

4-Year Field Tested of Vulcan for the Cooling Tower at Supermal Karawaci (SMK)



Installation details

Model	Vulcan S500
Tested field	Supermal Karawaci, Tangerang, Indonesia
Operating times	This large mall operates 7 days a week from 9:30 to 21:30, 365 days of the year
Tested location	One of 7 cooling towers servicing the Mall's water cooled package air-conditioning systems. The cooling tower selected is a 408TR system containing 45 m ³ water volume with a water flow rate of 318 m ³ /h in an open circuit system.
Testing period	February 2014 - February 2018 (4 Years)
Installed by	PT Biosolutions Indonesia



Vulcan S500 was located inside aluminum box and installed on a cooling tower main pipe in Supermal Karawaci.

Inspections

The photographs show that the refrigeration condenser tubes, from the beginning to the end of the trial period, were "as clean as new".



First Inspection: March 4, 2014.

The heat exchanger tube plates were removed to reveal the inside surface of the copper tubes. Since these tubes had recently been manually cleaned, virtually no scale was present, as is obvious on this photo.

Last inspection: February 12, 2018 at the end of the 4-year trial

The inside surfaces of the copper tubes show zero additional scale formation after 4 years in the test period.

Please note that for 4 years of 365 days continuous operation, there has been:

- No chemical water treatment.
- No bleed off of waste water.
- No cleaning of condenser tubes.
- No water treatment specialists employed.
- Copper tubes in the condensers stay very clean – without scale.
- No cleaning of the cooling tower inside surfaces.

Inspections during the 4 years:

2014 - 4 times
 2015 - 2 times
 2016 - 2 times
 2017 - 1 time
 2018 - 1 time

At each inspection, the following procedures were followed:

1. One of the refrigeration "Shell and Tube" condensers was opened and the tubes inspected.
2. Condenser tubes were photographed.
3. Cooling tower water sample was sent to lab.
4. Refrigeration hot gas pressure gauges were checked.

Showing copper tubes of AC condenser heat exchanger on dates indicated:



First Inspection: March 4, 2014



June 1, 2014



December 10, 2014



June 3, 2015



October 27, 2016



Inside of heat exchanger. Condenser end plate had lost all scale that was there previously. (Light spot at bottom is reflected light.)



August 3, 2017



Last inspection:
 February 12, 2018

Significant findings as a result of the 4-year field tested trial:

- Scale build-up did not take place. During this 4-year trial period, no scale formation was found on the condenser heat exchanger copper tubes of the system.
- We have found conclusively that EC (Electric Conductivity) levels of up to 10,000 $\mu\text{S}/\text{cm}$ can be safely ignored. Similarly, high TDS, metals, anions and many other substances in cooling tower water can be ignored when Vulcan is used. Cooling tower water blow downs are vastly reduced because with the Vulcan the maximum EC limit increases from 1,200 $\mu\text{S}/\text{cm}$ in chemically treated cooling tower water systems to the much higher limit of EC 10,000 $\mu\text{S}/\text{cm}$ for the electronic method of cooling tower water treatment.
At the new 10,000 $\mu\text{S}/\text{cm}$ EC limit, the need for cooling tower water blow down will likely be reduced from almost daily to once or twice per year.
- No system maintenance was required.
- All AC compressors ran entirely at clean condenser efficiencies.
- R22 refrigerant gauges on all condensers remained at constant hot gas head pressure.



Summary of Benefits:

- Large savings on **chemicals**. The complete elimination of chemicals in this cooling tower operation during the field test supports the fact that Vulcan is "eco friendly" and would meet the Leeds and Green Mark Building Criteria required for "Green Building" designation anywhere in the world. Enjoy the benefits of a world class, **sustainable and "Green" Cooling Tower!**
- Huge savings on **blow down** water consumption. Significant energy and water savings due to clean condenser tubes and no need for water blow downs below electric conductivity 10,000 $\mu\text{S}/\text{cm}$ levels with the electronic cooling tower water treatment system – representing alone a saving of virtually all previously wasted water due to blow downs.
- Savings on **payroll** – no operational stoppages required for condenser cleaning, less testing and fewer inspections needed.
- Savings on **supervision** – engineers appreciate the "set and forget" of this automatic water treatment system. Frequency of inspections and laboratory expenses for cooling tower water testing are reduced due to the safety and reliability of the electronic systems.
- Scale formation was eliminated. Refrigeration compressors operated at peak efficiency due to no scale in the condensers.
- Rust prevention in iron pipes is an added benefit of the Vulcan system.