How it works: Scale and its Prevention

Scale forms when water becomes over saturated with calcium and must precipitate a percentage of this to maintain its saturation equilibrium. As calcium is an inverse soluble mineral the hotter water gets the less calcium it can hold in solution, when it precipitates it bonds with available bicarbonate to form scale (also referred to as lime scale).

Another circumstance that can cause water to become over saturated with calcium occurs when water is released from being under pressure. Familiar examples of this include faucets and shower heads.

Preventing Scale

Traditional methods accomplish this by using a water softener that uses a specially charged media which attracts calcium ions. Once the media becomes covered in calcium it must regenerate, it does this by flushing a concentrated salt brine through the media to clean the beads which is rejected down the drain (backwash).

Fluid Dynamics has a proven greener, more cost effective way…

The catalytic way.

Saturated ~ *Chemistry.* (of a solution) containing the maximum amount of a substance capable of being dissolved under given conditions.

Precipitate ~ *Chemistry*. to separate (a substance) in solid form from a solution.

Catalytic vs. Water Softener

Both products are effectively trying to achieve the same effect, under saturating the water of calcium so the water does not need to precipitate it as scale.

Softeners achieve this by physically removing a percentage of calcium from the water through the previously described ion exchange system while the catalytic process directly treats calcium combining it with bicarbonate to form calcium carbonate in a form that does not have the tendency to form scale.

Here's a direct comparison of these options:

Water Softener

- High purchase cost
- High installation cost
- Chloride discharge
- High running costs/maintenance
- Not suitable for drinking water
- Requires regeneration/wastes water
- Environmental pollutant

Catalytic Process

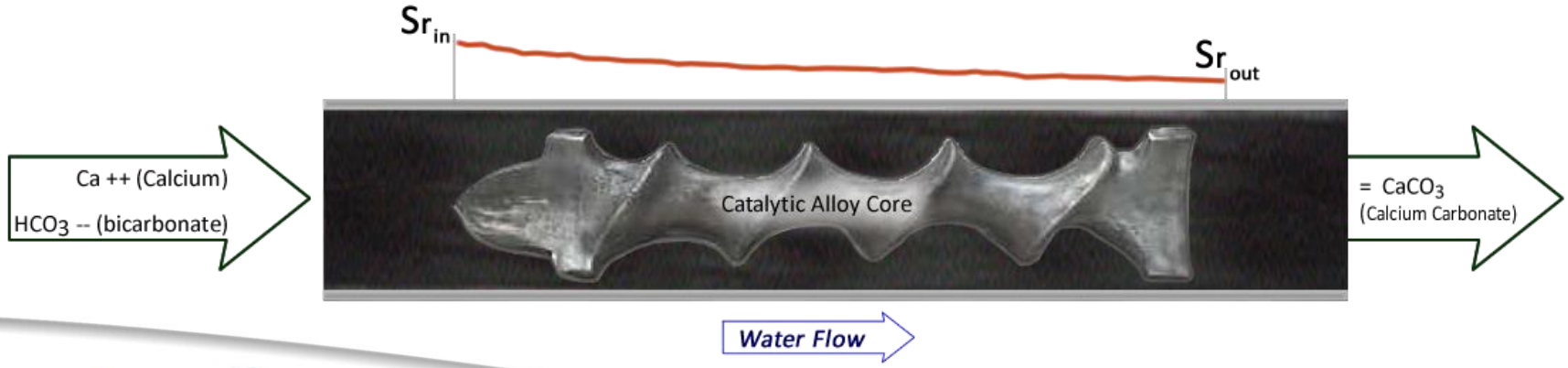
- Lower purchase cost
- Straightforward installation
- No salt required
- No running costs/maintenance
- Nothing is added or removed from water
- No wasted water
- Greenest method for scale prevention

Fluid Dynamics
Hard water solutions since 1973

So how does the Fluid Dynamics Catalytic process work?

- The Fluid Dynamics scale prevention product line utilizes a non-sacrificial lead free alloy core with a special surface. As water passes over the core a catalytic reaction takes place.
- The reaction causes carbonic acid to precipitate. The reduction of this acidic component increases the pH of the solution.
- This pH increase triggers calcium and bicarbonate to come out of solution combining to form calcium carbonate (CaCO3) in its aragonite state. The pH increase is only temporary and there's no noticeable difference in pH readings before and after the unit.
- Catalytic treated water has a greater capacity for calcium and bicarbonate. This greater capacity prevents scale deposition and in many cases any pre-existing scale is gradually absorbed.

The saturation ratio (Sr) decrease is initiated by the catalytic reaction



What happens to this calcium carbonate?

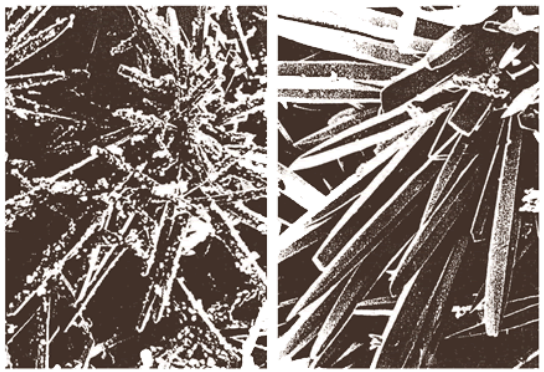
The calcium carbonate ($CaCO_3$) is still present it has just been converted to a different form.

$CaCO_3$ remains in the water but instead of being dissolved minerals it has been precipitated into a suspended crystallized form of calcium carbonate called aragonite.

When water arrives at a hot surface or is sprayed the water is now under saturated with calcium so does not need to scale.

Under certain conditions such as boiling/evaporation deposition may occur, however, rather than forming a hard scale $CaCO_3$ will leave a soft white residue that can easily be removed.

Calcite Aragonite



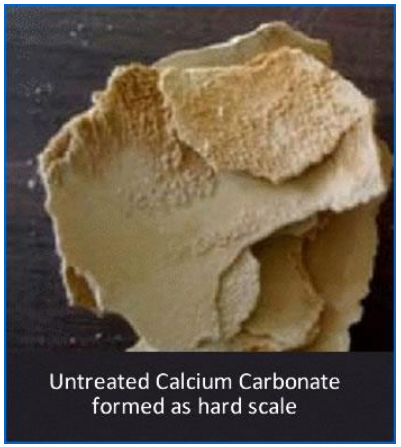
Calcite Aragonite

Calcium Carbonate

Calcite:

Shown to the right is calcite, the untreated form of calcium carbonate. This is the hard scale deposited by untreated water as a result of heat (water heaters) and pressure drops (faucets and nozzles).

It's color varies dependent on the other minerals in the water.


Untreated Calcium Carbonate formed as hard scale


After treatment the Calcium Carbonate is unable to bond to form scale

Aragonite:

To the left aragonite is shown, the treated form of calcium carbonate. Unlike calcite, aragonite stays in suspension and is carried through the system to the drain.

As a result the system does not scale.

Technology Summary

The catalytic process offers a viable cost effective solution to the nations hard water problems.

By reducing scale you reduce energy waste. This no longer has to be done using treatment methods which substitute one burden on the environment for another.

The catalytic process is wholly green with no running costs and no wasted water while providing continuous flow.

If you would like to have a more in depth understanding of our catalytic process we encourage you to read the scientific research confirming the validity of our technology shown at our web site (click here). The research was carried out by:

Dr D.M.Dawson, Ph.D,
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