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Our environment

BCA GREEN MARK

Singapore Susta

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Water saving

Conserving Water

Our water resources are wasted substantially whenever chemically treated cooling water is discharged as effluent. Good news is with the emergence of the BacComber green cooling water treatment technology, such wastage of water is fast becoming histroy. BacComber is a patented proprietary technology encompassing the Ultra Low Frequency (ULF) electromagnetic wave to control scaling, corrosion and biological growth holistically without the need for any chemical. No more secondary pollution and more notably the discharged water from BacComber treatment can be completely recycled. BacComber conserves water and meets the ultimate zero-discharge challenge!

Green Points

Ever increasing emphasis on sustainability and promoting greener environment has seen many countries taking the initiative in adopting green points scheme for recognizing green building projects and industry processes. The BacComber cooling water treatment system stands to tower over the rest of the treatment systems in these aspects while ensuring the most cost-effective way to achieve the targeted green points.

Corporate Social Responsibility (CSR) & Cost Saving

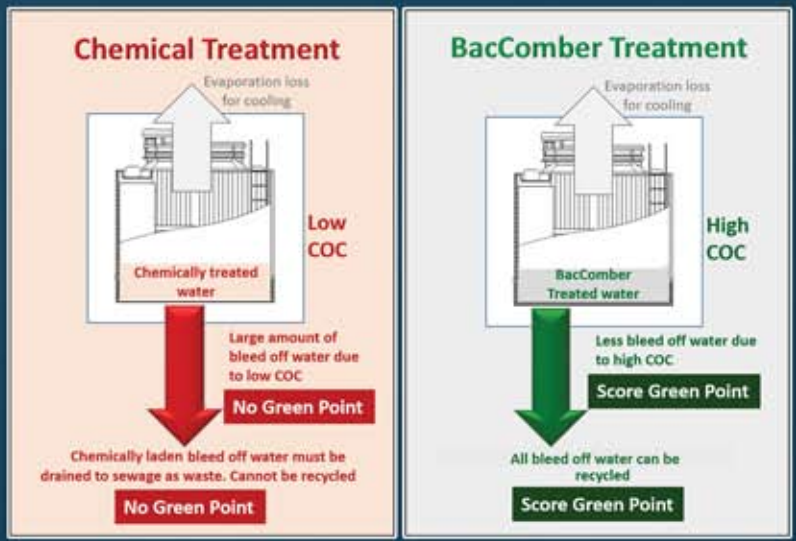
BacComber enhances corporate image and adds significant values by conserving water and providing a greener environment. The BacComber system fulfilled the highest standard in green building and ISO 14000 requirements. Users enjoy substantial water savings and totally eliminate the cost of chemical consumables, contribute to improving the quality of the environment we live in.

All bleed off water from BacComber treated cooling water can be recycled for washing, flushing, plant watering etc.

$$Bleed\ loss = \frac{Evaporation\ Loss}{COC - 1}$$

BacComber treatment is capable of increasing Cycle Of Concentration COC hence reduces bleed water loss.

Further water saving if all bleed off water is recycled.



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Cooling water

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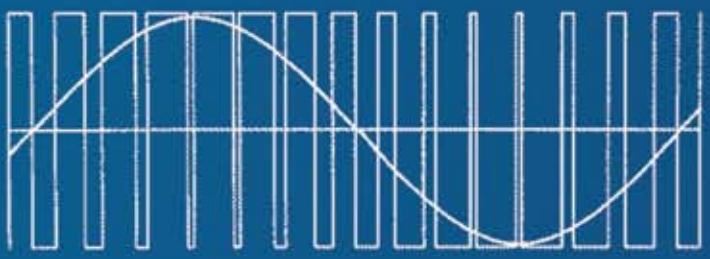
ULF Cooling Water Treatment Technology



BacComber ULF treatment excites water and elevates its internal energy. Resonated with the appropriate applied frequencies, scaling and corrosion control is achieved through the formation of non-adhering, powdery calcium carbonate scales in bulk water and protective magnetite layer on steel surfaces. The unique ionic current pulsates in water provides outstanding biological disinfection in controlling bacteria and algae simultaneously.

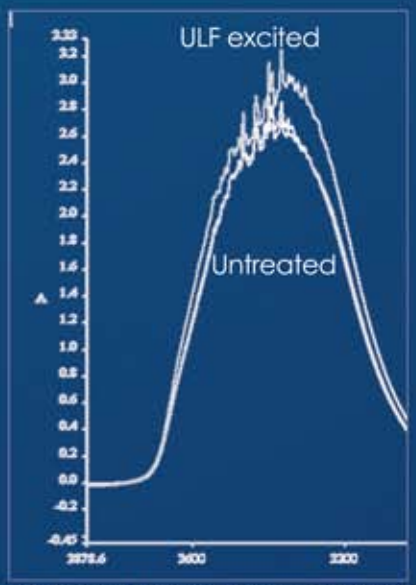
BacComber ULF electromagnetic wave is generated by advanced electronic microprocessor controlled system. Providing effective water treatment and protection to thousands of cooling water systems, chilled water systems and other process cooling water systems worldwide.

BacComber operates without chemical and consumable materials and contains no mechanical moving parts. It consumes extremely low power and is designed to require little to no human attendance and easy maintenance. This translate to very low operating and maintenance cost.

Premium BacComber version with cutting-edge continuous monitoring system is available to meet the most demanding specifications required by industry users in all types of highly challenging environment.

BacComber is built on a revolutionary concept of water treatment using the Ultra Low Frequency (ULF) Technology. The time varying ULF wave generated by BacComber emitters energize the vibrational and rotational energy of water and other constituents. This promotes many desirable treatment effects which are not achievable by conventional chemical treatment.

ULF frequency range in electromagnetic wave spectrum



Water internal enegy excitation by ULF

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Scaling

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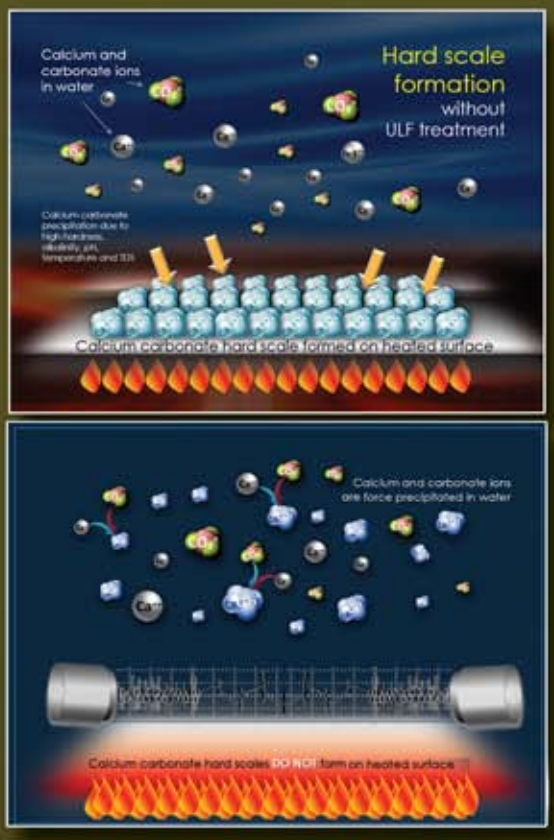
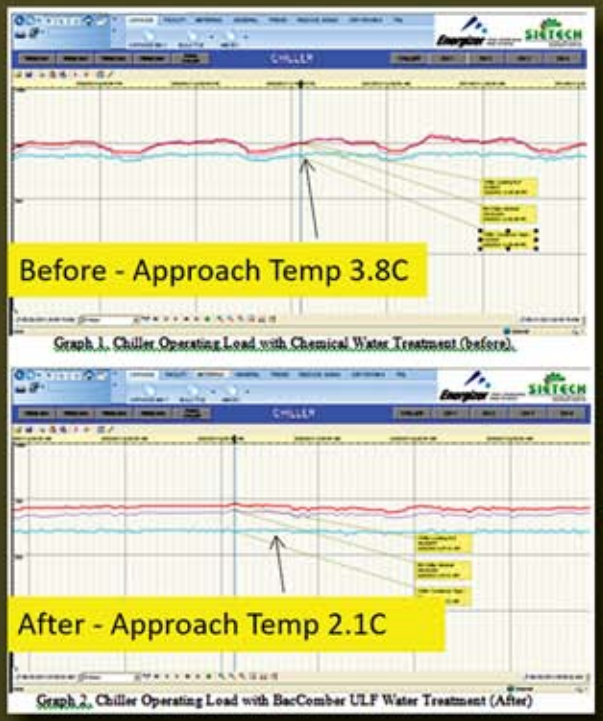
Scaling control



Calcium hardness solubility in water reduces when temperature is increased. Without ULF excitation, the reduced solubility causes the calcium ions to precipitate and form hard adhering calcium carbonate (calcite) scale on heat exchanger surfaces hence impeding heat transfer and lead to higher energy consumption. Furthermore, adhering calcite densely solidifies on heat exchanger surfaces and can only be dissolved and removed by acid chemical wash. A harmful, invasive approach that shortens equipment life.

BacComber ULF wave treatment prevents the formation of adhering hard scale by means of force precipitating the higher energy state, powdery calcium carbonate scales in bulk water known as aragonite. Fine aragonite particles suspend in bulk water instead of adhering to the heat exchanger surface and can be easily removed during the bleed off process. This saves the condenser and other heat exchanger surfaces from scaling and hence eliminates the need for chemical cleaning and saves energy. Accompanying scale control, the ULF treatment has positive effect in dislodging existing scale gradually, improving the overall heat transfer efficiency.



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Fe_2O_3 red rust before BacComber

Fe_3O_4 Magnetite after BacComber

Corrosion

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Corrosion control

Corrosion causes premature failure of cooling water piping system and equipment. BacComber treated cooling water system achieves "Excellent to Good" (1~5 mpy) corrosion rate for submerged steel based on CTI, ASTM and other international standards.

Corrosion test probe 2 weeks after BacComber treatment

Magnetite forms on Corrosion test probe 6 weeks after BacComber treatment

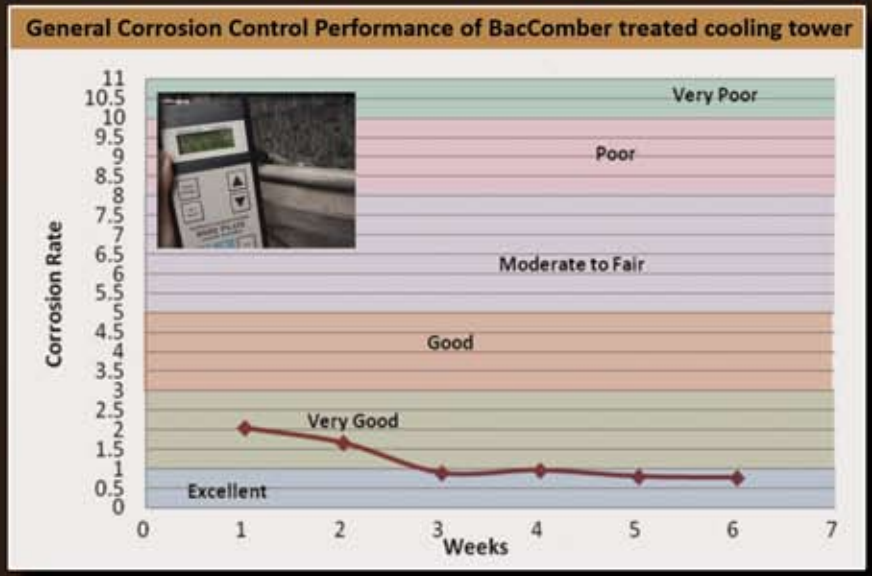
The excellent corrosion protection performance is achieved via the patented ULF excitation technology which promotes the magnetite formation beneath the coating or existing rust of submerged steel surface. Magnetite acts as a perfect corrosion protection coating and inhibits steel from further corrosion. Magnetite is non-porous, adheres strongly to the steel surface and acts as a protective coating. It is an active self generating, self-repairing coating under the ULF treatment.

Steel corrodes and forms rust when immersed in cooling water. Without ULF treatment, rust that formed is low energy iron oxide Fe_2O_3 which is porous and unable to protect the steel from further corrosion.

Under ULF treatment, ULF energy excites the steel through the cooling water in contact with steel. With the excitation, steel forms high energy state oxide Fe_3O_4 magnetite instead of low energy state Fe_2O_3. Magnetite is conductive and does not corrode when interference corrosion current leaves the magnetite coated surface. Magnetite therefore provides excellent "general and interference" corrosion protection.

The ULF corrosion protection enhances the equipment service life and therefore saves cost. In addition, the ULF treatment eliminates the use of any chemical corrosion inhibitors that typically provide nutrients to bacteria and algae; making complete recycling of ULF treated cooling water possible.

General Corrosion Control Performance of BacComber treated cooling tower



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Algae

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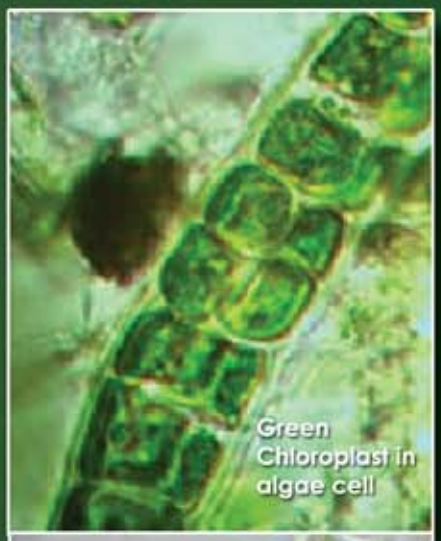
Algae control



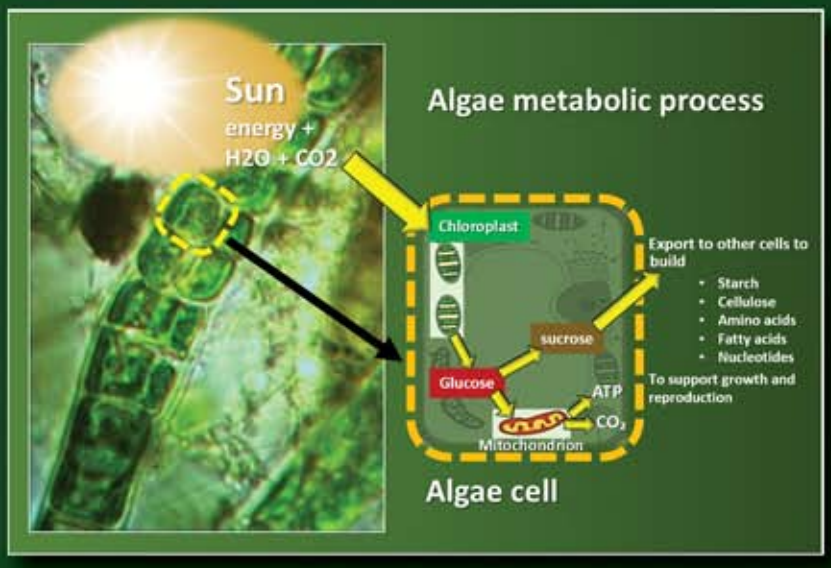
Algae bloom happens when there are nutrients and sunlight. Typically phosphates or nitrites (which are used in chemical water treatment) are good nutrients for algae. While Algae do not grow in condenser which is not exposed to sunlight but excessively unwanted algae growth in cooling tower such as in cooling tower infills and exposed water passages are common. It blocks water flow and affects cooling tower performance. Algae are also good sites for bacteria growth especially for the Legionella bacteria.

BacComber controls the algae growth without using any chemical algaecide. The ULF treatment controls algae growth by bursting chloroplast in algae and disrupt the metabolic activities of algae. ULF wave also controls the cell multiplication process hence resulting in an effective algae control mechanism.

Chloroplast in the algae cell undergoes photosynthesis by harnessing energy from Sun combined with water and CO_2 to produce Glucose. Glucose is then further converted into energy ATP and sucrose as basic materials for further building up of cells, support growth and reproduction.

With strong ULF wave treatment, the chloroplast is burst, disabling the algae's ability to produce Glucose. The effect is similar to using strong UVC light to kill algae. Once the chloroplast is burst, the entire metabolism in the algae cell is disrupted hence bringing about an effective algae control without using chemical algaecide.

Most chemical algaecides are strong oxidizing agent thus inducing corrosion in the cooling water system. With ULF treatment, no oxidizing chemical is used hence no secondary corrosion issue is created and the bleed off water from the cooling tower is safe to be recycled or discharged to surface drain/water way without polluting the environment.



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Bacteria

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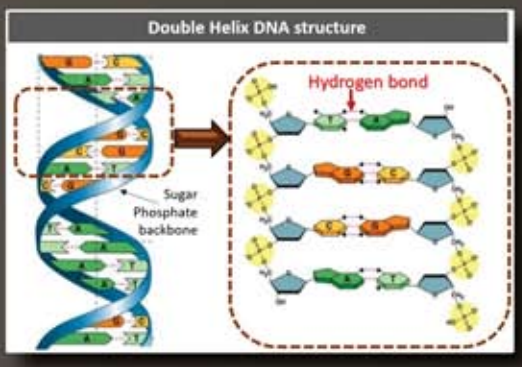
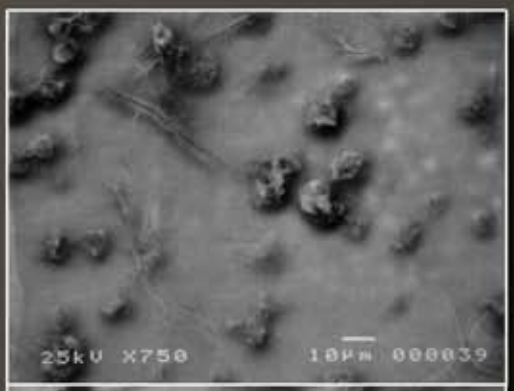
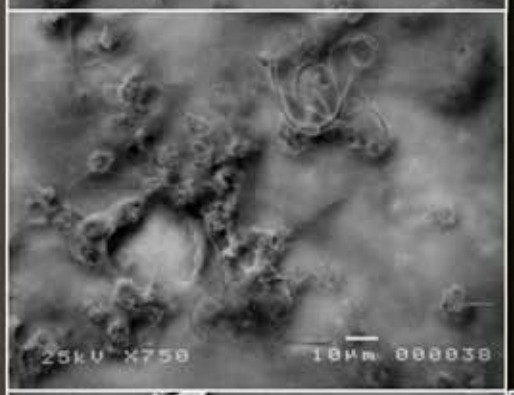
Bacteria control

Bacteria in cooling water lead to both health and energy wastage issues.







The operating temperature of cooling tower of 35~ 45°C is an ideal temperature range that promotes bacteria growth especially Legionella bacteria. This undesirable condition is further exacerbated by the formation of bacteria biofilm, algae growth and sedimentation in cooling towers. Many bacteria secrete slimy polymer polysaccharide (known as biofilm) and colonize in it for benefits of the bacteria community. The biofilm also act as a defence shelter against external attack such as chlorine. In cooling water, when bacteria population escalates, the biofilm thickness increases. This inadvertently will cause health issue, in particular Legionella pneumophila.

Impeding heat transfer is another negative effect of biofilm. Biofilm impedes heat transfer 4-5 times more than calcium carbonate hard scales causing huge increase in energy usage and wastage hence bacteria control must not be neglected in cooling water treatment.

In the conventional treatment of using strong oxidizing agents as disinfectants has the drawbacks of ineffective penetration into biofilm. Therefore it is unable to kill and disinfect all the bacteria colonized in the biofilm. Yet strong oxidizing agent causes corrosion to the metallic structures in the cooling water system.

Bacteria basically consist of water which is hydrogen bonded. Their double helix DNA sugar phosphate backbones are also held by hydrogen bonds which is susceptible to ULF treatment resulting in disruption of bacteria cell division, inhibiting the multiplication process. Bacteria metabolism is an electron transport chain process and its electron transport process is disrupted when the water they live in is treated by the ULF wave. Thus, BacComber effectively controls the bacteria metabolism and growth rate.

The cooling water bacteria count including those colonized in the biofilm will decline drastically after exposure to ULF treatment. The biofilm in the cooling water system will also reduce very significantly with the declined bacteria population providing a healthier environment and achieving energy saving.

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Installation

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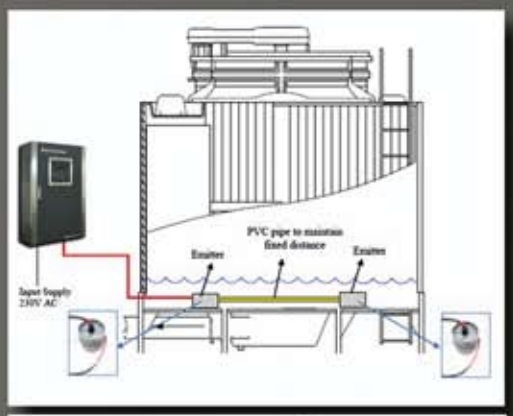
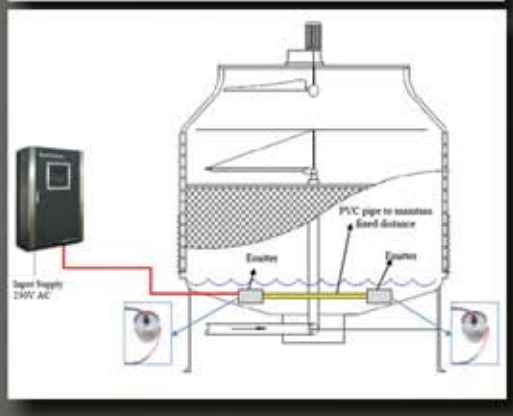
Small system





BacComber protects thousands of cooling water systems, chilled water systems and other process water systems worldwide. It is an advanced electronic microprocessor control system with no moving parts. It is reliable, robust, designed for both outdoor or indoor installations.

No dosing of chemicals or consumable material required, coupled with very low power consumption and minimal human intervention, the operating and maintenance costs of the BacComber system are kept very low.

Premium version of the BacComber system included advanced continuous monitoring system. It can be linked to remote monitoring system if required by the customer.

Small size cooling tower basins are typically made of fibre glass or steel materials.

For non metallic fibre glass basin, the emitter pairs are installed and immersed in water in the basin. The ULF wave signal cables of both emitters are routed back to the ULF wave generator/power unit.

For metallic basin, emitters are placed either in the basin or water channel but the return signal cable to the wave generator/power unit is connected to the metallic basin.

Power unit is installed outside the cooling tower, preferably in shaded locations such as beneath the cooling tower itself.

The ULF wave signal cables between emitters and the ULF wave generator shall be separated from any power cable to avoid interference between power cable and the ULF wave singnal cable.

Standard BacComber unit requires only single phase power supply in 110/230V, 50/60 Hz.

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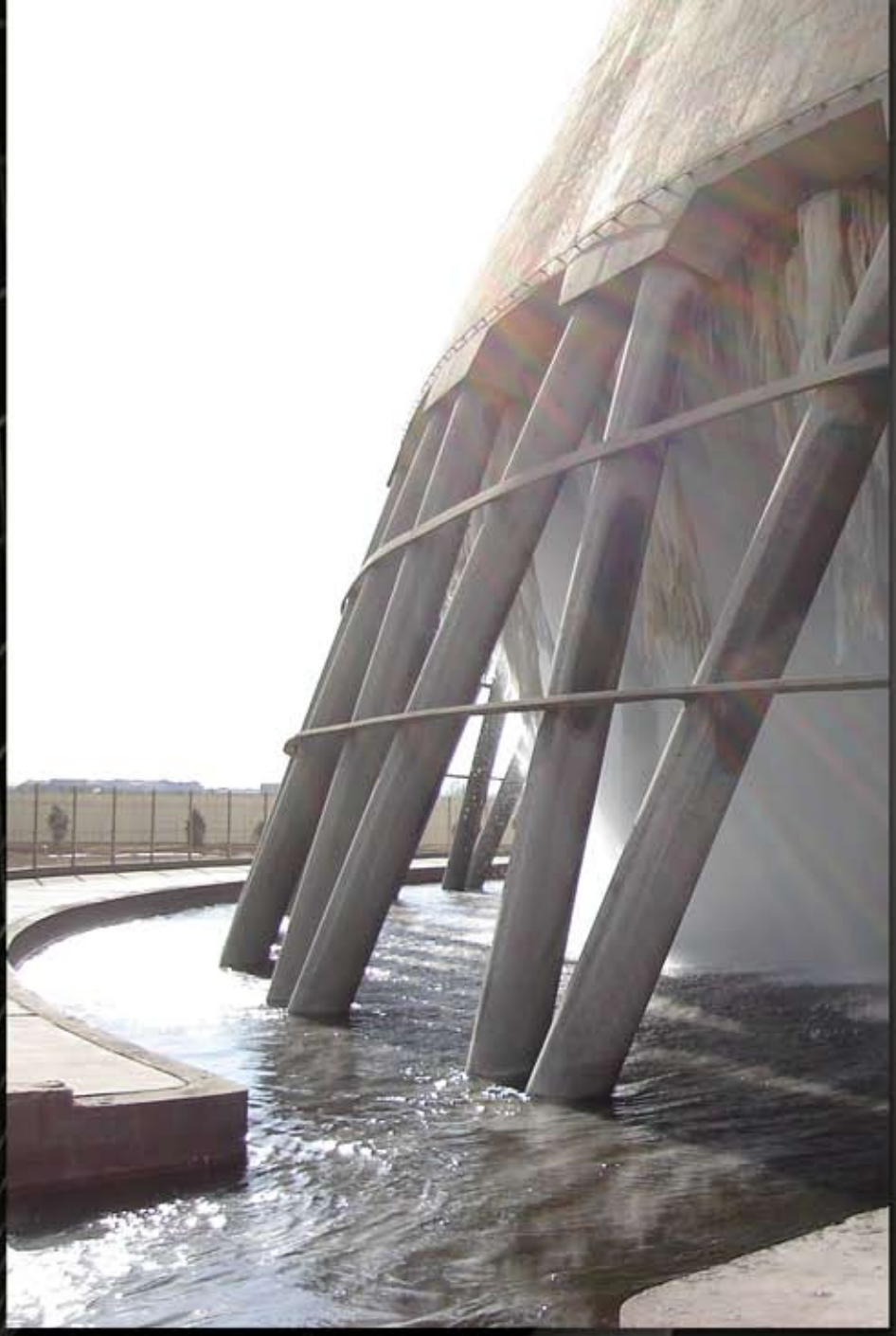

Installation

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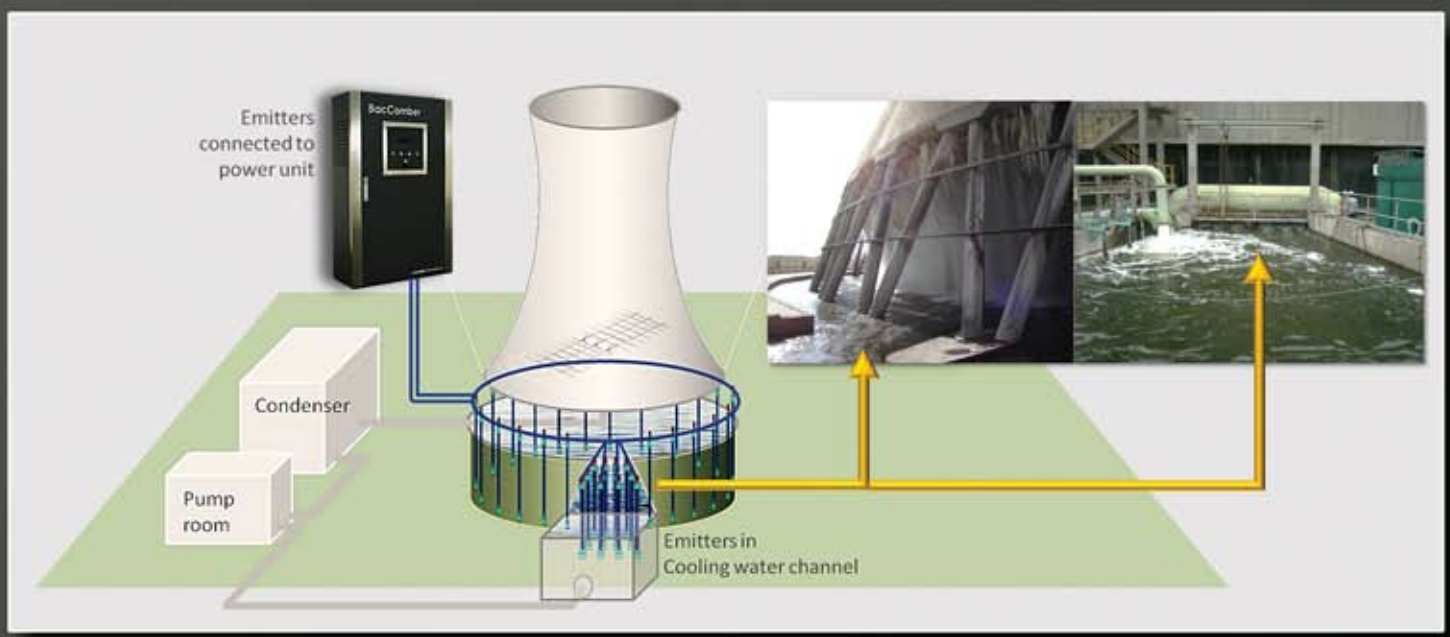
Large system

For large scale industrial cooling tower, the BacComber system is customized to suit operation and for ease of installation. Thus, installation can be carried out without disrupting the operations of the plant.

Typically the emitters are grouped and pre-assembled on skids or fixtures before lowering into the water sump or main cooling water channel between the cooling tower and pump room. The placement and distribution of the emitters are predetermined based on the water flow path and the layout of the cooling water system.

The power units are usually installed close to the emitters to reduce the cable length and installation works.

Larger BacComber system can be customized to include PLC controlled operation, remote system monitoring, data logging etc.



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Applications & Users

Since 2001

- Hospitals HVAC
- Data Centers HVAC
- Office Buildings HVAC
- Public Buildings HVAC
- Institutions HVAC
- District Cooling
- Mass Railways
- Process Plants
- Semiconductor Industries
- Power Stations
- Steel Mills
- Petrochemicals Plants
- Pulp and Papers Mills
- Sugar Mills
- Chemical Plants
- Smelting Plants
- Air Compressors Plants

....and many more

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more than 30 Green Patents granted since 2001

Founded in 2001, Ecospec is a green technology company which invests major part of its resources in continuous research and development. Ecospec shows its commitment to the environment and society at large by inventing revolutionary environmental technologies to help save the earth. By making the best green technologies available to the end users will allow the industries to save cost while protecting the environment.

Strong team of researchers from various disciplines of science and technology are staffed in the company to continuously incubate new ideas and inventions to benefit the world's environment. Since its incorporation, Ecospec has produced many groundbreaking inventions including;

- CSNOx emission abatement system
- ScaMag boiler water treatment system
- ACU Algae control system
- BioMag bio-fouling control system
- ElMag corrosion control system, etc.

All these inventions save cost while making the world a better place to live in. Today, Ecospec reaches out to the international community with its ULF technology. At Ecospec, we help to make the world greener.