BLUE BOX

PROJECT REPORT

Mississippi University Mitigates Airborne Transmission Risk
Blue Box Air Sustainable Coil Cleaning & COVID-19 Protocols

DESCRIPTION

The energy management and sustainability team at the University of Mississippi 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
Oxford, MS

BUILDING TYPE
University

PROJECT SIZE
59 Air Handler Units

AVERAGE PRESSURE DROP
25%

EQUIPMENT

Blue Box Air™ serviced 59 Air Handling Units (AHUs) across XX buildings :

UNIT NAME	BUILDING SIZE (CFM)	PRE-READ (“ w.g.)	POST-READ (“w.g.)	AVERAGE % CHANGED
Johnson Commons	77,959	1.21	0.65	46.28%
Library	208,519	0.44	0.23	47.73%
Health Services	12,078	0.70	0.59	15.71%
Student Union	160,768	0.40	0.33	17.61%
Lester Hall	19,440	0.50	0.45	11.59%
Music & Band	82,009	1.57	1.16	25.77%
Lewis Hall	39,605	0.75	0.68	8.70%
TOTAL / AVERAGE:	**600,378**	**0.79**	**0.58**	**24.77%**

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

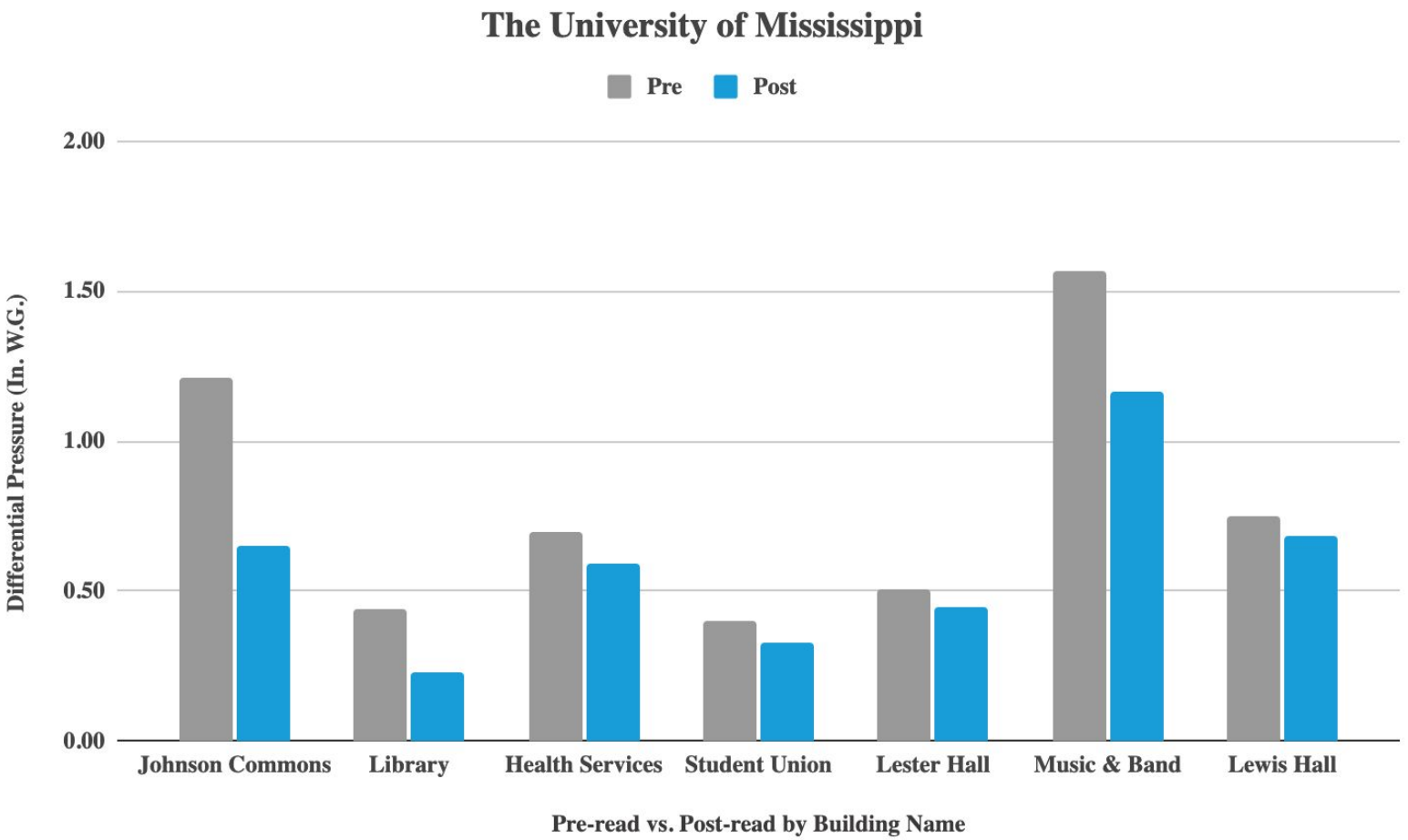
Improving Comfort Conditions by Restoring Airflow to Original Design

TOTAL COST SAVINGS	ANNUAL COOLING SAVINGS	ANNUAL FAN SAVINGS	ANNUAL CO2 EMISSIONS REMOVED
			CO_2
$85,700 1,224,290 kWh	**$70,926** 1,013,232 kWh	**$14,774** 211,058 kWh	**148** Metric Tons

PRESSURE DROP

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

- Average pressure drop across all AHU sizes dropped by 25**%**.
- This leads to fan energy savings of **211,058 kWh**.
- For all units, cleaning the coils removed the insulation layer and therefore increased the thermal cooling capacity.



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 2.75 to 3.

$$Q = U\ A\ \Delta T$$

Q = heat transfer

U = overall heat transfer coefficient

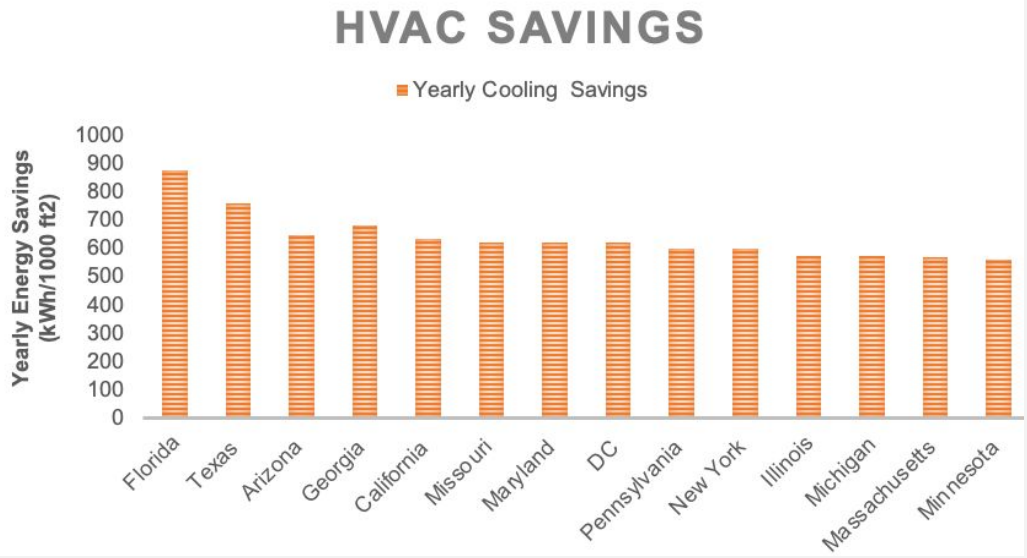
A = heat transfer surface area

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 2.75

OUTPUT



$70,926

ESTIMATED **COOLING SAVINGS**

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 $0.07