



CASE STUDY
RINGEN
CENTRUM

The benefits of high-class odor removal

USE THE HOT KITCHEN EXHAUST TO HEAT UP THE GARAGE

 **ozonetech.**

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.



THE CHOICE

Be true to the company sustainability policy. Or not.

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.

Therefore, Ozonotech presented an innovative solution in the early planning stage: to recover the heat from the kitchen exhaust to heat up both the mall and the underground garage.

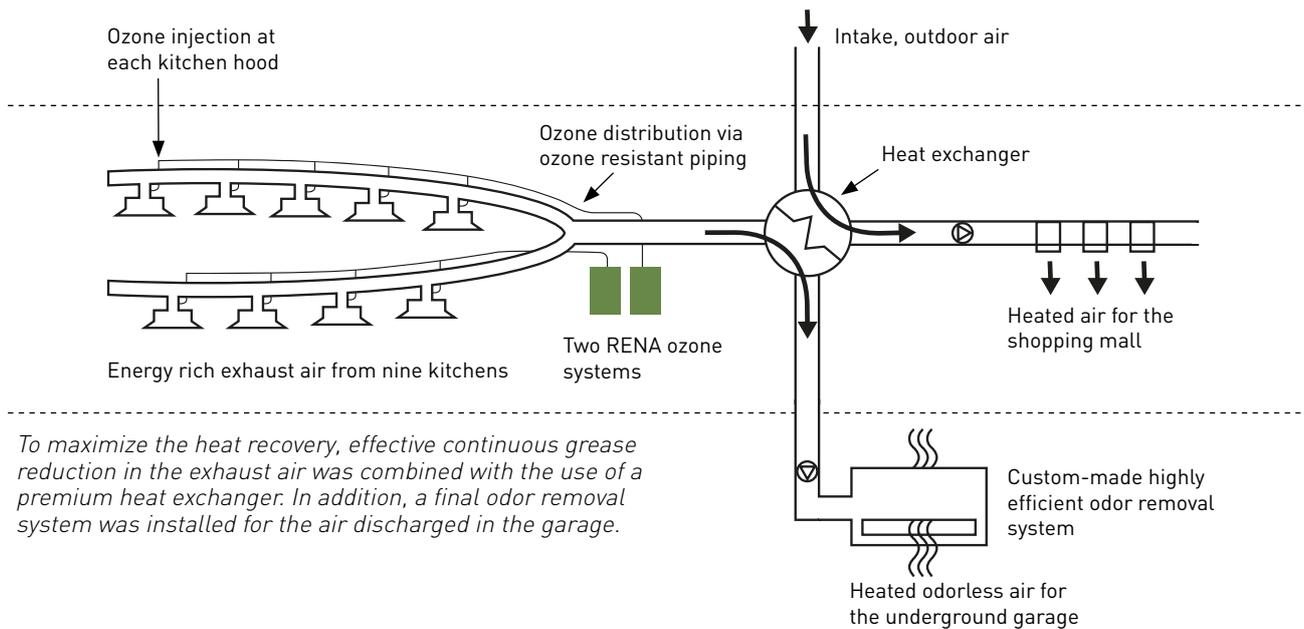
MULTI-AWARDED PROPERTY OWNER

AMF Fastigheter specializes in creating urban rooms where people want to be. This includes shaping city blocks that adds to the city, with work spaces, unique hotels, roof landscapes, shopping malls, meeting places, innovation houses, restaurants and food courts.

AMF Fastigheter was founded in 2008, had a turnover of 210 million euros 2017 and is multi-awarded for its projects.

Our RENA systems are present in several AMF properties.





THE DECISION

To recycle as much energy as possible from the food court kitchens

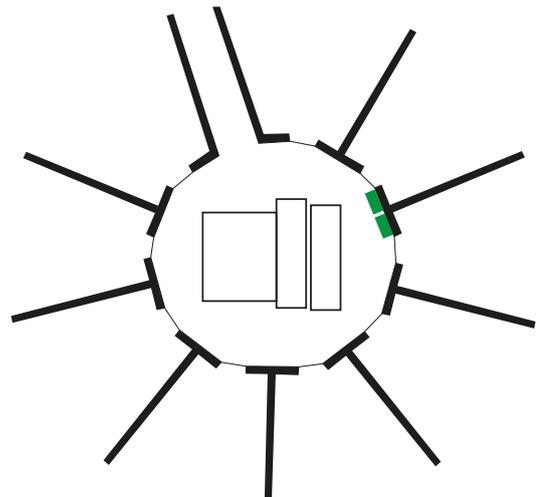
The backbone of the treatment was the ozone installation. Two high-performance RENA systems was installed with capacity to treat the 32 400 m³/h (9 000 l/s). The purpose was not only to make efficient energy recovery possible. Minimized grease build-up also reduces the fire hazard as well as the odors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

As the Theater is reminiscent of a circular theater or coliseum, the two 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 at Ozonetech matching all these criteria.



The back of the nine restaurants forms a ring containing a goods lift, staircase, passenger elevator and our RENA Kitchen Solutions (shown in green).



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 Ozonotech.

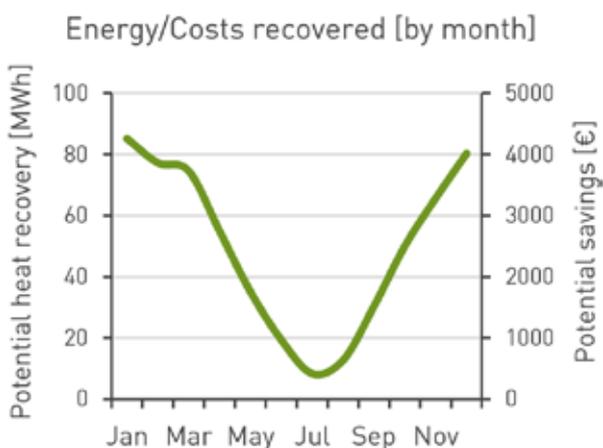
THE EVALUATION

Less energy used and a more sustainable commercial property

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).

FACTS

Name and location	Teatern in Ringen C, 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
Air flow	32 400 m ³ /h (9 000 l/s)
Solution	RENA Kitchen Solutions and Nodora odor removal system
Performance	Minimum 99% odor removal

RENA KITCHEN SOLUTIONS (per unit)

Dimensions (WxDxH)	695x265x1100 mm
Input power	1.5 kW
Noise level	49 dB

NODORA

Model	Nodora X
Footprint (WxD)	4800x2300 mm
Pressure drop	360 Pa



The success of the Theater also draws more visitors to the shopping mall.

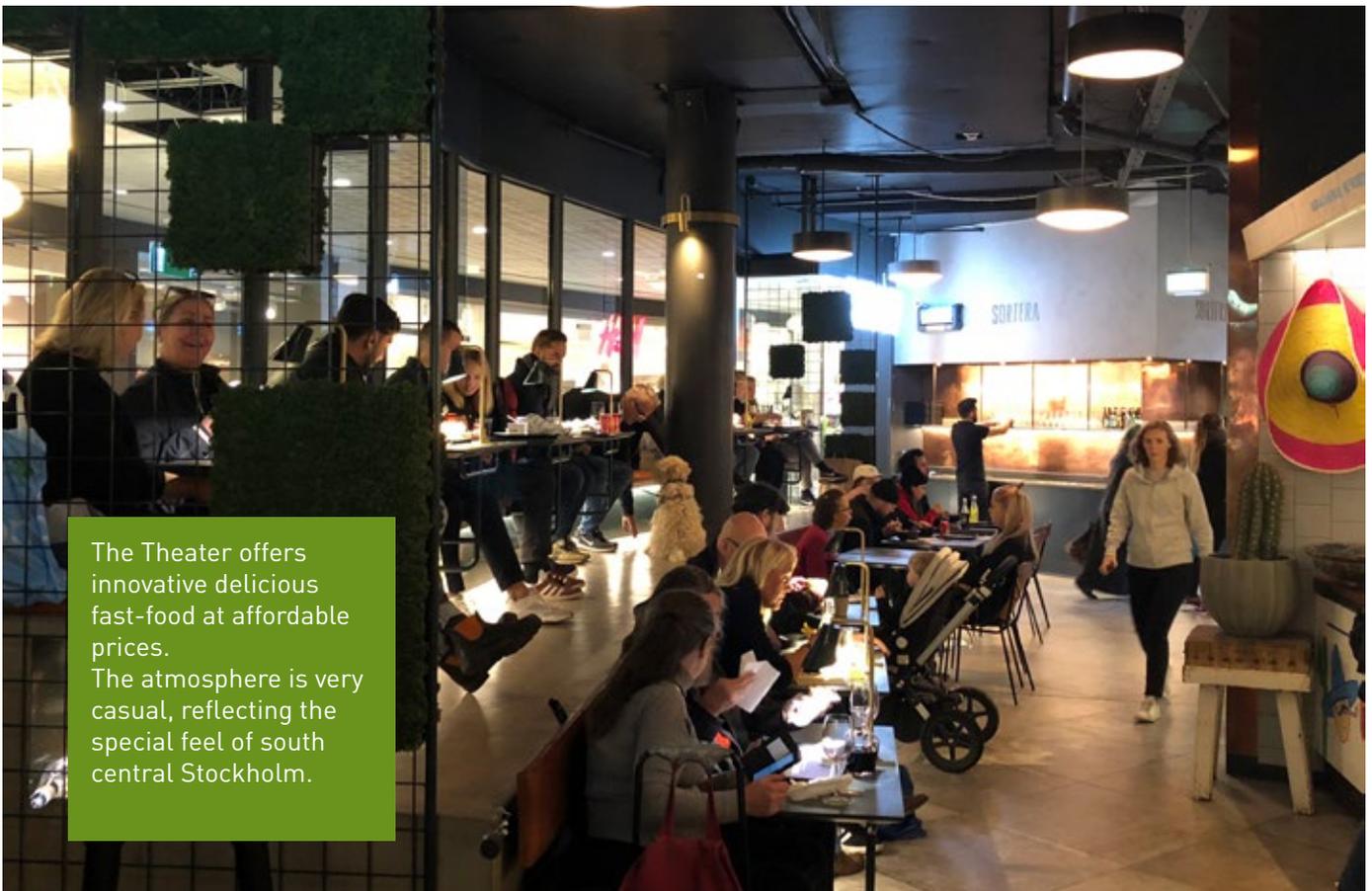
RINGEN CENTRUM

Opened 1981
 Owner AMF
 Fastigheter
 Area 13,100 m²
 Visitors/year 5,000,000



THE THEATER

Launch 2015
 Chefs 14
 Kitchens 9
 Patisserie 1
 Seats 250



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

About Ozonetech

Ozonetech is an award-winning cleantech company that has offered premium products for air and water treatment since 1993.

Our unique technology and extensive expertise has made us a rapidly growing global company with installations on six continents. All development and manufacturing is located in Sweden. In addition, we have in-house specialists for consultation, planning, installation and service.

As a Center of Excellence within air and water treatment, we also collaborate in international efforts to develop global standards for purification solutions.

At Ozonetech, we have a strong incentive to reduce energy consumption, health risks and the impact on the environment. Our current solutions provide a multitude of benefits in the processing and food industry, real estate, commercial kitchens as well as in the retail market.

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

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