

HOLISTIC KITCHEN VENTILATION CONCEPT

Integral energy solutions

1/2013




RECOVER ALMOST ALL
HEAT WITH VENTILATION
CEILING AND CENTRAL AIR
CONDITIONING UNITS

Did you know that
the kitchen offers
immense energy
potential?

The comprehensive utilisation of waste heat from large kitchens represents a significant energy saving potential, especially in the context of the entire building. However, this has only been exploited insufficiently to date due to the heavily contaminated return air. Menerga has developed an innovative, fully automatic cleaning system for this purpose, which can be used together with ultra-efficient central air conditioning units in order to recover heat in large kitchens without any problems whatsoever. On this basis, it is

possible to recover almost all of the waste heat via the holistic planning of ventilation ceilings and central air conditioning.

In terms of energy consumption, large kitchens represent one of the most important sub-systems of a building. In view of the high energy use for the preparation of meals in addition to the energy used for washing up, ventilation and heating, this area offers excellent potential on the heating side to significantly improve the building energy balance with the aid of a holistic ventilation concept as well as potential to reduce operating costs.

In doing so, the fundamental hygienic and ergonomic requirements as stipulated in VDI 2052 „Ventilation and air conditioning equipment for kitchens“ must be fulfilled. On one hand, this concerns the prevention of odour emissions and distribution in both the kitchen and adjacent rooms – such as the dining room – by quickly and reliably discharging the contaminated air. On the other hand, the working conditions for the kitchen staff in terms of air temperature, humidity and speed must be kept comfortable.

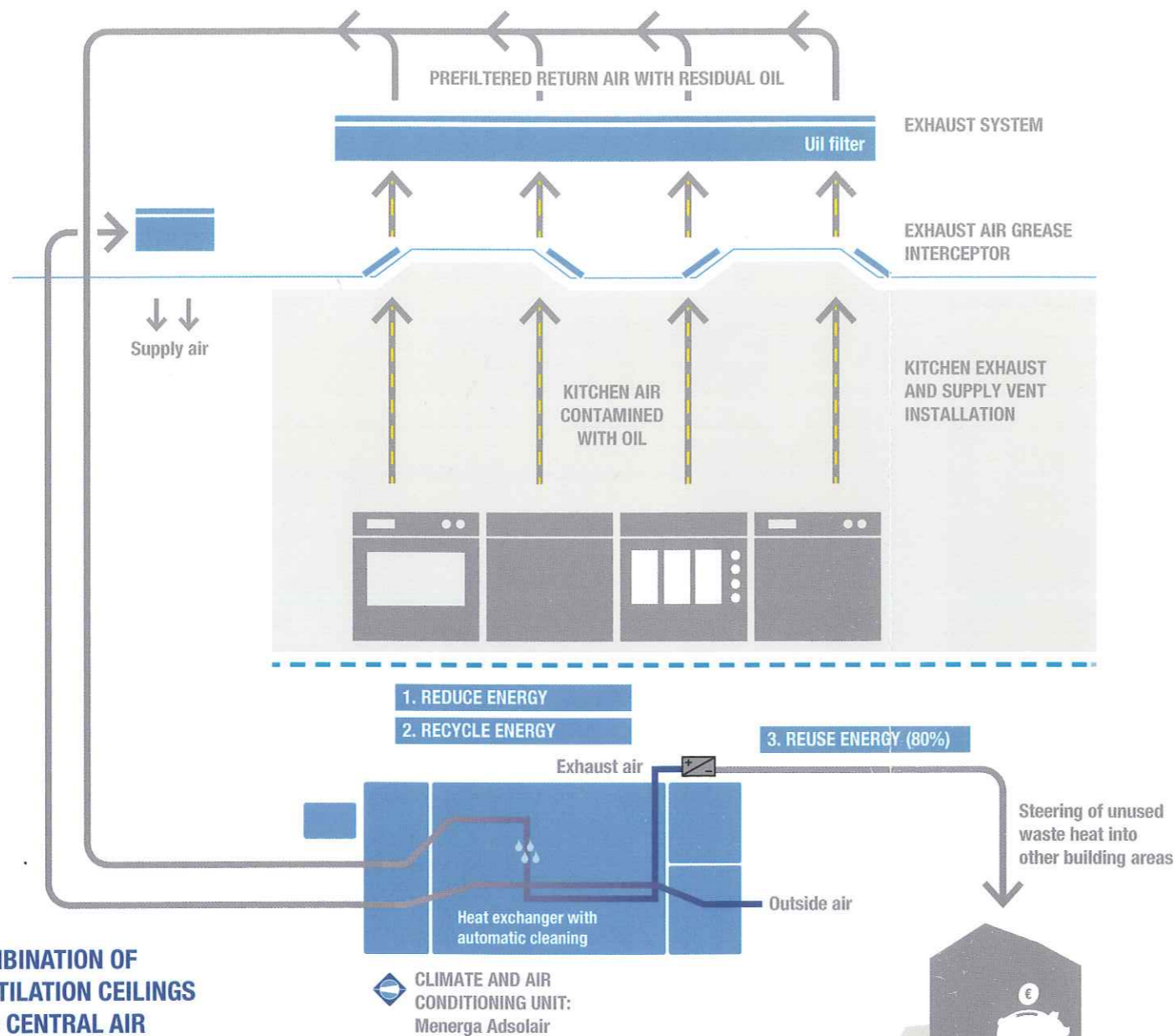
VDI 2052 REGULATIONS

Key points:

- Discharge of air pollutants, heat and humidity loads:
- Even air flow balance (equal pressure)
- No backflows from hygienically suspect areas
- No recirculation mode
- Room temperature 18 to 26 °C
- Air on temperature not below 19 °C
- Ultra-effective stainless steel aerosol separator
- Sufficient storage space of the hood
- Supply air filter at least F7; F9 in conjunction with differential pressure display better
- Discharge dishwasher vapour separately where possible
- VDI 3895 in the event of odour problems
- No room for manoeuvre with regard to the simultaneity factors

COMBINATION OF VENTILATION CEILING AND CENTRAL AIR CONDITIONING UNITS

These factors are significantly influenced by the airflow of supply air and return air as well as by the central air treatment. However, these two areas have only rarely been planned as a unit to date. This is primarily down to the fact that it was extremely difficult to implement the otherwise usual utilisation of central air conditioning units for the central air treatment due to the contaminated return air. In contrast, ventilation ceilings have prevailed with regard to supply air and return air in recent years. Their diverse advantages in terms of flow management, hygiene, fire protection, flexible design and



The „Dvorac Prinipovac“ castle restaurant located at Ilok Golf Course, Croatia is not the only location where the integrated ventilation concept has been implemented successfully.



Example: exhaust air utilisation in large-scale kitchens

simple maintenance have lead to 80% of all new and renovated kitchens in Germany now being implemented with ventilation ceilings. The combination of ventilation ceilings and central air conditioning units within the context of an integrated, holistic ventilation concept holds significant potential to fulfil the normative requirements as well as possible and to also significantly reduce energy consumption.

Thanks to the integrated planning of ventilation ceilings and central air conditioning units, it is possible to recover almost all of the waste heat generated by a large kitchen in three stages.

CONTAMINATED KITCHEN RETURN AIR

The main reason why the advantages of central air conditioning units, especially the high heat recovery efficiency, have remained largely unexploited in the field of kitchen ventilation to date is the heavy contamination of the return air. Fatty aerosols in particular are often carried into the system despite separation and filtering. This leads to an extremely high level of maintenance effort for filter changes and cleaning. Furthermore, the required thorough cleaning including the heat exchanger is not entirely possible or causes high maintenance effort in many central air conditioning units. As a result, fat deposits can lead to malfunctions and even cause the heat exchanger to breakdown due to blockages.

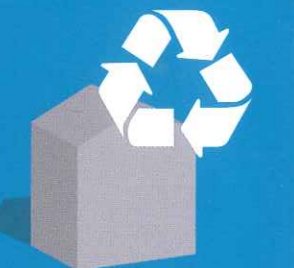
INNOVATIVE CLEANING SYSTEM FOR CENTRAL AIR CONDITIONING UNITS

Menerga has developed an innovative cleaning system that removes the pollutant deposits in the heat exchanger in a reliable and fully-automatic manner. For this purpose, a special cleaning fluid is sprayed into the return air channel of the heat exchanger that removes all residues from the plates. The basis of this is the “adiabatic” evaporative cooling technology that Menerga has been successfully using for natural cooling without power for over 20 years. In doing so, the return air is moistened directly in the heat exchanger, thus removing heat from it. In order to definitely prevent corrosion from

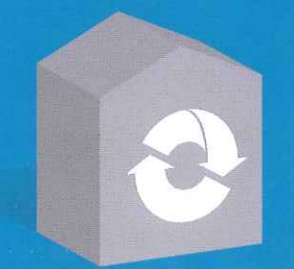
INTEGRATED VENTILATION AND ENERGY CONCEPT

Three significant planning stages are required in order to organise the handling of energy as intelligently and efficiently as possible within the context of a sustainable kitchen concept:

1. Reduce the necessary energy use to a minimum
Reduce



2. Recover as much energy as possible for the kitchen
Recycle



3. Use excess energy in the building
Reuse

the outset here, Menerga manufactures the heat exchanger itself using polypropylene plastic. This material is completely corrosion resistant, and therefore, in contrast to metals, also provides the ideal conditions to wash out the remaining pollutants from the kitchen return air using chemical processes. The fully automatic cleaning system has already been used in several large kitchens for many years and has proven its practical suitability in that field. The central air conditioning units reliably work with the full heat recovery efficiency of up to 85% and also work within the context of the normal maintenance cycles. As a result, it is now possible to offer holistic solutions for kitchen ventilation that combine the advantages of ventilation ceilings and central air conditioning units and, by largely utilising the waste heat, achieve an extremely high energy efficiency.

COORDINATION OF THE VENTILATION CEILING AND THE CENTRAL AIR CONDITIONING UNIT

The first step is to reduce the energy consumption of the entire ventilation system as much as possible. This is achieved by the harmonised design of the ventilation ceiling and the central air conditioning unit. With regard to the ventilation ceiling, this primarily concerns the establishment of the ideal flow pattern for the respective kitchen area so that heat, odours, air pollutants and humidity can be quickly and safely discharged and that pleasant working

conditions also prevail. In turn, the central air conditioning unit should prepare the airflow rates required for this as efficiently as possible and make them available. Even at this early stage, the thermal loads as well as the required air volume flows can be significantly reduced by the precise coordination of both systems.

DIRECT HEAT RECOVERY OF UP TO 85%

During the second stage, the aim is to supply as much of the heat contained in the return air directly back into the kitchen. This is achieved by the ultra-efficient heat recovery of the central air conditioning unit that transfers up to 85% of the energy con-

tained in the return air into the outside air. Particularly in winter, a considerable saving can be made on heating costs, especially in winter. If the temperature of the return air is below the outside temperature in summer, it is also possible to pre-cool the outside air in the heat exchanger, thus reducing the required cooling load.

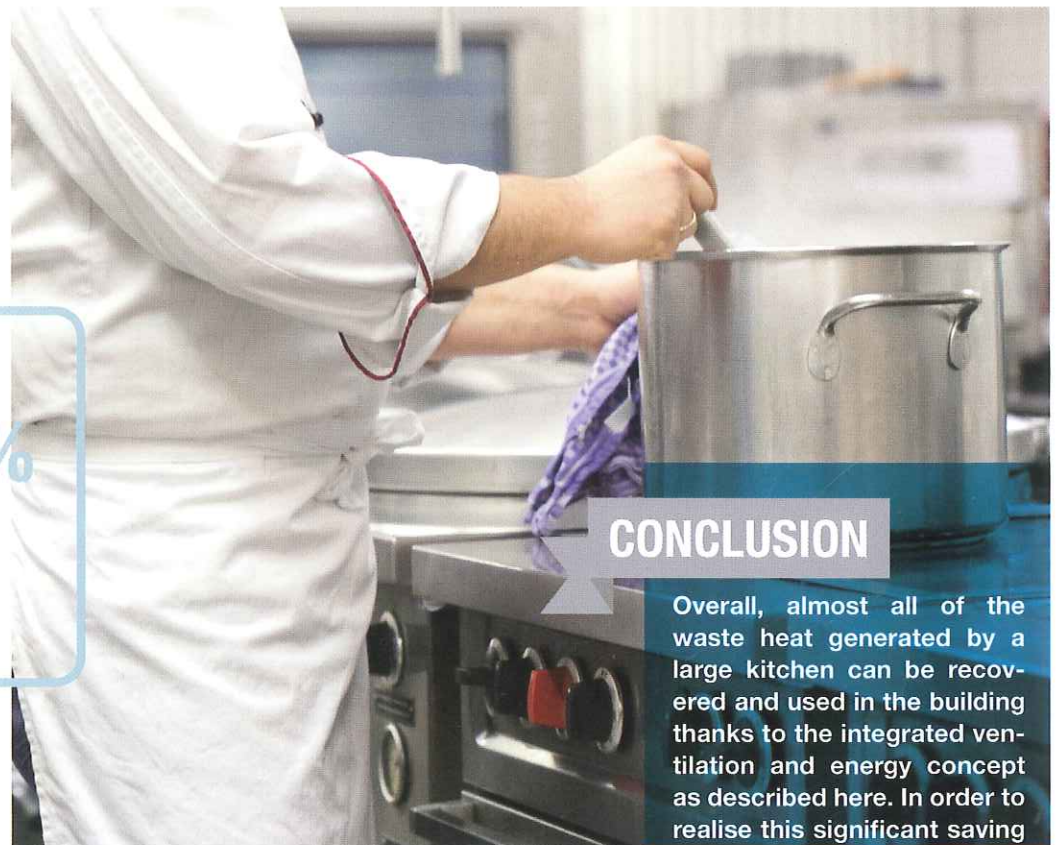
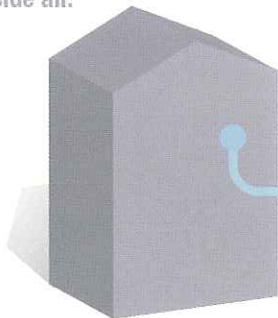
USE EXCESS HEAT WITH HEAT PUMPS

The third stage deals with the extraction of excess heat that is no longer required to heat the kitchen. The percentage of this is particularly high in summer and transitional periods when the majority of the outside air flow is fed past the heat exchanger via a bypass. However, significant potential

can also be opened up in winter in the event of high return air temperatures. In order to use the latent heat contained in the exhaust air, the central air conditioning unit is equipped with an integrated heat pump, whereby its evaporator is positioned in the air flow behind the heat exchanger. Here, the residual heat is withdrawn, brought to a higher temperature and subsequently fed into

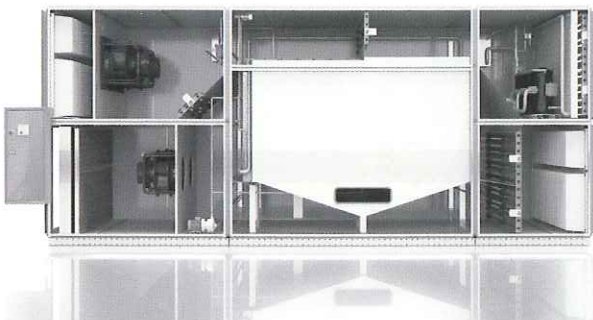
Up to 85% of the energy contained in the return air is transmitted to the outside air.

85%



CONCLUSION

Overall, almost all of the waste heat generated by a large kitchen can be recovered and used in the building thanks to the integrated ventilation and energy concept as described here. In order to realise this significant saving potential, the ventilation ceilings and central air conditioning units as components of a system must be planned together. Close collaboration with the respective manufacturer, who is then able to develop and implement an "all-in-one" solution for the kitchen air conditioning tailored to the respective building together with the responsible planners represents the best conditions for this.



MENERGA ADSOLAIR - Pollutant deposits in the heat exchanger belonging to the central air conditioning unit can be removed in a reliable and fully-automatic manner with the new cleaning system by Menerga.

a central storage unit via a water circuit. When applying this method, it is possible to supply a significant amount of energy from the kitchen return air throughout the year for heating and water heating.

Further information:
Menerga GmbH
info@menerga.com