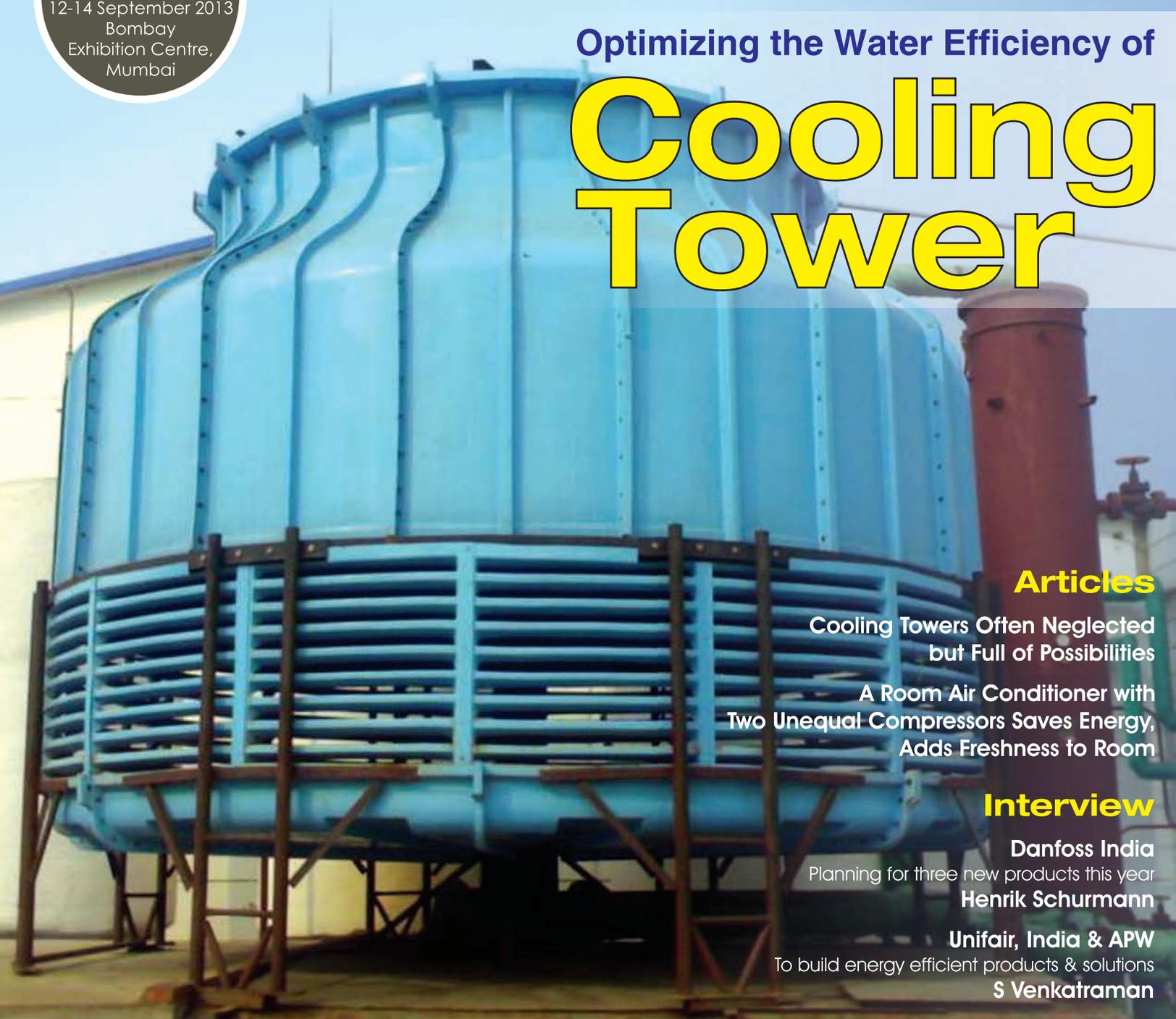


Cooling India

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Optimizing the Water Efficiency of Cooling Tower



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Water Quality & Scarcity

Optimizing Performance of Water Cooled Condensers in India

Water cooled condensers have distinct advantages and are widely used in industry. Their performance deteriorates as the water quality goes down. In most parts of India the user does not have control over input water quality. This article explains how one could still get best results even under such conditions, by treating the cooling tower water with micro-processor based ULF technology established in India since last 8 years. It also examines how one could optimize the amount of water used, as well as reuse bleed off water to achieve zero discharge. This is of paramount interest today, as there is scarcity of water all over the country for industrial use.

Understanding design constraints

One of the leading international brands of chillers popular in India recommends the conductivity of water in cooling tower to maximum 800 $\mu\text{S}/\text{cm}$ (approximately 400 ppm TDS). The other chiller manufacturers too have similar limitations and hardly any manufacturer recommends TDS limit over 1,000 - 1,200 ppm in cooling tower. The owner's manual of a chiller will indicate the maximum TDS recommended by the manufacturer.

In quite a few parts of India TDS of makeup water is 400-800 ppm. How then can one maintain limit of 1,000 - 1,200 ppm in cooling tower?

This obviously means most users' would exceed the recommendation of the condenser maker because of lack of access to proper quality of water. The traditional treatment with chemicals is mostly ineffective to control hard scale when the TDS goes beyond 1,000 - 1,200 ppm. This is obvious from the fact that

frequent acid descaling is the norm of industry.

The user, therefore, resigns to acid descaling as frequently as necessary, depending upon the water quality, although there is energy loss due to the hard scale and each acid descaling will reduce the design life of condenser.

TDS and Hard Scale

It is an established fact that higher the TDS, greater is the tendency to form hard scale. If other parameters remain same, not only the tendency to form hard scale goes up but also the amount of hard scale formed within a given period; and so does the energy loss.

This brings us to the main question of this article: is it possible to reduce the tendency of hard scale formation and frequency of acid descaling even when the TDS of cooling tower water is higher? If so there could be tremendous saving of both energy and water.

Hi-tech Solution

Traditional treatment has been focusing to minimize the hard scale

It promotes formation of CaCO₃ as micro particles which do not stick to the condenser tubes. This is achieved by using patented ULF technology

formation by using phosphates to trap Ca and keep calcium in water. This has limited success and lot of side effects. The new age solution of BacComber Treatment tackles the problem entirely differently. It promotes formation of CaCO₃ as micro particles which do not stick to the condenser tubes. This is achieved by using patented ULF technology (Ultra Low Frequency Waves). In short, CaCO₃ does not harm the condenser tubes even at high TDS. This means even a condenser designed to operate at 400 TDS maximum can now be safely used at several times more TDS. It helps one to use safely water available in most places, and save water by having higher COC.

Issue	Traditional Treatment	BacComber Treatment
Hard scale	CaCO ₃ Hard scale forms on tube surface	CaCO ₃ Hard scale does not form on tube surface
Solution	Use Phosphate to trap Ca and keep calcium in water	ULF Treatment w/o chemicals
Side effects	Algae, Corrosion etc.	None
Normal limit of TDS (ppm)	1,200 max	3,000 ppm or higher
Green marks for building	No	Yes
Microprocessor controlled	No	Yes
Consumables	Yes	None
Trained manpower to treat	Yes	No
Harmful acids used	Yes	No
Biocides used	Yes	No
Storage & handling of chemicals	Yes	No
Risk of wrong dosing	Yes	No

Table 1: Comparison between Traditional and BacComber Treatment



N S Rao Managing Director of Ecospec India Pvt Ltd, is B. Tech. (Hons) from I.I.T, Mumbai. He has been associated with HVAC industry for over two decades.



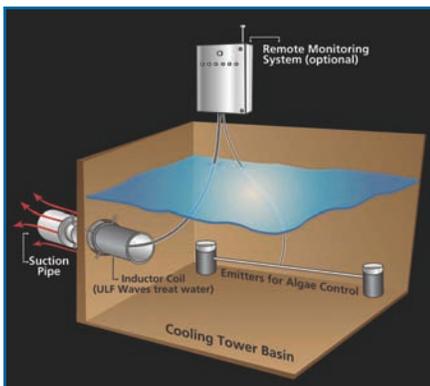
Picture 1: A clean condenser, treated with BacComber. It remains clean year after year, saving tremendous energy and enhancing condenser life

Elegant design

The elegance of BacComber lies in its simplicity. There are three main components of the system.

- **Inductor Coil:** it is inserted in the outlet pipe. ULF waves are generated in the inductor coil. Water gets treated when it passes through it.
- **Emitter Unit:** it is immersed in the CT basin for control of Algae. It is a non-consumable unit.
- **Electronic Control Unit:** it is connected to both the Inductor Coil and the Emitter Unit. It is placed near the cooling tower.

The installation takes place without any stoppage of chiller and is normally complete within a day. The system has no moving parts or consumables. Picture 2 illustrates this.



Picture 2: Typical Installation of BacComber System

The beauty of the system is:

- It is micro-processor controlled
- It can be installed without stopping the system
- It needs no modification to existing pipelines etc.
- It is maintenance free
- It is without any consumables.

The design is without any moving parts, free of routine maintenance and hassles that normally accompany cooling tower water treatment. The operation is free of human intervention, which means you get what you pay for and the treatment is on 24x7 without someone forgetting or dosing wrongly. It is free of human error. Any malfunction of equipment is brought to notice by trip lamp. You can also connect to BMS which gives you peace of mind in monitoring.

Zero Discharge

The shortage of water as well regulations of environment now make it necessary to opt for zero discharge. When chemicals are used for treatment of cooling tower water the bleed off water cannot be used for any other purpose, nor can it be discharged directly. It needs further treatment with even more chemicals and expense before discharge.

BacComber treated water is without any chemical additions. Hence it is used for gardening, washing etc. It helps in implementing zero discharge. In one case the water from cooling tower was put in a pond with gold fish in it.

This means the scarce water is now conserved to the last drop possible.

Made in India for Indian water

International companies often bring in the equipment designed for international conditions to India. In case of BacComber Treatment each case is custom designed locally based on the water conditions, site data and user requirements. It is manufactured in India with full warranty and local

service. It has a long history of over 8 years' successful operation in Indian conditions, led by the core team which is involved right from inception.

It is a three-in-one system that controls:

- Hard Scale
- Algae
- Corrosion.

Economic Advantage

The ROI is normally within a year or two. The savings continue year after year, in terms of both energy and recurring consumable costs in traditional treatment.

One of the leading companies was using chemical treatment for years.

They installed BacComber Treatment for over 30 cooling towers in one single financial year!

Imagine the economic benefits to get such a large CAPEX cleared in one year.

Major Benefits with BacComber Treatment

- ✓ Saving of energy up to 25%
- ✓ Saving of recurring annual chemical treatment costs
- ✓ Saving of water: when zero discharge is implemented
- ✓ Saving of life of condenser with avoidance of each acid descaling
- ✓ Saving of cost of treatment of bleed off water before discharge
- ✓ Saving of human effort in monitoring daily treatment

Installations in India

Table 2 gives an overview of the installations in India.

Conclusion

It was quite common for Indian companies to take years to adopt new technology from the West. Today, every Indian, rich or poor, adopts the latest

Largest Single Cooling Tower	
Export application Installation in India	Eq. to 25,000 TR/Sump capacity: 14,000 m3 Eq. to 10,000 TR/Sump capacity: 1,000 m3
Applications	
Most critical application	Power Plant
HVAC	IT/Office Buildings, Hotels, Malls, Hospital, Education Institutes, SEZ etc.
Industrial	Pesticide, Pharma, Injection Molding, Chemical ..
Recent Consultant Specified Projects	
Number of Cooling Towers	Over 95
Total TR	Over 38,000 TR
Type	Hospital, Hotel, Educational Institute, Industrial, Defense, SEZ, Commercial Building, Malls, Lab, Govt. units, Pharma
Longest Running Installation in a company	
No of years	8
No of Cooling Towers	10
Largest Multi-Location Supplies to a Single Company	
Number of Installations	39
Type of Applications	Condensers, Boilers, Chilled Water Pipes
Number of Plants/ Locations	7
Water Quality used	
Across India	North, South, West and East
Type of water	Borewell, tanker, river, municipal, STP
Type of Water Cooled Chillers	
HVAC	Centri, Screw, VAM, Reciprocating etc.
Industrial	Condensers and Heat Exchangers
MOC of condensers	Copper, SS, M.S., Carbon
BacComber Treatment has helped in avoiding hard scale year after year	
Table 2: Overview of BacComber Installations	

technology with confidence and ease. Mobile phones are a classic example. One of the Indian companies which adopted BacComber Treatment has now proposed to take it to their plants in Europe, from India! It is heartening to see companies reach out to the sophisticated micro-processor controlled BacComber Treatment to reap the benefits of green points for buildings, energy and water saving, with reduced recurring costs year after year. ■