



ThermStar
System



COMPARATIVE STUDY: BURGER KING

Electricity consumption with and
without Lepido at Burger King UK
2024-03-14

2024-03-14

BACKGROUND

At the 2024 Burger King UK Supplier Conference, Chapman Ventilation won the “Innovation & Saving” award.

The prize was given to them in recognition of the introduction of the energy-saving technology of Lepido - a heavy-duty heat exchanger that recovers waste heat from polluted air streams, and the introduction of the data monitoring technology from CapEnergy.

Burger King recently set up a test combining the two award winning technologies, utilizing the data collection ability of CapEnergy to measure and confirm the energy savings achieved by deploying the Lepido in the exhaust air from the kitchen and pre-heat the make-up air with the recovered energy.



HIGHLIGHTS

02

LEPIDO vs EHB

-The test focused on the electricity consumed in the Electrical Heater Battery (EHB) in the make-up air handling unit. At the control site without Lepido, the EHB accounted for 11% of the total electrical energy purchased. As the electricity consumption for the EHB on the site with Lepido was 0 (zero), the energy recovery with Lepido contributed to at least 11% savings on the electricity bill during the test period.

MORE THERMAL POWER THAN STANDARD EHB

-The Lepido delivers more thermal power than the standard EHB, which means other HVAC heating components, like air-con units and over door heaters save energy as well.

TOTAL SAVINGS 11%-36%

-Though not the focus of the test, the difference in electricity consumption for all measured components (not only the EHB) between the two sites was 36%, suggesting that the total savings linked to the Lepido during the period was between 11% and 36%.

ADDED BENEFITS

Adding to the benefits of significantly decreased energy bills, the Lepido enables BKUK to put in offers for a wider range of potential new locations. The Lepido decreases the electrical power required by the site by 27 kW, which pushes the total required for a standard Burger King restaurant down to about 100 kW. And 100 kW is very often what a city-center location is capped at.

THE PROJECT

03

Burger King UK wanted to measure the difference in electricity consumption for sites with and without the Lepido, to enable documentation of the actual electricity savings from energy recovery from their kitchen exhaust.

After a first evaluation of available data, they realized that they needed to drill down into the details, because to just compare the total electricity bills for the different sites was not enough; no two sites are exactly similar, no two sites have exactly the same customer flow, no two sites have exactly the same outside temperatures, and so on.

All these, and a long row of other factors, affect the total electricity usage.

So, to get third-party data on what is actually delivered in terms of energy savings when they deploy the Lepido, Burger King invested in measuring equipment from CapEnergy, to monitor all the electricity usage for all different appliances and functionalities.

The installation of the measuring equipment was done at the start of 2024 and the measuring period began in early February.

THE SOLUTION

04

The Welwyn Garden City (WGC) site was – on the advice of long-standing installation partner to Burger King, Chapman Ventilation – selected as the best fit for the install of the Lepido. As the control site – without Lepido – the Beverley site was selected as a good comparison.

The Lepido is installed in the kitchen exhaust, where it captures the inherent thermal energy from the warm kitchen exhaust ventilation. The captured thermal energy is transferred to the make-up air and heats it on its way into the building. The energy content in the kitchen exhaust is large, and the pre-project simulation suggested that the heat recovery circuit would provide more than 95% of the annual energy required to heat the make-up air to the desired set-point temperature.

The assumption was that the WGC site should purchase very few kWh from the utility for the Electric Heater Battery (EHB), which on all BKUK sites is deployed to heat the make-up air, using purchased electrical energy from the utility. The data measurement of kWh consumption of all electrical appliances at the site, promised the possibility to confirm or dismiss the assumption at the end of the period.

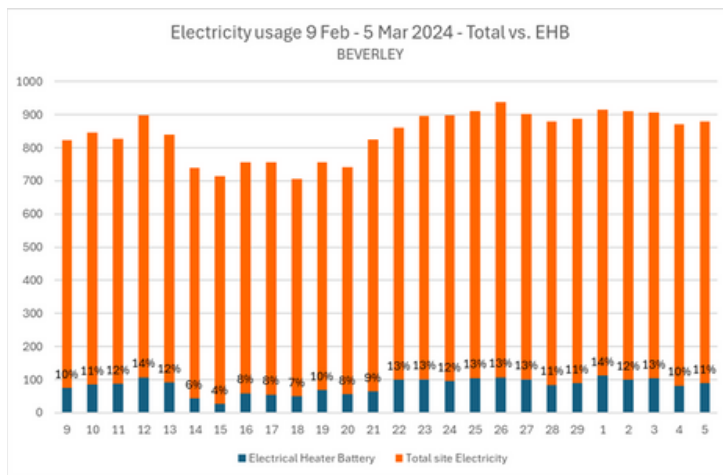


THE RESULT

05

The results, shown in the two charts below, are clear: For the WGC site, where the Lepido is installed, the Lepido did in the end cover all the required energy to heat the make-up air. At no point during the test did the WGC site consume any electrical power for the EHB. The outside temperature during the four-week period shown in the two exhibits below, spanned between the coldest day at 2,9°C and the warmest day at 11,9 °C, so a great representation of a normal February/March.

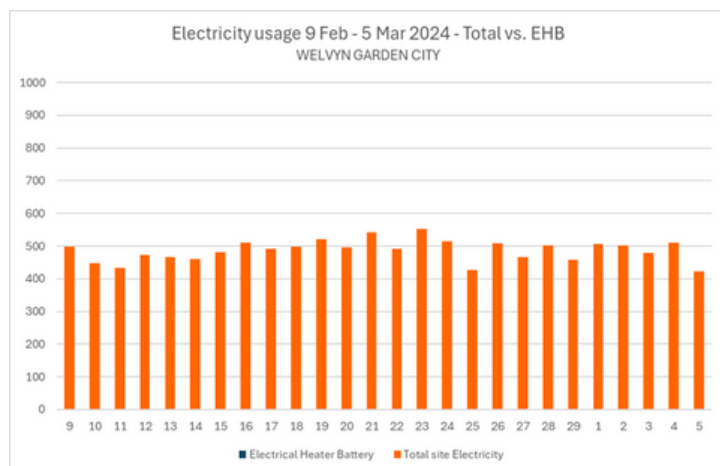
At the control site – the Burger King Beverley – on average 11% of the total electricity purchased was used in the EHB. The outside temperature for the Beverley site was very similar to the WGC temperature curve.



**Total electrical usage
at WGC (with Lepido)**



**Total electricity usage at
Beverley (without Lepido) EHB
in blue**



THE RESULT

06

The attentive reader also spots that the difference in total electricity usage between the two sites for an average day during the test period is larger than what can be explained by only the EHB consumption at the Beverley site. In total, the WGC site consumed 36% less electricity over the test period.

Part of the explanation for this is that the maximum thermal power the Lepido delivers, is higher than the nominal power of the installed EHB at Beverley.

In total, this means that the thermal power the Lepido delivers for the WGC site via warmer make-up air, leads to other HVAC heating components, like air-con units and over door heaters, consuming less power compared to the Beverley site, which results in a second tier saving.

This second tier saving is linked to the Lepido, albeit affected in other HVAC components. The test however, was not set up so as to securely attribute the exact figures for each component.

THE CONCLUSION

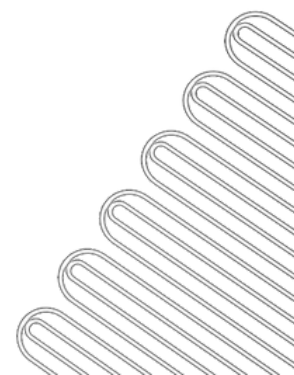
Based on the comparison between the selected sites, the test confirms that the Lepido does provide a significant saving in electrical use, both by fully canceling out all the electricity used in the EHB as a component, and by reducing the total electricity consumption for the site annually.

During the test period, the EHB accounted for 11% of the total electricity usage for the site without Lepido, while the site with the Lepido used 0% of electricity in the EHB.

The total savings in electricity usage between the site with Lepido and the site without Lepido during the test period is 36%.

Even though the test data cannot conclusively attribute to what extent the 36% savings are specifically linked to the Lepido, it can be concluded that the Lepido saves between 11% and 36% of the total electricity usage for a site.

Most likely, the reality is somewhere in the middle of the range, which would mean the total electricity saving for a site with Lepido would be in the region of a quarter of the electricity bill.



THE CONCLUSION

It should also be noted that the test result means that the EHB is no longer required when BKUK builds new sites. Apart from the savings in ELECTRICAL ENERGY, this also means the total ELECTRICAL POWER required for the site is decreased by more than 20%. As the nominal power for the EHB traditionally installed at a standard Burger King site was standardized at 27 kW, this means that the total required power has now decreased by the same amount.

For many attractive city locations, the total available electrical power is generally capped at 100 kW, and since the traditional spec for a standard Burger King restaurant required about 120-130 kW, the introduction of Lepido into the standard specification for New Build, means that 100 kW is enough to run all the appliances and functionalities required.

In the end this enables Burger King to potentially submit offers also on attractive city-center locations that historically had to be turned down. The increased energy saving also has the knock-on effect to unlock a wider range of potential locations!

In recognition of these results, Chapman Ventilation was awarded the "Innovation & Saving" prize at the 2024 Burger King UK Supplier Conference.





LEPIDO BY ENJAY

Lepido is an Innovated & Made in Sweden air-to-fluid heat exchanger, specially designed to be deployed in polluted air streams. It is developed for mounting in the duct, without any requirement for pre-filtration.

Contrary to a standard heat exchanger, where the natural forces constantly work against keeping the unit clean, the Lepido interior is designed to work with the natural forces. It involves a geometry that is fin-less design and allows for more spacing than a traditional heat exchanger.

For more information about Lepido: www.enjaysystems.com



FIVE GUYS



THANK YOU

Thanks for taking the time to read through the report. I'm hoping it kicked off some thoughts on how this can be applied in your processes, and I'd be more than happy to help with gauging the potential in your organisation. Please feel free to contact me as below if you think I can add any value to your energy and emission saving plans.

Nils Lekeberg, Co-founder
Enjay

nils.lekeberg@enjaysystems.com
+46 733 66 33 41

Questions or requests



30 N Gould St, Suite R, Sheridan, WY 82801



1-833-667-7359



www.thermstar.com



info@thermstar.com



Book Intro Call