

# 22 Month Field Validation of **THERMSTAR SYSTEM™** core heat recovery technology

ThermStar System™ is built around proven Lepido® heat recovery technology – the particulate-tolerant heat exchanger at the core of the platform. To validate the durability of this technology in one of the harshest exhaust environments possible, it was subjected to long-term field testing in a commercial kitchen exhaust application: the exhaust duct of a Burger King restaurant operating 7 days per week, 15 hours per day in Malmö, Sweden.

Open-flame grilling creates a hot air stream filled with grease, fats, oils, and moisture.

**Proven performance matters.**



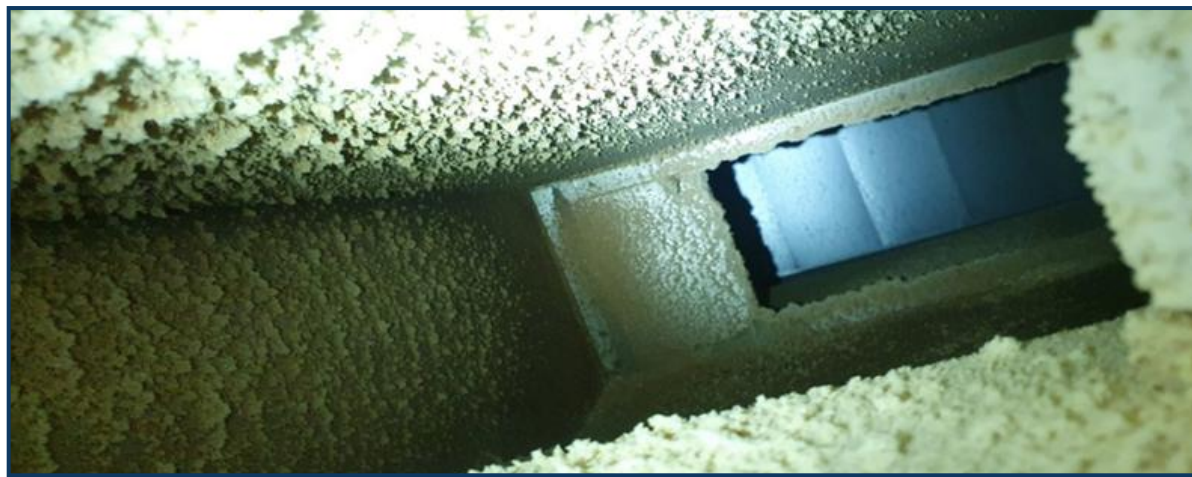


Photo from the ventilation system of the restaurant

This technology was built to handle environments like this.

## The Challenge: Where Other Systems Fail

Particulate-laden exhaust air has historically challenged conventional heat recovery systems. Traditional heat exchangers often foul in these environments—driving pressure drop up, increasing maintenance burden, and degrading thermal performance over time.

As a result, many facilities avoid heat recovery altogether because the maintenance burden outweighs the value of the recoverable energy.

## The Solution: A Different Design Philosophy

**ThermStar System™** core heat recovery technology approaches this challenge differently. Its patented Particle Repellent Geometry (PRG) utilizes CFD-modeled, purpose-engineered tube geometry and airflow paths specifically engineered for particulate-laden exhaust air. This design helps keep particulates moving through the airstream rather than accumulating on heat transfer surfaces.

### Behind the design:

- Patented coil geometry to minimize air flow restriction
- Multiple liquid channels for thermal distribution
- 100% counterflow operation
- Delivers strong heat transfer performance with stable and predictable pressure drop

Lepido cutaway image



# Test Environment: A Commercial Kitchen Exhaust Stream with Particulates and Humidity

In autumn 2020, Lepido® core heat recovery technology used within the **ThermStar System™** platform was installed in the exhaust duct of a Burger King restaurant in Malmö, Sweden. This exhaust environment presented continuous particulate, grease, moisture, and heat exposure.

A real-world field validation without compromises:

- No pre-filter or filtration of any kind
- No cleaning or other maintenance on the Lepido
- Continuous operation 15 hours per day for 22 months
- Kitchen airflow: 2,160 CFM with a 93°F average exhaust temperature
- System performance monitored continuously via a control system

Visual evidence of the operating environment and post-test exchanger condition



Photo from the ventilation system



Internal view of the Lepido® from the exhaust inlet side after 22 months

## The Results: Proof of extreme durability

After 22 months of continuous operation, measured performance remained exceptionally stable.

- Operational disruptions: 0
- Pressure drop increase: ~50 Pa (~25 Pa/year)
- Thermal effectiveness degradation: Less than 2%
- Energy recovered: Approx. 86,000 kWh/year



# Why Visible Buildup Did Not mean Performance Loss

Visible buildup on the heat exchanger surfaces is expected in exhaust environments of this nature. The key distinction is that Particle Repellent Geometry (PRG) is not designed to eliminate all deposition—it is engineered to manage it.

Approximately 98% of airborne particulates pass through the exchanger during operation. When deposition does occur, PRG influences where fouling accumulates and how it impacts performance.

Its staggered tube geometry helps keep the most thermally active heat transfer zones comparatively cleaner, while deposition tends to occur in less critical regions of the exchanger surface. This allows the system to maintain useful heat transfer and stable airflow characteristics despite visible fouling.

## What this Validation Demonstrates

This field validation demonstrates that successful particulate-laden exhaust heat recovery is not dependent on remaining visually clean.

Instead, it depends on engineered geometry that manages particulate deposition across both individual heat transfer surfaces and the exchanger core as a whole—preserving thermal performance and predictable pressure drop behavior under real operating conditions.

## Broader Application Relevance

This demonstrated level of sustained heat transfer performance in a high-particulate commercial kitchen exhaust environment validates Lepido® core heat recovery technology's ability to withstand severe particulate airflows in some of the most demanding exhaust applications. Comparable performance has also been demonstrated in active installations across food production, industrial laundry and linen processing, foundry, and other manufacturing environments.

**Ready to evaluate whether your exhaust stream is a candidate for engineered heat recovery? Contact ThermStar System™ for a technical feasibility review today.**



Book Intro Call

