2	[mol/m3]	0.40
Calcium (Ca2+)	[mg/l]	115
Magnesium (Mg2+)	[mg/l]	7.8
Sodium (Na+)	[mg/l]	10.6
Potassium (K+)	[mg/l]	1.8
Chloride (Cl-)	[mg/l]	20.3
Nitrate (NO3)	[mg/l]	3.4
Sulfate (SO42)	[mg/l]	50.8
Calcite precipitation capacity (CaCO3)	[mg/l]	30.0
The requirements according to DVGW-working sheet W512, paragraph 3.1 were adhered to.		

Efficiency Factor		
4	Requirements	The efficiency factor is calculated according to DVGW-process sheet W512 paragraph 4 following the formula
		$f_w = (M_{untreated} - M_{treated}) / M_{untreated}$
	Result	Boiler 1 = NS-Media Boiler 3 = NS-Media
	Single efficiency factor f_w	0.997 1.000
	Mean efficiency factor f_w	0.999
Notes		
The results relate to the type examinations submitted for assessment on the 09.02.2012. requirements concerning the efficacy factor were met.		

The NS-Media used in this test had been used in another application and had already treated some 30,000 litres.

For more information please contact Coolabah Water.