LowTen tm
A New Technology for Cleaner Heat Transfer Surfaces and Reduced Energy Usage

TAB 06/04

- CLEANER HEAT EXCHANGE SURFACES
- IMPROVED HEAT TRANSFER
- REDUCED ENERGY USAGE
- CONTROL OF COOLING TOWER FILL PLUGGING
- IMPROVED BIOCIDE EFFICACY

Presenting a unique ProChemTech International cooling water chemistry that can provide these specific benefits for your cooling water management program.

Background
Water, due to its low cost and physical properties, is the best material for transfer of heat and is thus the most common heat transfer fluid in use. Any improvement in the ability of water to transfer heat would be of substantial benefit by increasing the efficiency of water cooled equipment and reducing use of costly energy.

Fresh water shortages and increased costs for both makeup water and blowdown disposal have created a need to increase the cycles of concentration (cycles) in cooling tower systems, which decreases both the amount of makeup and blowdown. In some cases, treated wastewater is also being used as makeup water. Unfortunately, increasing cycles and use of treated wastewater as makeup increases the concentration of foulants (insoluble materials in the water such as airborne dust, pollen, and insects) in the cooling water, making the cycled waters highly fouling. Fouling, both deposition and biological related, in heat exchangers is unwanted, as even a small amount of fouling will decrease the efficiency of heat transfer, resulting in increased power consumption for chiller operation and decreased productivity in industrial processes.

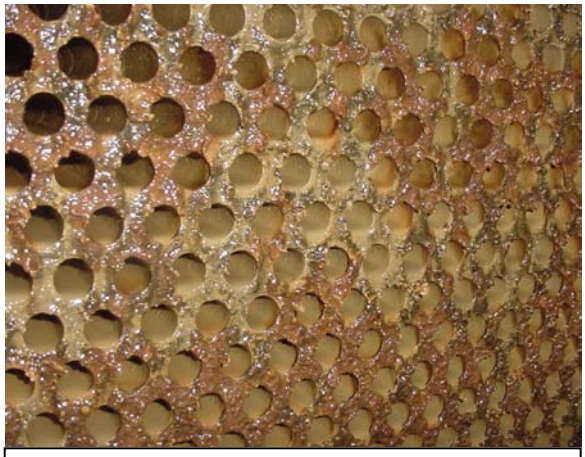
High efficiency cooling tower fill, due to smaller air and water passages, is also subject to plugging by accumulation of foulant materials within the fill. Such plugging substantially reduces the thermal efficiency of the cooling tower and, in some cases, has resulted in collapse of the fill due to the weight of the foulant in the fill.

Heat Transfer: Joint research conducted with Alcoa in 2001 has shown that the ability of water to transfer heat can be substantially improved by addition of low levels of a surface active chemistry to the cooling water. Field experiments undertaken at an Alcoa plant demonstrated an increase in heat transfer rate of 9 F per second in side by side comparisons of otherwise identical

cooling waters.
Subsequent field testing and experiments have shown that the surface active chemistry also provides three additional benefits to operators of cooling water systems as follows:

Cooling Tower Fill Fouling Control: Fouling and plugging of cooling tower fill, especially the new high efficiency types, has become a significant problem. Several full scale experiments, subsequently verified by substantial operating experience, has shown that cooling towers running a **LowTen** chemical program have visibly cleaner fill. As an example, one large HVAC cooling tower located in Phoenix, AZ, was previously cleaned on an annual basis due to buildup of fouling in the fill. After one year on **LowTen** chemistry, the chiller service company stated that the unit really did not need its annual cleaning.

Improved Biocide Efficacy: Biological activity with resultant fouling and potential health problems is commonly controlled by addition of biocides to a cooling water system. By reducing the surface tension of the cooling water, **LowTen** both functions as an effective biodispersant and increases the ability of biocides to penetrate biological masses. Both of these actions are proven to increase the efficacy of biocides. **LowTen,** which is halogen compatible, is especially effective when used in conjunction with bromine based biocides such as PCT 3026 controlled reactivity liquid bromine or the PCT ElectroBrom and MiniBrom on site bromine generator units.



Heat Exchanger Fouling

Cleaner Heat Exchange Surfaces: Fouling, deposition of "dirt" and biological slimes on heat exchange surfaces, can drastically reduce heat transfer. The cleaning action of surface active agents is well established and we have verified by inspection that chiller condensers operated on LowTen chemical programs show less fouling and deposition than units operated with typical treatment chemistries.

Chemistry
The improvements in cooling water performance resulting from addition of the **LowTen** surface active agents is due to a substantial reduction in the surface tension of the water. Reducing the surface tension of the water allows it to better “wet”, or make contact, with surfaces, resulting in the various effects noted.

While there are many surfactants available, the specific materials used in cooling water treatment must not only provide a significant reduction in cooling water surface tension, they must also be compatible with scale, corrosion, and biological control chemistries; be environmentally safe; and present no health & safety problems. The specific surface active agents that makeup the **LowTen** product meet these requirements and are the result of many years of laboratory experimentation

followed by extensive field testing.

The amount of active material needed in the cooling water to obtain the benefits noted is in the range of 3 to 6 ppm. Considering that many cooling water treatment formulations are designed to work with a product dosage of 75 to 150 mg/l in the cooling water, this equates into a formulation level of 4% actives in a typical cooling water treatment product. This low addition level makes it possible to technically and economically add **LowTen** to many commonly used cooling water treatment formulations.

Heat Transfer Economics

Review of the literature shows that an improvement in heat transfer efficiency of the magnitude obtained by **LowTen** will result in a 5 to 15% reduction in the energy needed to operate a typical chiller in HVAC service.

Benefits in industrial process cooling are more difficult to quantify. For instance, improved heat transfer efficiency means that furnace cooling jackets will obtain a higher temperature difference (delta T) across the jacket. A higher delta T means that less water will have to pass through the jacket to remove the same amount of heat, or, the same amount of water can remove more heat, lowering the temperature of the jacket. Pumping less water saves the energy used for running the pump, while some industrial processes can be speeded up if the cooling jackets can operate at a lower temperature, producing more product (revenue $) in less time.

For purposes of illustration**,** we have selected a 500 ton chiller running in typical HVAC service with a power use of 0.60 kw/ton and cost of $0.06/kwh. Operating this machine at full load gives a daily power cost of $432.00. Assuming full load operation for 200 days a year, we calculate an annual power cost of $86,400.

Using the expected efficiency improvement range of 5% to 15% from **LowTen** chemistry, the annual cost savings for power will be between **$4,320.00** and **$12,960.00**. This cost reduction is accomplished with no increase in chemical treatment costs or changes in the cooling water system, a simple change from the present cooling water treatment inhibitor to one formulated with **LowTen** chemistry is all that is required.

Availability

ProChemTech provides **LowTen** as a formulated component in many of its cooling water treatment products. **LowTen** cooling water treatment products are available from both our Apache Junction, AZ, and Brockway, PA, manufacturing plants.

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