Test Reports and Case Studies

HYDROPATH

Version 5.1

CONTENTS

INDEX

LABORATORY-BASED TEST REPORTS

INTRODUCTION

In this section we discuss tests that have been done in laboratory situation rather than out in the field. These tend to have a more scientific approach and a more controlled situation (and hence often more quantifiable results), but may not be "realistic" in the sense that they will often use scale models or controlled environments rather than running tests in the "real world".

Although they tend to be focussed on a specific application, the results of lab tests tend to be generally relevant for many applications.

British Gas Domestic Tests

Date: 1992 Country: UK

Keywords: Limescale , Domestic

Filename: LabTest British Gas.pdf, Testimonial British Gas.pdf

This is a rather old test and used an older (less effective) domestic model, the HS18. Nevertheless the results were impressive enough for British Gas to not only purchase a vast number of units over the next 20 years, but to actually invest in the company. This test obviously played a significant role in Hydropath's development, and so it is included for historical reasons!

The company performing the test are British Gas. At the time of testing, British Gas were a state-owned company supplying all of the domestic gas to Britain. They also serviced boilers and so had an interest in reducing the problem of scaling in domestic heat exchangers.

Method of Testing

A number of water conditioners (including the Hydropath unit) were placed on pipes leading to instantaneous water heaters, which were fully instrumented and run on a cycle until they blocked. The conditioners were evaluated to see how long they could prevent blockages.

Results

The Hydropath units were found to significantly outperform all the other water conditioners tested, and extend the time taken for a heater to block by over six times.

...none of the physical permanent magnetic devices were significantly effective in Preventing the water from scaling.

Figure 1 British Gas quote on electromagnetic conditioners (page 4).

...the potential savings in servicing to BG should be not less than £72.5m in the first 5 years.

Figure 2 British Gas Quote on Savings (summary page).

British Gas calculated their possible savings to be significant. These test results led to an investment in the company and a long-standing business relationship. To this day, British Gas purchases many thousands of Hydroflow units per year -now of course the HS38 rather than the original model. A testimonial letter from British Gas in the early days is also included for historical interest!

WEATHERFORD SCALING TESTS

Date: 2005

Country: US Keywords: Limescale, Oil industry Non-carbonate

Filename: LabTest Weatherford.pdf

Weatherford International are a large company providing products and services to the oilfield industry. Laboratory tests were performed in order to determine if Hydroflow could be used to prevent scaling in oil wells. Weatherford have since purchased a license to manufacture the technology and have exclusive rights to treating limescale in "up-stream" oil and gas field applications.

Method of Testing

Water was passed through narrow tubes and simultaneously heated. The pressure due to blockages was measured and the tubes examined by eye. The water contained ions that cause both barium sulphate ($BaSO_4$) scale and calcium carbonate scale (limescale). Tubes of different diameter were used and the flow rate was altered.

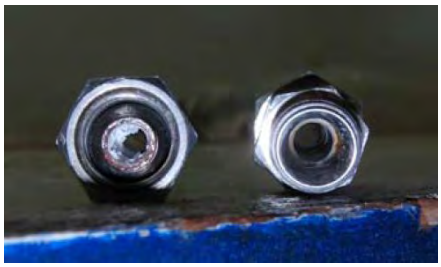


Figure 3 The scaling of an untreated pipe (left) compared to a pipe treated with Hydropath (right) (page 10).

Results

Without treatment, the pipe became blocked in just seven minutes (test 1A, page 4). The blockage was solid and it took a high pressure to clear it (page 4). The Hydropath unit used was shown to cause the scale to form in suspension rather than on the surfaces of the tubes. In tests 1 and 2, the tubes used for testing were very narrow and the water had a very low flow rate, so a small pressure increase can be seen in the treated system until the water washes away the precipitate (page 5). Test 3 used a 1 inch tube with a higher flow rate.

The difference in the amount of scale formed on the pipes with and without Hydropath was observed visually. Not only was there significantly more scale on the untreated system, but it could easily be seen that the scale was hard and

required manual scraping, unlike tin the treated system, where the deposits were soft, powder-like and easily brushed away.

CANADIAN ONSPEX TESTS

Date: 2008

Country: Canada Distributor: Hydroflow Canada

Keywords: Limescale, Domestic

Filename: LabTest Onspex.pdf

Onspex are an independent testing company and were enlisted to provide an independent verification of the effects of a Hydroflow unit.

Method of Testing

The unit was attached to a water heater that flowed for 15 mins, followed by a resting period of 45 mins. This cycle was continually repeated for a period of six weeks. The water used was very hard water at a level of 500 ppm TDS, and a flow rate of 3 gallons per minute.

Results

The control test without Hydroflow had to be stopped after 39 days as the flow rate had dropped from 3 gallons per minute to 1 gallon per minute. No appreciable decrease in the flow rate was seen on the heater equipped with Hydroflow.

The test clearly showed that Hydroflow was effective even in very hard water conditions, and kept the pipes completely clear. This should be compared with the control test -without Hydropath the system blocked up and the flow rate was reduced drastically.

A quote from the report:

" The device under test has kept the hard water from depositing enough minerals to impair heater operation during this series of time accelerated testing. Analysis of the deposits and flow readings indicate that this unit is effective in preventing clogging due to calcium carbonate build up. Analysis of the effectiveness of control unit testing: This test was conclusive. The control unit with no anti scale device installed was shut down because of flow below the test parameters of 1.0 gallons per minute after 39 days."

WESTPORT SCALING TESTS FOR HALLIBURTON

Date: 2004 Country: US

Keywords: Limescale, Oil industry

Filename: LabTest Wport.pdf

This was a report produced by the testing company Westport for Halliburton.

Method of Testing

The test was a "tube blocking test" (like the test in section 1.3) which used very narrow pipes through which heated brine was pumped, and the pressure measured to determine the presence of any blockages.

Results

Once properly set up, the test with Hydropath/ Clearwell (test 3) was compared to the test without Hydropath (test 4). Comparing the measured pressure differential, a huge difference can be seen. Without Hydropath, the pressure in the pipes steadily increases, until it goes beyond the shut-off level and the pump is automatically turned off (page 8). With Hydropath, there is only a small transient pressure increase, and the volume of water produced continues to increase steadily (page 7). The transient occured because the pipe is very narrow (to allow quicker testing) -in a larger pipe this would not happen (page 4).

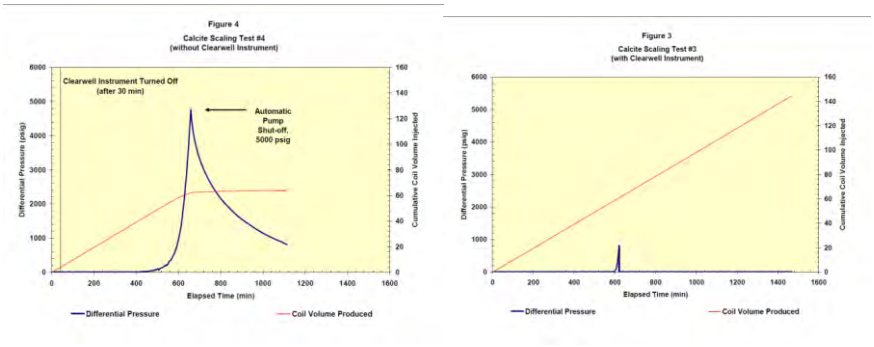


Figure 4 The pressure increase in an untreated pipe (left) and a pipe treated with Hydroflow (right).

The test confirmed the effectiveness of Hydropath Technology:

"The test results are very promising and warrant further investigation of the Clearwell technology for its application and financial impact in the oil industry."

SGS Bacteria tests

Date: 2004

Country: Taiwan Distributor: Hydropath Asia

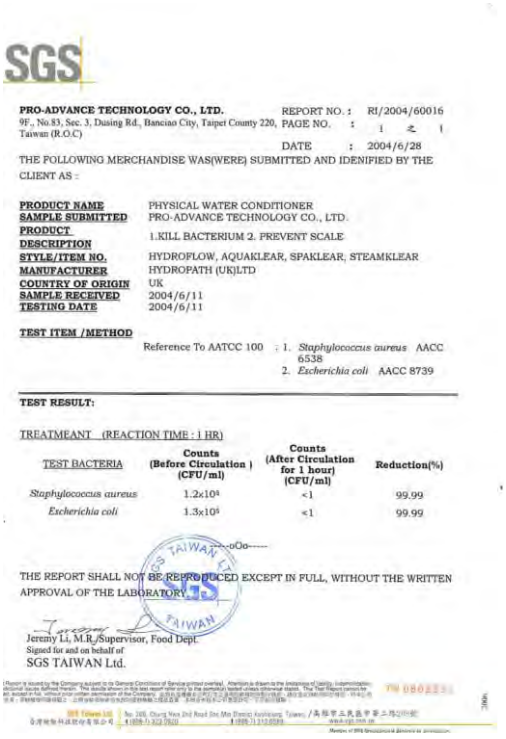
Keywords: Algae/ Bacteria

Filename: LabTest SGS Bacteria.pdf

This was a report produced by the testing company SGS.

Method of Testing

A 50 liter water tank was filled up with tap water. Water from the bottom of the tank was pumped through a pump and AquaKLEAR before returning to the water tank. The whole fixture was sanitized before adding Staphylococcus Aureus and E. Coli with a population of $1.2x10^5$ (120 000). to the water tank. Water was circulated through the AquaKLEAR by the pump for an hour. Sample water was then taken from the tank to test the bacteria count.



SGS

PRO-ADVANCE TECHNOLOGY CO., LTD.
9F., No.83, Sec. 3, Dusing Rd., Banciao City, Taipei County 220, Taiwan (R.O.C)

REPORT NO. : RI/2004/60016
PAGE NO. : 1 之 1
DATE : 2004/6/28

THE FOLLOWING MERCHANDISE WAS(WERE) SUBMITTED AND IDENIFIED BY THE CLIENT AS :

PRODUCT NAME	PHYSICAL WATER CONDITIONER
SAMPLE SUBMITTED	PRO-ADVANCE TECHNOLOGY CO., LTD.
PRODUCT DESCRIPTION	1.KILL BACTERIUM 2. PREVENT SCALE
STYLE/ITEM NO.	HYDROFLOW, AQUAKLEAR, SPAKLEAR, STEAMKLEAR
MANUFACTURER	HYDROPATH (UK)LTD
COUNTRY OF ORIGIN	UK
SAMPLE RECEIVED	2004/6/11
TESTING DATE	2004/6/11

TEST ITEM /METHOD

Reference To AATCC 100 : 1. *Staphylococcus aureus* AACC 6538
2. *Escherichia coli* AACC 8739

TEST RESULT:

TREATMEANT (REACTION TIME : 1 HR)

TEST BACTERIA	Counts (Before Circulation) (CFU/ml)	Counts (After Circulation for 1 hour) (CFU/ml)	Reduction(%)
Staphylococcus aureus	$1.2x10^5$	<1	99.99
Escherichia coli	$1.3x10^5$	<1	99.99

----oOo----

THE REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

Jeremy Li, M.R./Supervisor, Food Dept.
Signed for and on behalf of
SGS TAIWAN Ltd.

Figure 5 The report from SGS testing showing the elimination of bacteria.

Results

After one hour, the bacteria count was down to a minimal value of less than one per milliliter. This corresponds to at least a 99.99% reduction.

ALS BACTERIA TESTS

Date: 2011

Country: Hong Kong **Distributor: Hydropath Asia**

Keywords: Algae/ Bacteria

Filename: LabTest LD Test Results.pdf, LabTest LD Test Procedure

This was a report produced by the testing company ALS.

Method of Testing

The water tank was filled up with 15 litres of tap water. Water from the bottom of the tank was pumped through a pump and AquaKLEAR before returning to the water tank.

Culture used : *Legionella pneumophila* NCTC 11404

Summary of procedure:

Tap water is used and added with the suspension of legionella culture which is approx. 10^4-10^5 cfu/ml. This water sample is then treated by AquaKLEAR (Commercial & Industrial Ranges) for one hour at a flow velocity of 5m/s. Water sample was collected and transferred into sterilze bottles to carry out the legionella testing immediately and also conducted with the control for the comparison.

Testing result : The disinfection rate is 99.7% after the exposure of 1 hour in your system

Should you have any question, please feel free to contact us.
Yours sincerely,

Ivan Leung
Manager- Customer Services

Figure 6 The summary from ALS testing showing the elimination of bacteria.

The whole fixture was sanitized before adding Legionella with a population of $9.8x10^4$ to the water tank. Water was circulated through the AquaKLEAR by the pump for an hour. Sample water was then taken from the tank to test the bacteria count.

Results

It was found there was a 99.7% reduction in bacteria count as seen in the report.

ROYAL MILITARY COLLEGE OF SCIENCE

Date: 1995

Country: UK **Keywords: Limescale**

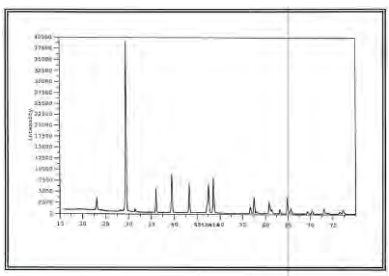
Filename: LabTest Shrivenham Military College

This report discusses the results of a test of Hydroflow on two stills used for producing distilled water in the chemistry laboratory of the Royal Military College of Science, Shrivenham, UK. The laboratory were having a problem with scaling in the stills and so this was both a laboratory test and a practical trial of the units in operation.The operator had used magnetic water treatment devices before without any success.

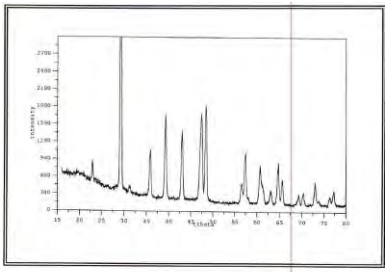
Method

The trial compared the operation of the stills with and without the Hydroflow unit. With the Hydroflow the minerals were deposited as powdery sediment at the bottom of the still, with no signs of encrustation on the glass container and only a small deposit on one particular area of the heating element.The deposits could be removed by simple brushing.

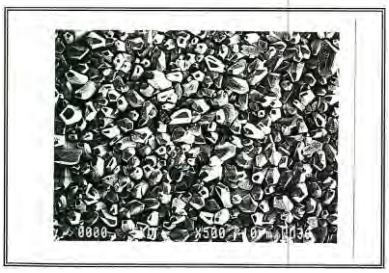
The unit was removed and the test repeated. Scale was again sedimenting at the bottom of the still. However, a thick layer of scale was observed on the glass wall and more scale was encrusting on the heating element. The scale had to be removed by acid cleaning.

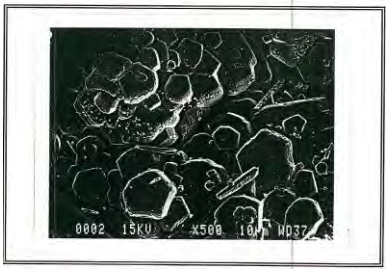


X-ray diffraction analysis and scanning electron microscope photograph taken of the sediment formed midway through the stage when Hydroflow was not connected.



X-ray diffraction analysis and scanning electron microscope photograph taken of the sediment formed midway through the stage when Hydroflow was connected.





The trial was a success and the laboratory bought two units.

A &L Laboratory Bacteria Testing

Date: 2012

Country: USA Keywords: Algae/ Bacteria,

Distributor: Hydroflow Holdings USA

Filename: LabTest A & L Laboratory biokill.pdf

This report details testing by A&L on the effect of S38 unit on various types of bacteria: Ecoli, Klebsiella pneumoniae and Pseudomonas aeruginosa.

The test system was a closed loop plumbing system with a flow rate of 2.1 gpm. Know bacterial quantities were added and then the unit was switched on.

The microorganisms were circulated around the system for 30 minutes.

Results

Table #1 Microorganisms Titer-logarithmic Reductions and Percent Kill 2.1gallons/minute Water Flow [Duration Time = 30 minutes].

Organisms	Control	Result	Log Reduction	%Kill
E.coli	8.32E+06	4.13E+03	3.3042	99.9504 %
Klebsiella	9.14E+05	5.83E+04	2.1955	99.3624 %
Pseudomonas	1.03E+07	1.37E+04	2.8774	99.8674 %

A table of the results is reproduced above. The bacterial kills were all 99.3% or above, with an average of 99.7%.

This corresponds to a log 8 reduction in the number of bacteria – a significant kill ratio.

AQUAVET FISH DISINFECTION

Date: 2013

Country: USA Keywords: Fish, , Algae/ Bacteria

Filename: LabTest Aqua Fish Disinfection

This was a highly detailed laboratory test over 90 days on how Hydropath technology could prevent bacterial infection (specifically *Aeromonas*) in tank-bred fish. Fish stored in a tank with water circulated through a Hydropath unit had their disease and bacteria levels compared to fish in untreated tanks.

Results

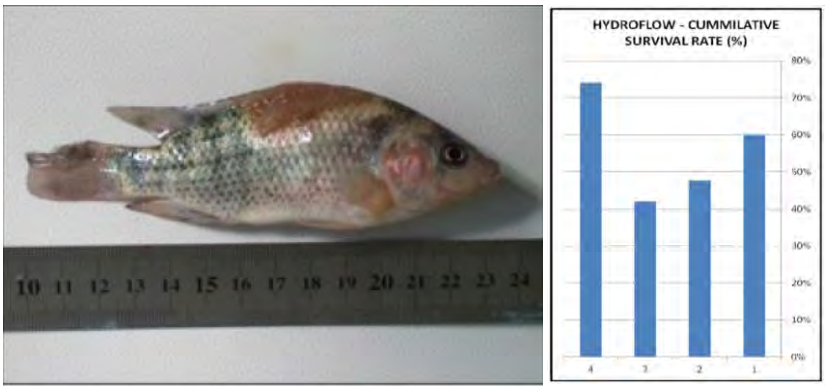


Figure 7 (Left) Infected untreated fish (right) Treated tank IV has higher survival rate.

The results were dramatic

- Survival rate of fish in treated tank 23% higher
- Bacterial counts 10-100 times lower
- Improved feeding behaviour
- Lower levels of bacterial, parasitic and fungal infection

FIELD TEST REPORTS

INTRODUCTION

This section describes tests that were not done in a laboratory under controlled conditions, but instead looked at the effectiveness of the technology in a real, working system.

The studies may not have the same level of control and detail as the Lab tests, but have the advantage of showing the real-life benefits of Hydropath Technology.

HAIFA CHEMICALS

Date: 1994

Country: Israel Distributor: Palbar

Keywords: Limescale, Cooling tower, Heat exchanger, Corrosion

Filename: FieldTest Haifa.pdf

The customer wished to replace the scale-prevention chemicals that were previously used. After laboratory testing and consultation with other companies, they determined that Hydropath was the leading physical water conditioner. They followed up this laboratory-based research with a field test. The test was done on a tube-in-shell heat exchanger. The exchanger used was an old one that had become severely blocked by scale.

Method of testing

A C100 HydroFLOW unit was placed on the inlet to the heat exchanger taking cooling tower water. The exchanger was weighed before and after the test to determine the amount of scale deposited. The temperature and pressure were measured before and after the heat exchanger.

Figure 8 The scaling of a tube in shell heat exchanger before treatment (left) and after three months treatment with Hydropath (right)

Results

The amount of scale in the exchanger was found to decrease over time -at the end of the test “the tubes were completely clean with no sign of any scale deposits” (page 11). This could also be seen in the increase in temperature of the cooling water at the outlet (page 9) and the decrease in the temperature of the condense water at its outlet (page 10). A heat exchanger is supposed to transfer heat from the condensed water to the cooling water so this is the desired results. The corrosion was reduced due to the formation of magnetite (page 11).

The conclusion of the report was that:

"The analytical results of the experiment provide categorical evidence that HydroFLOW devices act dramatically on existing scale in heat exchangers and pipes and that they prevent the formation of new scale. Against any criteria, the results of the experiment are good and Hydroflow has enabled proper and continuous operation while significantly suppressing the process of precipitation."

Broiler Chickens (UK)

Country: UK

Keywords: Broiler chickens, Agriculture

Filename: FieldTest Chickens UK.pdf

A test was performed on an early version of the domestic Hydroflow unit, the HS28, by an independent testing company in the UK.

Method of testing

An HS28 was placed between the water storage tank and the points from which the chickens were drinking on chicken house No. 1, and comparisons were made with chicken house No. 2. The study looked at a range of criteria, including the water consumption, the mortality of the chickens and the weight of the birds.

Results

The results were very positive -there was a large increase (18%) in the amount of water consumed by the birds, a drop in mortality by a third and an increase in bird weight. Other criteria also showed good results -such as the increase in feather quality.

As the HS28 was an early unit not designed to have an effect on bacteria, it seems likely that these benefits were primarily due to an anti-scaling effect. Reducing the scaling of the drinking water supplies would make it much easier for the birds to consume water and lead to a subsequent increase in their health.

BROILER CHICKENS (ISRAEL)

Country: Israel Distributor: Palbar

Keywords: Broiler chickens, Agriculture, Algae/ Bacteria

Filename: FieldTest Chickens Israel.pdf

A test was performed to see how HydroFLOW would improve the performance of broiler chickens. This was done at an experimental farm. As well as looking at the water consumption and weight increase of the chickens, the microbial content of the water was analysed.

Method of testing

A group of 2000 chickens fed with tap water treated by HydroFLOW was compared to a control group fed with untreated tap water.

Results

The treated water was visually clearer than the untreated tap water, and the Total Suspended Solids very low. The bacterial count of the treated water was significantly lower than the untreated water, and the mortality was reduced from 5.5 % to 4.1 %, i.e. the mortality was cut by a quarter.

The test did not show a significant increase in the water consumption or body weight of the chickens, unlike the test in the UK (test 2.3). It is likely that the chickens in this ”experimental farm” were kept in much better conditions with a much better supply of water and so the improvements in the results was not as dramatic as in the UK.

BARCEL LERMA FACTORY

Date: 2007

Country: Mexico Distributor: Ecobabu

Keywords: Limescale, Steam boiler, Factory

Filename: FieldTest Barcel Steam English.pdf, FieldTest Barcel Steam Espanol

This test evaluates the effectiveness of HydroFLOW units on steam boilers. This is a clearly-written report, with good descriptions of the savings and benefits of the technology.

Method of testing

Units were installed onto three boilers in 2006. The amount of scale initially was assessed, and then a small area was cleared of scale. This allowed the users to monitor how HydroFLOW prevented the build up of new scale, and also the removal of existing scale. The chemical composition of the water was analysed, to check that the units did not cause corrosion. If the units corroded the boilers, then there would be iron released into the water and so the iron levels would be high.

Results

There are many pictures in the report showing the removal of the existing limescale over time. In addition the report came to the following conclusions about the HydroFLOW units:

- *They eliminate the formation of crust (calcareous, without the need of chemical additions*
- *They do not cause corrosion (iron values at low ppm)*
- *They avoid the cost of chemical products applications and contribute to take care of the environment*
- *They assure a reliable and efficient operation, given that they do not call for frequent inspections and samplings (less maintenance), they work 24/7.*
- *They avoid the use of softeners due to the ionic exchange and the maintenance related to this equipment.*
- *They avoid the decrease in the boiler efficiency due to incrustation build-up*

The report notes that the cost of chemical treatment alone is $ 73,722 per year. Taking all the other savings into account, the Return on Investment (ROI – by the time it takes before the units “pay for themselves”) is 2.39 years.

Royal Scientific Society Study

Date: 2007

Country: Jordan Distributor: Jordan House

Keywords: Limescale, Corrosion

Filename: FieldTest Royal Scientific Society.pdf, FieldTest RSS Summary.pdf

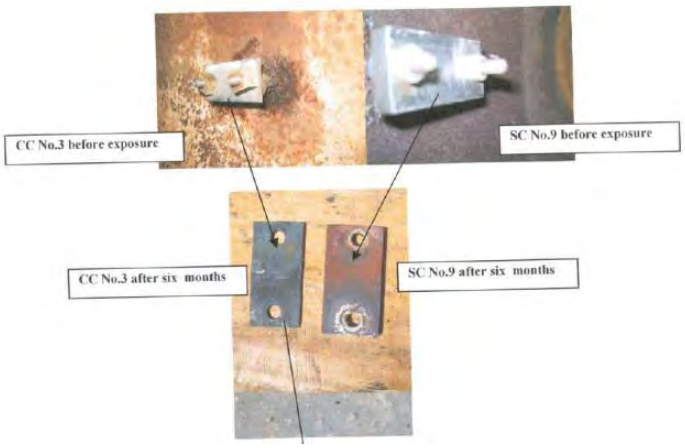


Figure 9 Images showing the corrosion coupon (left) and the scale coupon (right) before installation and after six months. The pictures show how little corrosion has occurred and how little limescale is present.

This test describes how HydroFLOW was sucessfully applied to reduce limescale and corrosion in a steel factory.

Method of testing

The entire system was treated with HydroFLOW units and 14 of metal coupons were placed inside the pipework. The amount that these corroded, and the buildup of scale on them, was monitored over a period of a year. In addition, the pipes were checked visually at random points.

Results

The results are summarised nicely in FieldTest RSS Summary.pdf. The conclusions of the report were that HydroFLOW

- Reduced the amount of Sulphate Reducing Bacteria in the system
- Slowed corrosion more than the chemical treatment did
- Eliminated limescale in the system

LINNEO DE PAULA MACHADO

Date: 2010

Country: Brazil Distributor: ESA Engenharia

Keywords: Limescale, Corrosion, Cooling tower

Filename: FieldTest Paula Machado English.pdf, FieldTest Paula Machado Portugues.pdf, FieldTest Paula Machado detail.pdf

Figure 10 Images of the Linneo de Paula Machado condominium building cooled by the cooling towers in this study.

This case study follows two sets of cooling towers (10 towers in total) used to cool condominium blocks over two years. The study showed that HydroFLOW could be used to treat cooling towers with high concentrations, even in the presence of large fluctuations in the composition of the water.

Method of testing

The two sets of towers were treated with custom AquaKLEAR 12 inch units, with the water circulating between the sets treated with an AquaKLEAR P60. The water in the towers was monitored for several properties, including ΔP (Delta P) the entry and exit temperatures (allowing a calculation of ΔT), the water conductivity,the concentration, the pH, etc. As well as monitoring the changes in the conductivity, the reasons for these changes was also noted (e.g. cleaning of system, contamination, etc.)

Corrosion coupons were also placed in the pipes and the corrosion rate monitored. Finally, a visual inspection of the heat exchanger surfaces was also performed.

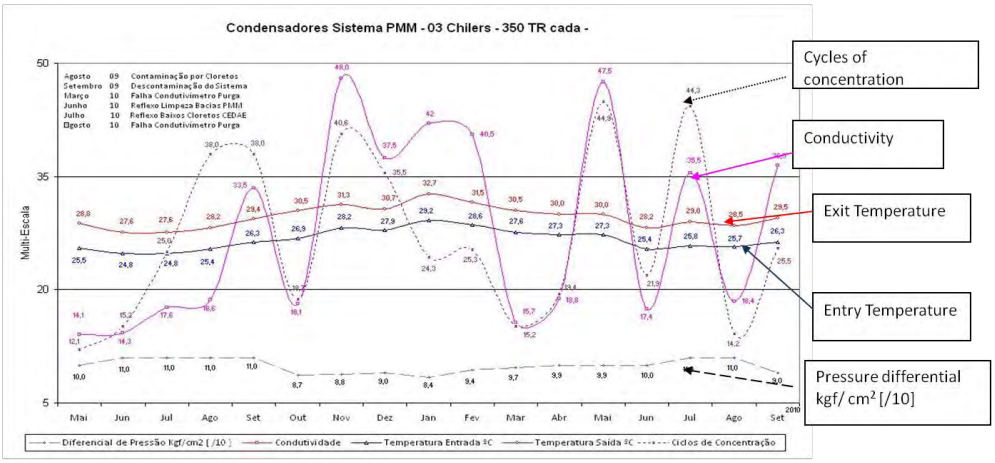


Figure 11 Plot showing how the temperature and pressure differentials in the cooling towers remained constant despite large changes in the water concentration.

Results

One of the main results was that the temperature and pressure differentials (ΔP, ΔT), which measure how well the tower is working, remained almost constant despite large fluctuations in the concentration (and hence conductivity) of the water (figures 2,3 5 and 6 in the report). This shows that HydroFLOW protects the cooling towers for a very large range of water conditions, and allows operations at higher than usual concentration levels (page 1, paragraph 6). This in turn led to a large reduction in the amount of backwash/ replacement water required.

The corrosion coupons showed that corrosion was reduced to an extent that no other chemical treatment was required (page 5). The amount of bacteria in the system was also shown to have been greatly reduced (tables 4, 5).

Figure 12 Photographs showing the heat exchangers before HydroFLOW in 2008 (left) and after HydroFLOW in 2010 (right). The clean-up of existing limescale is clearly visible in these images.

WILLIAMS GAS PIPELINE

Date: 2011

Country: USA Distributor: Hydroflow holdings USA

Keywords: Limescale, Gas pipeline

Filename: FieldTest Williams.pdf

This installation is on a Booster station on a gas pipeline in Washington, USA. The pipeline transfers gas through the northwestern USA, and is boosted by a set of engines in the station.

These engines need to be heated up rather than running from cold, by preheated water that passes through the engine jackets. This water is on a closed loop and is not exceptionally hard but nevertheless causes scaling in the engine jackets.

In September 2010, a HydroFLOW C160 unit was installed on the water inlet pipe to the boiler to protect the system.

Figure 13 The installation of the unit on the boiler for preheating the engines in the Williams pumping station

Results

Over four months, the hardness of the water was measured, as was the corrosion rate. The harness started at 16ppm before installation and was down to 0ppm after four months.

The ferrous metal corrosion rate was also measured. This started at 0.33 mils per year. After four months this had been reduced to 0.22 mils per year.

HULA VALLEY CENTER FILTRATION

Date: 2007 Country: Israel

Keywords: Flocculation, Turbidity

Filename: FieldTest Hula.pdf

This is a facility in eastern Dan which filters drinking water for the Hula Valley Centre communities.The water source is from the river Dan which is about 6 km up from the facility, using the eastern line which also deals with agricultural needs. The facility filters about 400 m3 through a rapid sand filtration system, and the total system operational pool volume is 4000 cubic metres, with pipeline diameters 6” -20” over a length of about 15 km.

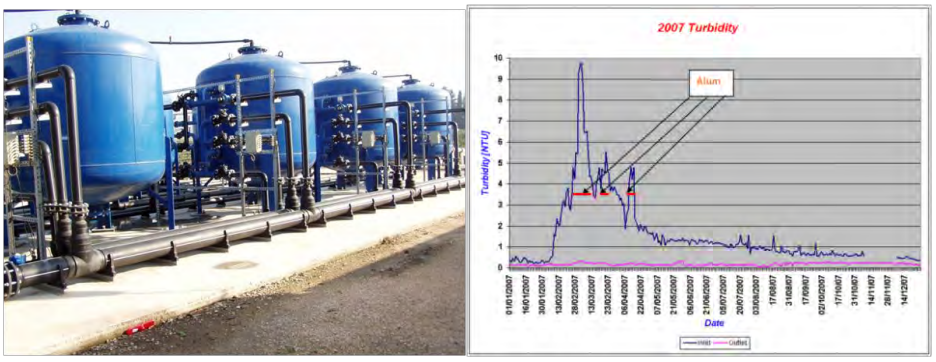


Figure 14 (Left) The sand filters at the Hula Valley Centre Plant. (Right) A plot showing the incoming and outgoing turbidity before and after the filters. Despite the large variation in incoming turbidity, the outgoing level remains low and constant, and even drops to essentially zero at times.

The problem was to try to reduce the turbidity of the water that was occurring due to very fine suspended particles. The existing filters were unable to reduce the turbidity level on their own. The plant wished to replace their Alum flocculant with a more environmentally friendly solution. A HydroFLOW Custom 8 inch unit was installed before the sand filters, along with a static mixer to increase turbulence.

Results

The trial ran for the whole of 2007. The turbidity level was measure on the incoming water, and again after the filters in order to evaluate the system. The regulations required that the turbidity level was kept below 0.1 NTU.

The system had a huge benefit, and consistently kept the turbidity within the required amounts. The outgoing turbidity was maintained at a low level throughout the year despite large seasonal variations in the incoming turbidity. At times, the turbidity dropped enough to be measured as zero on the recording equipment. A very small amount of Alum was added in parallel during turbidity spikes in the spring.

Wakiki Marriott Hotel

Date: **2011**

Country: Hawaii, USA Distributor: Hydroflow Holdings USA

Keywords: Algae/ Bacteria, Hotel

Filename: FieldTest Marriott Wakiki.pdf

This is an installation on a water feature in the Marriott Wakiki Hotel in Honolulu Hawaii.

The pond was showing significant algae buildup. Of particular interest is that this water feature does not have any filtration system installed. This meant it had to be vacuumed clean every other day.

Figure 15 The water feature before installation of AquaKLEAR (left) and two weeks later (right)).

Results

- The increased clarity of the water was noticeable within 3 days.
- The algae reduced by over 90
- The hotel completely stopped vacuuming the water fixture!
- Estimated Return on Investment due to maintenance cost savings: 612 months

LALA Tizayuka

Date: 2011

Country: Mexico Distributor: Ecobabu

Keywords: Algae/ Bacteria, Hotel

Filename: FieldTest LALA Tizayuka Espaniol.pdf

This field test describes an installation at the cooling tower of the Tizayuka factory of the LALA dairy group. The pressure on the entry and exit of the compressors was measured and the state of the interior of the compressor was monitored, as was the state of the cooling tower fins. The TDS of the make-up water for the tower was 500ppm.

Results

Over the testing period of around nine months, the towers were monitored monthly. Over this period, the pressure at the entrance to the compressors remained the same, indicating that they were not becoming blocked with scale.

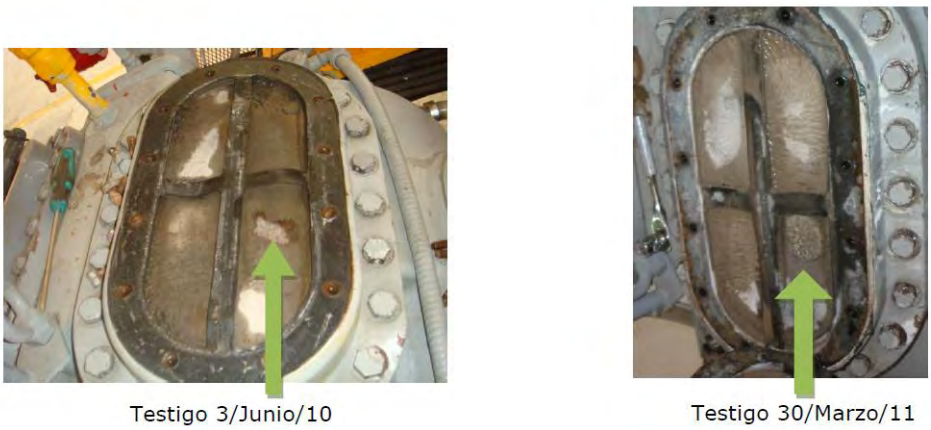


Figure 16 The internal state of the compressors at the beginning (left) and end (right) of the trial period, showing that there has been no buildup of scale.

The interior of the compressors remained free of hard scale, although a “sludge” was found in the compressors where the particulate scale had built up -it was recommended that a sand filter was introduced to eliminate this.

The cooling tower fins were also found to be free of scale, and that some pieces of scale had become detached from the tower fins.

3/Junio/10 Torre de enfriamiento

30/Marzo/11. Torre de enfriamiento

Figure 17 The cooling tower fins at the beginning (left) and end (right) of the trial period, showing that there has been no buildup of scale.

Hilton Meats

Date: 2009

Country: UK

Keywords: Limescale, Algae/ Bacteria, Food industry

Filename: FieldTest Hilton Meats.pdf

In September 2009 Hydropath were approached regarding scale management of tray washers in Hilton Meats, Huntingdon, UK. The existing chemicals were not controlling scale of the spray jets and tanks meaning that they had to be acid cleaned weekly, which was attacking the pumps resulting in them having to be refurbished every 6 or so months. Hydropath explained that their technology would not only eliminate scale problems, it would also kill bacteria, allowing a great reduction in the use of biocide.

Figure 18 A tray washing unit treated by Hydropath for limescale and bacteria.

On 17/12/2009, an AgriFLOW Unit was fitted to the Unit B tray wash. The results were monitored for both scale build up and bacterial contamination. The bacteria levels were tested by swabbing the trays after they had been washed. Following the success of the first installation, Hydropath returned nine months later, in August 2010, to fit AgriFLOW devices to the tray washing units A and C.

An additional HydroFLOW C unit was fitted to prevent scale in the hot water supply in October 2010.

Results

The bacteria levels in the tray washers has stabilised

Biocide detergent is being added at a much reduced level just as a precaution. The savings on detergent are 75%. This corresponds to a saving of approx 12 l/biocide per tray wash, per day.

Estimated total biocide saved is around 5000 litres/ year.

None of the tray washers need acid cleaning weekly -Saving 75 litres of acid per week, for approx 40 weeks/year. The estimated total acid saved was 3000 litres/year

The cast iron pump housings on the tray washers were attacked by the regular acid cleaning. Stopping acid cleaning has saved on service replacement of pumps equivalent to twice per year on Units B and C and once per year on Unit A i.e. five Pump replacements per year at a total cost of circa 4,500 per year

Unit B hot water supply -the hot water is used in various sterilisers around Block B. The pipework downstream of the water heater previously needed to be regularly acid cleaned to remove scale. This is no longer necessary and the pipework appears to have gradually cleaned itself since the fitting of the HydroFLOW C unit seven months ago. This has saved on acid costs and labour costs.

Savings

- Biocide 5000 litres/ year
- Acid 3000 litres/ year
- Pump replacements 4,500/ year
- Weekly clean down labour savings
- Additional acid cleaning on hot water supply
- Additional labour on hot water supply

NORTH EAST SPORTSPLEX ARENA

Date: 2011

Country: Canada **Distributor: Hydroflow Canada**

Keywords: Cooling Tower, Limescale, Algae/ Bacteria, Biofouling

Filename: FieldTest NESS Arena

Figure 19 The NESS arena

The Don Hartman North East Sportsplex in Calgary contains a range of sports facilities, including two NHL-sized ice arenas, and two gymnasia. The complex uses a large evaporative cooling tower to cool down the compressed ammonia that is then used to freeze the ice.

The cooling tower was suffering from both limescale and biofouling and contamination, despite the use of biocides. The arena's water hardness was 210 mg/l, and the make-up water volume was 10m^3/day (average). This corresponds to 2.1 kg (4.6 lb) of scale being deposited DAILY due to the water evaporation in the cooling tower.

An AquaKLEAR P120 was installed on the tower. The scale inhibitor was taken off-line, and the biocide level reduced by 50%.

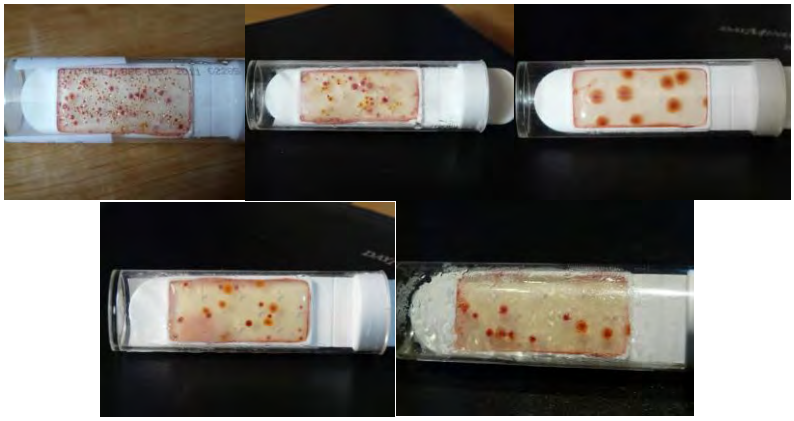


Figure 20 Bacterial samples taken (L-R, T-B) Before installation, 18 days after install, 50 days after install and 68 days after install. After install, biocides were reduced 50%. In the final sample, the biocides have been reduced by 75%.

Bacterial samples we taken prior to installation and at intervals afterwards. B efore installation, the bacterial count was 10^4 – 10^5, where the maximum permitted level is 10^6(i.e. 1,000,000). After installation, the biocides were reduced by 50%. 18 days after installation, the bacterial level was tested again, and found to be 10^3 – 10^4 – even withthe reduced biocide. 50 days after installation, the level was below 10^3(i.e. 1000) so the biocides were reduced further – to a total of 75% reduction from the original level. The reading after 68 dyas, with a 75% reduction in chemicals, was 10^3 – much lower that either the maximum permitted level or the original level using biocide treatment.

Figure 21 (Left) The condenser tubes with a small amount of remaining scale (center) Granular scale in the tower holding tanks and (right) the scale reomved from the remote sump tank.

The condenser tubes showed no biofouling, and also remained largely free of scale – the small amount remaining was not enough to cause a problem. However, large amount of granular scale appeared in the tower sump tank and the remote holding tank. This indicated that the unit was removing the existing scale from the system (especially the condenser tubes), and that it was precipitating in the tanks.

The customer is very happy as he has been able to reduce his biocide use by 75%, and completely eliminate the use of scale inhibitors.

TESCO COOLING TOWER

Date: 2009

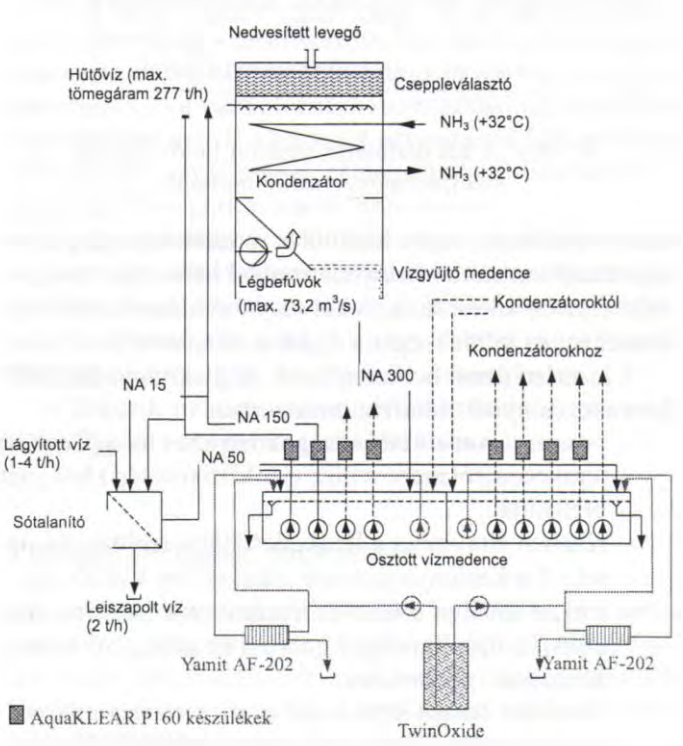
Country: Hungary Keywords: Limescale, Cooling Towers,

Distributor

Filename: CaseStudy Tescos Cooling Tower and Power Station.pdf

This case study presents a trial done on a cooling system installed in a Tesco Supermarket in Hungary. Tesco are UK-owned, and are the third largest retailer in the world after Walmart and Carrefour.

The installation was on a system used to cool ammonia condensers. The ammonia passes through pipes in the "cooling tower" and is either cooled simply by the air flow across the pipes (in Winter) or by water sprayed onto the pipes. The water sprayed is well water, so it is extremely hard. Even though the system was protected by two ion-exchange softeners, their incorrect operation meant that scale had built up on the surfaces of the condenser tubes, reducing efficiency and increasing the electrical energy used in the cooling process.



As this system is "half closed", as well as fitting an AquaKLEAR P160 unit to the inlet of each cooling tower, two filters were fitted in a side-stream arrangement to remove the powder-like crystals formed by the technology.

AquaKLEAR prevented the build-up of new scale on the condenser pipes, and dissolved the existing scale from the condenser casing and the cooling water ppipes. Aquaklear was not able to remove the scale from the (hot) condenser tube surfaces as the water was sprayed over them, rather than flowing over them, but was able to remove it from the (cooler) outer casing and the cooling water system.

Following the cleansing of the inner sections of the water cooling system pipes and the external surface of the condenser pipes, *the cooling water system, and consequently the circulated cooling water, became "clean".*

- Only suspended impurities smaller than 50 µm remained in the circulated cooling water.
- The dissolved minerals from the well water no longer deposited on the condenser pipes or cover, therefore the surface became free from $CaCO_3$.
- As the cooling water became free from suspended impurities larger than 50 µm, the blow-down process was only necessary to maintain the concentration of dissolved minerals. The quantity of blow-down water (loss of cooling water) was also less.
- After the cleansing of the cooling water system, the number of automatic re-rinsing of the 50 µm Yamite filters was reduced to tenth of the original number.
- The daily electrical energy consumption was reduced from 44,000 kWh/day to 35,000 – 38,000 kWh/day (representing a reduction of 14 - 20%), whilst the cooling requirement was increased due to the demand from a newly built workshop, 14,000 m^2 in size.
- The monthly average water cost was reduced from 3600,000 HUF/month, registered in 2007, to 150,000 HUF/month.
- The Na-Ion exchanges are not used and so no longer emit anything into the environment.

Oil Cooler in Power Station

Date: 2010

Country: Hungary Keywords: Limescale, Power Station, , Oil cooler,

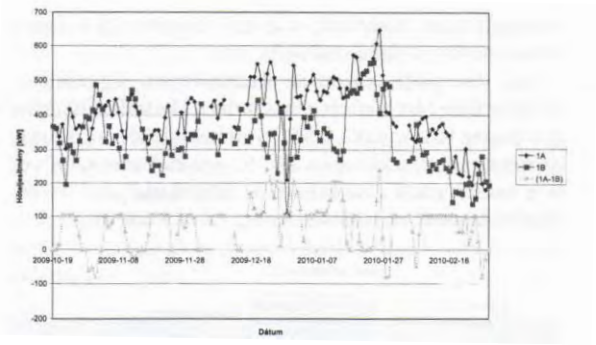
Distributor

Filename: CaseStudy Tescos Cooling Tower and Power Station.pdf

This case study describes the treatment of an oil cooler in a power station. The oil cooler used very hard lake/ river water, in a multiple pipe system. This was an old system that had previous needed to be descaled every 3-4 years using acid treatment. The oil cooler treated by AquaKLEAR (1A) was compared with an identical one (1B) that remained untreated.

The test ran from 19th October 2009 to 28th February 2010, lasting for 123 days with 9 days of down time. The temperature of the cooling water and the temperature of the turbine oil was measured every hour by computer.

We obtained the hourly average incoming temperature of the cooling water from the database of the Block's computer. From the - supposedly constant – mass flow of the cooling water and the turbine oil, as well as from the temperatures measured we determined the untested incoming average temperature of the turbine oil, which was not permitted to exceed the 45 °C limit value.



The test confirmed that the AquaKLEAR equipment in open cooling water systems:

- Ensures that there is no deposit of minerals (especially $CaCO_3$) on the surface of the cooling side (inside the pipe).
- Partially removes hardness-causing salts (especially $CaCO_3$) deposited on the cooling water side.
- And thus *offers replacement for continuous mechanical (*for example: Taprogge balls) *and periodic chemical cleansing (*for example: acid treatment) *in cooling water systems*.

TSENG CHOI GOVERNMENT COMPLEX

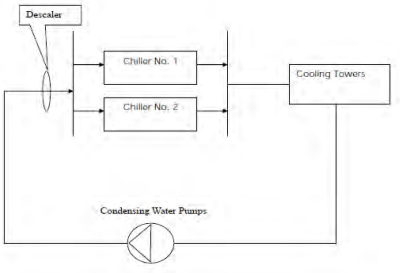
Date: 2011

Country: Hong Kong Keywords: Limescale, Government, Heat exchanger, Tube in shell

Filename: FieldTest Hong Kong EMSD.pdf

This was a study performed by the Electrical and Mechanical Services Department of the Hong Kong Governement to evaluate Hydroflow Technology in protecting large heat exchangers against scale (in fresh water).

The units were installed on the common header to two chillers with a cooling capacity of 455kW.The condenser tubes were initially cleaned in February 2010, before the year-long trial. They were cleaned again in January 2011, and baseline data was collected (i.e. without Hydroflow). Water temperature and flow as well as power consumption were logged.



Results

On analysis, the results show that the performance of the chiller went down when not protected, and increased when Hydroflow was installed.

- The estimated saving over the trial period was 71,493 kWh.
- This represents a **saving of 20.6%.**
- No scale was found in the condenser after a year.
- The estimated saving over a single year was $**64,344 dollars**

GOVERNMENT CITY HALL, HONG KONG

Date: 2011

Country: Hong Kong Keywords: Limescale, Government, Heat exchanger, Tube in shell, Sea water, Algae/ Bacteria

Filename: FieldTest Hong Kong EMSD.pdf, CaseStudy City Hall Hong Kong

Many of the buildings in Hong Kong use sea water cooling. This building used a "once through" method – i.e. the sea water passes into the heat exchanger, cools down the system, and then is discharged back to the sea. One of the common problems with sea water cooling methods is biofouling. The heat exchangers become clogged with biofilm and hard-shelled creatures. This blocks the flow and reduces heat transfer – the coefficient of performance (COP) goes down. The previous approach was to use a chlorinator, but new Environmental Department regulations have been introduced limiting the residual chlorine rate to 1ppm.

In this case study, the amount of maintenance was not the issue (this was handled by a sub-contractor), but the main concern was the energy lost due to the reduced efficiency.

The heat exchangers were cleaned in 2008, and baseline data (without Hydroflow) was collected for a year. In February 2010, an AquaKLEAR was installed and the Temperature, flow rate and power consumption monitored.and

After the installation, the problem of bio-fouling was much reduced and the COP was improved.

Results

The performance of the unprotected chiller went down over the measured period, whereas it increased when protected by Hydroflow.

- The estimated saving over the trial period was 25,780 kWh.
- This represents a **saving of 17.3%.**
- The estimated saving over a single year was $**23,202 dollars**

T.M Power Station, Japan

Date: 2012

Country: Japan Keywords: Flocculation, Sea water, Algae/ Bacteria Waste water Power Station

Filename: FieldTest TM Power Station

TM Power Station in Japan drains waste water to the sea. This water must meet certain quality criteria – in particular Nitrous Acid, ammonia and COD (chemical Oxygen Demand). For this reason, they were adding large amounts of chlorinate to the waste water.

An AquaKLEAR unit was fitted before the sand filter with the aim of reducing the Chlorine usage, whilst maintaining the required nitric acid and COD levels.

A unit was installed in August 2012 for a period of three months, and the pH, COD, SS (suspended solids) and Nitrous acid levels were measured after the filter, along with the chlorine usage.

Figure 22 The waste water treatment plant at T.M. Power Station

Results

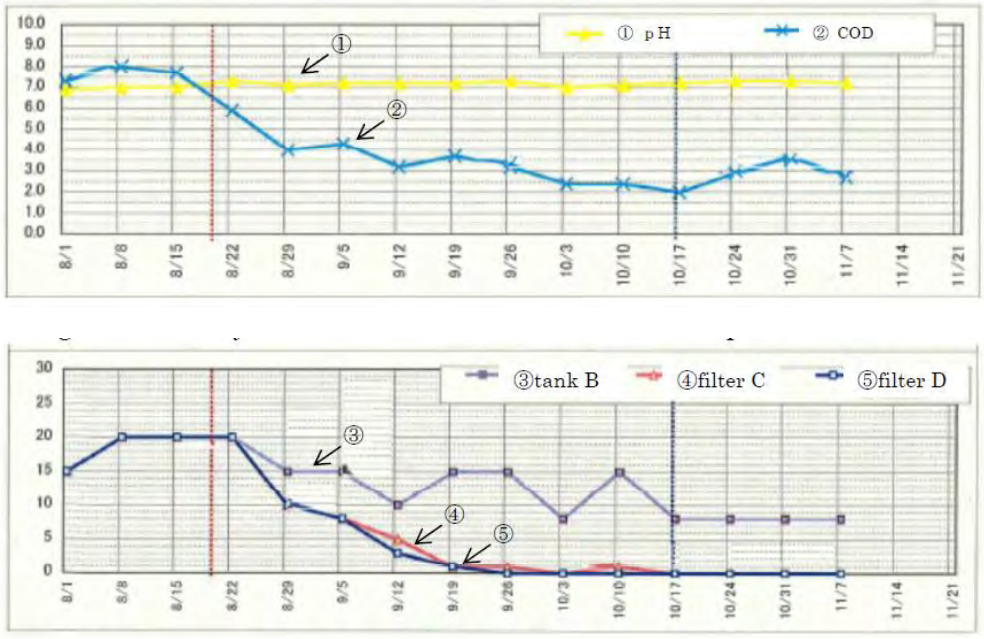


Figure 23 Upper plot: pH(yellow) and COD(blue) released to sea and lower plot Nitrous acid levels at various points

- pH has been maintained at the desired level of 7.1 – 7.3
- COD has been reduced from7.5 to 3.0 ppm (reduced x2.5).
- Nitrous acid reduced from 20 ppm to 1.0 ppm without adding any chlorine.
- It was not necessary to add any chlorine during of this test. (Saving cost)
- Water cloudiness reduced from 5.0 to 1.0 (very clean water.)
- S.S. (Suspended Solids) in the tank (B) for was reduced from 10.6 ppm to 5.0 ppm.

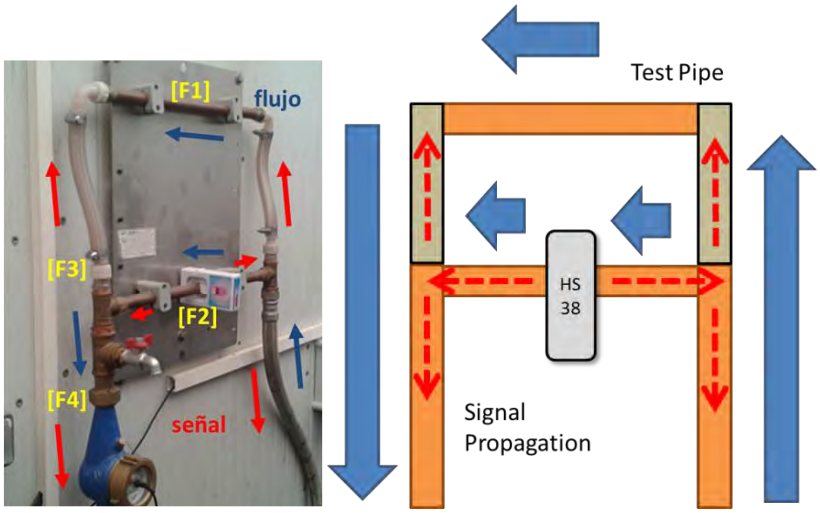
Car Wash Manufacturer

Date: 2013

Country: Spain Keywords: Limescale, Car wash

Filename: FieldTest Car Wash.pdf

A major manufacturer of **car wash machines** in Spain put a HydroFlow HS38 through a controlled test between April and December 2012.

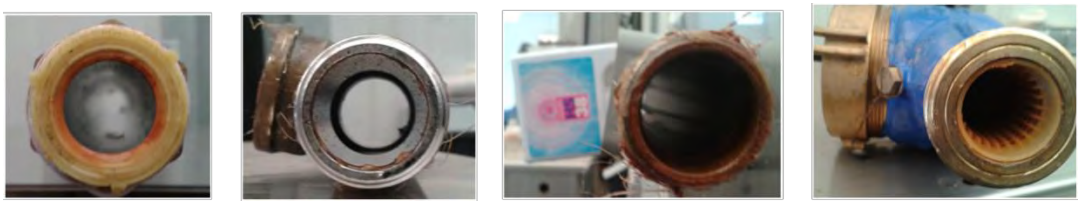


This trial was specifically designed to test the propagation of the signal, in particular upstream, and on different pipe material.The test system was arranged so that the water causing scale in the examined pipe would never actually pass through the unit, and so relied on the signal propagation for limescale protection.

Over nine months, some 500 m3 of main water was passed through the pipes. The water hardness was 45° (French scale).In that time, you would expect 1 or 2 mm of limescale to accumulate.

Results

After nine months, the pipes and flow metre were completely free from scale.



Quote

"I did not expect all the pipes to free of limescale. We now plan to further tests in a working environment, with a view to including HydroFlow in our product packs."

Norilsk Mining and Smelting Works

Date: 2012

Country: Russia Keywords: Mining, , Steel, Pipeline , Non-carbonate

Filename: FieldTest Norilsk Mining and Smelting

In this mining/ smelting works, Gypum (calcium sulphate, $CaSO_4$) is transported through pipelines of 219-245 mm OD for 1 km. The pipelines would scale up with gypsum deposits, reducing the flow to the extent that production stopped for cleaning, as often as every 1.5 months. The scaling could be so extreme the pipes would completely block.

Hydroflow Custom 12” were fitted and the flow rates (volume and mass) compared to untreated lines.

Results

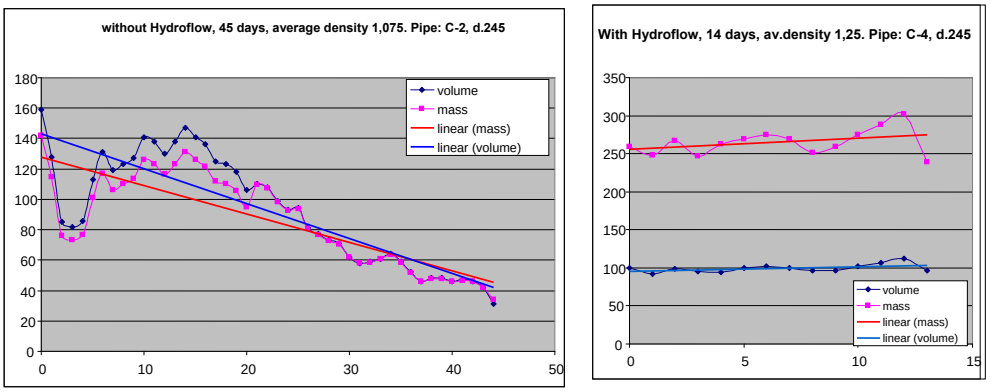


Figure 24: Large diameter pipes. (Left) the flow in the untreated pipe deceased until it reached the critical value (42 m^3/ h) after 45 days.(Right) the treated pipe show no decrease (and even a slight increase) in flow rate.

On the large diameter (245mm) pipes, the flow rate of the untreated pipe decreased constantly until it reached 42m^3/ h, after 45 days. The treated pipe showed no decrease (and even a slight increase) over the trial period. The trial needed to be stopped early for other production reasons, but there was no decrease over the period measured.

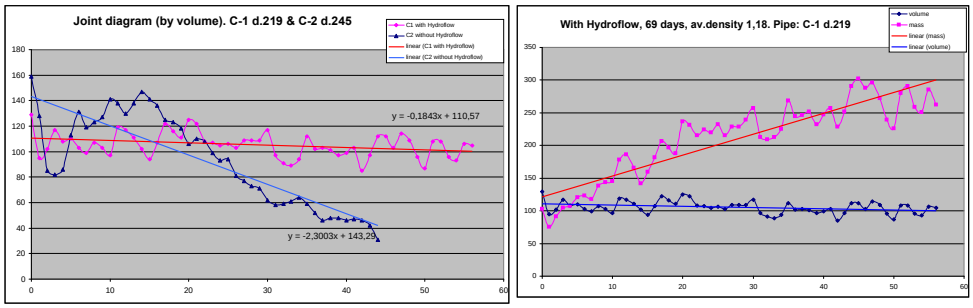


Figure 25: (Left) untreated pipe shows significant decrease by volume in blue (Right) the treated pipe shows near-constant flow rate. During this period, the density of the fluid went up, so the flow rate by mass (red) drops less (untreated) or increases (treated)

On the slightly smaller pipes (219mm) there was again a dramatic decrease in the flow rate (by volume) without Hydropath. With Hydropath, the flow rate remained almost constant.

The untreated pipe was again stopped when it reached its critical value, while the treated pipe did not drop to the critical value within the trial period. While the treated pipe did appear to have a very slight decrease in (volume) flow rate, it is so small as to be within the natural variation, and could be due to the increased desity of the material. Even assuming the decrease is “real”, the period of time between cleanings was extended by **9 times.**

Flow rate in larger pipe did not decrease during trial period

Flow rate in smaller pipes was almost constant

Increased time between cleanings by at least 9 times

Total pumped mass during trial 2.26 times higher, with 20% smaller pipe area

Waste Water Treatment in Reycled Paper Mills

Date: 2009

Country: Indonesia **Keywords: Flocculation, Waste water, Algae/ Bacteria Paper**

Filename: FieldTest Recycled Paper Waste Water

The waste water from paper mill recycling factories contains a large amount of material, both suspended and dissolved. This water needs to be treated until the dissolved and suspended amounts meet government regulation before it can be disposed of.

In addition to this, the high levels of material being fed into the Aerator (biological reactor) mean that the Aerator parameters became very unstable and the bacteria colonies took a long time to recover after collapse.

An Aquaklear P120 was fitted before the sediment tank.

Results

- Material levels (COD, BOD, TSS) remained within government regulations
- Bacterial recator more stable, coping with levels up to 2,500 ppm COD
- No “bubble effect” (excess production of CO2), saving $50-$200 Month on CaCO3 for treatment.
- Bacteria levels recover in 2days rather than 1-2 weeks
- Production capacity increased by 20%
- Improved performance allowed shut-down of main Oxygen Supply pump, reducing energy use from 82.5 kW to 37.5 kW

CASE STUDIES

INTRODUCTION

This section describes case studies. Of course, the difference between a “case study” and a “field test” is a matter of opinion.

I have chosen to define a case study as a story (usually written by a distributor) that, although it may contain numerical information or savings, does not have a detailed technical analysis of the trial. Basically, if it has a graph or a table, it is a field test, otherwise it is a case study!

SHANXI COAL OFFICE BUILDING

Date: 2003

Country: China Distributor: Hydropath Asia

Keywords: Plate heat exchanger, Limescale, Office, Hotel

Filename: CaseStudy Shanxi Coal.pdf

Shanxi Coal Building is an office and hotel complex. There were multiple three-plated heat exchangers connected in series supplying hot water to the complex.

Figure 26 The C100 HydroFLOW protecting the heat exchangers in the Shanxi Coal Building.

Results

Before HydroFLOW was installed, noticeable traces of scale were seen on two plated heat exchangers. Regular monthly cleaning on these heat exchangers was a routine job in order to maintain the heat exchangers efficiency and to provide enough hot water supply within the complex.

One C100 was installed in October 2002. The customer reported that the plate heat exchangers did not need cleaning after four months. In addition, existing traces of scale on the two plated heat exchangers disappeared.

CATHAY MURNI GARMENT FACTORY

Country: Indonesia Distributor: Hydropath Asia

Keywords: Fire tube, Steam boiler, Limescale, Factory, Textiles

Filename: CaseStudy Cathay Murni Steam.pdf

The Cathay Murni Garment factory requires large quantities of hot water for washing garments and of steam for ironing. These are supplied by a 20-year-old fire-tube steam boiler. The boiler was kept in good condition by adding water softener chemicals every other day. The boiler was cleaned annually. Underground water with hardness 200ppm was used for the boiler.

Figure 27 The 20-year-old steam boiler is protected by a HydroFLOW unit (left). The inside of the boiler remains free of scale, with only a light dusting of powder visisble (right)

Results

The water softener previously used was removed.

Before treatment with HydroFLOW, blow down was done once a day for 20 seconds. For the first three weeks, blow down frequency was increased to 10 seconds per hour to eliminate/clean existing scale within the boiler

After three weeks, it was noticed that the TDS at blow down dropped to below 1500ppm. It was estimated that fuel consumption was reduced by 30%. The boiler was also opened for inspection and it was found to be free from hard scale.

Felda Pengelli Factory

Date: 2003

Country: Malaysia Distributor: Hydropath Asia

Keywords: Water tube, Steam boiler, Limescale, Factory, Palm oil

Filename: CaseStudy Felda Pengelli Steam.pdf

This is an application on a steam boiler in a palm oil factory. The 45-ton boiler is made by Vickers Hoskins and is 4 stories in height, and operates at 450 PSI.

The boiler was originally protected with a water softener, but even so there was still a problem with limescale, so HydroFLOW was used as protection.

One HydroFLOW S120 and one C100 were installed on September 2003. Automatic blow down was set at 20 seconds in 25-minute intervals.

Figure 28 The 45 ton, 450 PSI Vickers Hoskins steam boiler used in the factory. It is four stories high.

Results

After 3 months, the boiler was opened for regular inspection. There was no scale found inside the boiler. TDS at blow down was kept at 1000ppm.

Ki Mei Hospital

Date: 2002

Country: Taiwan Distributor: Hydropath Asia

Keywords: Cooling tower, Limescale, Hospital, Competing water conditioner

Filename: CaseStudy Ki Mei Tower.pdf

Ki Mei Hospital is one of the most prestigious hospitals in Taiwan. Water with hardness above 150ppm is common in the area. Permanent magnet type water conditioners were used in some hospitals in Taiwan before, but without success. A HydroFLOW C series unit was installed in June 2002.

Figure 29 Ki Mei Hospital is one of the most prestigious hospitals in Taiwan. The cooling towers were kept free of scale using HydroFLOW. Note the existing magnetic water conditioner that had been installed without any benefit.

Results

The condenser was operated at its full efficiency after HydroFLOW was installed. Blow down at the cooling tower was carried out once a month in the winter season and once a week in the summer. Chemical dosage was totally eliminated. The hospital authority was so pleased with HydroFLOWs performance, that they recommended HydroFLOW to other hospitals in Taiwan.

JINAN STEEL

Country: China Distributor: Hydropath Asia

Keywords: Limescale, Factory, Steel

Filename: CaseStudy Jinan Steel.pdf

In the Jinan Steel factory, the furnace cover needed to be protected from the extreme heat -a temperature of 1800deg. To cool the furnace cover, water was passed through 160 3.8 mm pipes within the cover. This is similar to the cooling that is sometimes done with casting molds. The water hardness in the factory was 320-380ppm.

As the water cooled the cover and became heated, it deposited scale in the pipes. These pipes soon became blocked. Production need to be stopped every week to bypass the blocked pipes, and the cover needed to be replaced every six months.

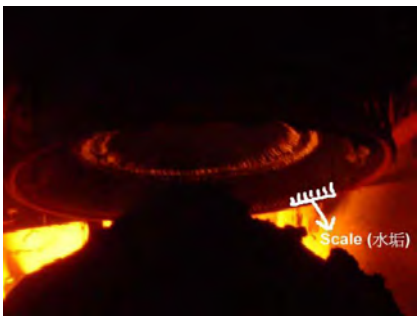


Figure 30 The cover of the furnace at the Jinan Steel factory protected by HydroFLOW.

Results

There were three production lines in the factory and one HydroFLOW C160 was installed for each line. After 6 months of installation, two production lines never had to be stopped because of scale blockage. The third line was only stopped twice during the same period.

Figure 31 Heat exchangers at Jinan steel factory protected by HydroFLOW.

The cost of each cleaning operation was estimated to be $6000. In the six month period, the HydroFLOW units reduced the cleaning costs from 3 × 26 × $6000 = 468, 000 to 1 × 2 × $6000 = $12,000 a saving of $456,000 in six months -almost a million dollars per year.

Guangxi Vannei Group Pipeline

Date: 2001

Country: China Distributor: Hydropath Asia

Keywords: Limescale, Factory, Steel, Pipeline

Filename: CaseStudy Guangxi Pipeline.pdf

The factory makes gas (C2H2) for steel cutting. One of the by-products from the production process is calcium deposit. These deposits blocked a two kilometre long pipe transporting the by-product. The scaling was so bad in the pipeline that it had to be replaced annually.

Figure 32 A worker measures the thickness of the scale in the pipeline by passing a stick through a hole in the pipe. This method of measurement only works with very thick scale!

Results

A HydroFLOW C160 was installed after the pump, on June 2001. The scaling in the pipe was measured as follows: a hole was drilled into the pipe, and a stick pushed into the hole until it touched the other side of the pipe. By this method the thickness of the scale could be measured. The fact that this method was practical shows how much scale there was!

Before HydroFLOW was fitted, the scale in the pipe was 3 centimeters thick. After only three months, the scale thickness had reduced to 1 centimeter.

Before the HydroFLOW was fitted, three pumps had to be used to pass the liquid through the blocked system. After installing HydroFLOW, only one pump needed to be used to give the same flow rate.

SALAYA PLASTIC FACTORY

Date: 2002

Country: Thailand Distributor: Hydropath Asia

Keywords: Limescale, Factory, Plastic, Injection molding, Cooling tower

Filename: CaseStudy Salaya.pdf

Salaya is a plastic factory. There were ten injection machines in the factory. Water hardness in the area was 380ppm and chemical treatment was used to prevent scaling. The cooling tower and heat exchanger had to be cleaned bi-weekly. A HydroFLOW C60 was installed in June 2002.

Figure 3.8: The injection molding machines protected by HydroFLOW. The removal of the scale improved the cooling so that these machines no longer overheated.

Results

Water hardness in the system was monitored by blow down at the cooling tower. Water softener chemical use was eliminated. One month after installation, old scale in brown sediment form was found in the cooling tower, indicating that existing scale has been removed.

After installation, it took only 10 minutes to clean the dust in the cooling tower every month. There was no hard scale within the heat exchanger and no more overheating occurred among the injection machines.

Hong Kong University of Science and Technology Pool

Country: Hong Kong Distributor: Hydropath Asia

Keywords: Swimming pool, Flocculation, Chlorine

Filename: CaseStudy HKU Pool.pdf

The outdoor swimming pool at Hong Kong university had three sand filters, two carbon filters and one ozonator. The ozonator broke down very often, whenever the temperature in the operating room was too high. The Ozonator was used because management wanted to reduce the chlorine dosage from 3ppm to 1ppm. Backwash frequency of the sand filters was once a week and the carbon in the carbon filters were replaced every two years. Three AquaKLEAR units were installed, the ozonator was switched off and the carbon filters were by-passed.

Figure 33 Hong Kong University of Science and technology (left) and its large outdoor pool (right).

Results

With the assistance of AquaKLEAR, the free chlorine dosage was maintained at 1ppm even without the ozonator. It was noticed that the chlorine usage was reduced by 30%. The University reduced the backwash frequency from once a week to once a month. The bacteria in the water were also eliminated

It was estimated that the University had its investment paid back within 9 months, with a saving of roughly HKD 92,000 per year. Management was pleased with AquaKLEAR performance and maintenance cost savings, and installed an AquaKLEAR P120 at its new indoor pool as well.

DA LIN POWER STATION

Date: 2003
Country: Taiwan Distributor: Hydropath Asia
Keywords: Biofouling, Tube in shell heat exchanger, Power station, Algae/ Bacteria
Filename: CaseStudy Da Lin Power.pdf

Figure 34 An AquaKLEAR Custom 10 inch unit protects the heat exchangers.

Seawater was used as a coolant in the heat exchanger, picture (A). Since the temperature inside the exchanger was below 50deg, scale was not a big problem. The problem was biofouling. Study shows that a layer of 250 microns (one quarter of a millimeter) thick microfouling (fouling by microbe rather than e.g. mussels) can reduce heat transfer efficiency by up to 25%. Microfouling also reduces water flow and increases corrosion. At Da Lin Power Station, each exchanger operated for two months only and then it took three days or more for cleaning.

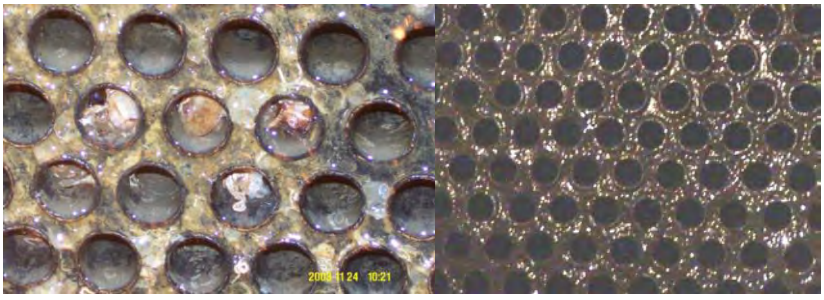


Figure 35 The heat exchanger showing the biofouling present before treatment with AquaKLEAR (left) and absent after treatment (right).

Results

On November 2003, an AquaKLEAR Custom 10 inch was installed, and after two months the heat exchanger was opened for inspection.

Biofouling was eliminated. Cleaning was done simply by spraying water and took only one hour, rather than the three days it took previously.

Mashad Packing Company

Date: 2009

Distributor: Radin Gostar Sina

Keywords: Limescale, Factory, Valves, Welding

Filename: CaseStudy Mashad Packing.pdf

Mashad Packing are a company that manufactures metal cans for food and drink packaging. The cans are assembled by resistive welding, which requires very delicate control of high-pressure hydraulic systems. If the welding time is not precisely correct, the procedure will fail. This means that the control valves for these hydraulic systems need to be working perfectly, and even a small amount of scale can have a major effect.

Figure 36 The Mashad Packing Company factory.

Results

In September 2008 two HydroFLOW HS-38 units were installed on the pump's high pressure outlet hoses. The units function was impressive. The introduction of HydroFLOW technology led to some results which were observable within two weeks after installation. Results include:

- No scaling on water pressure control turbines.
- No scaling on hoses and water transferring pipes
- Removing the scale existing in tubes and turbines
- Avoiding changing the turbines and tubes
- Non-stop production till now

Between September 2008 and the end of the study (March 2009) the system has never been stopped. No maintenance has been necessary and the maintaining team has been really pleased with the function of the unit.

SAIPA SHISHE AUTOCLAVING

Date: 2009

Distributor: Radin Gostar Sina

Keywords: Limescale, Factory, Autoclave, Automobiles

Filename: CaseStudy Saipa Shishe.pdf

Saipa Shishe, the automotive glass producer produces safety glass, including laminated automotive glass, tempered automotive glass, bullet-proof glass, tempered and laminated safety glass for buildings, double insulating glass and safety glass for domestic appliances.

Figure 37 The Saipa Shishe Company factory.

The finished laminated glass is produced in an autoclave. This is a large device that subjects its contents to high pressure (180 psi) and high temperature (up to 150deg C) steam. (Autoclaves are also used for sterilisation).

The huge autoclave (8 meters long and 3 meters in diameter) must have the rise and fall of its temperature carefully controlled throughout the production process. Cooling water is pumped through coils to cool the autoclave at exactly the right rate.

This autoclave was taken out of service every 1.5 to 2 months for 2 days due to scale build up in coils. Following dismantling the parts the cooling coil was cleaned using acid. This acid eroded the coil, so that the coil was completely worn and out of use after 4 or 5 more times of acid wash.

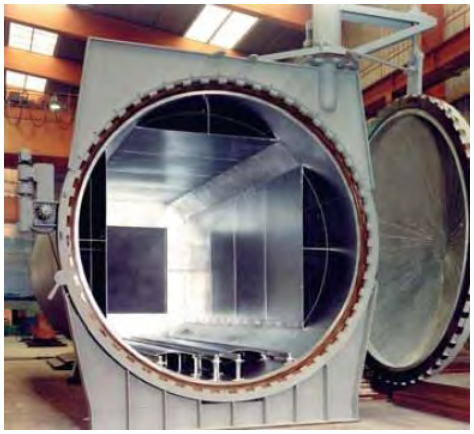


Figure 38 The Saipa Shishe Company factory 8-by-3 meter autoclave.

Results

It is more than 100 meters between the unit which was installed in the pump room and where the autoclave was located. A P100 AquaKLEAR unit was installed on the pump's 3 inch outlet pipe in the pump room in December 2007. The cooling system was not stopped once by the end of the study, 16 months later. The client is highly satisfied with the hydropath unit's function and has sent a confirmation letter which proves his satisfaction.

- Preventing the scale on pipes and coils
- Increasing the heat transfer efficiency
- Eliminating the water softener
- Applicable in hard water
- No chemicals
- No cutting, No plumbing
- No requirements of maintenance
- Low power consumption, only up to $6 per year
- Preventing the tear and wear of equipments
- Environmentally friendly

Between September 2008 and the end of the study (March 2009) the system has never been stopped. No maintenance has been necessary and the maintaining team has been really pleased with the function of the unit.

JORDAN RIVER HYDROELECTRIC POWER STATION

Date: 2005

Country: Israel Distributor: Palbar

Keywords: Limescale, Power station, Pipeline, Hydroelectric, Large unit

Filename: CaseStudy Jordan River Power Hebrew.pdf

This installation is on a pipeline that serves a hydroelectric power station.

Figure 39 The pipeline to the power station were coated with a very thick layer of extremely hard scale (top). HydroFLOW prevented and new scale from forming and began to remove the existing scale.

Figure 40 A photograph of the installation taken in 2002 (left). The same installation in 2010(right). The water level in this area often rises above the level of the pipes and hence the units are completely submerged hence the dirt built up on the unit!

The pipe is 3 to 4 kilometres long, and goes from a small lake to the Jordan River. The pipe sizes span from 16 inches to 30 inches. At the end of the pipeline there is a drop of 60m, at the bottom of which is a hydroelectric power plant.

The problem was the build-up of limescale. There was a ring of very hard limescale 80mm thick all along the pipe. As the power is generated by the flow of water, clearly a layer of limescale this thick is a major problem.

In 1998 the power station installed a Custom HydroFLOW. After one year they knew it worked as deposit of limescale stopped. Existing limescale has consistently reduced by a few millimetres each year (the rate of removal is slow as the layer of limescale is extremly hard and dense).

In 2003, two 26" Custom HydroFLOW were installed, and after two years another Custom HydroFLOW was also installed.

Results

The plant is very happy with the success and with each new pipe installation, HydroFLOW is also installed.

The water level in this area often rises above the level of the pipes, and hence the units become completely submerged on occasion. As the conditioner units are completely waterproof ("IP68 rated"), this does not harm them. The Power Supply Units are installed above the high-water mark. While the signal will be reduced when the unit is under water, you can see that the units are not damaged and continue to work when the water level drops again.

Prior to the HydroFLOW, the costs for cleaning the pipe by mechanical and acid systems were five times that of the cost of the HydroFLOW. The replacement of completely blocked pipes cost several million dollars.

The effect of limescale blocking the pipe sometimes caused flooding, as the pipe could not withstand the full water flow. With the installation HydroFLOW this too is a problem of the past.

SILVERLAKE RECREATION CENTER SWIMMING POOL

Date: 2006

Country: USA

Keywords: Backwash, Swimming pool, Chlorine

Filename: FieldTest Silverlake Pool.pdf

The purpose of the test was to determine the savings that could be made with AquaKLEAR, reducing in chemical usage and the improvements to the clarity of the water.

Method of testing

A set of data was taken for a two week period November 3-13, 2006. This was compared with data from the previous year to check it was typical. AquaKLEAR units (a P100 and a W63) were put in place and data was collected from November 13-26 with the units operating.

Figure 41 Images of Silverlake swimming pool, which achieved a reduction in backwash of 80% using two AquaKLEAR units.

Results

The results of the test are shown very clearly on page 2 of the report in the form of savings. For instance, the duration of each backwash was reduced from 5 mins to 1 min, leading to a reduction of the total backwash and sewage costs of 80%.

Including chemical and heating costs, the total annual savings amounted to $14,166.

In addition, operators of the pool noted a increase in the clarity of the pool water and a reduction in the “swimming pool smell” due to chloramines.

MARRIOT BEACH CLUB SWIMMING POOL

Date: 2005

Country: USA

Keywords: Swimming pool, Backwash, Chlorine, Flocculation

Filename: FieldTest Marriot Pool.pdf

A test was performed by the "Year Around Pool Company" on their cloudiest, most problematic pool. This pool was known as the "Ghost Pool" because it was always cloudy and never clear! Method of testing An AquaKLEAR P160 was fitted to the pool and the results monitored for a 30 day period.

Figure 42 Images of Marriot Beach Club swimming pool, which before treatment with AquaKLEAR was known as the "ghost pool" due the cloudy water. The water was completely cleared after three days treatment with AquaKLEAR.

Results

- After 3 days, the pool was clear for the first time.
- The grout lines on the tiled pool floor could be seen.
- After 5 days, the auto-chemicals were re-adjusted.
- After 7 days, there was still no sign that a backwash was necessary.
- The pool previously required backwashing once per day.

Treatment with AquaKLEAR meant that the chemical use could be reduced by about a half, and the backwashing was reduced by 75%.

DELTACCORD SPORTS AND HEALTH CENTRE

Date: 2006

Country: France

Keywords: Swimming pool, Flocculation, Chlorine

Filename: CaseStudy Pool Deltaccord.pdf

A test showing the improvements and savings in a sports and health centre pool.

The swimming pool was treated with an AquaKLEAR P unit, and the pool parameters monitored.

Results

the frequency of the filters backwashing was reduced by a factor of five and, while remaining within the framework of the legislation, the needed chlorine rate was divided by two, the bacteria were eliminated (verified by independent testing), and a better comfort to the users was provided.

Thanks to the reduction in the filters backwashing frequency and the quantity of the chemicals used, the savings obtained by the reduced water consumption and its heating, the Return on Investment was only 11 months.

Figure 43 The Deltaccord pool was treated with AquaKLEAR. It reduced its backwashing by a factor of five and cut its chlorine use by half. The return on the investment was only 11 months.

West End Mall

Date: 2009

Country: Hungary Distributor: Hydroflow Magyarorszag Kft

Keywords: Cooling tower

Filename: CaseStudy West End Mall.pdf

The West End Shopping Mall in Budapest, Hungary is one of Europe's largest shopping malls. It houses over 400 luxury and brand-name stores, it is fully air-conditioned. However, Hungarian summer temperatures often reach over forty-centigrade.

The site has 3 Baltimore TXV-500 'wet' cooling towers with total capacity of 9 megawatt, which work by the process of evaporation. The cooling system experienced extreme limescale build up, which impaired the efficiency of the air conditioning system.

Monthly cleaning costs exceeded 2,500 Euros, plus the extra utility costs for topping up the system and the removal of chemical waste. Municipal drinking water was being used for topping-up the cooling towers because the hardness of the ground water, which therefore also increased the metered water costs.

Each cooling tower was installed with a Custom designed AquaKLEAR 'P' unit. A standard P unit was also installed on the side filtration, to enhance flocculation of the extra debris brought by air suction and to aid filtration. A HydroFLOW C60 unit was installed to protect customer bathroom water systems.

Results

The cooling system has seen significant improvements following the installation of the AquaKLEAR units. No new limescale had formed in the pipes of the cooling towers and the existing scale softened, which is easy to filter and wipe away -along with debris and algae. This has significantly reduced maintenance and energy costs at the shopping centre, removing the need for expensive chemicals and improved the efficiency of the cooling system. The HydroFLOW C60 unit significantly reduced limescale build up on the self-pouring taps in the shopping centre's toilets. The taps rely on sensors, which recognise when hands are placed underneath, which transmits a message to pour the water. The sensors were susceptible to scale build up, reducing their effectiveness. However, following the installation of Hydropath technology, this problem has now been eliminated.

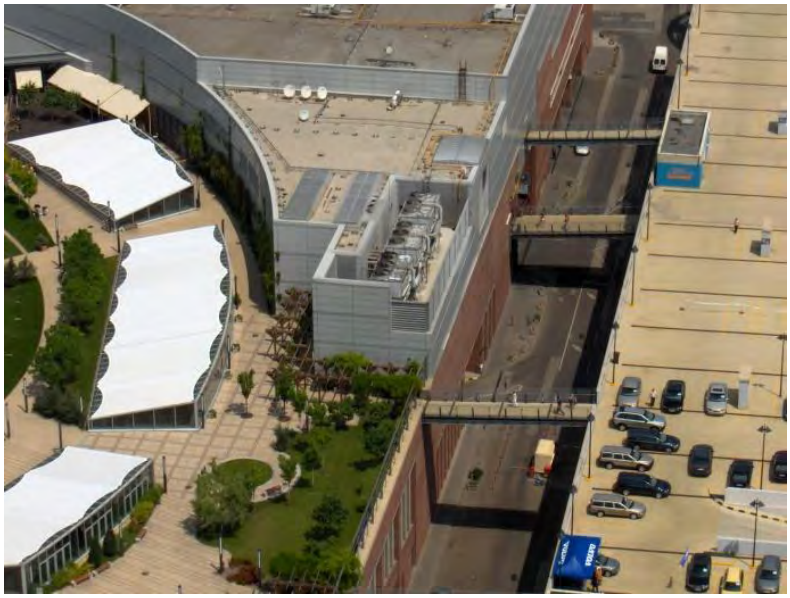


Figure 44 An arial view of the West End Mall in Budapest, Hungary. The cooling towers are visible in the centre of the the picture

Figure 45 The evaporative cooling towers in the west end mall.

A further benefit that West End Shopping Centre did not anticipate is that now they do not need to use the treated municipal supply water to run the cooling system, which is charged per usage. The cooling system now runs efficiently using ground water supply only.

WANDSWORTH BOROUGH COUNCIL

Date: 1996

Country: UK

Keywords: Limescale, Council, Government, Domestic, Heat exchanger

Filename: CaseStudy Wandsworth Council.jpg

An inhibitor was installed on the common cold feed to two direct fired Andrews water heaters that had been installed for 6 years. Neither of the heaters had received any treatment or been de-scaled in this time.

Results

The trial lasted for two months, and was particularly looking at the

energy savings associated with removing the scale from existing systems. It was found that the energy required for heated was reduced by 16%. The energy manager for the council says:

"My payback period on this project will be two and a half years without taking account of any further scale removal benefits and ignoring maintenance reductions and extended equipment life."

JV Murcott Casting Die

Date: 2006 Country: UK

Keywords: Limescale, Factory, Casting

Filename: CaseStudy Casting Die.pdf

JV Murcott is an aluminium high-pressure die-casting specialist whose customers include Nike, IBM, BMW, Jaguar, Rolls Royce and Triumph Motorcycles.

During the production process, cold water is pumped through very hot dies. These are prone to limescale build up and eventual blockage, which could lead to the die overheating.

Their only solution was to strip down the dies twice a year. Each machine weighs up to 20 tonnes and has 6-8 dies. These were taken offline, stripped down and the waterways drilled out. This would take 7 to 8 hours to strip down, 15 minutes to drill and then a further 7 to 8 hours to rebuild.

Another problem they faced was in their cooling towers. Not only did limescale accumulate there, but legionella also builds up. The cooling tower would also have to be taken offlinne twice a year and the limescale removed from the 'V' troughs and filter packs. They would usually be coated with limescale and the cleaning process would take three hours.

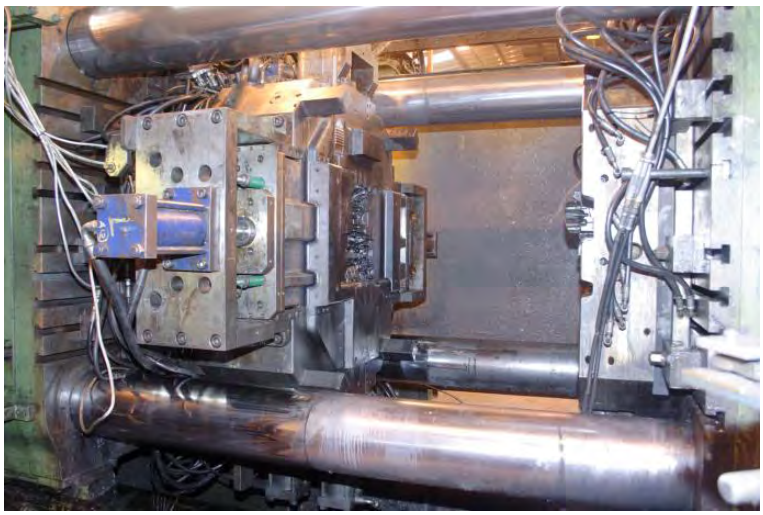


Figure 46 One of the casting dies protected by AquaKLEAR.

Results

In the summer of 2005 they installed an AquaKLEAR P120.

The dies were cleaned at the time of the AquaKLEAR installation. The usual inspections were done 6 months later, in line with the historical maintenance requirements. The operator was 'astonished' by the results; the dies had no limescale build-up and build up was virtually non-existent in the cooling tower. The usual 3 hour clean of the cooling tower took under an hour.

Another bonus related to the legionella. Legionella levels dropped dramatically, from the usual 10^3 (=1000) counts to 10^1 (=10) counts - well within acceptable health and safety levels.

As a result of the successful trials, Alan will be adding another AquaKLEAR unit to the second cooling tower and the older, second system of die casting machines.

"I was a bit sceptical about the effect that the Hydropath water conditioners would have but have been amazed at the results. It has all but removed a major production and maintenance headache for us, which has saved us time and money. We are also reducing the amount of chemicals that are needed to control legionella levels, so that's got to be good for the environment too."

AZADI SPORTS COMPLEX

Distributor: Radin Gostar Sina

Keywords: Limescale, Heater, Swimming pool

Azadi sports complex is a large 450 hectare site with a large range on different sporting facilities.

Figure 47 Azadi sport complex and Olympic swimming pool.

The central mechanical room is located beside Swimming pool hall. The mechanical room has four hot water boilers with capacity of 25,000,000 BTUH each. Boiler output Temp is 130deg C and return and supply collector size is 14". Hot water is pumped to several mechanical around the site. We have installed a Custom 14" HydroFLOW on the main return pipe from site before hot water boilers.

Figure 48 The Custom 14" unit (left) that protects the boilers (right) in the Azadi central mechanical room.

Results

The protection afforded by the HydroFLOW units can clearly be seen the boiler is free from scale with merely a light powdery deposit remaining.

LUKOIL METHANE AIR REMOVERS

Date: 2010

Country: Russia Distributor: Palbar, OOO Hydroflow

Keywords: Limescale, Air removers, Oil industry

This installation is to protect air removers in the oil/ gas industry. The process is as follows: methanol is mixed with formation water (1st stage) and then the pressure is dropped in the air removers. The air removers are like horizontal tanks with few chambers inside.

When the liquid comes into a place with less pressure, it becomes like a fizzy drink and bubbles begin to form. A reduction in pressure means that the liquid is less able to hold onto the scale forming minerals, and so the liquid becomes supersaturated and they get limescale. Most of the deposits are calcium carbonate.

Figure 49 The Lukoil air removers protected by HydroFLOW.

Results

In September 2009 one HydroFLOW C100 Ex unit was installed to protect two air removers. After 10 months they opened it, and the report is as follows:

The air removers are clean, only a narrow stripe of deposits is at the liquid level (where the border between liquid and gas is). It can easily be cleaned by hand in few minutes.

“All surfaces inside air remover are I-DE-AL!”

ESTREMOZ MEAT FACTORY

Country: Portugal Distributor: Bensaude Spratley

Keywords: Limescale, Heat exchanger, Solar panel, Food industry

This study describes an installation to protect the solar panels on a meat factory.

The meat factory is located in the interior of Portugal, Estremoz. The water there is extremely hard and they usually have all sorts of problems in their process line. The installation was made because they invested on a 72 panel solar system for hot water. In order to protect both the water deposits as well as the plate heat exchanger connected to the solar system closed circuit one HydroFLOW C45 unit was installed.

Figure 50 The Estremoz meat factory heats its water with a system of 72 solar panels, all protected by HydroFLOW.

Results

HydroFLOW has prevented any scale problems and allowed the factory to run their system on untreated water.

FISHER FARMS

Date: 2007 Country: Australia

Keywords: Limescale, Agriculture

A small chicken farm in the Waikato district of New Zealand has benefited from the installation of Hydropath Holdings AgriFLOW water conditioning system. Fisher Farm experienced problems with drinking water drip feeders becoming blocked with limescale and therefore jamming up. This resulted in constant dripping, and the use of flocculants to reduce Total Dissolved Solids (TDS) levels.

The owner investigated the possible solutions to the problem, and opted for Hydropath's patented water conditioning unit, AgriFLOW. The A45 unit was easily fitted to the incoming bore at the chicken farm, supplying water to a large Magnum filter.

Figure 51 chicken farm in Waikato, Australia.

Results

The farm owner was impressed with the results, as immediately the new units eliminated calcium build up, and reduced scale in the drip feeder system. A noticeable improvement was noted in the stainless steel sinks in the preparation areas, which would previously be stained with calcium deposits. Following the installation of AgriFLOW, they are now stain free.

Sewage Farm Fish Pond

Date: 2005 Country: Hong Kong Distributor: Hydropath Asia

Keywords: Algae/ Bacteria, Agriculture, Sewage

In this sewage plant, in order to confirm the water has been fully treated, the final stage of treatment is a fish pond. If the fish are able to survive, the water is clearly good enough! This pond was having a lot of trouble with algae, and so an AquaKLEAR unit was installed in September 2004.

Figure 52 Shek Wu Kui Sewage plant, Hong Kong.

In February 2005, just five months later, it could easily be seen that the pool was free of algae and that the pool water was visibly much clearer.

Water World Wallisellen Pool

Date: 2003

Country: Switzerland Distributor: CMS

Keywords: Swimming pool, Flocculation, Backwash

Filename: CaseStudy Swiss Pools Deutch.pdf, CaseStudy Swiss Pools English.pdf

These documents show case studies on two pools in Switzerland.

The first pool is Water World Wallisellen spa. It has a volume of 200 m3 and a circulation of 400m3 per hour. An installation of an AquaKLEAR unit in March 2003 led to a large reduction in backwash and hence a saving on the cost of the new metered water, the cost disposing of the waste water and the cost of heating the replacement water.

This led to a total annual saving of 40,000 Swiss Francs, around £26,000.

Figure 53 Latich Baar Indoor Pool, Switzerland.

The Latich Baar pool had a volume of 860 m^3, and a circulation 200 m^3/h. Active carbon filtering and flocculants were used to maintain the pool.

An AquaKLEAR unit was fitted in November 2002 and a trial ran until December 2003. With the AquaKLEAR fitted, the active carbon filter could be bypassed, and the amount of flocculant required could be reduced by 90%.

The overall annual saving was 26,530 Swiss francs, or around £17,000.

FLAMINGO CLUB SWIMMING POOLS

Date: 2003

Country: Brazil Distributor: ESA Engenharia

Keywords: Swimming pool, Chlorine, Backwash

Filename: CaseStudy Flamingo Pools Portugues.pdf, CaseStudy Flamingo Pools English.pdf

This is a preliminary study describing the savings that AquaKLEAR provided to a Pool in the Flamingo Club in Brazil.

During the first week, before installing Hydroflow/Aquaklear, the pool operators were running two backwashes of the filtration system. These, however, were discontinued when it was found that there was no pressure difference building up on the filter -i.e. the filter was not becoming blocked. This led to a reduction of 20 m^3/ backwashing, according to the team responsible for the control of the pool.

In a single week AquaKLEAR led to a reduction of 40m^3 water.

Figure 54 Flamingo Club Pool, Brazil.

Results

The number of backwashes was reduced by a factor of at least four times. This led to subsequent savings in the metered water costs, sewage costs and gas consumption and heating costs.

The amount of chlorine was reduced by 50% during the period of the trial, and could be reduced further subject to the minimum required by the regulatory bodies.

Son of the South Village

Date: 2010 Country: Israel

Distributor: Pazgas

Keywords: Immersion heater, Limescale, Residential, Well water

Filename: CaseStudy Son of the South Hebrew.pdf, CaseStudy Son of the South English

The Son of the South Village is a village in Israel. It is supplied with well-water which rests in a storage tank before being sent to the village. The hardness of this water is 300ppm. In August 2009 a HydroFLOW Custom 8 inch unit was installed on the exit from the pond in order to protect the village from limescale.

Figure 55 Heating elements of immersion heaters at the Son of the South village. Any scale flakes off the heating element.

To test the effectiveness of the unit, three cylinders with immersion heaters were examined over a year later, in September 2010. The elements of the heater were covered with a very thin flaky scale that fell off when lightly touched. Some of this flaky scale had built up in the bottom of the cylinder after falling off the element or being due to the existing scale in the pipes being removed. This should be contrasted with the typical state of an unprotected heating element in Israel which can form into a solid block of scale (see below)

Figure 56 Typical state of unprotected immersion heater elements in Israel (a location with very hard water).

The elements in this village were covered by something called “speeders” which are jackets that go around the elements. These increase the flow of water near the element to increase heat transfer but are notorious for scale build up. These were found to be completely clear.

Correctional Institution

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, cooling tower, Tube in shell heat exchanger, Algae/ Bacteria, Corrosion

Filename: CaseStudy Correctional

On August 10th, 2010, an AquaKLEAR P100 unit was installed on the 4 cooling tower return water line. Initially, the water softening system was not disconnected due to the customers concern the unit will not perform as advertised, but after three weeks of operation the softener was shut off.

Results

Within 72 hours the bacteria count had gone down from 1000 colony forming units per mL to 0 detectable units. The bacteria levels remained undetectable.

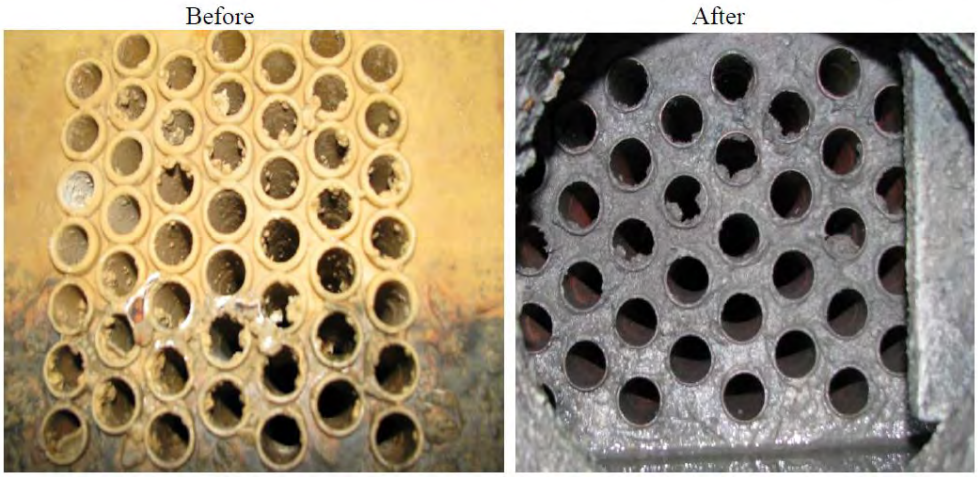


Figure 57 The tube bundle of the chillers in the correctional institute. After three months, the limescale has been removed, the tubes are coated with a protective layer of magnetite and the bacteria had dropped to undetectable levels.

Three months after installation, the chiller was inspected. The limescale had been removed, and the layer of corrosion was replaced by a protective layer of magnetite.

In the past the tubes would have to be cleaned twice a cooling season if the water softening equipment failed or was inoperable. It appears that the P100 system is having a positive impact on the water quality issue, removing not only calcium and corrosion but also prohibiting the ability for bacteria to grow in the water column.

The estimated projected savings for this piece of equipment per cooling season (7 months) is $ 3,500.00 in salt, $ 500 in chemical cleaning materials and 155,000 gallons ($250) of water between backwashing softening equipment and blowing down due to total dissolved solids in the water column.

Robert Bosch Humidifiers

Date: 2011

Country: Mexico Distributor: Ecobabu

Keywords: Limescale, Humidifiers

Filename: CaseStudy Robert Bosch Spanish.pdf, CaseStudy Robert Bosch English

S38 units were purchased to protect 4 humidifiers (Dristemm VCL-25-1 model). The water supply comes from a pit, which has a hardness of 91.91 ppm. Before the units were installed the humidifiers did not have any type of water treatment. When the drain lines were purged in May 2010 as part of routine maintenance, a severe problem of scale encrustation was detected.

Figure 58 The sensor, heating element and drain purge line of the humidifiers showing no scale build up.

A follow up visit was performed in January 2011. When the humidifiers were opened, it was found that there was no encrusted scale on the humidifiers. There was either no deposit at all, or only a 'sludge' caused by the build up of precipitated scale. The maintenance of the humidifiers was reduced from once every month to once every three months.

Tel Aviv University Dormitories

Date: 2011

Country: Israel Distributor: Pazgas

Keywords: Immersion heater, Limescale, Residential

Filename: CaseStudy Tel Aviv Uni Hebrew.pdf, CaseStudy Tel Aviv Uni English

This installation was on two sets of dormitories in Tel Aviv University. Each set of dormitories has its own water supply. The dormitories together contain a total of 237 cylinders heated by immersion heaters.

On 25 May 2010 Pazgas installed two HydroFLOW C120 units, one on each of the two incoming water lines, for protection limescale in the pipeline and to reduce corrosion in the boilers.

Figure 59 Heating elements of immersion heaters at Tel Aviv university Dormitories. The scale does not stick to the element and flakes off.

On the 28 December, seven months after installation, a check was made of the quality of water treatment systems.

In the figure you can see the results of activity of the HydroFLOW systems. A layer of powdery limescale (between 0 and 1 mm thick) is created on the heating element. Because the limescale forms as fine crystals in suspension, it does not stick to the heating element but instead falls off and collects at the bottom of the heater. This allows the heating element to continue to warm the water without compromising its energy efficiency or lag time for hot water. This should be contrasted with the untreated immersion heater seen elsewhere in Israel. The HydroFLOW units also remove existing limescale. This existing scale usually disappears during the first year of treatment. At this point also the rate of accumulation of scale at the bottom of the water heater is reduced as the unit is not having to treat scale coming from the existing pipe. The amount of scale forming from the new incoming water is low enough that it gets washed away by the outgoing water.

JAPANESE CAR MANUFACTURER

Date: 2011

Country: Japan Distributor: Hydropath Asia, Nippon Selpo

Keywords: Cooling tower, Limescale, Algae/ Bacteria, Automobiles, Tube in shell Heat exchanger, Factory, Biofouling

Filename: CaseStudy Japanese Car Manufacture.pdf

This case study describes the installation on a cooling tower in an automobile factory, belonging to a major Japanese car manufacturer. The study recorded the effects of the Hydropath unit on scale and algae over a period of around three and a half months.

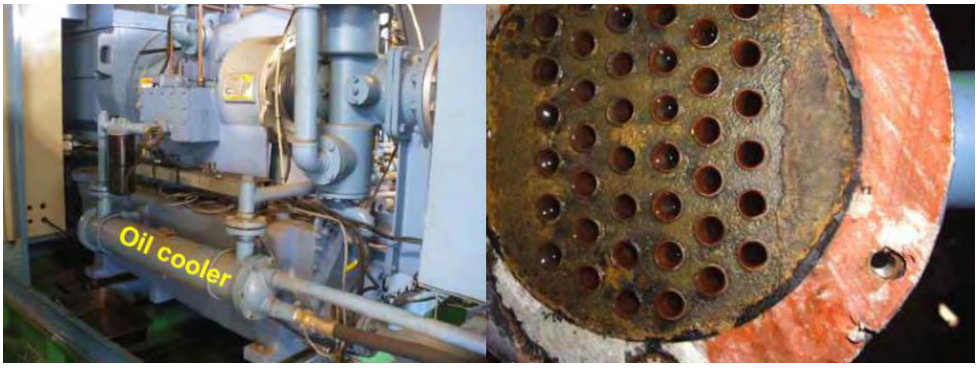


Figure 60 The oil compressor (left) and the inside of its cooler (right)

The heat exchanger and the oil compressor were normally opened up once every three years, at which time they require extensive cleaning -even though supposedly protected by chemical treatment.

The latest inspection was timed to coincide with the end of the test. On inspection, no scale was visible, and furthermore the biofouling “slime” normally observed was absent.

Although the heat exchanger could not be continually observed, the cooling tower fins were accessible and the growth of algae could be easily monitored. Over the three months, the algae growth was seen to continually decrease.

A water chemical analysis using the “Langelier Index” showed that the water is still classed as “highly scaling” -thus showing the way that Hydropath protects against limescale without changing the chemistry of the water and simply changing the location that the scale forms. The practical benefit is that this also means that the water is non-corrosive.

Figure 61 The cooling tower fins before (left) and 108 days after (right) installation of AquaKLEAR. The removal of algae can be clearly seen.

TIAN CHUEN BUILDINGS HOT SPRING

Date: 2008

Country: Taiwan Distributor: Hydropath Asia

Keywords: Limescale, Hot spring, Well water, Residential, High Concentration

Filename: CaseStudy Tian Chuen.pdf

There is a hot spring belt running under the northern part of Taipei City, Taiwan. Structures built on this belt are able to draw hot water from a well for leisure enjoyment and use.

The water from the well is extremely hard, with a TDS of up to 11,700 mg/ L. This of course lead to limescale blockages of pipes. Within 1.5 months of its opening the management of the Tian Chuen Building in Taipei noticed there was a build up of 2mm of hard scale on the pipe. Furthermore, buildup of scale was preventing the pumps from operating.

Figure 62 The pipe bringing well water to the Tian Chuen Building before (left) and after (right) installation of AquaKLEAR.

An AquaKLEAR P120 was installed. After 4 months, the scale had been reduced to 0.2mm and could easily be removed by hand.

Fish Farms in Italy

Date: 2007

Country: Italy Distributor: Hydrocoffee

Keywords: Limescale, Agriculture, Fish, Algae/ Bacteria

Filename: CaseStudy Rosignano Fiah Farm.pdf, CaseStudy Civitavecchi Fiah Farm.pdf

These two case studies describe treatment of fish farms/ hatcheries in Italy both of which are sea water farms.

The purposes of the installation were to protect the heat exchangers from limescale, reduce running costs, protect against outbreaks of bacterial and viral infection in the fish and improve clarity and quality of the water.

Several AgriFLOW units were placed around the farm to prevent limescale, enhance flocculation, and eliminate bacteria.

In both farms, the water was previously treated with UV light. this is extremely expensive -a single UV system consumes 10 KW/hour of electricity, 24 hours a day, adding up to running cost of around e1100 per month. Even so, the UV system was not fully protecting the fish and they were still falling prey to bacterial and other infections.

Figure 63 The fish tanks at Civitavecchi (left) and the AgriFLOW unit replacing the UV system at Rosignano (right).

The first units were installed in 2007. Since then, the farm has been operating without UV lights saving money, and there have been no problems with infections.

TERNOPIL BAKERY

Date: 2011

Country: Ukraine Distributor: Palbar, OOO Hydroflow

Keywords: Limescale, Food industry, Retail

Filename: CaseStudy Bakery Ternopil.pdf

This is an installation on a supermarket bakery in Ternopil, Ukraine. The humidity level in the stove needs to be kept high, so water is passed through the stoke in open guttering and continually evaporated. This continual evaporation obviously means a large buildup of scale.

Figure 64 The gutters after installation of the S38. Before installation, there would have been a thick layer of limescale buildup on the walls and base of the gutter. Now, there is only a small amount of powdery deposit which can be removed simply by shaking out

Results

Before installation, the oven needed to be cleaned every 3040 days. The pipes would get blocked by limescale, and sensing this, the controller would shut down the stove for cleaning.

The unit was installed 2 weeks after a cleaning session -i.e. there was already a significant amount of acles built up. After installation, the oven was left for 56 days (one and a half times longer than normal) and it kept running. At this time, the maintenance staff decided to open the oven anyway, in order to see the state of the gutters and the pipes.

Before, the gutters walls and bottom had a thick lime-scale layer. Now there are small particles, like the finest sand, lying on the bottom of the gutters. The ”sand” was shaken out and the gutters were set back in their places. Not only had the unit prevented the buildup of new scale, it had removed that already present.

GREIF PAPER MILL

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Factory, Paper

Filename: CaseStudy Bakery Ternopil.pdf

The Greif Riverville Paper Mill in Riverville, Virginia (www.greif.com) implemented HydroFLOW water conditioners in order to control the buildup of scale in the paper production process. The maintenance staff installed approximately fifteen water conditioners in various locations of high mineral concentrations. The Mills Senior Maintenance Engineer found the water conditioners to be a more viable and cost effective method of managing scale problems over traditional maintenance practices.

One of the byproducts of papermaking is the generation of calcium carbonate, sodium carbonate and sodium sulfate in the process water. Due to the high concentrations of these minerals scale deposits coat the inside of pipes, pumps and heat exchangers, restricting flow and heat transfer efficiency. Typically, pipes and equipment need to be disassembled and cleaned (by hydro-blasting) approximately every 6 months. Common applications in paper mills are white liquor piping, green liquor piping, evaporator piping, cooling towers, boilers, heat exchangers and washer nozzles.

Conclusions by the Paper Mills Senior Maintenance Engineer:

- The water conditioners kept the pump impeller housings clear of scale build up, improving flow rate and extending pump life.
- The water conditioners have a positive effect on heat exchanger performance by breaking-up the scale deposits on the internal tubes thus increasing heat transfer efficiency.
- The water conditioners kept piping clear of most scale deposits and made existing deposits easy to remove.
- The return on investment, due to decreased maintenance labour and power usage is approximately one year.

Figure 65 Untreated and treated pipes.

SARGENT FARMS

Date: 2011

Country: Canada Distributor: Hydroflow Canada

Keywords: Flocculation, Agriculture, Food industry

Filename: CaseStudy Sargent Farms.pdf

In the food processing of chickens, the process water used becomes contaminated with blood and other material. This must be removed from the water before it can be discharged to the sewer or reused. To help with the removal of the material, ferric sulphate was used as a flocculant. The material removed may be used for other purposes, e.g. for biofuels, so there is a large benefit to reduction of chemicals in the material.

Figure 66 The tank used for flocculation. Paddles inside the tank agitate the water.

Within a few hours of fitting the unit, the results were evident. The amount of flocculant was immediately reduced by 10 % and was reduced further over a period of a week. At the end of this process, it was found that the amount of flocculant used could be reduced by 25 %.

Paper Mill Bleach Plant

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Paper, Factory, Spray

Filename: CaseStudy Paper Mill Bleach Plant 20110801.pdf

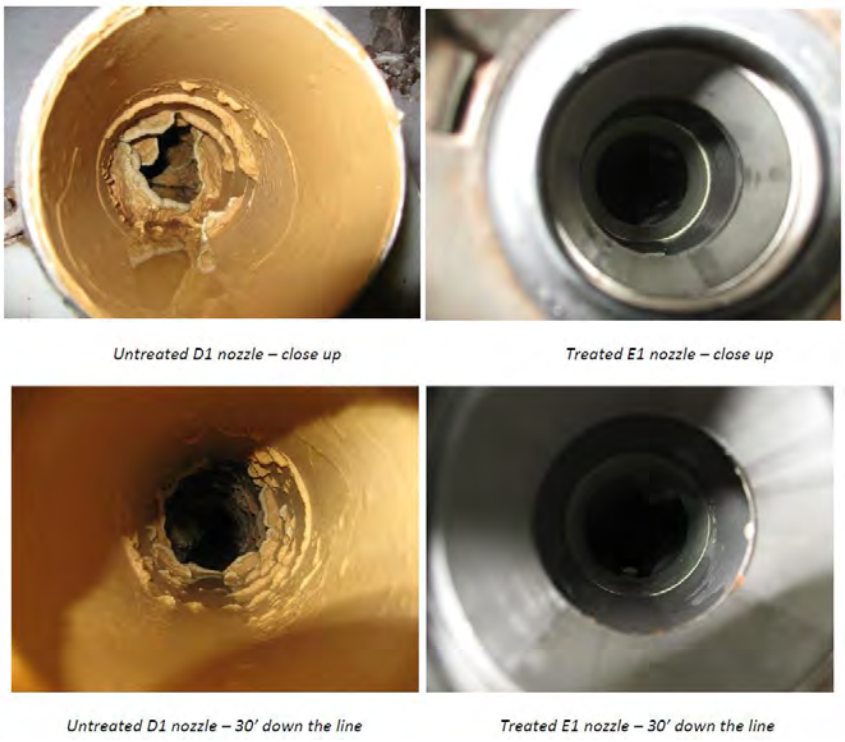


Figure 67 The inside of the pipe on the untreated (left) and treated (right) shower unit.

This is a study showing how HydroFLOW protected the shower nozzles and pipes in a paper factory's bleach plant shower room. Two units were compared -one with treatment, one without. The units were cleaned initially and left for 11 weeks, after which time the limescale build-up was examined. The E1 shower unit was treated with a single HydroFLOW Custom 8" unit. The pictures show the difference very clearly. There is significant build-up in the untreated pipe on the left, but the treated pipe remains clear after the 11 weeks of the trial.

Reference available.

WAPATO MUNICIPAL SWIMMING POOL

Date: 2011

Country: USA Distributor: HydroFLOW Holdings USA; MBI Water Solutions

Keywords: Swimming pool, Chlorine, Backwash

Filename: CaseStudy Wapato Pool.pdf

This installation was on a 375,000 gallon municipal swimming pool owned by Yakama Nation Youth Activities, Toppenish, Washington USA. The customer wanted to reduce chemical usage and improve water clarity.

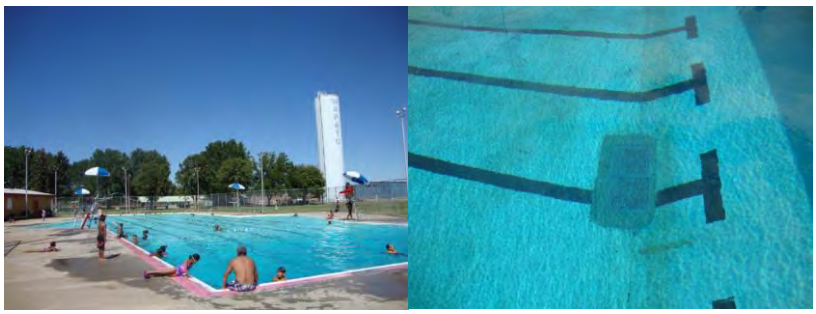


Figure 3.43: Wapato Municipal pool. (Left) One day after installation. (Right) Three days after installation. The water was found to be noticeably cleaner.

Trial method

Installation of one AquaKLEAR P160 (on a 375,000 gallon Municipal Pool) between the pump and Filtration Tank. Then document Pre-installation and Post-installation chemical usage Backwash Frequency, customer satisfaction and water quality. Photos will also be used to provide a comparison. The preliminary trail period was for two weeks. Conclusion: There is marked decrease in Chlorine usage approx 30% (50% prior years) in just two weeks. We expect at least 50% reduction next year. Muriatic acid reduction was approx. 40% and will probably drop to 50% or greater. The Dica-Lite (diatomaceous earth material) should be reduced due to the reduced Backwash volume and frequency. This will also reduce water consumption and electrical costs for heating the water. There is also strong Signal throughout the Entire Facility. This Signal is an unexpected benefit that may treat the boiler and the potable water as well! A strong signal was found in the incoming and outgoing water lines to the boiler and potable water heater. We look forward to the benefits of this technology quite possibly throughout the entire facility.

	Prior Years	2011 Pre-Install	2011 Post-Install (est. 2-wk study)
Sodium Hyper-Chlorite	40 Buckets=$9000.00	30 Buckets=$6,750.00	20 Buckets=$4,500.00
Muriatic Acid	2 tubs=$1,399.98	2 tubs=$1,399.98	1.2tubs=$839.98
Dica-Lite	50bags=$8,750.00	50bags=$8,750.00	<50bags (due to reduced Backwash/Cleaning

Figure 68 Savings made at Wapato pool. The usage of chemicals was reduced in 2011 due to more efficient monitoring even before the AquaKLEAR installation, but was reduced even further after installation.

DU VIN RESTAURANT DISHWASHER

Date: 2011

Country: USA Distributor: HydroFLOW Holdings USA; MBI Water Solutions

Keywords: Limescale, Restaurant, Food industry

Filename: CaseStudy Commercial Dishwasher.pdf

Figure 3.45: The dishwasher in the du Vin Restaurant before treatment by Hydropath.

The restaurant has two water heaters that warm up the domestic incoming water to 120 degrees Fahrenheit. Each of the restaurants three commercial dishwashers has an electric water heater that boosts the temperature to 150 degrees Fahrenheit.

In addition to standard limescale accumulation on all faucets, the restaurants 3 dishwashers suffer from severe limescale accumulation that shortens their life cycle, cause waste of electricity, require constant maintenance and cause spotting on glassware and silverware.

Install an HS48 water conditioner before the two standard water heaters and an S38 water conditioner before the booster heater of each dishwasher. Total water conditioners required: 1 x HS48 and 3 x S38.

Results

- Limescale immediately stopped accumulating on the faucet heads and inside the dishwashers.
- Limescale deposits gradually began to dissolve overtime, especially after a chemical descaling wash was performed (after the first inspection).
- The two standard water heaters and three booster water heaters are operating more efficiently.
- Significant spotting reduction on the glassware and silverware was achieved.
- Maintenance costs went down to a minimum.
- Limescale accumulation stopped as soon as the water conditioners were activated.

- Severe cases of scaled-up dishwashers might require the assistance of a 1 hour chemical descaling wash. Such a process will soften the limescale and assist the water conditioner with performing its descaling task.

- In some rare cases, where the hindering of spotting on glassware and silverware is not achieved, a dishwasher detergent might be required. HydroFLOW USA recommends a product called Lemi Shine (www.lemishine.com).

CHARING CROSS HOTEL

Date: 2005

Distributor: ECO Systems Country: UK

Keywords: Limescale, Hotel

Filename: CaseStudy Charing Cross Hotel.pdf

Charing Cross Hotel is a Grade II listed building in the Guomen group situated in the very center of London, close to both The Strand and Trafalgar Square.

Figure 69 The Guomen Group Charing Cross Hotel situated in central London.

HydroFLOW Physical Water Conditioners were selected for the Charing Cross Hotel as part of the £19 Million major refurbishment project completed in 1999, and in 2000 ECO Systems modified the original specification to enable this 239 bedroom hotel to have maximum scale protection possible to enable the secondary hot water and cold water systems to operate at peak energy and efficiency. When the boilers were opened for the first time after 6 years in September 2005, for servicing and cleansing, the maintenance contractors expected to find the pipes heavily contaminated with limescale, as they were not previously aware that any physical water conditioning has been installed on the water systems throughout the hotel. However there was no scale evident, yet within a half mile distance from this hotel, another large hotel has found hot water pipes where the scale has reduced the flow by as much as 50 per cent.

This is precisely the sort of result that we expect whenever this unique patented ECOlogical technology is installed to tackle limescale problems, whether in the UK or elsewhere in the 18 countries worldwide that have practical proof of the considerable beneficial effects achieved with Hydro-FLOW, often in hard water conditions far worse than the UK.

The result that a minimum amount of chemical were required to cleanse the system and a substantial time reduction in the shut down period to complete this work are also important factors to maintain lower maintenance and replacement expenditure in future years, whilst also ensuring a quicker return to full boiler operating capacity in a high occupancy Central London Hotel. The financial savings in this particular case have been equivalent to thousands of pounds over this five year period.

BARNAUL POWER STATION

Date: 2010

Country: Russia Distributor: Palbar; OOO Hydroflow

Keywords: Biofouling, Power station, Tube in shell heat exchanger, Algae/ Bacteria, Large unit

Filename: CaseStudy Barnaul Power.pdf

Barnaul heat power station. The station produces electricity and heat energy, which is used for central heating. The electrical power is 430 megawatt (0.43GW), and heat power -1460 gigacalories per hour. To put this into context Russia's total electricity generating capacity is approximately 200 GW.

Figure 3.48: (Left) A steam generator in Barnaul Power Station. The condensers are below this. (Right) The custom 40" AquaKLEAR installed on the heat exchanger pipeline.

The station was having a problem with biofouling, silt and mud deposits, (the source of the water is river) and inorganic deposits (scale) forming on the internal steam condenser pipes surfaces. This reduces efficiency, can block the exchanger tubes and means they require constant cleaning.

The Steam condenser is a 80KCS-1 type with main matrix cooling surface F=2345 m^2 and built-in matrix with F=655 m^2 . The inner pipe diameter is 25mm, and the pipes are made from brass. The input and output pipes to the condenser were 1000mm across. Two large Custom 40" AquaKLEAR units were fitted to the input and output of the steam condenser. Two units were used because it was a twoway condenser with an intermediate chamber. OOO Hydroflow wanted to be sure that signal

would cover all the length of all the condenser pipes. Moreover, the second unit solves the problem with the loops, which can reduce the unit's working efficiency.

Results

During the winter time operation the river water has higher salinity, and level of organic matters and biofouling is notably lower. During scheduled shutdown of the power-generating unit at the end of winter, in April, the condensers were opened for checking. Deposits were present in tubes of both condensers.

In the condenser with AquaKLEAR the deposits were soft, by touch they resemble the finest powder (this is a character feature of HydroFLOW and AquaKLEAR systems operation). Some tubes contained non-organic buildup, which could be removed with a jet of the water.

When the power-generating unit was stopped in summer time, in July 2011, condensers were again opened for checking.

The "temperature force" or "heat force", (i.e. the difference in temperature between the water doing the cooling and the water being cooled) went down to 2.2deg C (lower is better). The critical value for operation in this power station is 7deg C.

The following was found in the condenser with the AquaKLEAR:

- The inlet chamber of the tube bundle partially contained foreign matters (wood chips, plastic parts);
- The internal surfaces of tubes have silt deposits. Characteristics of deposits -soft, can be washed out with the water. On most of the tubes there can be seen a characteristic metal glitter (brass), which indicates cleanness of the surface;
- Properties of deposits in the outlet chamber are similar to that of the inlet chamber, and the brass glitter can also be seen here;
- A characteristic smell of organic decomposition is absent.

In another power-generating unit condenser the following was found:

- Inlet chambers of the tube bundle partially contained foreign matters (wood chips, plastic parts).
- Internal surfaces of tubes have deposits. Characteristics of deposits supposedly, it is river mud.
- The tube bundle have tubes with 100% Clogging

- The number of tubes with 100% Clogging is about 10-15% of the total
- Condenser chambers have strong smell, characteristic of organic material decomposition.

In cooperation with specialists of the Central Analytical Laboratory Vodokanal probe sampling of the source water and on the outlet of both condensers was performed. From these tests it could be seen that the Aqua-KLEAR system suppresses biofouling of the steam condenser cooling surfaces in respect of:

- thermo-tolerant coliform bacteria > 3,3 times;
- total amount of coliform bacteria > 3,3 times;
- total amount of coliphages > 2 times;
- sulfite-reducing clostridia > 90 times.

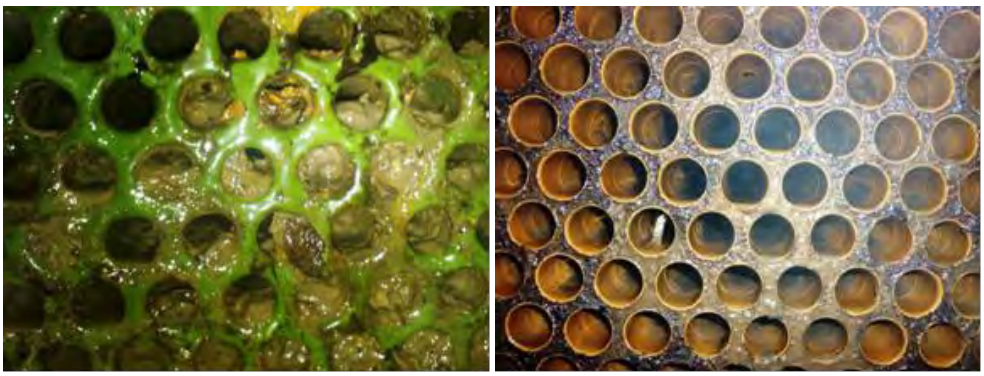


Figure 70 The outlet port of two heat exchangers on the steam condensers (Left) without AquaKLEAR fitted and (Right) with AquaKLEAR. Note the biofilm and the blockage of some of the tubes. With AquaKLEAR, the tubes remain free and the biofouling is eliminated.

Copper Mines

Date: 2011

Country: Chile Distributor: LAMS

Keywords: Limescale, Mining

Filename: CaseStudy Copper Mines.pdf

The mining industry needs to manage the flow of water from the adducts (water collection point), process, effluent and water returns.

Figure 71 Installations on copper mines in Chile.

Given the high levels of consumption in mining, most of the pipes that carry water are large diameter starting from 6 to 30 inches and larger. The mining industry uses long stretches of pipe, from hundreds of meters to kilometers, with a considerable amount of equipment, such as manual valves, controls, pumps and flow meters. The water in mining is very hard.

All of the above points mean that limescale is a large problem in the mining industry, and can be very hard to solve.

HydroFLOW is an ideal product to use. The units protect any diameter of pipes, for large distances. The pipes do not need to be cut into, allowing easy installation.

Summary of benefits

Flowmeters with clean electrodes, reliable measurement

Pipes, valves, pumps always operating

Asset protection extends the useful life of equipment

Huge savings in maintenance, operation, spare parts, etc.

Looks after the environment and occupational health of workers -no chemicals

INSTITUTION OF CIVIL ENGINEERS

Date: 2007

Distributor: ECO Systems Country: UK

Keywords: Limescale

Filename: CaseStudy Institution of Civil Engineers.pdf

The Institution of Civil Engineers (ICE) is an international body founded in a London coffee shop in 1818 and today representing over 80,000 members worldwide. Their headquarters, One Great George Street, was built between 1910 and 1913 as the result of an architectural competition won by James Miller, RSA (1860-1947), and is situated in Westminster, Central London, just off Parliament Square.

Figure 72 The headquarters of the Institution of Civil Engineers, On Great George Street, in central London.

In October 2006 ECO Systems received a request from the ICE to prepare a recommendation to solve the continual problem of the coils scaling up in the three 1000 litre calorifiers servicing the secondary hot water system at their Westminster, Central London headquarters off Parliament Square. The HydroFLOW C units specified were ordered in November, and were installed in January 2007. Due to the previous chemical de-scaling regime in past years, two of the coils had been badly corroded by acid de-scaling and required replacement when the existing scale had been broken down by the HydroFLOW's effect. When the calorifiers were opened for annual inspection a year later, they were totally clear of scale, and no additional corrosive damaging chemical cleaning was required.

The past 5 years has proved to the ICE the huge environmental effect achieved, in addition to substantially reducing the annual planned preventative maintenance programmer downtime by 75%, an added financial saving.

This has enabled the calorifiers to be operating at their optimum peak efficiency throughout this period and due to this fact, it is now possible to use only one calorifier, whilst keeping one in reserve, and one which has now been de-commissioned and removed. The inherent ECOlogical value of HydroFLOW's technology has proved to the ICE the considerable financial benefits attained, and additional smaller HydroFLOW units have been fitted tot eh water supplies to catering water boilers and immersion water heaters for the wash basins in the lavatories.

In these days of ever-increasing energy and operation expenditure, Hydro-FLOW offers a perfect answer to keep future costs to a minimum. Payback period was less than 18 months for this project.

URIMIEH CEMENT FACTORY

Date: 2009

Distributor: Radin Gostar Sina

Keywords: Limescale, Cement, Factory

Filename: CaseStudy Urimieh Cement.pdf

Urumieh White Cement Co. is a large cement manufacturer based in the Middle East. It produces 14,400 tons of clinker and 15,000 tons of white cement per month for domestic and commercial use in the Middle East. Water is an essential part of the cement production process and as the factory is based in a hard water area, resultant scale build up was a problem and affected the efficiency of the production equipment.

Figure 73 Urimieh cement factory.

The management decided to trial the Hydropath physical water conditioning technology; they installed two AquaKlear units at the site; one P120 unit and one P160 unit to tackle the limescale is used in a number of production processes at the plant:

- to cool the gearboxes and bearings with a heat exchanger in grind and kiln
- it is sprayed directly onto the cement in the Conditioning Tower before furnace
- it is pumped into the cooling tower
- a steam boiler is used for fuel steam tracing in winter.

Figure 74 Limescale buildup on a pipeline before application of Hydro-FLOW. The effective diameter of the pipe is significantly reduced.

Within 5 months, the AquaKLEAR units had proved their worth; limescale build up was no longer an issue and existing deposits had begun to break down. Nima Sato of Radin Gostar Sina, a Hydropath distributor comments,

"This chemical-free technology has a myriad of uses throughout industry, wherever water is used. It saves customers like Urumieh White Cement Co. many times its purchase cost in terms of energy and chemical bills, staff time as well as maximizing efficiency. We prefer to recommend Hydropath products because they are patented and work like no other water conditioning technology and most importantly, we know they work!"

BANK HEADQUARTERS, HONG KONG

Date: 2008

Country: Hong Kong Distributor: Hydropath Asia

Keywords: Biofouling, Algae/ Bacteria, Government

Filename: CaseStudy Bank Headquarters , CaseStudy Bank Headquarters Report

This installation is for a major international bank with their headquarters in Hong Kong. Their headquarters is cooled by two 150 ton water chillers, in addition to an air cooled chiller (1000 tons).

Figure 75: Standard Chartered Headquarters, Hong Kong (center)

Bio-fouling was present in the condenser tubes. Although the customer was following the regulations set down by the Hong Kong government for prevention of bio-fouling, the problem still persisted. Thus, the customer looked to use a physical treatment to help control the problem. One unit was “high-cut” and not working to capacity.

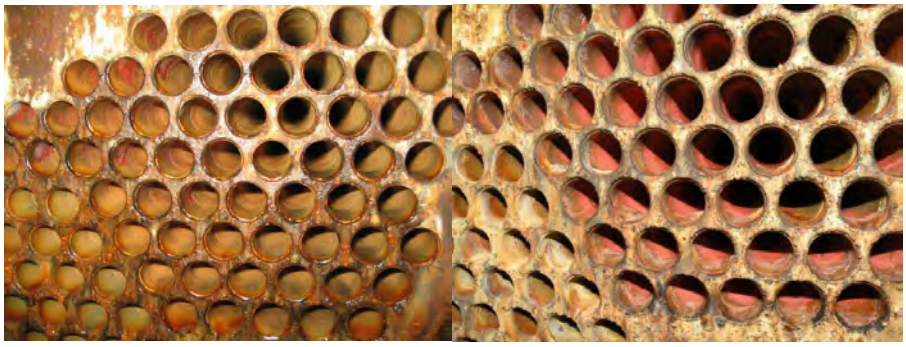


Figure 76: The chiller tubes before (left) and three months after (right) installation.

An Aquaklear P160 was installed to address the problem. A water analysis was performed to determine bacteria levels.

Three months after installation, the tubes were re-inspected and the bio-fouling found to be much reduced. The unit could again operate properly, and the coefficient of performance (COP) was found to have increased by 10.6 %. The total bacteria count can be seen to be greatly reduced.

Period	Total Dissolved Solid (mg/L)	Calcium Hardness (mg/L)	Conductivity (uS/cm)	Total Alkalinity (mg/L)	Residual biocide concentration Nalco ST40 (mg/L)	Residual biocide concentration Na co 2953 (mg/L)	Residual inhibitor concentration Nalco 7376 (mg/L)	Total Bacteria Count (CFU/ml)	Legionella pneumophila Sg1 (CFU/ml)	Legionella pneumophila Sg2 to Sg14 (CFU/ml)	Legionella other species (CFU/ml)
2007-12	735	265	1050	160	0.3	<0.5	5	48	<10	<10	<10
2008-01	650	230	925	150	0.2	<0.5	4.5	37000	<10	<10	<10
2008-02	975	350	1400	200	0.25	<0.5	5	34000	<10	<10	<10
2008-03	585	210	830	120	0.3	<0.5	6.5	220	<10	<10	<10
2008-04	1200	400	1700	170	0.3	<0.5	3.9	58	<10	<10	<10
2008-05	1000	340	1400	140	0.25	<0.5	4.2	140	<10	<10	<10
2008-12	1000	360	1425	220	0.3	0.5	2.6	6	<10	<10	<10
2009-01	650	230	925	100	0.3	<0.5	2.4	<1	<10	<10	<10
2009-02	925	320	1325	110	0.3	0.5	2.6	2	<10	<10	<10
2009-03	485	160	700	90	0.3	<0.5	2.2	2	<10	<10	<10
2009-04	480	150	700	100	0.25	0.5	2.4	38	<10	<10	<10
2009-05	970	350	1370	200	0.3		4.2	2	<10	<10	<10

Canterbury Koi Pond

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA, Nano Tek-on

Keywords: Fish, Algae/ Bacteria, Flocculation, Backwash

Filename: CaseStudy Koi Pond

This study describes a commercial Koi Carp pond in Honolulu Hawaii. The pond was having problems with algae growth and water clarity.

A unit was installed on the feed to the pump.

Figure 77 (Left) The pond on the date of installation, 6th October 2011 and (Right) a few weeks later, 29th November 2011

Results

- Reduction of algae in five days
- The water became clear
- The amount of algae on the bottom of the pond reduced by 80-90%
- Reduction in manual cleaning
- Reduction in backwash

ALAKEA TOWER FOUNTAIN

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA, Nano Tek-on

Keywords: Fountain, Limescale, Flocculation, Backwash

Filename: CaseStudy Water Fixture

The Fountain outside the Alakea Tower was suffering from various problems.

Figure 78 The Alakea Tower Fountain

The chemical in the water splashes over the granite around the water fixture and stains the granite, which eventually required polishing. To polish the granite the water fixture had to be emptied, causing water waste and manual resources.

In addition to the above, this water fixture had to be drained once a month, cleaned and new water put in due to the pollution and organic debris that fall in the water constantly.

A unit was fitted to the recirculation pump.

Figure 79 (Left) the granite before installation, showing staing and (Right) the granite two months after installation without staining.

Results

- The water improvement was noticeable from 9/20/11 to 10/06/11.
- 10/24/11 inspection; the water fixture and the surrounding granite had just been cleaned, therefore no difference was recorded.
- A reduction of 50% of chemicals was achieved.
- The granite is no longer staining by the chemicals in the water.
- The water fixture has not been drained in the last 2 1/2 months and water is perfectly good, by that, saving 2500 gallons of water each time.

Important issues to note regarding water fixtures and similar

- Open Water fixtures and ornamental ponds: It is important to install the HydroFlow unit on the pipe where most of the water volume circulates in order to improve the water quality.
- The incoming water has to be away from the drain or scupper to allow the entire water volume to circulate through the HydroFlow unit.

CHELSEA FOOTBALL CLUB COMPLEX

Date

Country: UK Distributor: ECO Systems

Keywords: Limescale, Hotel, Football

Filename: CaseStudy Chelsea Football Grounds and Hotel

The Chelsea Football & Village complex at Stamford Bridge in the center of London has benefitted from advanced Hydropath limescale conditioning technology in successfully preventing the build up of limescale.

Figure 80 The Chelsea FC Stand in London

Three commercial water conditioning Hydroflow models were installed in the secondary hot water heating plant of Chelsea's FC East Stand changing rooms; to improve maintenance and energy efficiency and to extend the operational lifespan of the plant and all ancillary equipment ie: pumps, valves, etc.

As a result of Hydroflow's technology; the secondary HW system now needs no chemical de-scaling schedules—an important Health and Safety factor and there would be a significant reduction in down time and costs for Contractors carrying out maintenance and insurance inspections.

Following swiftly on from that environmental triumph for Hydropath; Chelsea Village Management requested surveys for two hotels within the Millennium Copthorne Hotels group. With installation again overseen and supplied by Eco-Systems, a Distributor of Hydropath Holdings Ltd. both the Copthorne hotel and Millennium hotel each had specified and installed two Hydroflow Commercial models.

Both hotels have since experienced vastly improved transfer and flow rates. These are important factors for both the stadium and the hotels where maximum heat and flow are essential at peak pressure times. Improved water pressure on the flow pump will also increase operational life on all the equipment where limescale build up would have definitely caused premature failure.

G & G Orchards

Date: 2012

Country: USA Distributor: Hydroflow Holdings USAMBI Water solutions

Keywords: Limescale, Cooling tower, Agriculture, Food industry

Filename: CaseStudy G & G Orchards

Figure 81 The owner-operator of the Orchard, the cooling tower and some of ther cherries produced by the orchard.

G&G Orchards in Yakima is the only Hispanic-owned packing house in Washington. Today, that operation includes some 800 acres of orchards, a packing house, and a controlled atmosphere, cold storage facility. They are also produce late season cherries in the most sought after varieties.They wished to remove and prevent limescale in their cooling tower and to reduce their use of chemicals. A P120 Aquaklear was fitted on the feed to the tower spray nozzles, and the state of the tubes, the tower fins and the sump monitored over time.

Results after 22 weeks

- Chemical usage was discontinued after 8 weeks
- Low conductivity maintained: blow-down reduced by 50%
- Limescale deposits on tubes and fins are gradually being removed
- Water in the sump is clear of algae and bio deposits
- Estimated return on investment (ROI): under 18 months

Figure 82 The tower fins are gradually being cleared of limescale and biological residue

CINTAS LAUNDRY

Date: 2011

Country: Canada **Distributor: Hydroflow Canada**

Keywords: Limescale, Steam boiler, Tube in shell heat exchanger, Laundry

Filename: CaseStudy Cintas Laundry

Cintas Laundry in Calgary is a commercial facility for laundering uniforms from hotels etc. The areas of concern were the steam boiler which was used for generating steam for dry cleaning and heating the wash water, the tube-in-shell heat exchanger used to reclaim heat from the waste water, and the washing machines themselves. Both the exchanger and the boiler were difficult to clean, requiring both downtime and additional chemicals.

Figure 83 The tube-in-shell heat exchanger for heat reclamation (left) and the steam boiler.

Hydroflow units were fitted to the inlets to the steam boiler and the heat exchanger, and the supply line to the washers. The goal was to reduce the amount of chemicals being used. The salt softener for the wash water was eliminated and the boiler treatment chemicals reduced.

Results

Figure 84 The "mirror-like" interior of the heat exchanger and the powdery deposit on the steam boiler tubes.

After five months, the inside of the tube and shell heat reclamation unit was spotless - “Mirror like” as professed by Jon Nica, the Plant Engineer. The unit required no cleaning and was closed up and put back into service. Jon brought this technology to Cintas based on his experience with Hydroflow in Romania on a cooling tower.

In the same five month period, the Hydroflow unit removed the existing scale in the steam boiler and left a fine powder residue on the tubes that can be wiped off. The Boiler Inspector asked if they had chemically cleaned the boiler before he arrived. He also commented that the boiler is unusually clean.

- 20% reduction is water consumption due to no backwashing of the softeners
- 15% reduction in gas
- 98% reduction in salt for softeners (being used for iron removal)
- Saving of $12,000.00 annually on chemical cleaning
- **They have calculated a $72,000.00 total per year savings.**

MANHATTAN TOWER

Date: September 2012 **Country: Israel**

Distributor: Palbar Keywords:

Limescale, Residential

Filename: CaseStudy Manhattan Tower

Client: Manhattan Tower, 40 floors and 177 apartments building at Tzameret Park, Tel Aviv

Systems installed: HydroFLOW C160, HydroFLOW C120

Water scheme description:

The building's pipeline is connecting to a water tank located at an underground parking floor. The water is pumped to another tank located on the roof, then splits to two lines: one is providing water to the upper floors (20% of the apartments) through pumps; Other is providing water to the lower floors (80% of the apartments) by gravitation.

Installation description:

HydroFLOW C120 was installed on a pipe providing water to the upper floors; HydroFLOW C160 was installed on a pipe providing water to the lower floors.

Results:

One boiler was opened on August 1st 2012. The boiler is located next to the gym, on floor (-1), andis the farthest from the HydroFLOW system installed. The boiler was not opened for the last three years, since the last heat element was replaced.

As expected, any existing scale was disintegrated, and the heating element was found clean.

In summation: Without treatment, one would expect to find a thick limescale build up on a three year old element. Accordingly, the results are very good and to the satisfaction of the client.

VETERINARY TREADMILL

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Algae/ Bacteria, Medical, Veterinary

Filename: CaseStudy Hydro Treadmill Therapy Pool

Figure 85: Hydro-Therapy Treadmill Pool

One of the treatment option employed by TOPS Veterinary is hydro-treadmill therapy. There are two 1,000 gallon therapy pools, supported by a large sand filtration system (pool sized system) Prior to the test they were treated with a low level chlorine dosage alongside a Copper Ionization system.

A trial was performed to see if Hydropath Technology could help reduce their chemical usage. A SpaKLEAR unit was installed and testing lasted for 9.5 weeks.

Figure 86: Left: The bacterial slides before the trial, Right: The bacterial slides after 9.5 weeks operation and 50% chemical reduction

Results

The trial showed they could reduce their chemical use by 50% and still maintain a bacteria-free pool.

Beit America Tower

Date: September 1995 **Country: Israel**

Distributor: Palbar Keywords: Limescale, Cooling tower

Filename: CaseStudy Beit America Tower

Client: Beit America, an office building in Tel Aviv

Systems installed: HydroFLOW C160, HydroFLOW C120

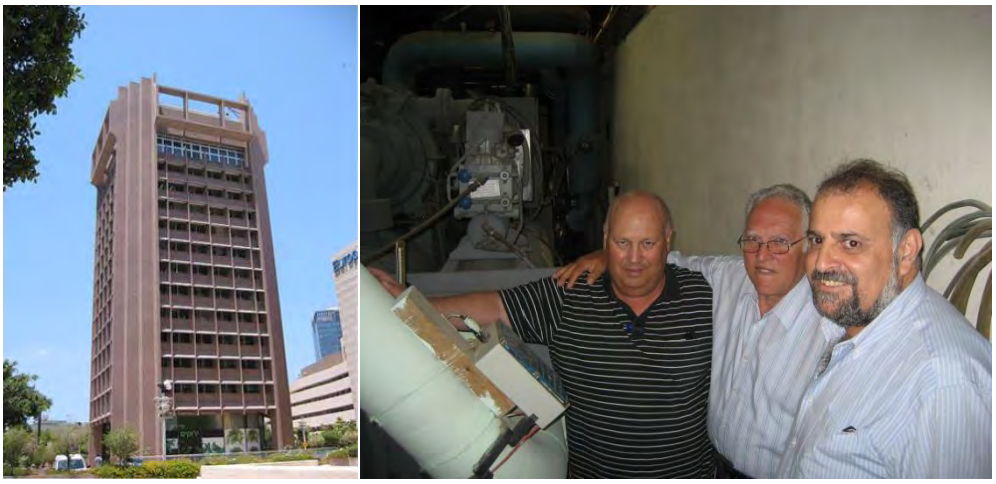


Figure 87 (Left) Beit America Tower. (Right) the installed unit Along with Avigdor Paldi From Palbar, Dr Stefanini from Hydropath and the engineer from Beit America

Background

This was the first installation of Hydropath Technology on a cooling tower, using a prototype version of the Aquaklear unit. The unit was installed (on the inlet to a chiller fed by four cooling towers) in 1995. Previously, over $1000 per month was spent on anti-scale treatment. Now, no treatment is used either for scale or for disinfection. The tower water is now used for toilet flushes, etc. Consequently, the water use has been reduced from 1000 gallons a month to 250. The manufacturers of the towers and the engineer examining the 30 year old pumps were amazed and the condition of the system.

Results:

The system successfully cleaned the chiller's internal heat exchanger. It is still keeping the cooling towers clean from limescale, bacteria and algae today, with no use of chemicals or other technology except HydroPATH, and no need for maintenance.

The system was opened again in 2008. The heat exchanger was found clean.

HaMa'apil Swimming Pool

Date: June 2012 **Country: Israel**

Distributor: Palbar Keywords: Flocculation, Swimming pool

Filename: CaseStudy HaMa'pil Swimming Pool

Application:

- 500 cubic meters (132,000 gallon) swimming pool (recently built)
- A 6" circulation pipe connecting to two 10 cubic meters filters, circulating 120 cubic meters per hour
- Automatic chemical injection system

Testing method:

The AquaKLEAR system was installed on June 2012. On September 2nd the system was disconnected and on September 16th it was reconnected. Chemical usage and backwashes frequency was documented for 6 weeks, starting on September 2nd.

Documenting was done by Yoram Strull, who is in charge of the swimming pool.

Results:

Using AquaKLEAR systems allows:

- Chlorine reduction by 47%
- Acid reduction by 70%
- Saving 48 cubic meters of water per month

Note that reducing chemical usage and backwash frequency is reducing the overall maintenance of the swimming pool.

Office Building Cooling Tower

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Algae/ Bacteria, Limescale, Cooling tower

Filename: CaseStudy Office Building Cooling Tower

Algae grows uncontrollably in the basin of the cooling tower. In addition, limescale has accumulated on the cooling tower honeycomb fills, louvers and infratructure even though the water is being treated with chemicals, under the supervision of the facility manager and an outside chemical company.

Method

Monitor Hydropath technology's ability to eradicate biological growth in the basin of the cooling tower. Monitor Hydropath technology's ability to prevent limescale accumulation on the cooling tower's honeycomb fills, louvers and infrastructure.

Figure 88: Cooling tower basin before (left) and 10 weeks after(right) application of Hydroflow

Results

Approximately 90% of the biological growth was eradicated without the use of incremental chemicals.

Basin water is no longer murky and foamy.

Limescale stopped accumulating as soon as the *Hydro*FLOW device was turned on.

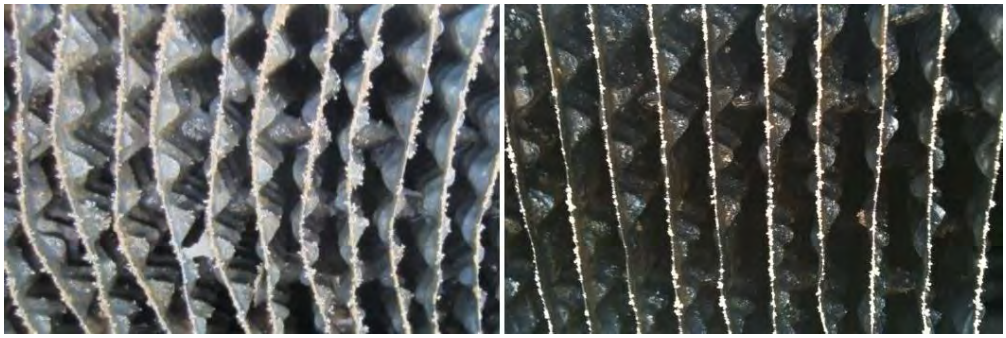


Figure 89: Cooling tower fins before (left) and 10- weeks after (right) application

Conclusion

Biological growth has been noticeably reduced with the installation of the *Hydro*FLOW water conditioner. Biocide treatment should be continued in order to retard the growth of impurities introduced to the system because of its external exposure.

Limescale issues on the louvers, honeycomb fills and infrastructure have been reduced thanks to the *Hydro*FLOW water conditioner. The cooling system's chillers will be examined during the annual maintenance routine, which will be performed in the latter part of the year. Bio-film and limscale deposits are expected to be minimal.

Wastewater Ammonia Stripper

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA, Hydrowerks

Keywords: Waste water, Limescale, Heat exchanger, Tube in shell

Filename: CaseStudy – Wastewater Ammonia Stripper

Prior to disposing wastewater in a lagoon, it is sent through a shell and tube heat exchanger. The warm wastewater is sprayed into the top of each ammonia stripper. Each ammonia stripper is filled with plastic packing that assists the evaporation process. The below pictures demonstrate what two weeks of processing wastewater through the ammonia strippers does to the plastic packing.

Clean plastic packing

Dirty plastic packing

Once the packing becomes full of scale the entire wastewater processing system has to be shut down. This typically takes two people an entire day.

Results

The *Hydro*FLOW device was able to extend the time between cleanings by a factor of eight; the customer can now go 4 months before needing to clean the packing material, which reduced the cleanings per year from 26 to 3 times.

"We are very happy with the results that we have seen form the HydroFLOW water conditioner. The wastewater process continues uninterrupted thus no longer risking a shutdown to the manufacturing process."

Estimated Return On Investment

1-2 months due to reduced maintenance and manufacturing downtime.

Referral available.

Trailer Manufacturer

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA, Hydrowerks

Keywords: Factory, Limescale, Pump

Filename: CaseStudy – Water Heater and Pump

The Carry-on Corporation manufacture utility, cargo, horse, livestock and specialty trailers, were experiencing scaling problems in their Iowa facility - the largest in the corporation. Scaling was occurring on the wash bay water heaters, pumps, hoses and washer wands.

They were looking for a non-chemical system that would eliminate the scale build up inside the 3,000 PSI wash system.

- The facility is fed from city water, relatively hard at roughly 300 ppm.
- Water softener and/or chemicals are not used.
- Replacement and maintenance due to scaling is well over $3,000/ year.

A *Hydro*FLOW C45 was installed on the inlet to the first wash bay.

Results:

Since installation, the wash bay water heaters, pumps, hoses and washer wands have been free of scale. The customer is very pleased with the results.

"Upon opening up the pumps, we found no scale. The water heaters, hoses and fixtures look the best that they have ever looked! Now that we're convinced Hydropath technology works to prevent scale accumulation, we intend to install HydroFLOW devices in our other manufacturing facilities."

Estimated Return On Investment:

Roughly one year.

Referral available.

Britannia Airways Humidifiers

Country: UK

Keywords: Humidifiers, Limescale, Airport

Filename: CaseStudy Britannia Airways

Britannia Airways, based at Luton Airport, London, had to maintain a constant level of humidity in its computer rooms and hangers, but the efficiency of the humidifiers was being undermined by scale formation.

The humidifiers required descaling within one month of installation and the deposits were so hard that acid cleaning was required, damaging the heating elements and reducing their lifespan to three months. Cleaning required a 24 hour shut down and careful disposal of the acid waste.

A trial was conducted on a single humidifier over a two month testing period.The hard scale deposit was eliminated, any remaining deposits could be easily knocked off.

Following this success, the system was brought into general use. Monthly maintenance time has been reduced from 24 hours to 2, and the use of scid cleaning is no longer required.

The support services supervisor of Britannia Airways was delighted:

"Cleaning the bottles used to be regarded as a punishment detail. Now it is a pleasure."

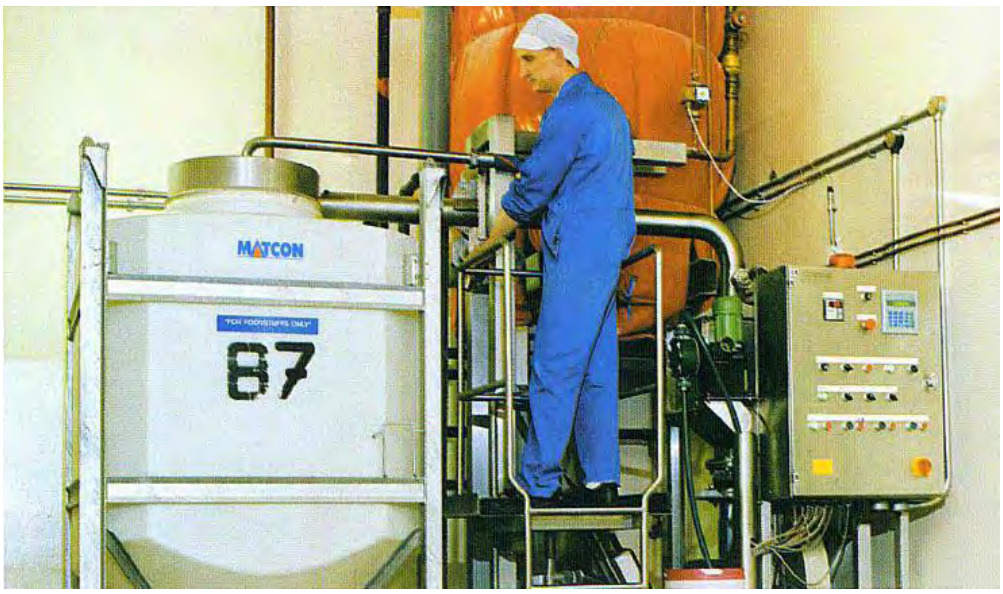
RANK HOVIS MCDOUGAL

Country: UK

Keywords: Limescale, Food industry

Filename: CaseStudy Rank Hovis Mcdougall

At McDougall's Factory in Reading, UK, the high volume preparation of dry mixes for pre-packages food required regular cleaning of the food bins. The bins had a custom built cleaning bay system that sprayed the bins twice a day with powerful hot jets of 60C water mixed with sodium hypochlorite.



The cleaning system suffered from a rapid build-up of scale in the nozzles and jets of the spray fittings. Even when the temperature was reduced to 40C, the scale still had to be cleaned twice per week.

"The situation necessitated the unpleasant job of dismantling the spray heads, then soaking themin a strong chemical cleanser. Overall, this cause severe disruption to the production process."

A Hydroflow C60 unit was installed on the inlet to the cleaner bays. Maintenance intervals were slashed from twice a week to once every 10 weeks. Additionally, a simple wipe over the nozzles is adequate, rather than requiring them to be dismantled and soaked in chemicals.

The site engineering manager described the results as *"immediately impressive"* and Mcdougalls are delighted by the gains in efficiency, cost and productivity.

Chemical Plant Remineralisation

Date: 2012

Country: Spain Distributor: Hydroflow España

Keywords: Factory, Limescale, High concentration

Filename: CaseStudy Chemical Plant

This chemical plant is a large plant in north-eastern Spain, owned by a large German group.

As part of their process, they need to make a pH adjustment, or "remineralise" the water. This is done by adding limewater, i.e. a highly concentrated solution of calcium carbonate. Obviously, such a high concentration causes very rapid scaling in the pipes and equipment transporting it. The scaling was so rapid that the pipes would develop a layer of scale of about 15mm in three months, and within six months would have to be replaced completely. The client said they would be happy if the pipes lasted for a full year rather than six months.

Two Hydroflow C45 units were installed at the beginning of 2012. After three months a section of the pipe was opened for inspection.

The inspection lasted for less than a minute. There were no limescale encrustations present and no white deposits. This contrasts with the 15mm thick layer that would otherwise have been present.

The head of maintenance for the plant pronounced the results as *"very good"* and the client has gone on to purchase a further unit.

Gypsum Mine

Date: 2012

Country: Spain **Distributor: Clean Clear Water**

Keywords: Mining, Limescale, High concentration, Non-carbonate

Filename: CaseStudy Gypsum Mine

This study describes a mine produces Gypsum (calcium sulfate dihydrate $CaSO_4$) and so has an extreme problem with scaling. The scaling is not only the standard calcium carbonate scaling, but also calcium sulphate. The water contains about 500 mg/ l of Calcium, 1400 mg/l of Sulphate and about 350 mg/ l of bicarbonate.

A pump is used to remove water from an underground pool in the bottom of the mine. The pump would scale up every three months and have to be lifted from the mine so that it could be cleaned with acids; sometimes they would need to replace metal rings and hydraulic joints because they were cracked

A Hydroflow unit was installed halfway between the pump and the mine entrance, approximately 350m from the pump. The fact that the Hydropath signal can travel back up the pipe against the flow of the water made this application possible. The unit was installed on the 1st Aug 2012.

Results

After a trial period of three months of operation, the results are very positive. The pump was photographed for inspection, and found to contain only a light coating of powder, the water discharge along the pipe was very turbid and full of scaling crystals. The trial continues for another three months, at the end of which the pump will be completely opened, inspected and photographed.

Trial terms

During the period of the trial, the unit was rented to the customer. At the end of the trial period the customer will purchase the unit.

600 and 700 HP Steam Boilers

Date: 2013

Country: USA Keywords: Limescale, Steam boiler, Factory,

Distributor: Hydroflow Holdings USA

Filename: CaseStudy 600 and 700 HP Steam Boilers.pdf

This study describes two large diesel steam boilers. These were using well water originally at 200ppm but brought down by a softener to 80ppm. Cleaning required a week of down-time and acid cleaning.One *Hydro*FLOW 60i unit was installed on the water line, after the softener, which provides make-up water to the DA tank. Two *Hydro*FLOW 60i units were installed on the incoming water line feeding each steam boiler.

Results

- Within a few days, soft chunks of grayish and reddish scale and "putty" (wet calcite crystals) began washing out via blow-down.
- The water softener was bypassed less than a month after installation, which led to acceleration in the removal of scale from the system.
- Within 2.5 months, the stack temperature of each steam boiler reduced from approximately 650 to 400 degrees F, indicating increased efficiency.
- Within 2.5 months, fuel consumption went down from 400 to 275 gallon per day; which translates to roughly **$150K savings annually (return on investment of 2-3 months).**
- Due to the great results, the customer decided to delay the possible replacement of the steam boilers **($350K each).**
- Quote from the maintenance supervisor: "I'm very pleased with *Hydro*FLOW's results. Instead of dreading it, I'm actually looking forward to the next state inspection!"

Fast Food Restaurant

Date: 2013

Country: USA Keywords: Limescale, Food industry, , Ice maker,

Distributor: Hydroflow Holdings USA

Filename: CaseStudy Fast Food Restaurant.pdf

Wendy's are the world's third largest fast food chain, after McDonalds and burger King. This restaurant's water source is from very hard (519 ppm) city water. A water softener and filter system are currently used. Replacing the water heater and maintaining the ice machine is costing the location approximately $3,500 per year.

Units were fitted to the incoming main and the inlet to the ice maker (after the filter).

Results

- Very little scale was found upon opening the ice machine. The minuscule scale that was present was mushy and easily wiped off. The maintenance manager also noticed that the pipes were de-scaling.
- The new soda machine is starting to have scale problems and a second S38 unit needs to be installed to protect the machine.
- This is a picture of the maintenance manager holding a reservoir located at the bottom of the ice maker. This would have been full of solid scale in the past. Today, what scale is present is very mushy and was easily wiped off.

Quote from customer:

"I would have expected much more scale normally and it would have been very hard. To clean it would have involved scrapping the scale off. Today it is just mushy and easily wiped off."

Estimated Return On Investment:

Less than ten months.

GAS STATION/CAR WASH/ CONVENIENCE STORE

Date: 2013

Country: USA Keywords: Limescale, Food industry,Car wash,

Distributor: Hydroflow Holdings USA

Filename: CaseStudy Gas Station….pdf

Overview

Sheetz, Inc. is a chain of gas stations / convenience stores. Since 1952, Sheetz has grown from a small dairy / deli in Altoona, Pennsylvania, to one of the fastest growing family-owned convenience stores in the world, with more than 435 locations and more than 14,500 employees.

The Sheetz convenience store, at Hancock Maryland, suffered from limescale and biological growth issues that increased its energy consumption, water usage and maintenance costs. The store utilized chemicals and a water softener in an attempt to combat these problems, to no avail.

In 2013 a *Hydro*FLOW water conditioner was installed on the incoming water supply, and water softener and chemical use discontinued.

Before - 7 day accumulation

After - 90 day scale accumulation

Summary

- The 90 day evaluation showed *Hydro*FLOW water conditioners can remedy the limescale and biological growth problems many Sheetz stores encounter, without the use of chemicals and a water softener.
- In addition to the store at Hancock, two other stores in Pennsylvania were evaluated, with similar results.
- The Sheetz Corporation intends to gradually replace conventional water treatment methods with *Hydro*FLOW water conditioners.

Commercial Building Cooling Tower

Date: 2013

Country: USA Keywords: Limescale, Cooling tower, Algae/ Bacteria,

Distributor Hydroflow Holdings USA

Filename: CaseStudy Commercial Building Cooling Tower.pdf

This installation is in Central Pacific Plaza, Honolulu, Hawai, on a cooling tower with two 300 ton cells and one 75 ton cell. The objective was to keep biological growth, scale accumulation and corrosion rate under control while using minimal amounts of chemicals.

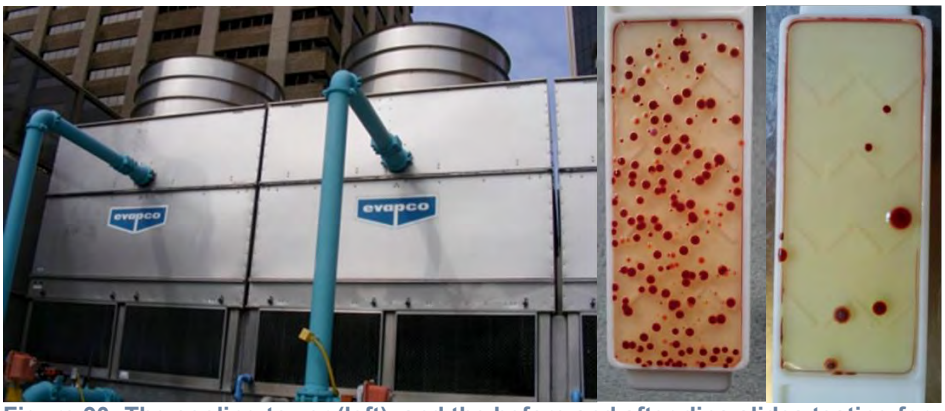


Figure 90; The cooling tower (left), and the before and after dips slides testing for bacteria.

A HydroFLOW Custom 14" unit was installed after the sump pumps and before the chillers.

Results (after 90 days)

- Lime scale and corrosion buildup inside the cooling tower and chillers remained under control even though anti-scalant and anti-corrosive chemicals were discontinued
- Biocide chemical was reduced by 85% and bacteria levels reduced from 100,000 CFU to 1,000 CFU
- Blow-down reduced by 50%
- Conductivity remained stable at 1245 ~ 1295 Micro Siemens
- ROI of 3-4 months
- Average annual **saving of $121,000**

SLAUGHTERHOUSE MATADERO DE LA PLANA

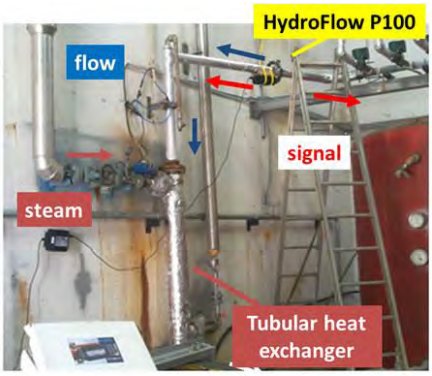
Date: 2013

Country: Spain Keywords: Limescale, Heat exchanger, Tube in shell, Food industry

Filename: CaseStudy Matadero de la Plana.pdf

The Matadero de la Plana is a slaughterhouse in a very hard water area of Spain, over 40 degrees (French).A small tube in shell heat exchanger works with steam to maintain the temperature of the water at a high level. The water enters the exchanger at 60 degrees and comes out at 85 degrees.With untreated water, the heat exchanger blocked up with limescale within 30 days.A salt based decalcifier had been used; but it was laborious and expensive to operate.

The Matadero ran a trial of a HydroFlow in 2012 for 2 months, which gave positive results, though slightly clouded by the fact that large amounts of scale were released by the metal pipes, leaving a matting of soft scale at the point of entry to the heat exchanger.



A P100 unit was purchased and installed in 2013 and the exchanger cleaned.

Two months later, the heat exchanger was opened for inspection; and the head of Maintenance was very happy with what he found. The Heat exchanger was completely free of new limescale.

17 of the 18 tubes were completely clean, and one was slightly blocked by soft limescale released from the pipes, that was easily cleaned.

Figure 91 (left, the normal level opf limescale accumualation. Right, the exchanger after 2 months protected by Hydroflow.

MILLENIUM POINT

Date: 2012

Country: UK **Keywords: Limescale, Drainage, Waste water**

Filename: CaseStudy Millenium Point.pdf

Millennium Point in Birmingham is a facility that contains a cinema, a museum, space for the University and college, and assorted retail outlets.

Figure 92: Millennium Point

The drainpipes used to drain rainwater from several paved terrace areas were showing significant scaling. This was unusual, as rainwater is very soft, but in fact the rainwater was dissolving the limestone in the paving blocks. The rains would block the pipe and cause flooding, leading to water ingress in the building. The drains needed cleaning every 3 months.

Figure 93: (Left) limescale in the drain. (Centre) A hatch cover cleaned and left for 3 months (Right) A hatch cover showing signs of scale removal

Results

A cleaned hatch showed no deposit after 3 months. Uncleaned hatches showed signs of gradual scale removal.

- Previously drains were cleaned every 3 months
- Drain pipes remained clear for the 9 months of the trial period
- Evidence of (gradual) removal

PEPSICO/ WALKERS

Date: 2012

Country: UK **Keywords: Limescale, Spray, Food industry, Factory**

Filename: CaseStudy PepsiCo.pdf

Walkers Crisps (known as Lays internationally) are the UK's largest manufacturer of crisps ("potato chips"). They hold almost 50% of the UK market, with the site in Leicester using 800 tons of potatoes and producing 11 million bags of crisps annually. Walkers are a part of PepsiCo.

The production line contains cold water spray with small outlets (200 microns in diameter highly prone to scaling. These nozzles would block on a weekly basis, requiring removal from the line cleaning in an acid bath for 3 hours

A single Hydroflow i45 unit was fitted to protect four sets of nozzles on the line. Weekly cleanings of the nozzles were discontinued.

Figure 94: The spray bars on the production line (left) and the bars being removed for weekly cleaning

Results

The unit was installed on 19 March 2013.

As of September 2013, the nozzles have remained clear for **24 weeks**, whereas the nozzles previously were cleaned **every week**.

Over a year, this corresponds to a saving in the cleaning costs of **95%**, including **49 x 3hrs = 147** hours of lost production time and labour costs, and a saving of approximately **49 x 4 litres = 196 litres** of acid solution per year.

WALLA WALLA WASTE WATER PLANT STRUVITE

Date: 2013

Country: USA Keywords: Non-carbonate, Factory, Algae/ Bacteria, , Non-carbonate,

Distributor Hydroflow Holdings USA

Filename: CaseStudy Walla Walla Waste Water Plant - Struvite.pdf

This study is on a belt press in a waste water treatment plant. The deposit was purely "Struvite" or Magnesium Ammonium Phosphate ($NH_4MgPO_4 \cdot 6H_2O$). The study looked to see if Hydropath technology could prevent or even remove Struvite. Custom AquaKLEAR 12" unit was installed on 31st May 2013.

Results

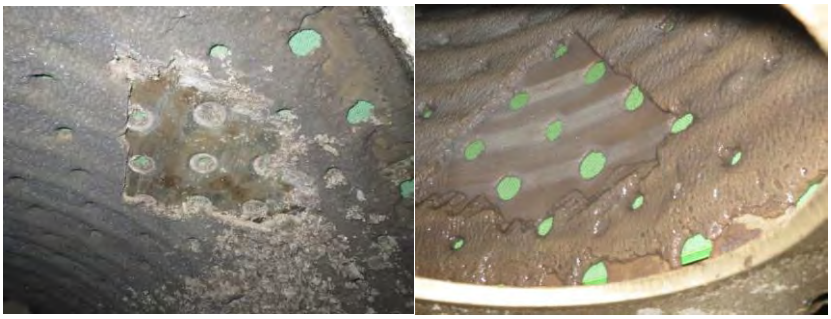


Figure 95 (Left) the roll before installation with a section of deposit removed. (Right) After 8 weeks there is no new deposit and the old deposit is starting to dissolve.

A patch of hard deposit on the inside of the roll was chiselled off before installation. After 8 weeks no new deposit was seen. On the belt press, there was a constant flow of water, and so after 5 weeks the existing deposit has dissolved and only soft "paste" remained.

Figure 96 (left) Hard deposit before and (Right) soft deposit after 5 weeks

FRED MEYER / KROGER GROCERY STORE

Date: 2013

Country: USA Keywords: Limescale, Retail, Spray,

Distributor Hydroflow Holdings USA

Filename: CaseStudy Grocery Store Produce Department.pdf

Fred Meyer is a subsidiary of KROGER CO., the largest traditional grocery retailer in the United States with over 3000 stores and an annual turnover of almost 100 billion. The goal of the installation was to reduce scale and scum accumulation within the mister nozzles and on the display cases in the produce department.

An S38 was installed on the mister system after the pump and filter.

Results

Scale buildup was minuscule on the front display, signage area and nozzle screens. Removal of scale was effortlessly performed with a damp piece of cloth. Scum buildup on screen nozzles was easily removed by running under water.

- *Hydro*FLOW removed existing scale and prevented new scale from accumulating.
- *Hydro*FLOW eradicated bacteria and algae, allowing for easier removal of scum from screen nozzles.
- *Hydro*FLOW reduced man hours required for removal of scale and scum from the produce display cases by roughly 75%.
- *Hydro*FLOW's compact configuration allows for easy installation with minimal disturbance in tight working areas.

The estimated return on investment was under three months.

Dying Plant Waste Water Treatment Plants

Date: 2012/ 2013

Country: Indonesia Keywords: Flocculation, Waste Water, Factory,

Distributor Hydropath Asia

Filename: CaseStudy dying plant waste water Indo Pacific.doc, CaseStudy dying plant waste water Malakasari.doc

Yarn dying in Indonesia uses the natural purple dye “indigo”. The wate water from this process obviously needs to be disposed of, but before it can be released, it needs to meet certain government regulations with respect to Total Suspended Solids, Chemical oxygen Demand, Biological Oxygen Demand etc. These two case studies describe installations on the waste water treatment to reduce and stabilise these parameters.

As part of the treatment process, the waste water was treated with Aluminium Sulphate flocculant, before being send to clarifiers/ settling tanks.

Results

After one month of treatment, both factories found:

- The Color was removed from the water
- The effluent was clear
- The COD; BOD; TSS were reduced and stablised
- The Government Regulations complied with
- Chemical usage was reduced.

Hydropath has successfully performed to the expected standard and has met the expected results.

HOTEL BARCELO CALA VINYAS

Date: 2013

Country: Spain **Keywords: Limescale, Hotel, Pipeline,**

Distributor Sistema de Descalcificacion

Filename: CaseStudy Hotel Spain.doc

Hotel Barcelo Cala Vinyas is a big hotel in a hard water area in Mallorca. The hot water system of the hotel was affected by big scale encrustations within the pipes themselves, to the extent that the diameter of the pipes was effectively reduced.

The first visit was to install a **HYDROFLOW P-100** unit On taking apart the pipe and taking the measurements of scale, the thickness of scale on the pipe was found to be 1cm.

Results

After a month the scale was reduced to 6mm, reducing the scale by 4mm or 40%. Taking into account that this result is after 30 days, in a hot water zone where the process is much slower than with cold water. It can be concluded that the installation has proved to be successful in adressing the scale problems this client was experiencing.

Mercerising Washing Machine

Date: 2013

Country: Indonesia Keywords: Limescale, Factory, Textiles

Distributor Hydropath Asia

Filename: CaseStudy Mercerising Machine Indonesia.doc

Hydropath technology was installed on a Mercerizing Machine used for washing Cotton/Rayon Fabric with NaOH and water. Sodium hydroxide alters the pH of the water, making it more alkaline and increasing the deposition of limescale.

Usually, if the final wash with water is not good, the cotton / rayon fabric will be water marked. If the cylinder roll has hard scale, the fabric will be

woolly. The results expected are for no Hard Scale in the machine to be present, such as: cylinder roll, chamber and no Water Mark at the finished product. The results will be measured by inspection o f the machine and the fabric.

Results

Two months after installation, the Hard Scale at the cylinder roll and chambers was breaking down and the woolliness of the Cotton / Rayon fabric was reduced. There was no Water Mark on the Cotton / Rayon fabric and it was easy to maintain the machine. Hydropath technology has

successfully met the expected results.

Sodium Hydroxide Recovery Machine

Date: 2013

Country: Indonesia Keywords: Limescale,, Factory, Textiles

Distributor Hydropath Asia

Filename: CaseStudy NaOH recovery Macine.doc

The company is recycling Sodium Hydroxide (NaOH) after a process in which

it is used to wash fabric in Mercerizing Machine. To extract the Sodium

Hydroxide, they use a NaOH Recovery Machine.

The expected results were for no hard scale to be present in the tubes of the cylinder (the heat exchanger) and for easy maintenance. The expected results were to be measured by how stable is the flow rate of NaOH and by visual inspection.

Results

After three months the hard scale before using Hydropath Technology was broken and there was no hard scale in the tube.The flow rate and quality is stable and it is easy to clean the tube. Using Hydropath technology has been successful is addressing this client's problems.

TESTIMONIALS

INTRODUCTION

This section compiles testimonials. Again, there is significant overlap between these and case studies and some have as much detail as any case study.

I have chosen to put here everything that has a testimonial document from the customer, from full-blown studies to simple recommendations. Remember that many of the Field Test Reports will be written by the customers themselves, or an independent engineering firm.

GRONTMIJ/ VROOM & DREESMAN

Date: 2009

Country: Netherlands Distributor: Maimtec

Keywords: Limescale, cooling tower,Heater, Retail

Filename: Testimonial Grontmij.pdf

Figure 97 The Rotterdam branch of the Dutch superstore V&D (Vroom & Dreesman).

Grontmij Technical Management is one of the biggest and most important technical advices bureaus in the Netherlands and is also Internationally active. As such they are responsible for technical support for the big V&D (Vroom & Dressman) superstores all over the Netherlands. In each mediumto-large city you can find a V&D store.

In the large V&D store in Eindhoven, they had significant problems with scale in their two large 300 litre boilers. The system was treated by a C60 above on the inlet cold water feed to the boilers and a number of smaller units (S-38, HS-40 and also HS-38) around the building to protect scale-sensitive apparatus like dishwashers, boilers, washing machines, steam ovens etc.

When the boilers were examined a year and a half later, they were found to be completely scale free. After one year using this treatment in the big V&D store in Eindhoven Grontmij Technical management decided to perform an experiment by stopping the work of the Ion Exchanger that was located in front of the professional dishwasher of the Le Place restaurant on the 4 floor.They found out that the results were very good -no scale and no scale stripes on plates and glasses.

Since then this Ion Exchanger has remained switched off and the subsequent saving is very high.

After the big V&D in Eindhoven (2005) was successfully treated with HydroFLOW, units were installed in other V&D stores in Maastricht, Rotterdam, Delft and Venlo.

The most recent installation was on the cooling tower for the air conditioning system in the large V&D store in Eindhoven, which is a big building with 6 floors. The cooling tower is active there from the beginning of April to October each year. Usually in March every year they need to clean the mattresses and other parts of the cooling tower system to remove scale and other dirt from the previous season.

Figure 98 The cooling tower and chiller at the Eindhoven V&D.

Results

The AquaKLEAR P160 was installed in end of summer 2007 on the circulating pipe between the cooling tower carrier chiller. Grontmij technical management were very satisfied with the results:

"In 2005 we installed HydroFLOW units to treat the whole cold and warm water system of the big V&D store in Eindhoven and the scale problem is fully solved.

Since summer 2007 there has been a P160 AquaKLEAR active, treating the water of the cooling tower in the big V&D store in Eindhoven and also there the cooling tower is completely scale free. These successful projects with the HydroFLOW units in the different locations in the last 4 years showed us that the Hydroflow technology meets all our expectations."

PHOENIX PAPER MILL

Date: 2001

Country: China Distributor: Hydropath Asia

Keywords: Limescale, Factory, Paper, Competing water conditioner

Filename: CaseStudy Phoenix Mill.pdf

Phoenix paper mill is situated at Nanning, China where water hardness is above 200ppm. Production at the factory had to be stopped for one day in every two weeks for cleaning because of hard scale formation at different parts of the production line. Since there was no access to install HydroFLOW near the heat exchanger, which was 3-storey in height above the ground, a HydroFLOW Custom 24 inch unit was installed on April 2001. A competing water conditioner had previously been install but to no effect. Rather than go to the expense of removing it, it was simply left in place.

Figure 99 A custom 24 inch HydroFLOW unit installed in Phoenix Mill paper factory. Note the competitor's water conditioner!

Results

Five months after the installation, there was still no need to stop the production because of scale. The factory had gone from requiring cleaning every two weeks to requiring cleaning less than every five months!

The benefits of HydroFLOW included:

- Heat exchangers and valves remained clear of scale.
- Water pressure and flow rate remained unchanged.
- Cleaning was not required, improving safety and economy.
- No chemical treatment was required.

The factory estimated that they saved at least US $85,000 annually from cleaning and no work stoppage.

Family Tree Apartments and Pool

Date: 2010

Country: USA Distributor: Hydroflow Holdings USA (Dealer: H20 Solutions)

Keywords: Limescale, Heater, Swimming pool, Flocculation, Chlorine

Filename: Testimonial FTA.pdf, CaseStudy Pinhole Family Tree Apartments.pdf

This is a complex with 121 apartments and a total of twelve 100 gallon water heaters, and a swimming pool. The complex is supplied with water from a well.

Limescale began to cause significant problems with the heating system, ranging from leaks to the replacement of heaters on a 3 year cycle. Hydro-FLOW units were installed throughout the complex in August 2009, including on two heaters that were due to be replaced due to excessive scale.

The pool at the complex required excessive amounts of chlorine, leading to complaints about the smell and sore eyes. An AquaKLEAR unit was fitted to address this.

Results

Within two months, the previously-scaled water heaters had been completely cleared of scale. Noises and leaks due to scale also reduced significantly. The maintenance costs were reduced dramatically, and no heaters have been considered to be replaced because of scale.

Three days after fitting the AquaKLEAR unit to the pool, the water had become crystal clear and no longer smelled. The tenants reported a more pleasant experience without the smell and without sore eyes.

In order to check that these benefits really were due to the AquaKLEAR, the unit was removed and within three days the pool was as before and the tenants began to complain again.

"There is no doubt that HydroFLOW has the most viable solution to hard water and scaling problems within a water system. These products have undoubtedly saved us thousands of dollars in maintenance and created happier tenants"

Douglas Rayburn Wool Spinners and Dyers

Date: 1997

Country: UK

Keywords: Limescale, Factory, Textiles

Filename: Testimonial Douglar Rayburn.pdf

Douglas Rayburn Wool Spinners and Dyers were experiencing problems with their four heat exchangers. These were installed in 1991 and each had a flow rate of around 560 litres per week. The water was very hard, being from the company's own well.

Approximately six months after installation, the efficiency of the plant fell due to a build up of scale in the heat exchanger. This had to be removed by chemical cleaning, which took 3 days and was necessary every 3 months.

In February 1995, a HydroFLOW unit was installed to protect the heat exchangers.

Results

Between the installation of the unit in February 1995 and the date of the testimonial (March 1997), no cleaning had been required on the heat exchangers. The required cleaning had gone from once every 3 months to less than once in two years.

The exchangers were stripped annually for an insurance inspection and no problems were found.

Heathrow Airport

Date: 1995

Country: UK Keywords: Limescale, Airport, Heat exchanger

Filename: Testimonial Heathrow.pdf

London's Heathrow airport is the 4th busiest in the world. London is one of the areas in the UK with the hardest water.

Every year they were forced to dismantle their heaters, and chemically remove the limescale from them. Due to the high costs of this, they were searching for a solution.

In March 1994 a trial was done using a HydroFLOW C120 to protect the calorifiers (i.e. heaters).

Results

After three months, the calorifiers were dismantled and found to be completely free from scale.

Following the trial the company bought a further £40,000 worth of conditioners and recommended the products to other airports within the BAA group.

Heathrow Airport Hilton

Date: 1999

Country: UK

Keywords: Limescale, Airport, Hotel, Ice maker

Filename: Testimonial Heathrow Hilton.pdf

One of the difficulties in selling limescale prevention is that the effects are not instantly visible.

Whilst selling, to the Heathrow Airport Hilton one application with a more rapid effect was tried - ice-making machines. These are rather vulnerable to scale. They scale up very rapidly so are a good application to show results in a short time. It was decided to fit a HydroFLOW unit to the ice-maker as a trial.

Results

The company were very impressed with the results. Not only was the ice machine free of scale, but the ice produced was actually much higher quality. The ice made is visibly much clearer ("100% better" according to the hotel) as the suspended limescale crystals act as seeds to help the ice form.

Following this success, the hotel decided to treat their entire system with HydroFLOW, and have discontinued using their water softener.

MAKRIS LOBSTER AND STEAK HOUSE

Date: 2005

Country: USA

Keywords: Limescale, Steamer, Restaurant

Filename: Testimonial Makris Steak.pdf

The Makris Lobster and Steak House in Manchester, New Hampshire ("We ship lobsters anywhere") had ongoing problems with scale. They had to descale their steam weekly at a cost of $9 a time, and still experienced problems. Their probe housing also had to be replaced every 15 months at a cost of $300 a time.

Results

Within a few months the results were clear. At the time of the testimonial, four months later, the steamer did not need to be descale done. This means a saving of at least 90% on descaling costs.

Wokingham Council

Date: 1999

Country: UK

Keywords: Limescale, Council, Government, Domestic, Heat exchanger

Filename: Testimonial Wokingham Council.pdf

This is a testimonial from Wokingham Council (a "council" is a local government organisation in the UK.) Their tenant services department are responsible for 3000 properties.

In 1997 they began installing HydroFLOW units as part of a program to eradicate limescale.

Results

The council describes them as:

"...one of the best long term measures for the reduction and prevention of the continual scale problem. In addition improved energy efficiency and a 12% reduction in fuel costs can be achieved once the scale has been removed."

The council also testified to the cleaning properties of the HydroFLOW:

"Recently an HS34 unit was installed on the incoming cold water supply to a rather old (10 years) and dilapidated all electric shower unit. Within 48hrs of operation the water pressure and heating controls had significantly improved and within 7 days the shower unit performance had returned to near 95% of its original condition."

The council decided to include HydroFLOW units as standard on all future heating project and contacts.

Mount Magnet Caravan Park

Date: 2008

Country: Australia Distributor: Limescale Australia

Keywords: Limescale, Caravan park, Domestic

Filename: Testimonial Mt Magnet.pdf

Mount Magnet is a caravan park in Meekatharra, an area of Australia with very hard water.

The owner of the park had huge problems with limescale on the sinks, tubs and particularly in the air conditioners. The air-conditioner "batts" got a huge build-up of limescale and had to be trown away every year.

One of the owners favourite talking points was a stalagmite that had built up below a dripping tap becuase the water was so hard! He installed HydroFLOW to try to deal with this problem.

Results

The owner was impressed by the results:

"I have tested it in every possible way, by leaving water residue lying in the sink, laundry tub and leaving a dripping tap to continue onto a brick floor for 3 weeks while I was away from home. The only thing remaining in the sink and tub was a thin smear which promptly wiped off with a dry cloth and left no mineral residue whatsoever."

Unfortunately, the HydroFLOW was so good at preventing and removing scale that he no longer had his stalagmite!

However he was more than happy to lose his favourite talking point as he was saving more than $100 per year on the cost of replacing the air conditioning batts alone, had more efficient air conditioners and no longer had problems keeping his bathroom fittings clean.

Sliced Domestic Boilers

Date: 2005

Country: Netherlands Distributor: Maimtec

Keywords: Limescale, Heater, Domestic

Filename: Testimonial Domestic Boiler.pdf

It can sometimes be difficult to find dramatic stories of domestic applications. Industrial heat exchangers, etc. are all designed to be taken apart, and so limescale buildup can be clearly evaluated. However no-one would cut open their domestic boiler to check for limescale. ...or almost no one.

This rather unique testimonial comes from a domestic customer who was the manager of an installation company. He installed HydroFLOW in his house in 2002. In 2004 he installed a new system and therefore did not need either his old combi-boiler or his close-in boiler (both had been in operation for 12 years). However, he was curious to see the effect, and so cut open these boilers to look inside.

Figure 100 The insides of a domestic combi (left) and close-in (right) boiler. Both had been in operation for 12 years.

Results

This is his reaction:

"I was astonished to see what I saw. The boilers bodies of both boilers were with no scale rests at all and the warming elements of both boilers were unbelievable clean. As experienced maintenance man I have never seen such.

Of course every installation system as many components that influence the working but in my case the Hydroflow unit was located about 12-15 m from the Combi-boiler and the influence was amazing.

I am recommending everyone to install such a unit in his house, the installation is very simple and the results are amazing."

WNT Printing

Country: Netherlands Distributor: Maimtec

Keywords: Limescale, Printing

Filename: Testimonial Printing.pdf, Testimonial Printing English.pdf

This case study comes from the monthly newspaper of Wegener, Holland. It deals with an installation on a printing press of WNT.

S38 -Small Wonder

"The containers for cleaning water to the printing plates had to be cleaned once every 2 weeks and sometimes even sooner. WNT decided to find a solution to this and reduce the frequency of cleaning required. During our search for solution we came to the firm Maimtec.

Maimtec advised us to use the S-38(SteamKlear) to solve this problem. The S38 treats the water via radio-frequency electric field. After 8 weeks we still don't have to clean this container. Without the S38 we had to clean it 26 times a year and with it this has been reduced to six to seven times -a reduction of 75%."

Sjaak Louwerns Tech. Dep. Printing Office WNT

Savings per year

- Less chemicals -580 saving
- Less sewage water -14,625 litres saving.
- Less container cleaning: 1 man hour per unit -60 man-hours saving

DOMESTIC POOL

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Swimming pool

Filename: Testimonial Domestic Pool w water analysis

This is a testimonial from a domestic pool user:

"I bought one and Rudy came out and installed it on my household cold water supply line on Friday. My wife and I have a 18 round above ground pool. I have fought with hard water for years and have spent a lot of money on chemicals to get them balanced. Ive even considered having the Fire Department come out and fill it with creek water to eliminate the hardness and scaling.

This technology worked well beyond my expectations. I added some water to my pool on Sunday and topped it off on Monday. I took my water sample to Clover Leaf today for testing. They were shocked. They had never seen one of my test reports that wasnt off the charts in some form or another. They compared my best test from last year to the opening test with no chemicals added.

The hardness, alkalinity, copper, and iron are in the absolute best range in all categories. I just saved $300 in pool chemicals that I normally have to buy to get the pool adjusted correctly. On top of that it takes me about 3 months to get the levels to stabilize where the chlorine tablets and algaecide work correctly. By then the swimming season is nearly over. Not this year. All I have to do this year is add one bag of Multi Shock and keep a couple of chlorine tablets in the floater. I would highly recommend that the City of Yakima invest in [the technology]."

Test Results

Saturation Index: 0.26 Water Color: None Water Clarity: Clear

Test Name	Test Results	Recommended Range
Free Chlorine	5.3 ppm	2.0 - 4.0 ppm
Total Chlorine	7.5 ppm	2.0 - 4.0 ppm
Combined Chlorine	2.1 ppm	0.0 - 0.2 ppm
pH	7.5	7.2 - 7.8
Hardness	240 ppm	150 - 200 ppm
Alkalinity (w/ stabilizer correction)	180 ppm	100 - 150 ppm
Cyanuric Acid	100 ppm	30 - 150 ppm
Copper	0.79 ppm	0 - 0.3 ppm
Iron	0 ppm	0.0 - 0.3 ppm
Total Dissolved Solids	Not Run	

Figure 101 Water analysis before (2010)

Test Results

Saturation Index: -0.17 Water Color: None Water Clarity: Clear

Test Name	Test Results	Recommended Range
Free Chlorine	0.2 ppm	2.0 - 4.0 ppm
Total Chlorine	0.4 ppm	2.0 - 4.0 ppm
Combined Chlorine	0.1 ppm	0.0 - 0.2 ppm
pH	7.5	7.2 - 7.8
Hardness	150 ppm	150 - 200 ppm
Alkalinity (w/ stabilizer correction)	155 ppm	100 - 150 ppm
Cyanuric Acid	50 ppm	30 - 150 ppm
Copper	0.18 ppm	0 - 0.3 ppm
Iron	0 ppm	0.0 - 0.3 ppm
Total Dissolved Solids	Not Run	

Figure 102 Water analysis after (2011)

BROOKFIELDS RESTAURANT

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Food industry, Restaurant

Filename: Testimonial Brookfields

This is a testimonial from a chain of restaurants in California, who used several S38 SteamKLEAR units as a replacement for water softeners. These were fitted on a range of applications such as steam ovens, dishwashers, water heaters, etc., and they found a range of benefits. The text of the reference follows:

"Pleasing patrons at our restaurants is much more than serving a great meal. Our customers judge us on the performance of our wait staff, restroom cleanliness, the comfort of our seats, even our outdoor landscaping. One of the toughest things to do in a restaurant is dish cleaning. It's a science. And even though we balance the soap and rinse thoroughly, flatware and glasses can still come out of the dishwasher with water spots on them. Believe me, they are absolutely clean and sterilized, but water spots in the customer's eyes leave them questioning cleanliness. We triple filter our incoming water, and until recently, we have been running our hot water through a traditional salt water softener. But still the hard water sometimes wins out and we send the dishes back for a second cleaning. This wastes water, wastes staff time and can be costly in terms of utility charges and customer confidence. Last December, I was introduced to an intriguing new device called Hydro-FLOW, a water conditioner that clamps on the incoming water pipe. I was skeptical at first, but since I spend nearly $3,000 a year on water treatment, I am always on the lookout for a better solution that will help me manage the 11,000 gallons of water we go through in each of my restaurants per day. We tested HydroFLOW technology for one month, checking its effectiveness each week. I began noticing differences almost immediately. The first thing I noticed was that the silverware began to sparkle like new. After two weeks, the scale build up on the inside of the dishwasher was beginning to break down, and the scale around the sink faucets wiped clean with just a wet paper towel. (Prior to this, we were unable to remove scale buildup without a lot of elbow grease and abrasive pads). After just six weeks, the HydroFLOW device not only proved to be the "solution" I was looking for in cleaning my dishes and glassware, it cleaned the residual scale in my dishwasher and faucets. I have now completely shut off my salt-water softener and am abandoning it in favor of the Hydro-FLOW water conditioner. In a word, this device is remarkable! I have ordered HydroFLOW devices for my other two restaurants, one for my home and one for my sister's home."

Sam Manolakas, President -Brookfield Restaurants

BIMBO BAKERIES USA

Date: 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Food industry, Factory

Filename: Testimonial Bimbo Bakery.pdf

Figure 4.7: Tesmimonial from Bimbo Bakeries, USA.

BIMBO BAKERIES USA

November 10, 2011

RE: *Hydro*FLOW Holdings USA

To whom it may concern,

Bimbo Bakeries USA (BBU) is a leader in the baking industry, known for its category leading brands, innovative products, freshness and quality. Our team of 15,000 U.S. associates operate 35 bakeries in United States serving 8,500 routes distributing our leading brands such as Arnold, Bimbo, Boboli, Brownberry, Entenmann's, Francisco, Freihofer's, Marinela, Mrs. Bairds, Oroweat, Stroehmann, Thomas', and Tia Rosa.
In April 2011, Bimbo Bakeries USA commenced a project with *Hydro*FLOW Holdings USA to install *Hydro*FLOW water conditioners on the steam boilers of our facilities. These environmentally friendly water conditioners have proven to significantly reduce limescale and corrosion accumulation in our steam boilers, thus providing significant cost savings associated with reduced chemical usage and increased heat transfer efficiency. To date, the engineering, installation and customer services provided by *Hydro*FLOW Holdings USA have been excellent.

Our parent company Grupo Bimbo recently completed its acquisition of Sara Lee Corporation's North American Bakery business. We will be evaluating the installation *Hydro*FLOW water conditioners on the steam boilers for these new assets as we move into the future.

Sincerely,

Jim McKeown
Director of Environmental / Energy / Security
Bimbo Bakeries USA
Office: 570-455-7756 ext. 11
Fax: 570-579-0078
Cell: 610-737-3159
E-Mail: jmckeown@bbumail.com

PLUMBING CONTRACTOR TESTIMONIAL

Date 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Domestic, Algae/ Bacteria, Swimming pool

Filename: Testimonal Plumbing Contractor.pdf

PHCC Schlueter PLUMBING, INC.
PLUMBING SPECIALISTS

Commercial • Industrial • Residential
Plant Maintenance • Welding
Plumbing • Excavating • Sewer Service

2533 E. Sharon Road • Cincinnati, Ohio 45241
PHONE: 771-7588 or 777-1863

To whom it may concern,

Approximately 6 years ago we came across Hydropath technology. We were installing tankless heaters and were concerned about lime scale problems with the units. Even though we were skeptical of the "little magic box" we decided to try a couple of HydroFLOW S38 water conditioners on a couple of installations. Instead of doing the recommended yearly de-liming, we waited 2 years and when our service tech flushed the heat exchangers, they were completely clean. That made believers of us. Since then we use an S38 on every tankless heater we install.

More recently we have gotten much better acquainted with HydroFLOW USA and some other applications for Hydropath technology, such as that the water conditioners will kill 99.99% of bacteria and algae that pass through them. We've now had great success with installing the water conditioners on pools, which almost totally eliminates the need for pool chemicals. We actually use them on our own home pools.

With Hydropath technology, there is no longer a need for traditional water softeners, and all the associated salt lugging, etc. I highly recommend using HydroFLOW water conditioners, or becoming a dealer for HydroFLOW. This is a great way to help your clients save money and is also a great stand-alone or add-on sale. Make some extra money on service jobs while helping the environment with this green technology.

Please feel free to contact me for more information.

Joseph C. Schlueter

President, Schlueter Plumbing, Inc.

Solutions, Not Excuses!

YAKIMA NATION WELL WATER

Date 2011

Country: USA Distributor: Hydroflow Holdings USA

Keywords: Limescale, Algae/ Bacteria, Well water, Corrosion

Filename: Testimonal Well Water Bacteria.pdf

11/31/2011

To Whom It May Concern:

The Yakama Nation Land Enterprise Toppenish Warehouse was having a bacterial issue in the well. We had an independent lab "Valley Labs" come and take samples of our potable water on 8/25/2010; E.Coli & Coliform were tested for and bacteria colonies were found. We could not drink the water and had to bring in bottled water. On 8/18/2011 we had MBI Water Solutions LLC install an S-38 *Hydro*FLOW water conditioner on our main line to see if it would kill the bacteria. The technology claimed to have a bacterial kill benefit along with de-scaling pipes, corrosion protection and removing bio-film in pipes. We gave it a few weeks to do its job and on 9/8/2011 we had Valley Labs run more tests on our potable water. The results showed zero colonies of bacteria present! We are very pleased with these amazing results and plan to use *Hydro*FLOW water conditioners at other sites of Land Enterprise and the Yakama Nation.

Josh Hanson,
Facility & Maintenance Manager
Yakama Nation Land Enterprise
Phone: 509-952-5919
Email: josh@ynle.com

YAKAMA NATION LAND ENTERPRISE

Bacteria Test

DOH#	Analytes	Results	Units	MRL	Trigger	MCL	Method	Analyzed	Analyst
	BACTERIA TEST	SATISFACTORY							
	Total Coliform Bacteria	Absent	P/A	1			SM 9223D	09/08/11	DCO
	E. coli	Absent	P/A	1			SM 9223D	09/08/11	DCO

Figure 103 An extract from the lab test report showing no colonies of bacteria present.

Greenfield Village

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA, H2O solutions

Keywords: Limescale

Filename: Testimonial Greenfield Village

This is a testimonial from the comptroller of Greenfield Village Apartment Complex, a 128-apartment complex with retail on the ground floor and built about 5 years ago. Each apartment is complete with its own water heater, fan coil heater and a separate recirculation pump. When the complex was acquired in 2011, inspection revealed significant scaling on the water inlets and recirculation pumps. Many of the recirculation pumps were in fact frozen, and the water heaters were starting to fail. Analysis showed the water was very hard at 308 ppm.

Figure 104 A seized pump (left) and limescale deposits (right) in Greenfield Village

There was no documentation of the heating systems, which were complicated and hard to understand. H2O water solutions analysed the system and suggested Hydroflow as a solution, with units fitted to the inlet to each water heater.

It would cost around $400,000 to replace the water heaters, pumps and fan coils, so although purchasing the Hydroflow units had a high upfront cost, there was a “remarkably short” return on investment.

As of Feb 2012, the Hydroflow units had been installed for 8 months, and not only had the units remained operation and limescale free, but the scale in the pumps has dissolved and all but one of the pumps has un-seized. There has been no need to replace pumps, water heaters or fan coils.

The customer says:

“Kevin Bennett and the entire H2O solutions, LLC team was exceptional to work with and has significantly contributed to the low cost of ownership.”

Baker Produce

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA, MBI Water solutions

Keywords: Limescale, Cooling tower, Agriculture, Food industry

Filename: Testimonial Baker Produce

Baker Produce grow different varieties of Apples, cherries, asparagus and potatoes in Washington State. The water heaters used to wash the produce were becoming heavily scaled.

Results

- One *Hydro*FLOW C45 water conditioner was used to treat 3 water heaters used to wash produce.
- In less than 3 months, the water conditioner descaled the water heaters.
- Chlorine, soap and other chemicals used in the washing process were greatly reduced.
- The spray nozzles had not clogged up since the water conditioner was installed. This used to be a daily problem.
- The maintenance staff stated that they never saw bare tubes in the water heaters prior to the installation of the water conditioner.
- Maintenance time has been reduced by 70%.
- The projected return on investment (ROI) is less than 1 year.

Customer comments

"Good Morning Rudy,

Rudy, it is hard to believe, but the pictures tell the story. I am amazed at the results so far. Thank you and the guys at MBI for considering Baker Produce Inc. This problem that you are working on has been an extreme problem for me since I came to Baker Produce. Please feel free to show these pictures. If someone wants to call me to verify I will be happy to share with them. Best of luck with the public. I am feeling good about what I am seeing. Have a great day."

Baker Produce (Zillah, WA)

RV Park Pool and Spa

Date: 2012

Country: USA Distributor: Hydroflow Holdings USA, MBI Water solutions

Keywords: Algae/ Bacteria, Swimming pool,

Filename:Testimonial Pool and Spa – Bio kill

YAKAMA NATION
RV PARK

Yakama Nation RV Park
280 Buster Road
Toppenish, WA 98948
main: 509. 865.2000
fax: 509.865.1801
www.ynrv.com

11-05-12

To whom it may concern,

I am writing this letter as the manager of Yakama Nation RV Park located in Toppenish WA. I have been the manager for 3 years. Last spring, Rudy, from MBI proposed a hydro flow water treatment system that would decrease the amount of chemicals needed to sustain a clean pool and hot tub and also claimed that it would decrease maintenance on both systems. After using the system for 1 season, I can honestly say that the pool and hot tub chemical purchases have decreased, the algae blooms were not as aggressive and we did not have the need to backwash our pumps as often. I suspect next year that our costs and labor for taking care of the pool will continue to decrease since we understand the system better and what it takes working with their system to maintain a perfect pool and hot tub.

Anything that decreases supply and labor costs is great for me!

Sincerely,

Rozanne Mecca, Yakama Nation RV Park Manager

FIRE DEPARTMENT, SHARONVILLE

Date: 2013

Country: USA Keywords: Limescale, Government,

Distributor: Hydroflow Holdings USA

Filename: Testimonial Sharonville Fire Department.pdf

CITY
OF
SHARONVILLE

11637 Chester Road
Sharonville, Ohio 45246
(513) 563-0252
FAX (513) 483-6122

FIRE DEPARTMENT

MAYOR
Virgil O. Lovitt, II

FIRE CHIEF
Ralph Hammonds

SAFETY SERVICE DIRECTOR
Ted Mack

To whom it may concern,

About a year and a half ago, while Schlueter Plumbing was at our station doing some maintenance work,

The technician, Tim mentioned that he had a solution to our severe limescale problems. At that time our drinking fountain had a very ugly off-white buildup on it, and several of our shower valves were so hard to turn that we could barely use them.

We took Tim's advice and went with a Hydroflow 100 unit.

The first thing we noticed after the installation was that within a few weeks the drinking fountain had started to clean up and looked much more appealing to drink from. Over a month or so the shower valves became much easier to operate, and the water flow has increased dramatically. Also the "crusties" are gone from the shower heads.

We have realized significant financial savings due to the decrease in the need for plumbing maintenance work.

We would highly recommend the use of Hydroflow technology to anyone who has limescale issues.

Sincerely,

Sharonville fire dept.

FEDERAL AGENCY FOR STATE RESERVES, RUSSIA

Date: 2011

Country: Russia Keywords: Limescale, Government, Heater,

Distributor: OOO Hydroflow

Filename: Testimonial FKGU Volzhanka.pdf

TRANSLATION FROM RUSSIAN:

FEDERAL AGENCY
FOR STATE RESERVES
(Rosrezerv)
MANAGEMENT OF ROSRESERV
IN PRIVOLZHSKY FEDERAL
OKRUG
FGKU COMBINE «VOLZHANKA»
Giluchastok St., 1, Arkadak, 412210

To the head of the
company
OOO «Hydroflow»

Testimonial about acquisition of anti-limescale unit C-60 and C-100 by FKGU «VOLZHANKA» in OOO «Hydroflow» company

In the boiler house of FGKU combine «Volzhanka» on the boiler DKVR 4/13 and on the boiler DE 6,5/14 are installed and operated water treatment system Hydroflow C-60 and C-100 since 2009.

The system showed themselves from the best side, allowing to achieve decreasing of limescale in boilers from 2.3 mm to 0.7 mm in the heating period, i.e. in 1.6 mm.

In the heating period of 2011 by boiler house was spent 876300 cubic meters of natural gas, with worth 3811 thousands rubles (about 125360$). According to the operation instructions of the boiler 1.6 mm of limescale increases fuel consumption by 11%. Thus the water treatment system «Hydroflow» allowed us to reduce the consumption of natural gas in the 96393 cubic meters, respectively, in monetary form on 419309 (about 13790$) rubles during the heating period, and it is direct financial savings from the use of water treatment system «Hydroflow».

Acting Director C.B.Makarov

INSTALLATIONS

INTRODUCTION

This section contains a sample of other Hydropath installations around the world.

Obviously this list is incomplete, and the installations shown here are just examples. These are presented without much further explanation

Power Stations and Refineries

Keywords: Oil industry, Desalination, Sea water, Radin Gostar Sina, Power station

Figure 105 Lavan Oil Refinery, Middle East. Sea water cooling (above) and desalination (below).

The Lavan oil refinery. Sea water is used here to cool the refinery. Conversely, the heat from the refinery is used to desalinate the water via flash desalination. Note that we also can treat reverse osmosis-based desalination.

Figure 106 Khanghiran Gas Refinery

Keywords: Gas refinery

Steel Manufactories and Iron Industry

There are also several installations in heavy industry such as iron mines and steel factories.

China also has steel production protected by HydroFLOW.

Figure 107 Steam Power Plant, Middle East. The power station uses sea water for cooling (above). This site also uses electrolysis to generate sodium hypochloride from sea water -this is also protected by AquaKLEAR.

Keywords: Power station, Sea water, Steam boiler, Electrolysis, Radin Gostar Sina

Figure 108 Haifa Power Station, Israel. cooled with Sea Water. Large Custom unit installation -about 1 metre.

Keywords: Power station, Limescale, Palbar, Large unit

Figure 109 Wo Chi Reverse Osmosis plant. This is an installation on an island off Taiwan. All the water there is produced by reverse osmosis. HydroFLOW protect all of the equipment against limescale.

Keywords: Reverse osmosis, Desalination, Limescale, Hydropath Asia

Figure 110 Mine and Iron concentrate production, Middle East.

Keywords: Mining, Factory, Radin Gostar Sina

Figure 111 Steel factory, Middle East. The steel being produced (left) and the HydroFLOW protecting the system (right).

Keywords: Steel, Factory, Radin Gostar Sina

Figure 112 Man on Shan steel factory, China. 35 ton steam boiler. (right) Blow down water

Keywords: Steam boiler, Factory, Limescale, Hydropath Asia, Steel

Figure 113 steel factory, Taiwan.

Keywords: Pipeline, Factory, Limescale, Steel, Hydropath Asia

FACTORIES

There are installations in a range of factories, including cement factories, medicine factories and glass wool factories.

Figure 114 Examples of cement factories protected by Hydropath, Middle East.

Keywords: Cement, Factory, Radin Gostar Sina

Figure 115 Glass wool factory, Middle East.

Keywords: Glass wool, Factory, Radin Gostar Sina

Figure 116 Bosch Diesel, Jihlava, Czech Republic. Two HydroFLOW C100 units were installed in 2002, and another two C100 units were installed in 2007.

Keywords: Koncept, Diesel

Figure 117 Ten ton Steam Boiler in Trinuggal Garment Factory, Indonesia (Left) and Six ton Steam Boiler in Batu Pahat Garment Factory, Malaysia (Right).

Keywords: Textiles, Steam boiler, Factory, Hydropath Asia

Figure 118 Starch Mill, India.

Keywords: Starch, Factory, Steam boiler, Hydropath Asia

Assorted Installations

Figure 119 Protecting spray nozzles in a subway station, Middle East.

Keywords: Subway, Radin Gostar Sina, Spray

Figure 120 Examples of installations in hospitals, of which there are many. Left, cooling Tower system, Buddhist Tze Chi Hospital, Taiwan. Right, Nemocnice Kyjov Hospital, Czech Republic. A C100 unit installed in a hospital in 2003.

Keywords: Cooling tower, Hospital, Hydropath Asia, Koncept

Figure 121 Cooling Tower system, Hyundai department store, Korea.

Keywords: Cooling tower, Retail, Hydropath Asia

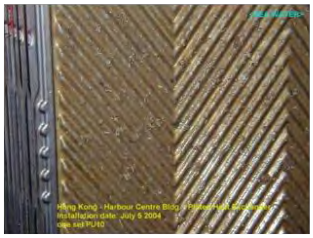


Figure 122 Hong Kong harbour centre building (top) with sea water used in the heat exchangers of cooling towers. A custom AquaKLEAR 10" was installed in July 2004 to protect against Biofouling (left), and by March 2005 the surfaces were clear (bottom right).

Keywords: Cooling tower, Sea water, Biofouling, Plate heat exchanger, Hydropath Asia

Figure 123 A further example of biofouling elimination of plate heat exchangers.

Keywords: Biofouling, Plate heat exchanger, Hydropath Asia