

Coil clean with Viper Brite leads to performance gains

Despite undergoing refrigeration and air conditioning refurbishment works in 2019, the performance of one Sydney supermarket's main air handling unit (AHU) cooling coil had been adversely impacted due to the continuous build-up of hard carbon contamination deep within the coil fins and rows.

Over the years many attempts to remove the contamination had been made by service technicians using a variety of products and cleaning techniques. Whilst some of the carbon was able to be removed from the surface of the coil, these practices had conversely contributed to the hard carbon particles being further embedded into the coil (see image 1).

Based on the 25 year age and condition of the coil, one solution considered by the customer, was to undergo major capital works consisting of a complete coil replacement at an estimated cost in excess of \$20,000.

Prior to such an investment, a trial using Viper chemicals was conducted with Supercool Group of Companies in an attempt to remove the hard carbon from the coil and avoid the immediate investment in replacement coil costs. Note the coil size being 2800(L) x 1300(H) x 250(W).



Image 1: Hard carbon contamination was quite evident not only on the surface of the coil, but also deep within the fins and rows.



At a glance...

- 1: The store's AHU cooling coil had been adversely affected by hard carbon contamination deep within the coil.
- 2: Cleaning the coil with Viper Brite removed a significant amount of hard carbon providing immediate performance gains and energy savings. Total airflow improved by 21% and the fan current draw (A) and power (kW) both decreased by 29%.
- 3: Despite the coil being approx 25 years old, it is estimated the service life has been extended by another 3-5 years, postponing an immediate coil replacement cost for the owner estimated in excess of \$20,000.

Viper Brite is a non-acidic, alkaline solution that produces expanding foam for cleaning all types of outdoor condenser coils and commercial & industrial evaporators.

Problem: Reduced System Efficiencies

The significantly blocked coil had directly affected the performance of the whole system in three key areas;

1. The reduced airflow across the coil was resulting in higher fan static in the AHU chamber causing the fans to operate under a larger load than required and drawing higher current (Amps).
2. The reduced airflow affected the ventilation and fresh air in the conditioned space. This was evident during the thermal imaging on the coil causing hot and cold pockets to appear (see image 2).
3. The reduced airflow across the coil directly resulted in liquid refrigerant not vaporising, causing lower compressor suction pressures and lower superheat. This directly impacted efficiency of the system and ultimately reduced the cooling capacity for the required load in the store whilst the compressor was drawing a higher current.

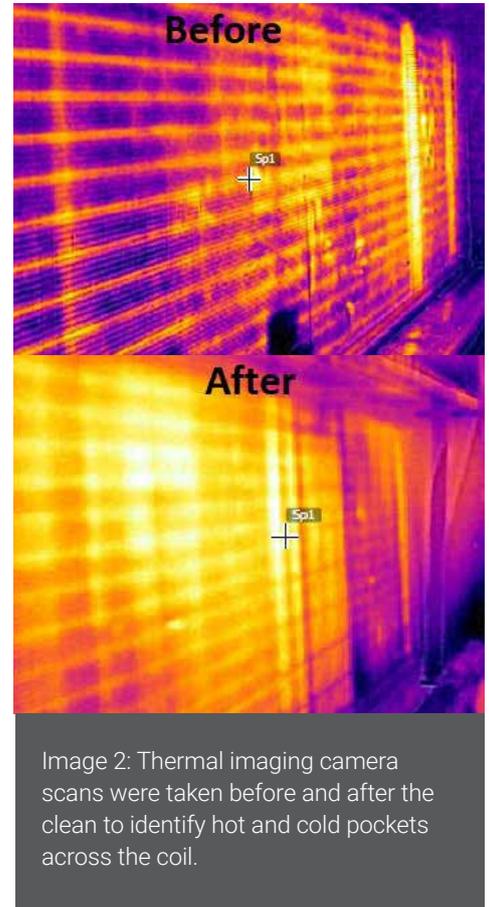
Solution: Viper Products

With the aluminium fins nearing their life and having signs of deterioration and fatigue, it was agreed Viper Brite would be the most suitable coil cleaner to use. With correct application Viper Brite will restore the heat transfer properties of the entire coil body by blistering and lifting dirt, grease, grime and hard oxidation.

Method:

Viper Brite was mixed in a small pressure pack spray bottle at a dilution ratio of 4:1. The Viper Foam gun was not used in this trial due to the high level of contamination. Also, due to the aggressiveness of the alkaline content all participants were always required to wear safety glasses.

1. Initially, Viper Brite was applied on a small section approximately 50cm wide from the left side on the air onto the coil (see image 3).
2. Starting at the bottom, Viper Brite was sprayed onto the coil letting the chemical fill over the tube runs of the coil. This allowed the foaming action to take place and commence the process of pushing out and removing the hard carbon from deep within the coil (see image 4).
3. After 10 minutes the foam had stopped reacting and liquefied, indicating it was time to rinse. A high pressure washer was used to rinse this section of the coil. (see image 5). This step was repeated in each section left to right across the coil.



4. Due to the extent of the blockage and that rinsing was still flushing contamination from the coil, no further product was applied to the coils after the 5 applications. It was recommended that the coils be left for a couple of days and then follow up with a further pressure washer rinse until no further contamination was coming into the drain pan.
5. End result of coil (see image 7). Added to the improved heat exchange co-efficient of the coil, the immediate result suggests a saving of 15,029 kWh p.a. through the evaporator fans alone - providing an immediate payback from the Viper Brite cleaning of the coil.



Image 3: Initially Viper Brite was applied on a small section from the left side on the air onto the coil.



Image 4: Spraying onto the coil initiated the foaming action, pushing out and removing the hard carbon.



Image 5: When the foam had stopped reacting, it liquified indicating it was time to rinse.



Image 6: Result after the first application and rinse.

Conclusion:

The trial results confirmed that the Viper Brite product removed a significant amount of hard carbon from the AHU cooling coil, removing significant coil blockages and improving the total airflow by 21%. Additionally, the fan current draw (A) and power (kW) both decreased by 29%.

It can be calculated that an overall saving of 15,029 kWh p.a. can be attributed to just the evaporator fans alone. The total saving coupled with overall system energy is expected to be greater throughout the summer period.

Due to the poor state of the coil, the maintenance took 1.5 days for two technicians using 3 x 4L bottles of Viper Brite. This investment has provided immediate performance gains and energy savings and has postponed the need for an immediate coil replacement (estimated to cost in excess of \$20,000).

Whilst the coil is approximately 25 years old, it is anticipated the coils now serviceable life will be extended by another 3-5 years before replacement will be required.

The amount of contaminants that were dislodged from the coil with every high-pressure water rinse was clear evidence that the mass inside the coil was gradually broken down with each application of Viper Brite.

This restoration project was an excellent example of the effectiveness of the Refrigeration Technologies Viper products and provided all participants substantial evidence of the savings that could result if a structured coil cleaning process and chemical standardisation awareness program was implemented with the service technicians.

Airflow (Total Flow Rate l/s)			
Before	After	Difference (Actual)	Difference (%)
6,772	8,222	+1,450	+21%
Airflow (Velocity m/s)			
Before	After	Difference (Actual)	Difference (%)
8.36	10.15	+1.79	+21%
Evaporator Fan Current (A)			
Before	After	Difference (Actual)	Difference (%)
18.10	12.90	-5.20	-29%
Evaporator Fan Power (kW)			
Before	After	Difference (Actual)	Difference (%)
13.50	9.60	-3.90	-29%

Results: Data measuring total flow rate (L/s), airflow velocity (m/s), fan current (A) and fan power (kW) was collected before and after using Viper Brite.



Image 7: Added to the improved heat exchange co-efficient of the coil, the immediate result suggests a saving of 15,029 kWh p.a. through the evaporator fans alone.

If you are interested in a Viper products training seminar for your team or require an on-site demonstration at a known problematic site, please reach out to your local Kirby representative, who will assist.

The full range of Viper products are available across the Kirby network and can be viewed in detail at <https://www.supercool.com.au/refrigeration-technologies-viper-2019-product-catalogue-now-available.html>