



CBRE Reduce HVAC Load
Blue Box Air Sustainable Coil Cleaning & COVID-19 Protocols

DESCRIPTION

The leadership team at CBRE identified Blue Box Air™ as a perfect solution provider to address their unique HVAC coil health needs. Not only did Blue Box Air™ deliver quantifiable results in increased airflow and system efficiency, but also massive kw/h and load reductions on their motors that equates to tens of thousands of dollars per year.

Blue Box™ is designed to restore and preserve the integrity and performance of HVAC systems, ensuring that today's problems don't become tomorrow's problems.

THE SOLUTION

The solution consisted of using Blue Box Air's patented enzyme to perform deep cleaning of the heat exchanger coils. The goal is to remove biofouling throughout the entire depth of the coil and achieve the following:

Coil Disinfection

The patented Blue Box™ enzyme treatment process combats the problem of bacteria, biofilm, mold, viruses, and fungi growing deep inside the coils.

Coil Restoration

Coils that are struggling to perform at peak efficiency can now be salvaged. By removing biofilm, Blue Box™ can restore the coils airflow and heat transfer, greatly improving the HVAC systems efficiency and performance.

Coil Life

Blue Box™ extends the useful life of your HVAC so that you can avoid unnecessary and costly coil replacement.



LOCATION
28 Liberty, NY



BUILDING TYPE
Commercial



PROJECT SIZE
43-45 Air Handler Units



AVERAGE PRESSURE DROP
30%

EQUIPMENT

In 2020 and 2021, Blue Box Air™ was able to take pre/post service readings on 43-45 Air Handling Units (AHUs):

DESCRIPTION	2020	2021	RUNNING AVERAGE
AVERAGE PRE CLEAN	0.229	0.197	0.213
AVERAGE POST CLEAN	0.147	0.142	0.145
AVERAGE DROP (%)	-33.52%	-26.29%	-29.91%
FAN SAVINGS (\$)	\$44,457	\$31,812	\$38,134
FAN SAVINGS (kWh)	261,509	187,130	224,320
COOLING SAVINGS (\$)	\$86,165	\$86,165	\$86,165
COOLING SAVINGS (kWh)	506,854	506,854	506,854
CO2 EMISSIONS REMOVED (IN METRIC TONS)	183	131	157
CO2 EMISSIONS REMOVED (IN POUNDS)	403,445	288,805	346,125

HIGHLIGHTS

This was a successful project to demonstrate the Blue Box™ technology and process.

Our technicians were able to penetrate our bio-enzymes through all of the coils and improve air flow and temperature transfer. With our ability to change up the viscosity of the bio-enzymes, the technicians were able to break up the blockage areas located inside of the coils. It is recommended that all of the systems in the property should be serviced in order to see the greatest efficiency and air quality gains for the entire building which is what we accomplished here.

No Downtime for System During Cleaning

Penetration of Foam Through Coils

Low Pressure Application: Zero Risk of Damage

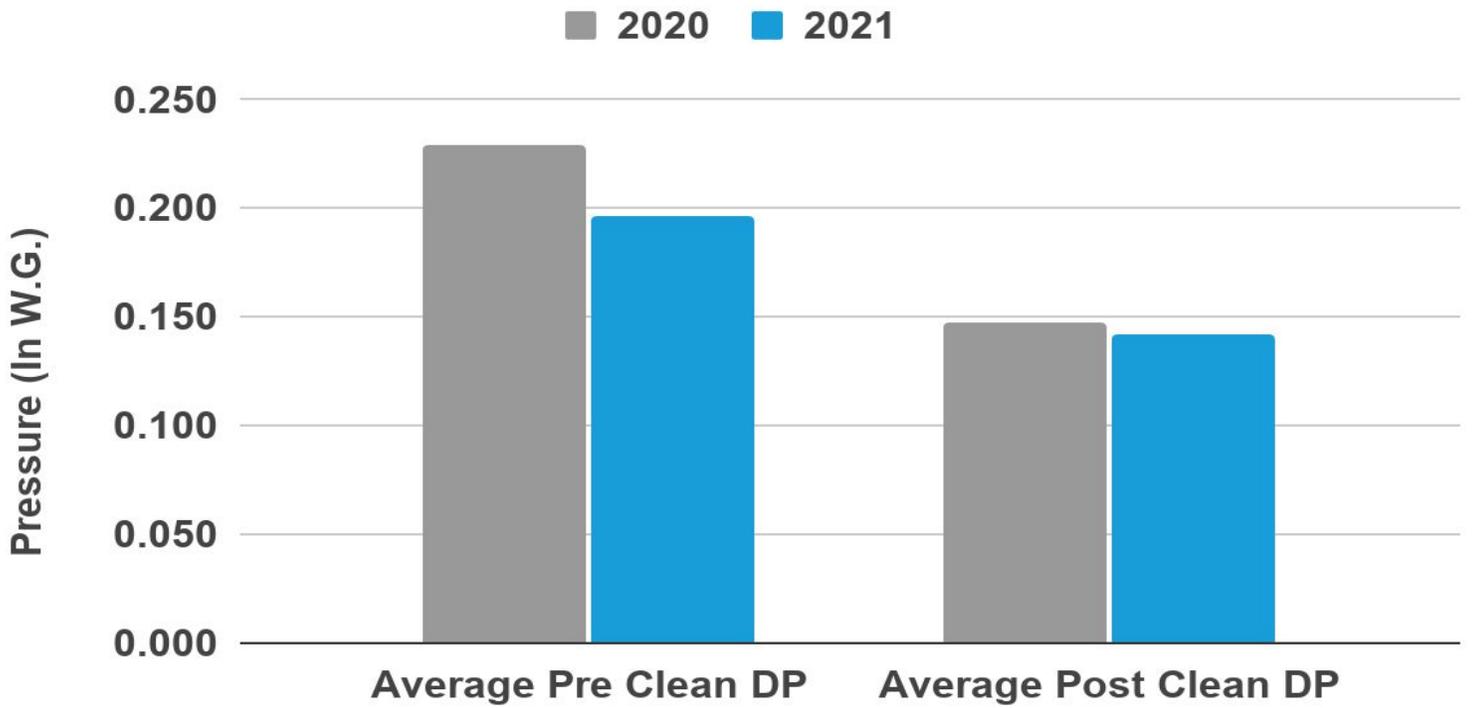
COVID-19 Coil Disinfection

Reduction in Load on Blower Motor and Components

Improved Heat Transfer Across Coils

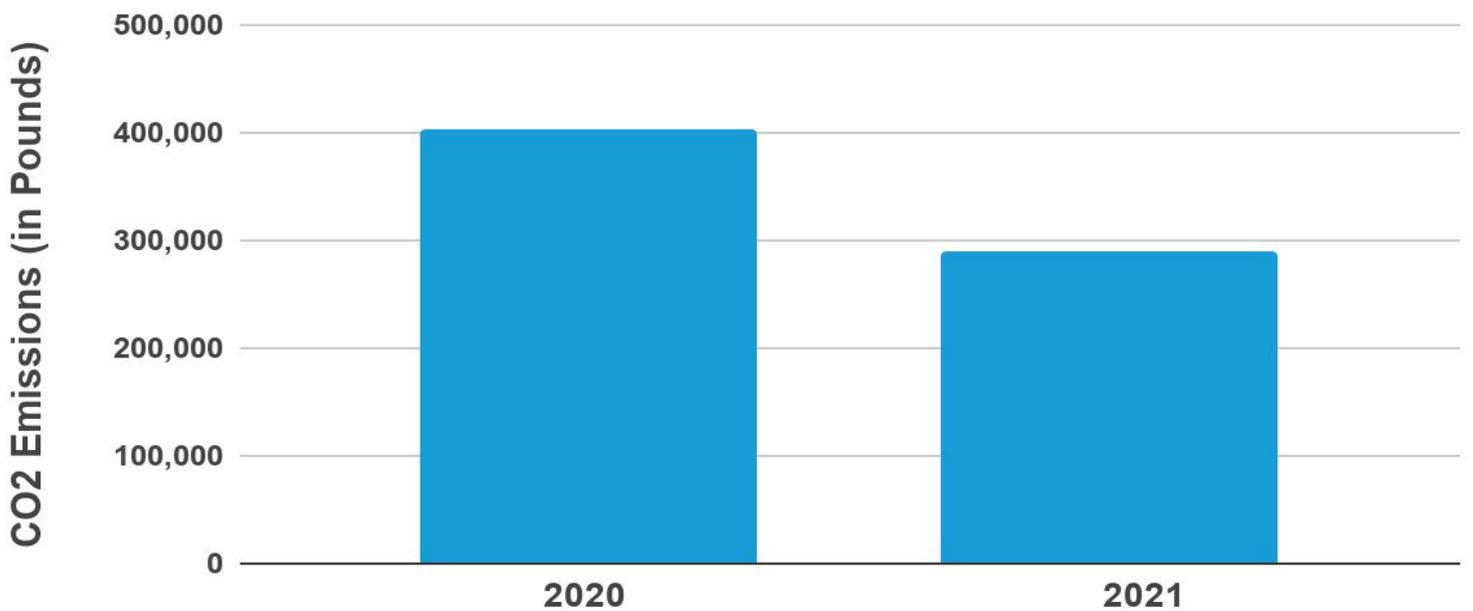
Improving Comfort Conditions by Restoring Airflow to Original Design

Year to Year Change in Average Differential Pressure



CO2 Emissions Removed (in Pounds)

2020 vs. 2021



PRESSURE DROP (2020 SUMMARY)

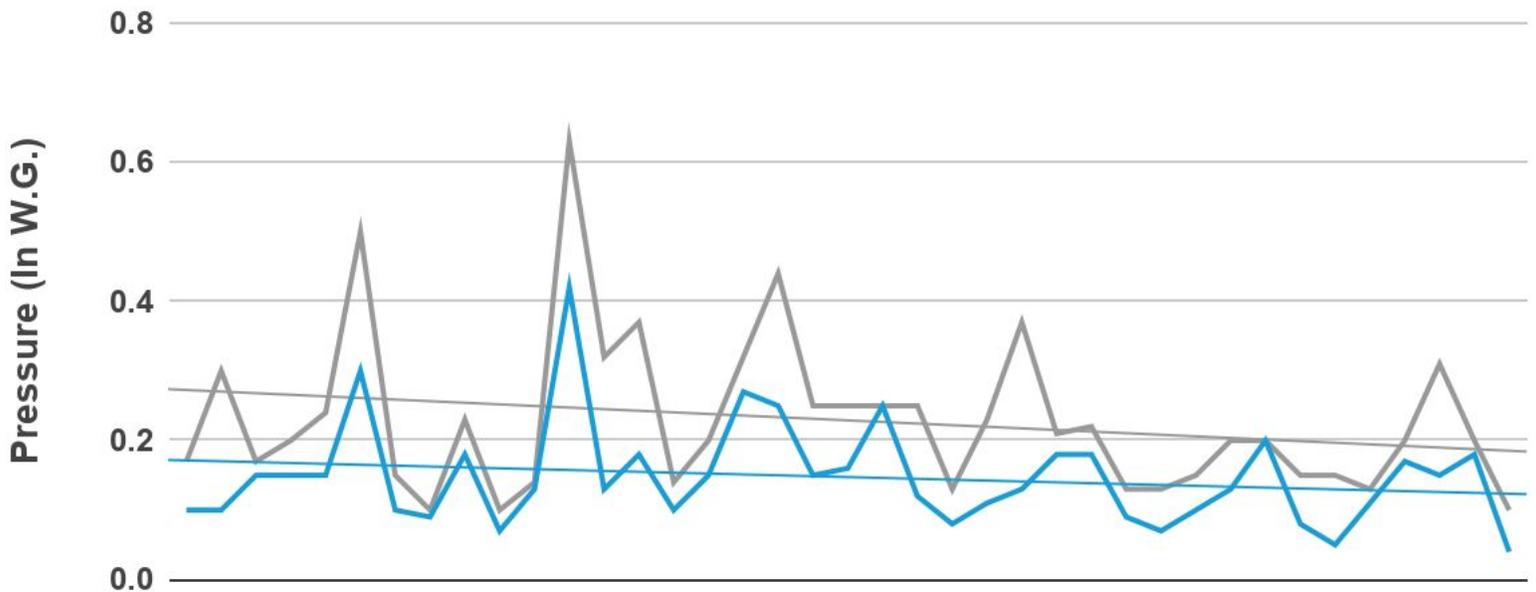
After performing coil cleaning and penetrating through the depth of the coil:

- Average pressure drop across all AHUs dropped by **33.52%**.
- This leads to fan energy savings of **261,509 kWh**.
- For all units, cleaning the coils removed the insulation layer and therefore increased the thermal cooling capacity.
- Assuming a 3.45% increase in thermal efficiency gains with a total of 1,906,207 CFM, the cooling savings realized are estimated to be approximately **506,854 kWh** which equates to about \$86,165.

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2020

— Pre — Post



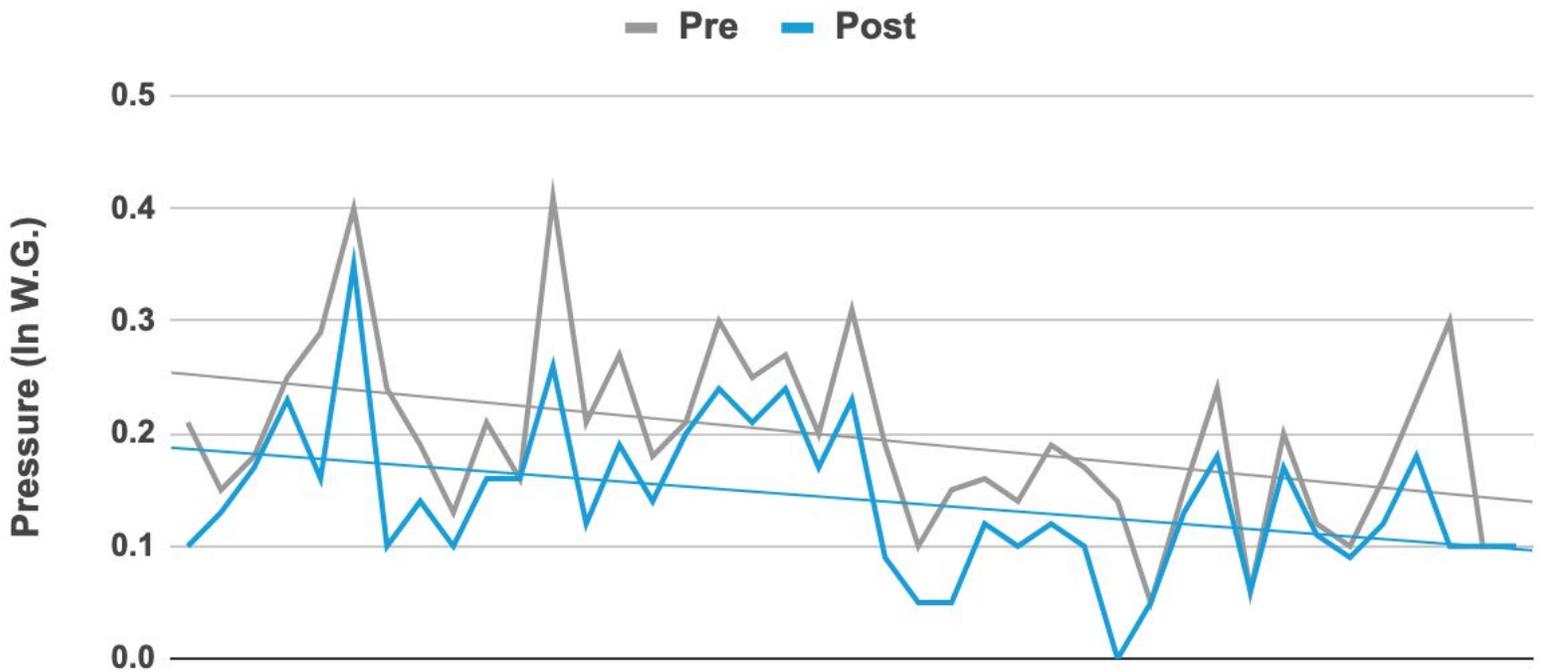
Line chart illustrating the pre clean vs. post clean across 39 AHUs. Average pressure drop = 34%.

PRESSURE DROP (2021 SUMMARY)

After performing coil cleaning and penetrating through the depth of the coil:

- Average pressure drop across all AHUs dropped by **26.29%**.
- This leads to fan energy savings of **187,130 kWh**.
- For all units, cleaning the coils removed the insulation layer and therefore increased the thermal cooling capacity.
- Assuming a 3.45% increase in thermal efficiency gains with a total of 1,906,207 CFM, the cooling savings realized are estimated to be approximately **506,854 kWh** which equates to about \$86,165.

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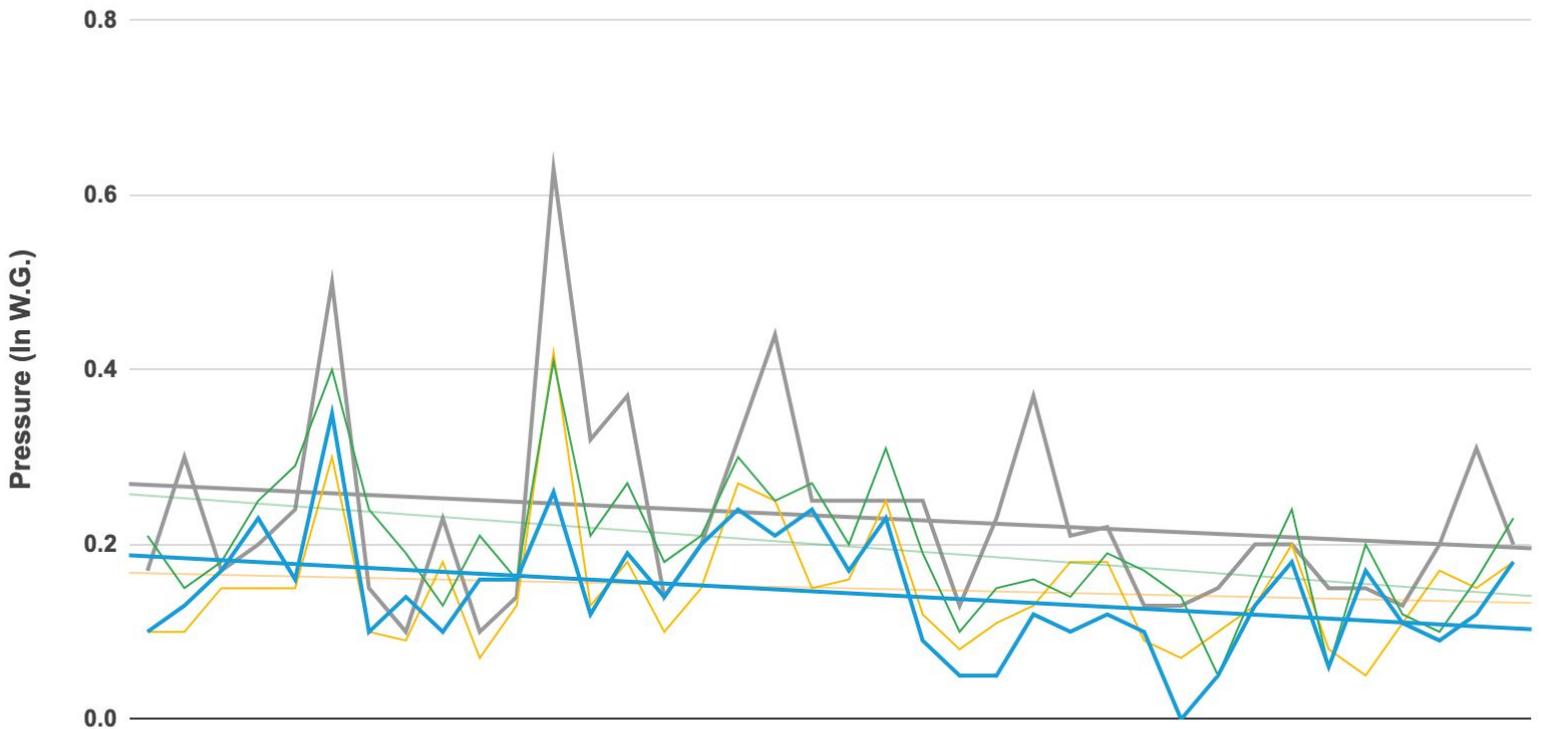
Line chart illustrating the pre clean vs. post clean across 41 AHUs. Average pressure drop = 27%.

[PROJECT PHOTOS - 2021](#)

TOTAL COST SAVINGS	ANNUAL COOLING SAVINGS	ANNUAL FAN SAVINGS	ANNUAL CO2 EMISSIONS REMOVED
\$124,299 731,174 kWh	\$86,165 506,854 kWh	\$38,134 224,320 kWh	157 Metric Tons

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— Pre 2020 — Post 2020 — Pre 2021 — Post 2021



Line chart illustrating the year over year change of differential pressure readings across 38 units.

CONCLUSION

With Blue Box™, it is now possible to keep your HVAC running at peak efficiency. Blue Box Air will reduce the load on the blower motor and greatly extend the life of its components. We use a low pressure application method so there is never any risk of damage to your fins or coils. Our Enzyme is ph neutral, odor free, and down drain safe. For the first time in HVAC history, it is now possible to keep your buildings' HVAC running at peak efficiency year round, and with no downtime for your normal business operations. The systems for an entire building, running at peak efficiency, will have significant impact on the CapEx, OpEx and the indoor air quality of the building.

CALCULATED THERMAL EFFICIENCY GAINS

Heat Transfer Savings:

Major Heat transfer loss to the fins due to the much lower thermal conductivity of the organic biofilm covering the aluminum fins.

- When a tiny biofilm (1.5 thousandth of an inch i.e. half the thickness of a common paper sheet) builds up on a coil, it adds an insulating layer on the heat transfer surfaces.
- This additional layer reduces the heat transfer coefficient U.

Results:

Cleaning the coils will improve the COP to the same effect as increasing the COP from 2.90 to 3.

$$Q = U A \Delta T$$

Q = heat transfer

U = overall heat transfer coefficient

A = heat transfer surface area

ΔT = temperature difference

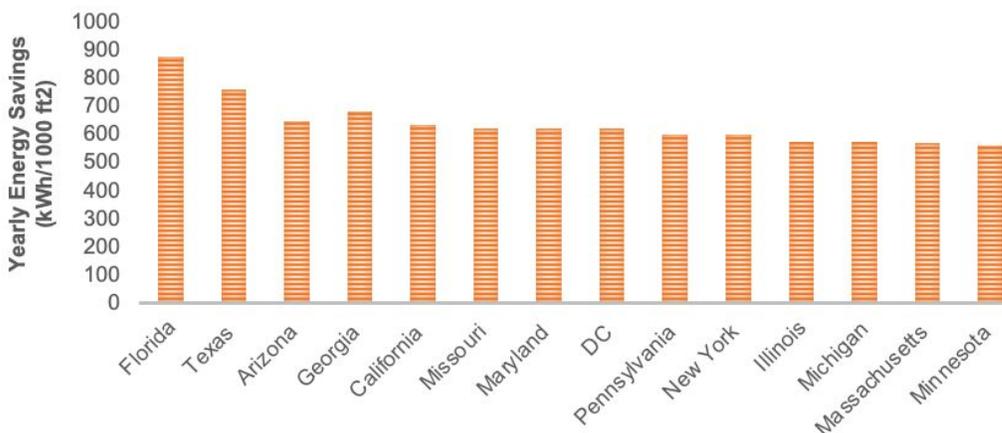
Calculations:

1. Hourly weather data of last 5 years to get outside air enthalpy
2. Return air enthalpy, assume T air after coil = 55 F
3. Calculate energy for different COP 3 and COP 2.90, assuming 3.45% increase in thermal efficiency gains
4. Operational hours - 12/7

OUTPUT

HVAC SAVINGS

Yearly Cooling Savings



\$86,165

ESTIMATED COOLING SAVINGS

(yearly)

We rely on a manometer to measure the pressure differential across the coils and then use an industry standard fan power law algorithm from ASHRAE to determine the reduction in load on the blower motor. In order to do so, we input the CFM, pre reading differential, post service differential and total cost per kWh. The model calculates out the energy savings and reduction in CO2. Since we can not account for each system's individual operating environment, the calculations assume the system would continue running at the new pressure differential without new fouling. We used a total cost (delivery and usage) per kWh of \$0.17