Triangularwave Patented Chemical-Free Deposit Control Theory

Technologically Advanced Method for Hard Water Conditioning & Treatment

Versatile Deposit Control Products & Systems To Effectively Meet The Needs Of Any Industry and Application - ***Chemical-Free***
• Residential • Commercial • Industrial

Control Scale Deposits / Bacteria / Corrosion / Algae / Colloids In All Fluid Based Systems

HARD WATER PROBLEMS SOLVED EASILY

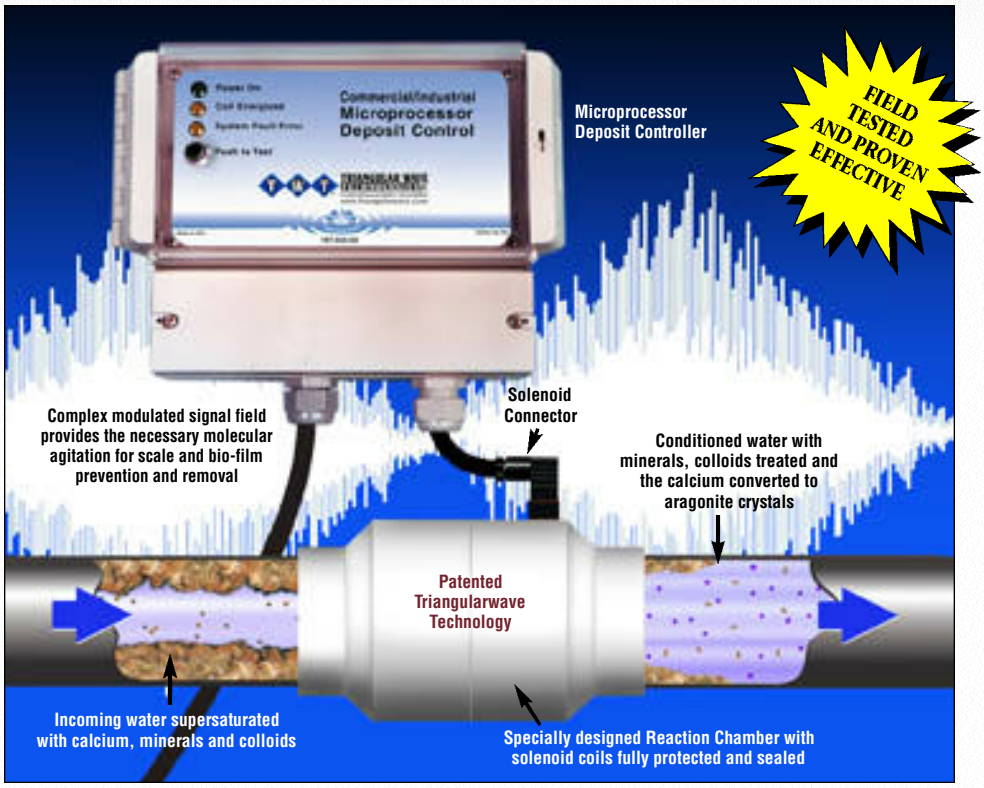
Efficient, Cost Effective & Reliable

SATISFACTION TWT GUARANTEED

TWT® Patented Deposit Control systems use advanced technology to restore and maintain a clean, corrosion-free delivery system in an environmentally safe and chemical-free manner... The result is clean pipes and tubing with no biofilm and reduced bacterial contamination.

TWT, Inc. offers a full range of products & systems designed to address fluid problems wherever fluid flows. TWT has the versatile, efficient, cost-effective methods to solve your fluid management problems end to end.

- ***Controls scale, bio-film & corrosion***
- ***Enhance operating efficiency & life cycle of equipment***
- ***The only products & systems that pay for themselves***
- **Review application and installation guidelines of all products and systems to ensure proper use and treatment.**



MADE IN U.S.A.

ISO Certified Facility

Email: info@triangularwave.com • triwaveinc@aol.com • Websites: www.triangularwave.com • www.twtwatertreatment.com

The Return On Investment of a TWT System is Undeniably Significant From An Operational, Economical, and Safety Points-Of-View.

Control Scale Deposits/Bacteria/Corrosion Algae/ Colloids In All Fluid Based Systems

Improve Operating Efficiency And Life Cycle Of Equipment

The TWT Deposit Control System is an advanced method for controlling scale and bio-fouling. It is applicable with once through and recirculating HVAC, Cooling Towers, Heat Exchangers, Boilers, Chillers, Spray Systems, Pumps, Induction Furnaces, and Process Cooling Systems, as well as agricultural, industrial processing, wastewater, and other fluid based systems.

Biofilm accumulates on the walls of plumbing systems, pipes, fittings and heat exchangers reducing evaporation and exacerbating the growth of scaling and mineral deposits. Biofilm varies from a few microns to several millimeters in thickness (300-500 microns typically in cooling system piping and heat exchangers). It offers a safe environment for pathogenic and sulfate-reducing bacteria. The biofilm entraps scale, suspended solids and various nutrients for bacteria, including legionella bacteria (Legionnaires disease).

Detrimental biofilm related issues are responsible for substantially increasing energy, maintenance and production costs along with contributing to the unnecessary waste of precious water supplies in residential, commercial and industrial applications.

Why does scale occur?:

The source of scaling problems lies in hard water which contains excess ions such as calcium and magnesium. Because of the inverse solubility laws, these mineral ions precipitate as hard water is heated, resulting in the deposition of scales on heat transfer surfaces.

TWT Operating Principals:

The TWT System utilizes a principal of molecular agitation to neutralize the dissolved calcium that causes hardness and lime scaling. Molecular agitation uses resonant energy forces, which develop on charged particles moving through an electrical impulse induction field, to change the molecular surface energy states of dissolved minerals. Dissolved mineral surface energy states, a quantum function, determine the subsequent precipitated crystalline structures created. In this case, the doubly positive ionic calcium is treated so that neutral aragonite crystal instead of lime scale crystal precipitation results.

The signal from the TWT system circuitry flows to a solenoid coil (reaction chamber) wound around the pipe being treated. This coil develops the frequency modulated electrical impulse induction field that immediately neutralizes the hardness, or functionally "softens" the water. The field penetrates the piping to its center, with the modulation component acting on the passing water and dissolved mineral molecules.

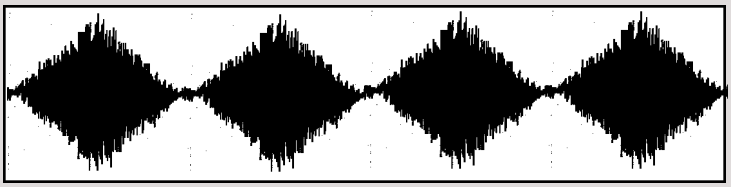
Deposit Control Theory:

The Triangularwave Deposit Control System is an advanced method for controlling scale and bio-fouling. It is applicable with once-through and recirculating HVAC heating, process cooling, agricultural, industrial processing, wastewater, and other fluid-based systems.

The Triangularwave System is an electronic deposit control method based on frequency modulation technology. The electronic deposit control technology uses a signal coil that is wrapped around a pipe in the plumbing system being treated. The signal coil is connected to an electronic unit that sends a complex, dynamic current with rapidly changing polarity, frequency, and amplitude to produce an time-varying magnetic field inside the pipe. The time-varying magnetic field produces an induced oscillating electric field inside the pipe, the phenomenon, this is well-known as Faraday's Law. The induced, oscillating electric field provides the necessary molecular agitation for chemical-free scale prevention and removal.

Faraday's Law of Induction:

As the induced electrical field oscillates, all particles which have an electrical charge are affected by the induced field. This causes the unstable mineral ions to precipitate out of solution or collide with each other to the point where the calcium carbonate crystals grow until they become so large that there are no more surface charges left to stick to the pipe walls. These calcium molecules precipitate into an aragonite form and flow through the system. As a byproduct of this "snowball" effect, freed water molecules become available to remove existing scale, molecule by molecule.

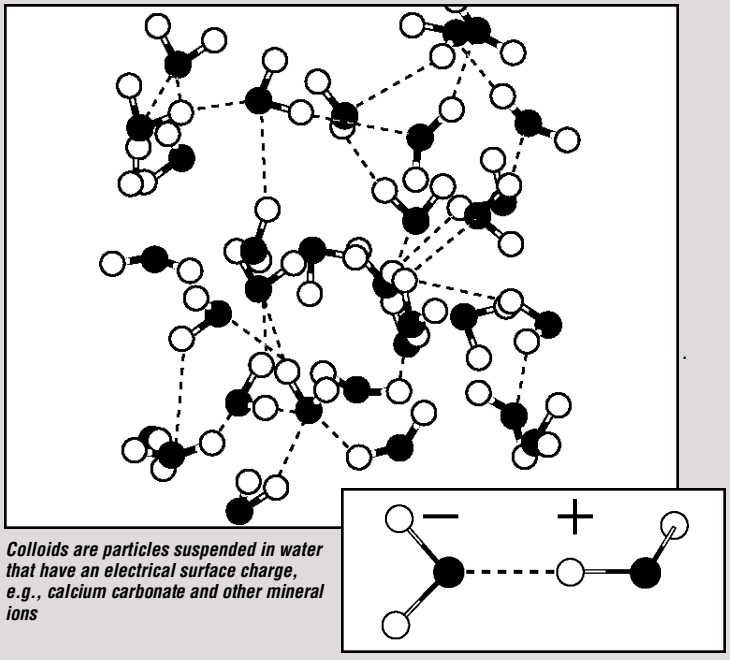


Triangular Wave form as shown on the oscilloscope

Some things you need to know:

- Water is a polar molecule, with both a negative side and a positive side.
- The molecule is made up of two hydrogen atoms and one oxygen atom.
- When two molecules get close together, the polar forces work to draw the moleculestogether. The oxygen atom of one water molecule will bond with several hydrogen atoms of the other molecules. These bonds are called hydrogen bonds.
- The more hydrogen bonds there are in water, the less able the water is to be reactive as a solvent, or to "hydrate" other materials in the water. This gives rise to "hard" water, and to water with a high volume of particulates (colloidal particles).

Water is a polar molecule, the triangularwave treatment technology takes advantage of this unique characteristic of water.



Colloids are particles suspended in water that have an electrical surface charge, e.g., calcium carbonate and other mineral ions

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When the triangularwave system treats water or other fluids, several things happen:

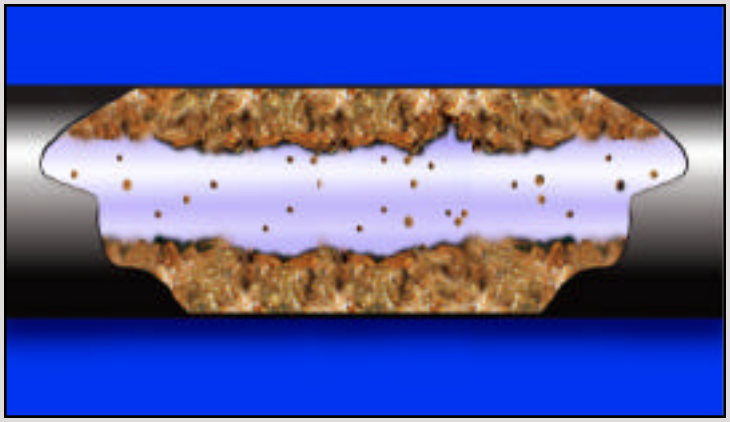
1. The hydrogen bonds between water molecules are broken without any increase in water temperature, and more water molecules are freed to hydrate scale ions and colloidal particles (hydration), i.e., they work to "entrap" the colloidal particles. Efficiently hydrated water reduces the possibility of hard water and scale formation
2. The colloidal particles in the water receive an enhanced surface charge, possibly from the freed water molecules. The enhanced surface charge is great enough for the colloidal particles to repel each other and from the sides of the equipment, staying suspended in the fluid.
3. The scale ions dissolved in the water are agitated, colliding and forming larger scale molecules that join together as crystals. The crystals no longer have a surface charge, and flow out harmlessly through the fluid stream, instead of forming corrosive deposits.

How do scale deposits form?

Calcium carbonate (CaCo3) is the primary constituent of scale in water systems. Calcium and carbonate ions (mineral ions) enter the water as parts of other molecules that themselves dissolve in the water. When these ions precipitate out of solution, they join to form calcium carbonate (an ionic compound) at the surfaces of equip ment. The main culprit in most scale problems is the supersaturated solution.

There is so much scale-causing mineral in the solution that the ions are only partially hydrated. These scale-causing minerals (e.g., calcium, magnesium) are unstable and “barely hanging” in the water. If the scale-causing minerals are left untreated and conditions such as pH, temperature, pressure change, and evaporation are present in the flow system (as is expected in cooling towers, condensers, boilers, and other equipment), the solubility of these scale-causing minerals may decrease.

Since they are not dissolving, but rather precipitating out, their surface charge leaves them vulnerable to their electrostatic attraction to the metal surfaces of the equipment, making them stick to the surfaces. This is unavoidable, unless active scale prevention measures are taken.



Scale causing minerals sticking to metal services of the pipe

How are the scale deposits removed?

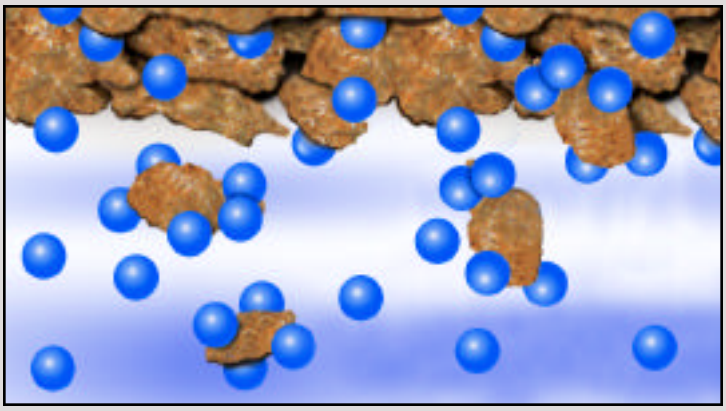
The patented, chemical-free TWT Deposit Controller takes this negative and turns it into a positive (no pun intended!). The induced molecular agitation generated by the TWT Deposit Controller causes the unstable mineral ions to collide with each other and precipitate out of solution. Impurities in the water such as alumina or silica provide initial nucleation sites for further precipitation of adjacent mineral ions. A “snowball effect” starts, resulting in the growth of many crystals, each consisting of numerous mineral ions. The resulting insoluble crystal salts become large in size and float; they do not stick to the metal surfaces, since the crystals do not have charges at the surface anymore. Essentially, the mineral ions become attracted to each other rather than to the metal surfaces.

How does the TWT Deposit Control System do this?

Very often, water in plumbing systems will have colloid-sized particles. These include alumina, silica, bacteria, and algae. The colloidal particles have a surface charge that is relatively weak. As the colloids move around in the water, they collide and aggregate.

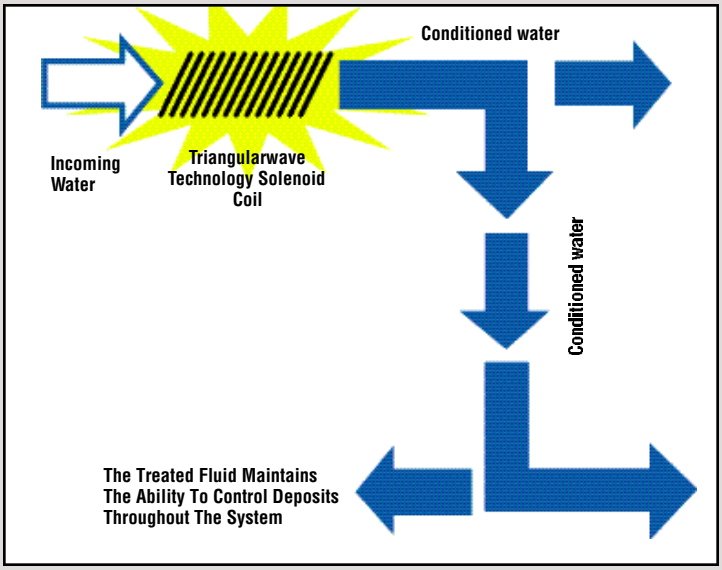
When the aggregate colloids pass through the triangularwave field, the surface charges on the colloids are enhanced. Some researchers theorize that this effect may be caused by an ordering of the water molecules adsorbed on the surface of the colloids. The net result is that the colloids repel each other and repel from the sides of the equipment, instead of forming corrosive deposits on the equipment surfaces.In the specific case of bacteria, the results are even more gratifying.

Slime-forming bacteria attach to the walls of the equipment and form bio-film. Bio-film is the habitat for other bacteria, such as legionella. The Triangularwave System enhances the surface charge of the slime-forming bacteria as above, preventing them from attaching to the equipment. In addition to preventing the corrosive deposits, this deprives the other bacteria of the habitat they need to feed and propagate. Over a period of time, most of the bacteria die.



Freed water molecules dissolving existing scales.

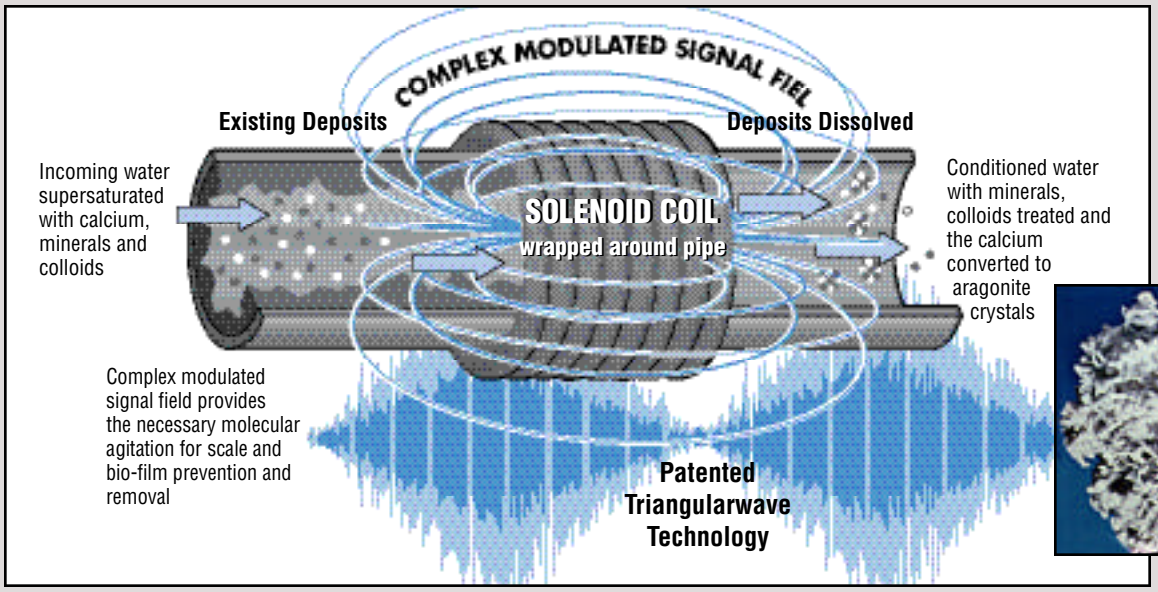
When the TWT systems are properly installed the effects of the Triangularwave Technology Treatment Last Downstream



In effect, a clean, corrosion-free delivery system is restored and maintained in an environmentally safe and chemical-free manner. The result is clean pipes and tubing with no biofilm and reduced bacterial contamination.

Sensing Environmental Needs with Intelligent Solutions
Be Smart, Buy Once! Go Green Save Green

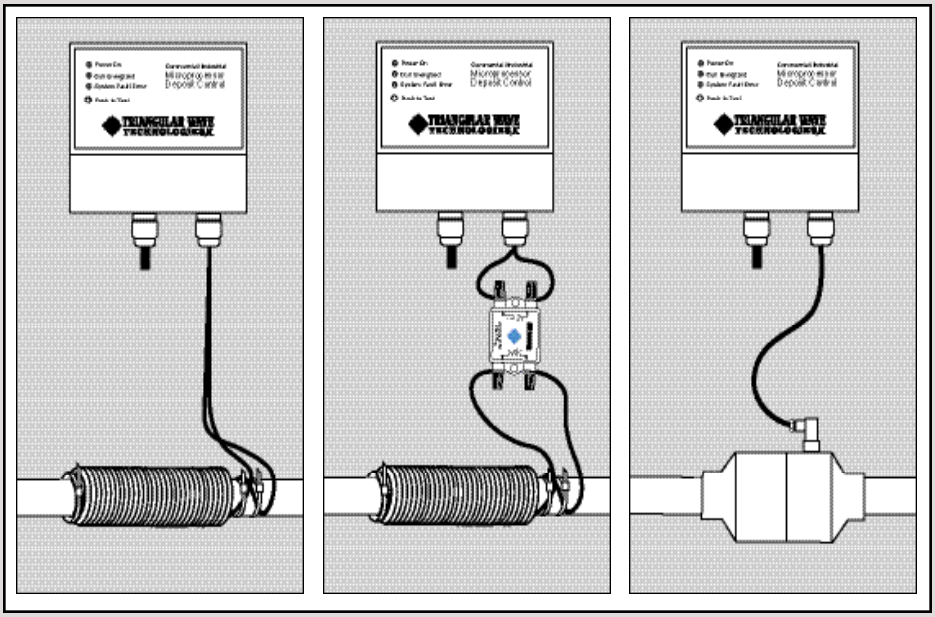
Non-invasive by design on-site solenoid wrap



To find additional technical information about TWT® Deposit Control Technology. Go on the home page of the TWT web site (www.triangularwave.com) and click on “About the Technology” there you will find additional Installation & Technical Guidelines

Aragonite crystals in suspension

For Maximum Effectiveness Follow These Simple Guidelines



TWT-Deposit Control Solenoid Coil Wrap on PVC Pipe Application:

PVC/Plastic pipes require NO copper pipe signal enhancer or reaction chamber

TWT-Deposit Control Solenoid Coil Wrap with a CSE Copper Pipe Signal Enhancer Application:

Copper pipe signal enhancer is required for copper pipe applications only

TWT-Deposit Control with Stainless Steel or PVC Reaction Chamber Application:

Magnetic pipes (steel/iron) require a reaction chamber

TWT® Copper Pipe Signal Enhancer

The copper pipe signal enhancer is a passive signal/ impedance matching circuit. This device provides a power boost to the conditioning signal in copper pipes (for copper pipe applications only).

TWT® Reaction Chambers

To use in conjunction with the TWT Deposit Control Systems when required, Triangularwave Technologies, Inc. has developed a line of factory-wrapped wire Reaction Chambers to address magnetic pipe environments. Typically, wire coil cannot be installed on any magnetic pipe, such as steel, galvanized steel, ductile iron, or cast iron.

The TWT Reaction Chambers solve this problem by providing an easily installed section of non-magnetic pipe to provide the proper pipe material for the Deposit Control System to work as designed. The TWT Reaction Chambers are fully sealed, protecting their layers of factory-wrapped coil. The PVC, Stainless Steel and the Industrial Reaction Chamber systems are designed and manufactured to meet the highest quality specifications.

Conserve Water, Save Energy...Non-Chemical, Safe, Cost-Effective Treatment System:

TWT® The Ultimate in Water Treatment & Conditioning

CHEMICAL-FREE

The Green Way

TWT TRIANGULARWAVE TECHNOLOGIES, INC.
Chemical-Free Water Treatment

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