TWT PATENTED CHEMICAL-FREE ELECTRONIC DEPOSIT CONTROL SYSTEMS FOR THE LAUNDRY & CLEANING INDUSTRIES

Scale and Bio-Film Control for Vertical Boilers and Equipment

How does Triangular Wave electronic deposit control technology work?

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

The Triangular Wave System is an electronic deposit control method based on frequency modulation, using a signal coil (solenoid) that is wrapped around a pipe in the plumbing system. The solenoid is energized by a power supply that constantly changes the polarity, frequency and amplitude of the current being sent to the solenoid.

- Polarity changes from positive to negative many thousands of times per second.
- Frequency varies from 2,000 cycles per second to 7,000 cycles per second. That range of frequencies is wide enough to affect the water and the materials in the water.
- Amplitude varies from 25 milliamps to 250 milliamps. This means that the water molecules and the materials in the water are being subjected to a wide range of field forces.

The entire Triangular Wave Signal is repeated 30 times each second. When the current reaches the solenoid, a constantly changing electro-magnetic field is formed. That field induces a constantly changing voltage in the fluid. The induced, oscillating electric field provides the necessary molecular agitation for scale prevention and removal. The key to the system's unique success is that different particles respond to different frequencies and amplitudes. The microprocessor rapidly varies the frequency and amplitude of the signal to deliver combinations to treat nearly 100% of the particles in the water. Bacteria and scale-forming colloids in the water receive a strong boost in their natural surface charge. The particles repel one another and remain in stable suspension, rather than uniting to form scale or colonizing to form bio-film or other system fouling. The TWT Deposit Control System is an advanced electronic treatment method for hard water and its effects on water-based applications. The system is non-invasive and non-chemical by design and is suitable for practically all applications requiring hard water treatment

The build up of scale deposits is a common and costly problem in the Dry Cleaning industry. The higher costs of maintaining and cleaning your boiler can be attributed to the continuous cleaning of scaled surfaces or to the increased energy and operating costs due to the poor conductivity of the fluid pipe. For example, a 2.0 mm scale layer can induce a 47% decrease in overall heat transfer. Moreover, scale deposits narrow the inner diameter of piping, increasing the amount of energy required to pump the water through the system.

TRIANGULAR WAVE TECHNOLOGIES, INC.
FLUID MANAGEMENT SOLUTIONS

This steam boiler has been in continuous service, five days a week since mid-1987. It operates at a maximum pressure of 125 PSI, and the average workday is 8 to 10 hours. Prior to 1995, this boiler was subjected to a daily dose of harsh chemicals to prevent internal scale build-up. In mid-1995, an TWT Deposit Control System was installed on the boiler feed pipe between the injector pump and the boiler. From that time to the present, this boiler has not been polluted with harsh de-scaling chemicals and as an ecological benefit, these chemicals have not been flushed back into the environment. An added bonus is a savings in natural gas consumption because of clean internal heating surfaces; further, steam lines and steam traps need less maintenance.

The TWT Deposit Control System changes the structure of the dissolved solids in the incoming water, preventing them from adhering to the internal surfaces of the boiler. The accumulated solids are flushed from the boiler through normal "blowdown". The savings in chemicals alone can amount to between $1000 to $2000 annually plus approximately 8% savings in utility costs.

TWT Microprocessor
Deposit Control System

BENEFITS OF THE PATENTED TRIANGULAR WAVE SYSTEMS

TWT Deposit Control Systems reduce or eliminate the need for chemical treatment of fluids and chemical cleaning of heat exchanger tube bundles and water pipes.

PREVENTS SCALE BUILD-UP

- Scale particles in the water receive an enhanced surface charge that causes them to repel each other and from the walls of the equipment

ELIMINATES TOXIC CHEMICALS

- No recurring chemical expense
- No handling and storage of hazardous chemicals on site
- No chemical discharge

REDUCES CORROSION

- Reduces bio-corrosion by preventing the formation of bio-growth on vessel surfaces where bacteria can attack the metal
- With higher concentration ratios and TDS, the pH will be higher and there will be much less tendency for corrosion
- Prolongs life cycle of equipment
- Increased cycles of concentration in cooling systems = ***significant water savings***

CONTROLS ALGAE AND BACTERIA

- Bacteria and algae must attach to something before they can feed and reproduce. The Triangular Wave System keeps the bacteria, algae, and their food dispersed in the water, off of surfaces, and away from their biofilm breeding ground
- Eventually the biofilm will die, too

SHORT PAYBACK PERIOD

- The combined reduction of water, chemical and energy costs is enough to pay for the Triangular Wave System in as little as 9 to 18 months
- With the Triangular Wave Treatment, the systems can run at higher concentration ratios, meaning the amount of water removed as blowdown and the corresponding sewer charges are greatly reduced
- With no chemicals being added, the requirements for pretreatment of blow down are eliminated
- One time cost vs. recurring monthly chemical = ***better profit margin***
- Labor costs for maintaining the systems will be reduced
- Labor costs to clean the vessel surfaces will be reduced
- Costs to replace corroded parts like heat exchanger tube bundles, etc. will be reduced
- Less downtime for equipment repairs and maintenance= ***increased production***
- The Triangular Wave System requires little or no maintenance
- There is little electrical current flow through the electromagnetic system
- Reduces energy costs use through improved heat transfer efficiency
- Increased heat transfer from non-scaled tube surfaces = ***significant energy savings***
- Easy interface with facility management hardware and software systems for centralized management

OTHER BENEFITS

The constant battle of monitoring cooling and heating systems will become a thing of the past.Balancing the water chemistry on a daily or weekly basis is not necessary with the Triangular Wave System. Cleaning of the systems will be much easier, involving a pressure wash one or two times per year, rather than extensive manual brushing and acid washing. When water systems are clean and free of deposits, heat transfer is at its most efficient. Scale and biofilm are great insulators, that are eliminated. Also scale buildup in pipes creates increased roughness and reduced flow area. Clean pipes mean less energy is needed to drive the pumps.

Energy costs may be reduced by up to 30%. Many municipal sewer agencies penalize and charge fees to users, because their blowdown contains hazardous chemicals, which the agencies must treat.Without chemicals in the blowdown, those fees can be avoided.

- ***Unpolluted discharge from blowdown and bleed= environmental compliance***

The workplace is safer, because the staff is not handling toxic chemicals. Cooling and heating systems are large investments that need to be protected.The Triangular Wave System reduces corrosion, deposits, and harmful chemicals, all of which allow the equipment to meet or exceed life cycle expectations. Recent studies by manufacturers of cooling systems indicate that systems that should last 20 years or more are lasting an average of 8 to 12 years.

ENERGY SAVINGS MECHANISM

The primary energy savings result from a decrease in energy consumption in heating or cooling applications. This savings is associated with the prevention or removal of scale build-up on a heat exchange surface where even a thin film (1/32" or 0.8 mm) can increase energy consumption by nearly 10%. Examples of savings resulting from the removal of calcium-magnesium scales are shown in ***table below***. A secondary energy savings can be attributed to reducing the pump load, or system pressure, required to move the water through scale-free, unrestricted piping.

Scale Thickness (inches)	Increase Energy Consumption (%)
1/32	8.5
1/16	12.4
1/8	25.0
1/4	40.0

Example Increase in Energy Consumption as a Function of Scale Thickness*

* See Federal Technology Alerts/Non-Chemical Technologies for Scale and Hardness Control (http://www.pnl.gov/fta/11_non.htm)

TWT treatment equipment is a reusable investment and retains its value – if you move your facility or re-engineer your plumbing system, TWT equipment moves with you.

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