Global Ecology Corporation

Presents

HVAC Chemical Evolution

Executive Summary – HVAC Water Treatment Chemicals

Global Ecology Corporation (GEC) has recently begun the long process of registering a chemical product with the Environmental Protection Agency (EPA) for the purpose of validating the use of a licensed proprietary *Ionized Mineral Solution (IMS)* for application as a water treatment chemical in the HVAC industry. The chemical is highly certified and widely tested for biocide applications in drinking water, waste water treatment, fish farming, algae and fungus control, agriculture and as a topical disinfectant. In fact, it has been scientifically tested as a biocide, algaecide and fungicide in nearly every conceivable format, but never with HVAC equipment. However, it has been proven 100% effective for the elimination and control of all microorganisms that foul the water in cooling towers, both open and closed loop systems and boilers.

Currently, most HVAC systems require the use of corrosive biocides, scale removers, anti-corrosion chemicals and water softeners to maintain safe, balanced operating conditions. These products are produced by many manufacturers in formulations that claim similar results for each of their targeted treatment issues. The partnership believes the product and system can be proven unique in that it will consolidate the water treatment abilities of several chemicals into to a single chemical that is more efficient, safe to handle, environmentally friendly and economical to use.

The market for water treatment chemicals is vast and the distribution system for these products fragmented. It's likely that each city will have several small distributors and they will represent products from many manufacturers. It's also likely that each distributor will supply many building maintenance contractors that will manage HVAC systems for building owners and/or management companies. It is believed that much of the power to direct chemical purchases comes from building management companies. The partnership therefore plans to focus its marketing efforts toward developing a close relationship with significant management companies serving this industry. It is believed this strategy will broaden initial market penetration on a greatly accelerated basis.

In the recent past, and due the increased focus on environmental and energy issues, the water treatment industry has been searching for new technologies to improve equipment efficiency and pollution problems. GEC is confident the *Ionized Mineral Solutions* created by its Canadian supplier has the potential to 1) substantially reduce HVAC power consumption through greater efficiency from cleaner heat transfer surfaces 2) substantially reduce the amount of water lost due to excessive "blow-downs" (system water evacuations) 3) reduce chemical cost 4) reduce maintenance cost and simplify maintenance procedures 5) increase equipment longevity.

The Company has spent a sufficient amount of time studying the various related aspects involving the chemical testing and approval process, plus the marketing and distribution strategies. The conclusion is that we are well-positioned to assemble the necessary strategic relationships and perform each phase in a timely manner once we receive the anticipated approval from the EPA.

Problems in HVAC Water Systems – Closed Loop and Open Air

Raw or filtered makeup water contains dissolved minerals and insoluble matter that pose a serious threat to efficient cooling. Microbiological organisms, dirt or silt, dissolved minerals and gases, if left untreated, can concentrate and cause serious reductions in heat transfer efficiency, increased maintenance problems, or even a total system failure.

By their very design, open re-circulating cooling systems are prime candidates for contamination problems. As the cooling water evaporates, contaminants are allowed to concentrate in the system.

Contaminants enter the system either through the makeup water or from the air via the cooling tower. If left untreated, high concentrations of impurities in open re-circulating systems can lead to a number of serious problems, including:

1. Scale
2. Fouling
3. Microbiological growth
4. Corrosion

While open re-circulating systems are particularly vulnerable to these problems, once-through and closed systems are also subject to these same problems. All systems require attention to these four areas. More attention is given to open re-circulating systems because of the greater potential for problems inherent in their design.

Scale: The most serious side effect of scale formation is reduced heat transfer efficiency. Loss of heat transfer efficiency can cause reduced production or higher fuel cost. If heat transfer falls below the critical level the entire system may need to be shut down and cleaned. Unscheduled downtime can obviously cost thousands of dollars in lost production and increased maintenance. Once scale becomes a serious threat to efficiency or continued operation, mechanical or chemical cleaning is necessary. In most cases, mineral scale is a silent thief of plant profitability. Even minute amounts of scale can provide enough insulation to affect heat transfer and profitability severely.

Scale in cooling water systems is mainly composed of inorganic mineral compounds such as calcium carbonate (which is most common), magnesium silicate, calcium phosphate and iron oxide. These minerals are dissolved in the water, but if left to concentrate uncontrolled, they will precipitate. Scale occurs first in heat transfer areas but can form even on supply piping. Many factors affect the formation of scale, such as the mineral concentration in the cooling water, water temperature, pH, availability of nucleation sites (the point of initial crystal formation) and the time allowed for scale formation to begin after nucleation occurs.

Dissolved mineral salts are inversely temperature soluble and the higher the temperature, the lower their solubility. The most critical factors for scale formation are pH, scaling ion concentration and temperature. Consequently, most open re-circulating systems operate in a saturated state, because the scaling ions are highly concentrated. Precipitation is prevented under these conditions by the addition of a scale inhibitor.

Fouling: Waterborne contaminants enter cooling systems from both external and internal sources. Though filtered and clarified, makeup water may still hold particles of silt, clay, sand and other substances. The cooling tower constantly scrubs dirt and dust from the air, adding more contaminants to the cooling water. Corrosion by-products, microbiological growth and process leaks all add to the waterborne fouling potential in a cooling system. The solids agglomerate as they collide with each other in the water. As more and more solids adhere, the low water velocity, laminar flow, and rough metal surfaces within the heat exchangers allow the masses of solids to settle out, deposit onto the metal. These deposits reduce heat transfer efficiency, provide sites for corrosion under the deposit and threaten system reliability.

Microbiological Contamination: Cooling water systems are ideal spots for microscopic organisms to grow. "Bugs" thrive on water, energy and chemical nutrients that exist in various parts of most cooling water systems. Generally, a temperature range of 70-1 40 º F (21-60º C) and a pH range of 6-9 provide the perfect environment for microbial growth. Bacteria, algae and fungi are the most common microbes that can cause serious damage to cooling water systems.

Microbiological fouling can cause:

1. Energy losses
2. Reduced heat transfer efficiency
3. Increased corrosion and pitting
4. Loss of tower efficiency
5. Wood and metal decay causing loss of structural integrity of the cooling tower

Corrosion: Corrosion is the breakdown of metal in the presence of water, air and other metals. The process reflects the natural tendency of most manufactured process metals to recombine with oxygen and return to their natural (oxide) states. Corrosion is a particularly serious problem in industrial cooling water systems because it can reduce cooling efficiency, increase operating costs, destroy equipment and products and ultimately threaten plant shutdown.

Most cooling systems are very vulnerable to corrosion. They contain a wide variety of metals and circulate warm water at relatively high linear velocities. Both of these factors accelerate the corrosion process. Deposits in the system caused by silt, dirt, debris, scale and bacteria, along with various gases, solids and other matter dissolved in the water all serve to compound the problem (Figure 11.8). Even a slight change in the cooling water pH level can cause a rapid increase in corrosion. Open re-circulating systems are particularly corrosive because of their oxygen-enriched environment.

Projected Advantages with *Ionized Mineral Solution (IMS)*

Scale Inhibitor and Removal**:** Our advantage for this problem is that the ionizer used to suspend our copper biocide also ionizes most other metals present in makeup water. This includes calcium and magnesium, which are the main culprits in scale formation. We believe it will be demonstrated that dosing water with *IMS* will be an even more efficient scale inhibitor than current products, thus eliminating their requirement in the systems. Another significant anti-scale advantage is that the continued use of *IMS* will actually remove scale present prior to the product's introduction to the system.

Fouling: *IMS*, unlike halogen-type biocides used in cooling towers, is non-oxidizing and will not contribute corrosive activities in the tower system. The "total water column" saturation and continued molecular suspension characteristics of the chemical will eliminate all microbiological growth. We also project that the chemical's ionizing interaction with the system's solids will limit agglomeration, reducing or eliminating the metal surface accumulations.

Microbiological Contamination: The copper-based biocide is extremely lethal to all forms of bacteria and pathogenic micro-organisms, even at concentration levels less than 500 parts per billion. Additionally, its chemical distribution characteristic means that all bacteria anywhere in the entire system will be lethally exposed and eliminated. This, unlike UV light treatment, would include any bacteria hiding in silt deposits throughout the system. One of the biggest interior surface problems is the accumulation of bio-slime coating the heat exchange pipes. This condition then promotes scaling and corrosion behind the slime wall. *IMS* will remove the slime, prevent its reforming and then dissolve what scaling that has accumulated.

Corrosion: Nothing can completely stop corrosion, so the objective is to slow it down. We are confident our non-oxidizing *IMS* formula can achieve this like no other single additive as it reduces or eliminates nearly all contributing factors associated with this problem.

pH Control: The formula should also help control pH levels and perhaps make higher pH levels more tolerable due to the mineral ionization capability. We also believe that by adding our ionizing solution without the active copper we may be able keep pH balances in the 'safe' range for much longer periods of time. If proven to be the case, this could substantially reduce the number tower water "blown-downs" required for maintaining pH balance, saving large quantities potable water.

Conclusion*:* We project that *IMS* will be proven to 1) be more efficient and longer lasting than all other chemical biocides and UVL systems 2) remove old scale and prevent new from forming, eliminating the need for anti-scaling chemical 3) eliminate or greatly reduce the need for both anti-corrosion formulas and pH stabilizers combined. The chemical is environmentally friendly and safe to handle with no atmospheric dissipation, unlike current caustic, corrosive and air polluting halogen biocides. It will work equally well in closed and open loop systems. In fact, its use in closed loop systems will be of particular interest based on the formula's active copper ingredient's ability to remain suspended evenly throughout the system and active for long period's time.

Brief Market Size Analysis

The latest study that we are able to quote regarding chemical usage was taken in 2002. This study analyzes the then $3.1 billion US water treatment chemicals industry. It projects the US water treatment chemical market will grow 4.5 percent annually through 2007. Using this growth projection, we estimate the current chemical market to exceed $4 billion in 2011.

Increased water recycling by industry will drive demand for corrosion inhibitors, coagulants and flocculants, oxidizers and biocides, and chelating agents. Cooling water will remain the top application while wastewater treatment is among the industry's fastest growing. The main competitors in the marketplace are Ondeo Nalco, GE Betz, Arch Chemicals, Ashland Specialty Chemical, Buckman Laboratories, ChemTreat, Cytec Industries, Great Lakes Chemical, Kemira, Occidental Chemical, and Rohm and Haas.