UV-GUARD™
UV DISINFECTION SPECIALISTS

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Effects on the Passage of Water through a UV Guard HWC (UVG HWC) Water Conditioner Analogy – Mini Turbine

In most instances water enters the GUVG HWC in a laminar flow.
On contact with the UVG HWC alloy;

- There is an increase in the water velocity as the water is forced around and over the UVG HWC alloy discs.
- There is a definite positive and negative pressure field generated either side of each UVG HWC alloy disc.
- As water is forced through the UVG HWC and across our specially founded alloy element, the water flow is changed from laminar to a turbulent flow. This occurs throughout the length of the alloy element, generating static energy and a definite electrochemical (galvanic, cathode-anode) reaction.
- This turbulent effect provides a more pronounced exposure and contact reaction between the crystalline particles in the water and the surface contact area of the UVG HWC alloy element.
- UVG HWC has been proven to decrease the Zeta potential by a factor of almost 2 (see point A for an explanation of Zeta Potential).
- Nuclei (nano size crystals) are created and are seeding the solution as a result of the reactions taking place. Since millions of these seeds are created, each crystal does not grow very much creating a very fine non sticking deposit. These non sticking deposits flow through the water carrying system as flocs. These flocs will either flow through the system in colloidal suspension, settle at the low point of a system or can be easily filtered down stream of the UVG HWC.
- UVG HWC effectively lowers the calcium ions concentration by generating a large number of very small calcium carbonate crystals which results in a lowering of the surface tension of water providing a softer wetter feel.
- This lower calcium concentrate causes the LSI (see point B for an explanation of LSI) concentration to fall below the zero value. This causes existing carbonate scaling to dissolve and flow through the system. Once installed UVG HWC will begin to work immediately, however it may take equally as long or longer to remove the existing scale as it took for the scale to deposit.
- The increase in water velocity and the turbulent action of the water prevent any scale build up from occurring in the UVG HWC unit.

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The treated water leaves the UVG HWC in a turbulent flow and;

- Resists the deposition of calcium carbonate.
- Removes dehydrated scale (over time).
- Stops the deposition of salt and keeps it in solution.
- Retards the corrosive action of Iron sulphide and iron oxide.
- Helps with iron bacteria staining.
- Inhibits the formation of some algae.
- Works effectively in either hot or cold water.
- Lowers the surface tension of water providing a softer wetter feel.

Point A – Zeta Potential

The Zeta potential is a measure of the electric charge of a particle in water. It is a very powerful indicator of the possibility of particles to agglomerate and form larger particles. The importance of this Zeta Potential shift can not be overstressed. Many of the important properties of particulate systems are determined directly (or indirectly) by the electrical potential present on the particles. The potential distribution determines the interaction energy between particles. In many cases this is responsible for the stability of particles towards coagulation and flow behaviour of suspensions. There are many situations in which the Zeta potential is a parameter of great importance such as the flow of liquid or particles through membranes. This will have a major impact on microbial systems in contact with treated water.

Point B Langeliar Stability Index (LSI)

The Langelier Stability Index (LSI) is a number that predicts the stability of calcium carbonate in water systems. It will indicate if the water will precipitate and form scale or if it will dissolve calcium carbonate. Langelier developed a mathematical expression able to predict the pH at which water will be saturated with calcium carbonate. The saturation pH name is pH_s. The actual LSI is expressed as the difference between the pH of the solution and the saturation pH. One can then write:

$$LSI = pH - pH_s$$

When the actual pH is higher than the pH_s, the LSI is positive. This implies super saturation of the solution in calcium carbonate and therefore the solution will have a tendency to produce scale. An increasing LSI positive value indicates an increasing scaling potential.

If the pH is lower than the pH_s, the LSI value will be negative and have a very limited capability to scale. In fact as the absolute value of the negative LSI grows, the ability of the water to dissolve calcium carbonate increases.

If the LSI is close to zero this indicates a borderline situation. Any change in water quality, temperature change, and evaporation could change the index and change the ability of the water to create scale.

Passage of the solution through the UVG HWC changes the electrochemical conditions and therefore changes the crystallisation conditions in such a way that a different crystalline structure is obtained from the crystallization of the calcium carbonate present in solution.

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Frequently Asked Questions

Q. **How does UVG HWC work?**

A. There are a number of reactions that take place in a UVG HWC unit as water contacts our specially engineered alloy element;

- There is an increase in water velocity.
- There are positive (high) and negative (low) pressure fields created along the length of the UVG HWC alloy element.
- Water flow is changed from a Laminar to a Turbulent flow.
- There is a definite electrochemical (galvanic, cathode-anode) reaction between the minerals in the water and the specially founded UVG HWC alloy.

These generated reactions change the characteristics of the minerals in the water creating a very fine non-sticking deposit.

Q. **What happens to these very fine non-sticking deposits?**

A. These flocs will either flow through an open system in colloidal suspension, settle at the low point of a system (can be flushing or implementing a maintenance program) or can be easily filtered down stream of the UVG HWC. Any residue left on a surface is easily removed.

Q. **Will existing scale be removed and how long does it take to clean the system?**

A. Several factors need to be taken into consideration.

- The thickness, hardness and type of scale.
- The length of the scaled area from the UVG HWC.
- The volume of water flowing through the system.

In many instances the thickness of scale in the water carrying system has taken a number of weeks, months and years to build up. Once installed UVG HWC will begin to work immediately. It may take equally as long or longer to remove the existing scale as it took for the scale to deposit.

Q. **Will UVG HWC affect water pressure and flow rates?**

A. No. It is important to select the correct size UVG HWC for the application. Selection of a UVG HWC is simple, you need to know;

- The flow of the system.
- The size of the supply line.
- If the UVG HWC is to be installed in a mains pressure system or a pump driven system.

Simply compare the flow rate you have against the UVG HWC specifications data sheet and select the corresponding unit. Should your flow rate fall between models select the larger of the two units.

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Q. **Does UVG HWC soften water?**
A. Yes, because of the definite change in the characteristics of the minerals, the surface tension of the water is reduced giving you a softer, “wetter” water.

Q. **Does the UVG HWC alloy element need to be replaced?**
A. No, the UVG HWC alloy element is not a sacrificial anode and therefore does not need to be replaced. We still have units working that were installed over 20 years ago!

Q. **Does the UVG HWC unit require on going maintenance?**
A. No, once installed UVG HWC does not require any on going maintenance.

Q. **Is it necessary to earth the UVG HWC?**
A. No, UVG HWC does not need to be earthed and can be installed above or below ground.

Q. **Why use UVG HWC as apposed to a salt water softener?**
A. Salt water softeners may solve one problem but introduce other’s by adding unwanted pollutants to the environment and in addition can cause safety and health issues. UVG HWC is chemical free and therefore 100% environmentally friendly!

Q. **What is the difference between UVG HWC and Magnetic and Powered water conditioners?**
A. Magnetic and Powered water conditioners are clamped to the outside of a pipe and generate a magnetic field through which the water travels. The powered units need to be plugged into a power supply and continue to operate whilst there is power. UVG HWC has no plug, the water contacts our specially engineered alloy element and it works effectively with either a laminar or turbulent supply of water.

Q. **Is UVG HWC easy to install?**
A. Yes, Simply remove the corresponding length of pipe and install the UVG HWC.

Q. **Is the location of a UVG HWC in a system critical?**
A. Yes, please see scenarios below.

Installation Questions

Q. **I have just purchased a UVG HWC to protect my hot water system, where do I install the unit?**
A. If you have purchased a UVG HWC to provide protection for your hot water system we recommend that you install the unit on the cold water supply line immediately prior to your hot water system (See drawing 1).

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Q. **We are a commercial customer and have a boiler and circulate hot water around a ring main in our building, where do we install the UVG HWC?**

A. For UVG HWC to work at its most efficient in this situation you want the water to be continually recirculating over the UVG HWC, by doing this the water is being treated continually instead of just once.
Scenario 1.
If the supply line to the boiler and the ring main return line connect and resupply the boiler we recommend that you install the UVG HWC between the boiler and the junction of the ring main and supply line (See drawing 2).
Scenario 2.
If the supply line to the boiler is separate to the ring may return we recommend that you install two (2) UVG HWC units. Fit one UVG HWC to the supply line as close to the boiler as is practical. The second UVG HWC is to be installed immediately after the circulatory pump (See drawing 3).

Q. **We have purchased a UVG HWC for our cooling tower, where do we install it?**

A. You would install the UVG HWC in a cooling tower application no differently to that of a ring main. See the two scenarios above (See drawing 4 or 5).

Q. **Where do we install the UVG HWC in our evaporative cooler?**

A. The UVG HWC should be installed after the circulatory pump and prior to the distribution pipes to the evaporative pads (See drawing 6).

Q. **We live in a rural area and rely on rainwater storage for our supply. We have a pump that supplies our house, and we filter the water. Where should we install the UVG HWC?**

A. Install the UVG HWC immediately after the pump and prior to your water filters.

Q. **We live in suburbia and have just purchased a UVG HWC for a whole house application. We have a reticulation system for the front and back garden that we would like to be protected by UVG HWC. Where do we install the unit?**

A. Install the UVG HWC on the main supply line to the house just prior to the first junction to your reticulation system.
If you do not have a reticulation system, install the UVG HWC as close to the house as is practical.

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Q. **We have a bore (well) on our property. Where do we install the UVG HWC and how do I protect my submersible pump?**

A. Install you UVG HWC on the supply line as it exits the bore (well). If you pump is installed with a 100mm PVC shroud we have a submersible UVG HWC that can be fitted to the shroud, providing a level of protection from the minerals in the water.

Normal Water

Scale will continue to build up and eventually element hot spots develop and the element fails.

Conditioned Water

Scale is attracted to the heating and flakes away