

How to save running costs of large scale air conditioning systems.

Scale-X[®]
Magnetic Fluid Conditioners



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Introduction.

Flooded condenser chillers with water cooling towers offer the most efficient refrigerated air conditioning solution, however, the “open” nature of the cooling water system invites problems:

1. Scaling and fouling of cooling surfaces which reduces the rate of heat transfer, due mainly to deposition of scale forming crystals (most commonly calcium carbonate) and biofilm deposition.
2. Rapid corrosion which reduces plant availability and life span due to scale deposition and biological attack from biofilm / bioslime deposition.
3. Biological fouling also presents serious health hazards (biofilm / bioslime encourages the proliferation of algae and bacteria including dangerous organisms such as Legionella).

Why do we need to deal with these problems?

Scaled, fouled and corroded surfaces reduce the rate of heat transfer in the system. Heat transfer is the means by which the cooling effect is obtained. These problems therefore reduce the *efficiency* of the system. It follows that if you reduce system efficiency, you need more electric power to run it.

Environmental and human health issues also accrue from fouled air conditioning systems. Even mildly dirty systems can cause sickness and death from water borne bacteria.

So how do we deal with these problems?

To help contain energy costs and avoid bacterial infection we need to keep the system as clean as possible, but conventional cleaning methods introduce another set of costs and more problems.

The conventional approach:

Conventional maintenance of air conditioning plant involves regular cleaning of both cooling tower slats and condenser tubes plus regular dosing with a cocktail of chemicals. All of these maintenance measures invite further problems.

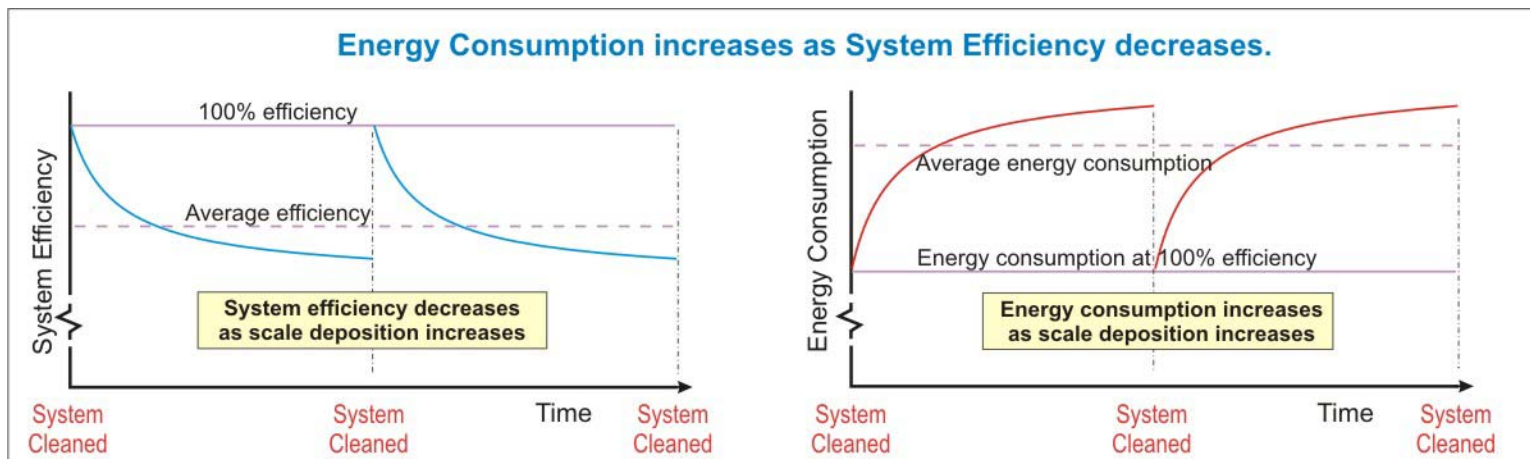
1. Pressure cleaning of cooling towers is only partially effective without the use of harsh acids
2. Cleaning of condenser tubes again requires harsh acids and in many cases severe brushing or even boring. The risk of tube puncture and damage is ever present.
3. The chemical “scale inhibitors”, “corrosion inhibitors” and “biocides” added to systems are all hazardous materials and simply don't solve the problem.

Conventional cleaning results:

If the chemical scale and corrosion “inhibitor” regime was effective there would be no need for manual cleaning, but it remains essential despite continual dosing with chemicals.

The fact is that manual cleaning, inherently, is performed after the problem has occurred!

Further, every time the system is cleaned scale build up occurs rapidly again because of the strong electrostatic attraction of scale crystals to the clean metal heat transfer surfaces. The rate of scale build up only decreases as the surfaces become more scaled again. This means the system becomes fouled again very soon after cleaning and efficiency drops rapidly - the opposite to what is desired.



Conventional disinfection results:

If the biocides were effective there would be no cases of Legionella infection, but every year even in countries (like Australia) where biocides are mandated, deaths occur from Legionnaires Disease. In the UK water cooling towers are banned because of the proven ineffectiveness of biocides.

The fact is that all living organisms seek to survive despite our efforts to control some of them.

Nature has provided living things with the ability to continually evolve to evade threats to life which includes chemicals aimed at killing them. Single cell organisms like bacteria are able to mutate very rapidly to evade poisons, which explains the dismal failure of biocide chemicals at controlling this danger to human health.

The challenge:

To optimise energy costs without compromising cooling levels, the system efficiency must be maintained at 100% of new equipment design efficiency continuously.

Since cleaning after fouling has occurred is essentially a failed process, the answer must therefore be to stop the fouling from occurring in the first place. Chemicals are rigorously promoted for this purpose but in fact they are ineffective or can actually be shown to aggravate the problems.

To eliminate regular maintenance requirement and costs, and to eliminate chemical costs and maintain 100% efficiency, the system must somehow be kept in pristine condition continuously.

The solution:

To eliminate the operating problems, costs and to maintain the “magic” 100% design efficiency, an entirely different technology for treating the system must be adopted...

There is only one ***permanent solution*** to this challenge.

Magnetic Fluid Conditioners (MFCs) appropriately fitted to the system offer the only way possible to eliminate the perpetual cycle of the system continuously losing efficiency as long as it is running then being shut down for cleaning, only to lose efficiency again soon after being restarted.

After 26 years of research and development **Scale-X[®] MFCs** represent a quantum leap forward in magnetic fluid conditioning technology and guarantee to keep a system in pristine condition.

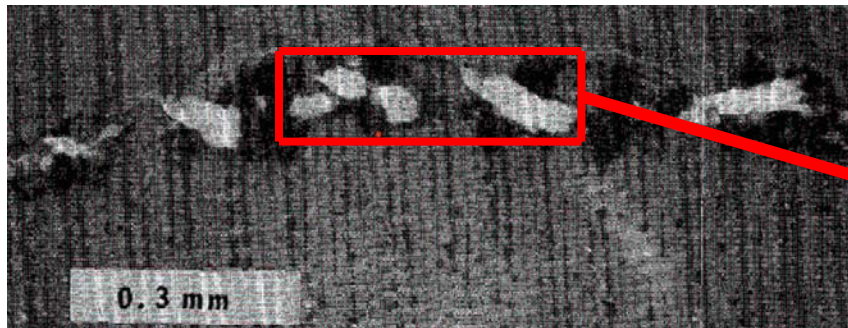
All Scale-X Magnetic Fluid Conditioners are precision engineered, powerful and application specific devices; purpose designed for each system and uncompromising, to ensure the desired result of continuous 100% efficiency of operation from the system.

The Principal of How Magnetic Fluid Conditioning Works

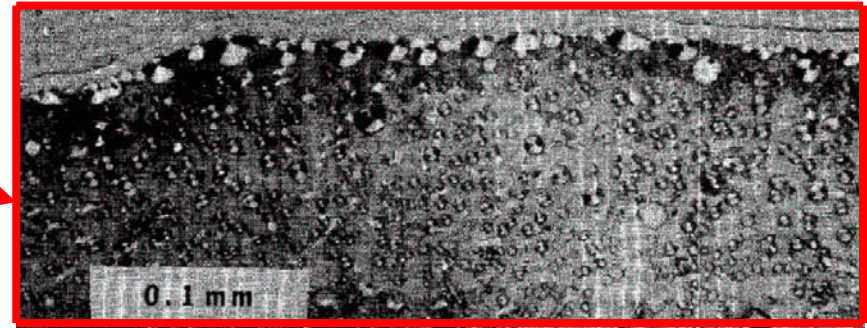
Experimental Evidence of Effects of Magnetic Fields on Moving Water

IEEE Transactions on Magnetics, Vol Mag-21, No 5, Sept 1985 and lecture notes.

By Dr. Klaus L Kronenberg, California State Polytechnic University



Surface of droplet of untreated water
- 670ppm TDS

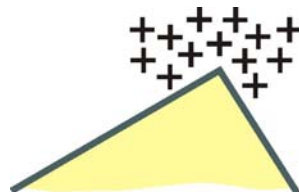
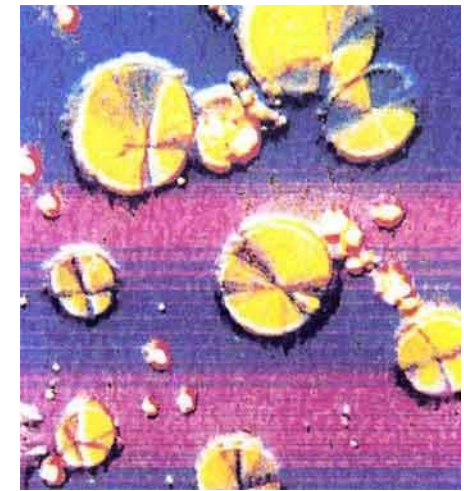


Surface of droplet of magnetically treated
water - 670ppm TDS

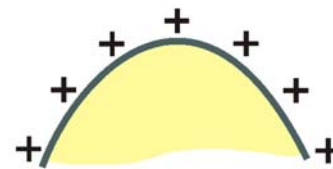


Observable Effects of Magnetic Fluid Conditioning on Water

Magnification of 1100 times reveals that calcium carbonate of magnetically treated water forms small circular, disc-shaped crystals as compared with the large irregular prism-shaped crystals formed in untreated water.



The sharp edges of prism-shaped crystals have strong bonding and **form scale on pipes and vessel surfaces.**



The rounded crystals have tendency against adhesion and **do NOT form scale on pipes and vessel surfaces.**



Scale-X MFCs eliminated the chronic scale problem in the “Yallourn W Power Station” brown coal open cut mine administration building air conditioning system.



The climatic conditions in Victoria are such that air-conditioning systems typically operates for only 3 to 4 months during summer each year. This building cooling tower was located adjacent to an open cut brown coal mine and suffered from air born contamination from the mine.

The system had a chronic scale and sludge problem. Both the condenser and cooling tower required cleaning at least every 1 to 2 months otherwise it would trip out on high head pressure. The condenser tubes required mechanical cleaning in addition to chemical cleaning to remove the scale.

“The Scale-X MFC system was in place on 12th August 1988 and regularly inspected and photographed up to June 1990. During this period of two years (two summers) the condenser has not required cleaning - scaling and sludging have been non existent.”

“During operation with the MFCs the corrosion pattern on the cast iron end plate of the condenser was unchanged. This was not the case pre MFC treatment when chemical treatment was applied.”

The Magnetic Treatment of Water for Scaling, Corrosion and Biological Control
J M Loble, Air Conditioning Engineer, State Electricity Commission of Victoria
The 1990 International Maintenance Management Conference
Melbourne & Sydney Australia, August 1990



Following the Scale-X MFCs eliminating the chronic scale problem detailed above the State Electricity Commission of Victoria, operator of Yallourn W Power Station, installed Scale-X MFCs on 4 other building air conditioning systems.