Advanced Material Technologies

Providing Solutions, Delivering Results!

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Since 2000

News Bulletin

Superior Water Conditioners to prevent water tube failures and their effect on steam generator corrosion

We have been promoting to the Australian Boiler, Chemical, Refineries, Metallurgical industry the new and innovative Superior Water Conditioners for issues where lime scale, fouling and air leakage in steam condensers, boiler water lines affects plant efficiency. This loss on heat transfer can be quite serious and cost the plant hundreds of thousands of dollars or more if a problem occurs during a peak generating period or becomes a long term event.

Internal Tube Deposits

Deposits on the internal of water tubes can set up a nightmare scenario. In the first place, deposits might initiate corrosion by establishing differential oxygen cells where the area underneath the deposit material becomes anodic to the exposed metal.

To explain, the formation of small anodes in a large cathode environment generates the most insidious types of corrosion – pitting – in which a small metal loss by weight can result in through wall penetrations and reduce flow rates from hard scale (calcite) buildup.

Now with the Superior water conditioners the hard-scale deposit currently experienced is now reduced to a softer material simply by changing the molecular structure of the water through an induced magnetic field. Hence, the deposited material will become less porous and the oxygen differential scale does not have the ability to form allowing the chlorides and sulphates in the water to not concentrate under a deposit causing the corrosion mechanism.

The Upshot of these issues and why Superior Water Conditioners should be installed

Cooling water from a lake or river typically contains a few hundred ppm of anions and cations, most notably calcium, sodium, magnesium, potassium, bicarbonate, chloride, silica and sulphate, as well as other materials, including suspended solids. In cooling towers, these impurities cycle up in concentration. As these contaminants enter the boiler, a number of temperature induces reactions occur. Two common reactions are shown;_

28 Charlton Street Mt. Warrigal NSW. 2528. Australia. E-mail: john.pulbrook@bigpond.com

Phone: 0242 956915 **Mobile: 0450 695691** **Skype: johnpulbrook1**

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- $Ca^{2+} + + 2HCO_3 =_{=} CaCO_3 + CO_2 + H_2O$
- Ca^{2+} + (or Mg^{2+}) + SiO_3^{2-} = $CaSiO_3$ + (or $MgSiO_3$)

These are scale formation reactions that Superior water conditioners will prevent from occurring. These reactions causing a thin deposit on the internals of pipes will significantly reduce heat transfer and a boiler must be fired harder to achieve the same level of steam production. This also can lead to overheating of the boiler tubes which will shorten boiler tube life.

Much more frightening is the effect that cooling water in-leakage has with regard to rapid and catastrophic corrosion. The reaction shown below is a prime example:-

$Mg_2Cl + H_2O + heat = Mg_2(OH)_2 + HCl$

Magnesium salts react with water to produce magnesium hydroxide precipitate plus hydrochloric acid. While hydrochloric acid may cause general corrosion in and of itself, the compound will concentrate under deposits where the reaction of acid with iron generates hydrogen which can lead to hydrogen damage of the boiler tubes. In this mechanism hydrogen gas molecules which are very small penetrate into the metal wall and react with carbon atoms in the steel to generate methane (CH_4).

$2H_2 + Fe_3C = 3Fe + CH_4$

Formation of the gaseous methane and hydrogen molecules will cause cracking in the steel, greatly weakening its strength. After hydrogen damage has occurred, the plant engineers might replace tubes to find other tubes continue to rupture. Needless to say the down line mechanisms that may fail and are very unwelcome in a finely balanced piece of machinery that may cost millions to repair when in fact all that was needed up line was the installation of Superior water conditioners.

With the Superior magnetic water conditioning to alleviate the above described problems will provide the following functions;

- Prevent scale deposition
- Descaling, recognizing that the descaling process is slow and may take several months to complete.
- Corrosion control.
- White rust control.

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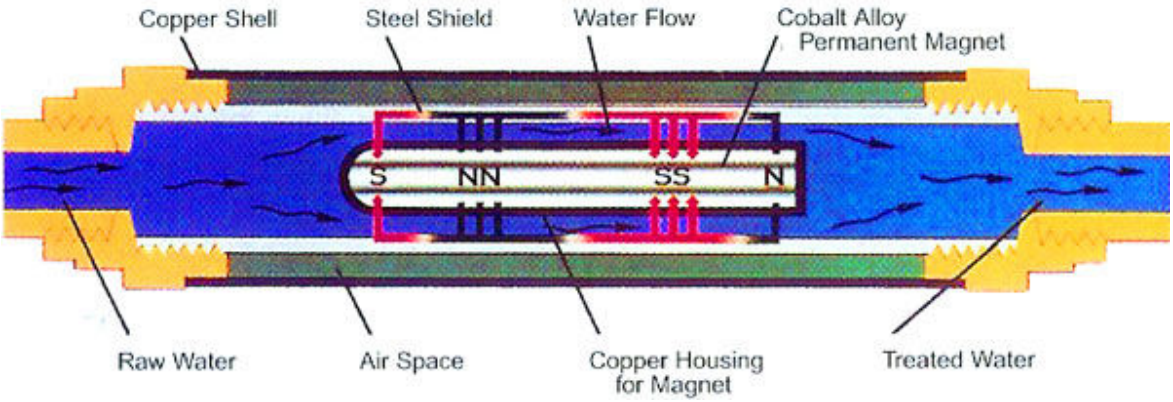
Magnetic water conditioners have been employed in over 300,000 applications. Their operation is characterized by:

- Minimal maintenance.
- Slight pressure drop.
- Absence of chemical additions, and therefore no environmental effects.
- Indefinite service life.
- Easily integrated into existing applications.

This non chemical method to control lime scale is not only used to increase quality in the product and reduce production costs but also as a means to reduce pollution and enhance the image of the industry.

SCALE & CORROSION

Water is the most frequently used media to transfer thermal energy for useful purposes. When water temperature changes, minerals precipitate and forms a hard, brittle scale that collects in piping and on heat transfer surfaces. This insulating scale build-up reduces efficiency of equipment, increase the fuel use and will increase maintenance time and costs. When water passes through Superior's alternating magnetic fields, it allows the minerals to form in a suspended state; therefore eliminating the formation of hard, brittle scale. Maintaining scale-free surfaces assures optimum utilization of your equipment. Superiorized® water controls the formation of scale and corrosion deposits without the use of hazardous and costly chemicals. Because no chemicals are used, discharged water is pollution-free and is not harmful to the environment. Superior water treatment systems solve lime scale build-up problems, resulting in energy and water conservation and pollution prevention.



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