

Ringen Centrum

A Mellifiq reference project



The benefits of high-class odor removal

**The hot kitchen exhaust
heats up the garage**

MELLIFIQ

Ringen Centrum, Stockholm, Sweden

Ringen Centrum, with its more than 60 shops, is located in south central Stockholm. Here the culinary scene flourishes through the popular food court "The Theater" where several of Sweden's most renowned chefs have incorporated fast food-establishments with their own creative touch.

Facts

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|--------------|---|
| Name: | Teatern in Ringen Centrum |
| Location: | Stockholm, Sweden |
| Industry: | Commercial kitchen ventilation |
| Purpose: | <ul style="list-style-type: none">• Increased fire safety• Minimized ventilation maintenance cost• Maximized energy recovery via the existing property ventilation• Heating the underground garage with purified exhaust air |
| Performance: | Minimum 99% odor removal |
| Air flow: | 32,400 m ³ /h (9,000 L/s) |

Solution:

Ozonetech RENA Kitchen Solutions

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|---------------------|----------------------|
| Units: | 2 |
| Dimensions (HxWxD): | 1,100 x 695 x 265 mm |
| Input power: | 49 dB |

Nodora odor removal system

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|------------------|------------------|
| Model: | Nodora X |
| Units: | 1 |
| Footprint (WxD): | 4,800 x 2,300 mm |
| Pressure drop: | 360 Pa |

The problem

The property owner was determined to raise the attractiveness of the Ringen shopping center. The plan included a food court with a unique layout and a high-quality fast-food concept. The restaurants would form a circle with a coliseum-like dining area, hence the name The Theater.

The nine restaurants would produce a lot of heat and the purification of the kitchen exhaust air had to be solved.

There were two alternatives. The standard solution, to install ventilation channels with discharge to public outdoor areas. Or to aim higher and recycle as much energy as possible from the hot air to lower overall energy use.

For AMF Fastigheter, the leading Swedish property owner in sustainability, the choice was easy, they wanted to be true to the company's sustainability policy and therefore decided to go with Mellifiq.



The food court at Ringen centrum, called "The Theater".



The Theater offers innovative delicious fast-food at affordable prices. The atmosphere is very casual, reflecting the special feel of south central Stockholm.

The solution

An innovative solution was presented in the early planning stage: to recover the heat from the kitchen exhaust to heat up both the mall and the underground garage.

The backbone of the treatment was the ozone installation. Two Ozonotech high-performance RENA systems was installed with capacity to treat the 32,400 m³/h (9,000 l/s). The purpose was not only to make efficient energy recovery possible. Minimized grease build-up also reduces the fire hazard as well as the odors and the need for maintenance of the kitchen ventilation ducts.

As the Theater is reminiscent of a circular theater or coliseum, the two Ozonotech RENA systems were placed in the center producing ozone distributed to the nine injection points.

However, as the exhaust air was to be emitted into the parking garage, the warm odorous air had to be treated first. Efficient odor removal is a key performance factor as cooking odors from VOCs (volatile organic compounds) can be detected at very low concentrations. The air treatment must also take into consideration practical limitations such as installation space as well as minimizing pressure drop for energy efficiency.

The final solution was a large custom-made polishing step designed from scratch by engineers, matching all these criteria.



The fully automated wall-mounted RENA Kitchen Solutions with remote monitoring.



High-efficient odor removal system with multiple discharge points designed from scratch by engineers at Mellifiq.

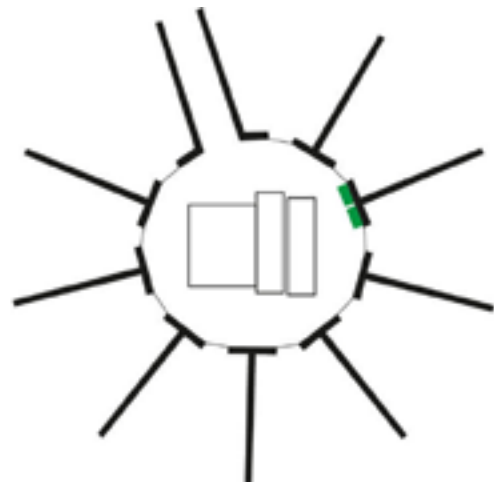
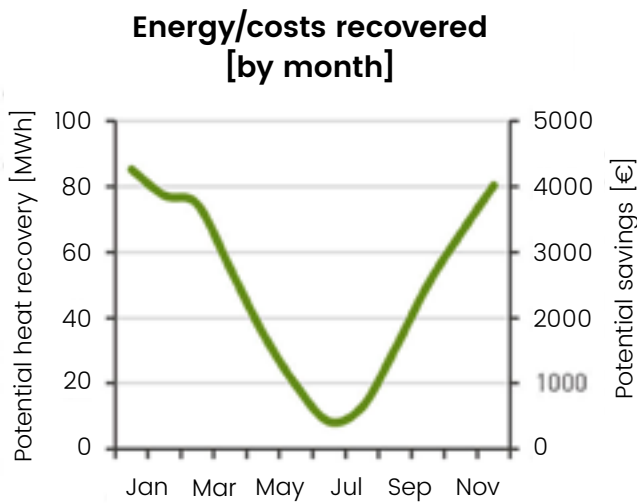
Evaluation

The ozone installation has performed as expected with a 100% uptime. There has been no grease inside the ducts at inspections. The warm air has been let out into the shopping mall via the existing ventilation.

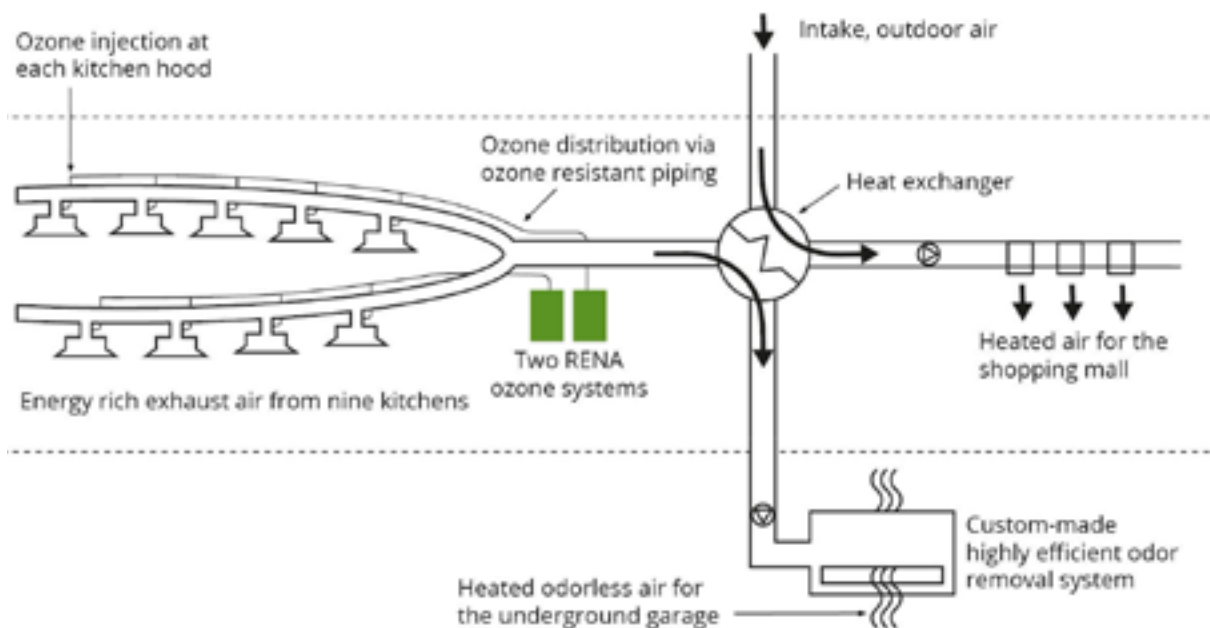
The performance of the custom-made odor removal system was evaluated at six occasions during an 18

month period in terms of odor removal and filter lifetime expectancy.

The smell was minimal and analysis shows that the combined RENA ozone system and custom-made odor removal system yield a minimum 99% odor removal.



Potential savings from the heat recovery in MWh (left) and euros (right). The back of the nine restaurants forms a ring containing a goods lift, staircase, passenger elevator and our RENA Kitchen Solutions (shown in green).



To maximize the heat recovery, effective continuous grease reduction in the exhaust air was combined with the use of a premium heat exchanger. In addition, a final odor removal system was installed for the air discharged in the garage.

About Mellifiq

Mellifiq is a multi-awarded environmental service company group, that has since the early nineties evolved into a world leading system and solution provider with multiple groundbreaking applications for industrial, municipal, and real estate clients. We supply cutting-edge technologies to manage the most sophisticated air, water, and energy challenges.

Mellifiq offers a complete range of air and water treatment technologies and solutions across multiple industries such as processing industry, energy sector, food and beverage, pharmaceutical, wastewater treatment and commercial real estate.

Mellifiq offers strong and renowned brands, such as Ozonotech, Nodora and Water Maid, and world-class engineering services combined an excellent track record of more than 40 years of innovation. We help our clients achieve the most efficient and sustainable solutions while creating the maximum value for their businesses.

With several business units across Europe, Mellifiq is headquartered in Stockholm where research and development, production, QA and certification all take place. Our unique technology and our extensive expertise have made us the Center of Excellence for the world's most complex projects, and a global player with installations on all six continents.

Everyday millions of people rely on our solutions for ventilation, disinfection, sanitation, and odor control. We are committed to raising the bar for the concept of clean and the industry standard for engineering, technical services and general contracting.

For additional information, visit our website at www.mellifiq.com

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