

Energy Efficient Oil and Emulsion Mist Filters



KMA ULTRAVENT[®] air extraction and filtration systems:

- ✓ High separation of fume and mist
- ✓ Integrated heat recovery
- ✓ Recirculating or exhaust air mode
- ✓ Reduction of operating costs



ULTRAVENT

Clean air at the workplace



Air pollution through oil and emulsion mist

The negative impact of oil and emulsion mist is very high in modern CNC machines. Due to the rotation speed and the heat generated by CNC tools (Drilling, Milling, Rotating etc.) it is necessary to add high amounts of cutting fluid to the tooling machines in order to cool them down. The released aerosols, oil and emulsion mist represent a serious issue in the context of industrial safety and the protection of workers health.

- Micro-fog condenses in the production hall, soiling the equipment
- Increased fire risk
- Increased risk of slipping
- Health risk to the employees

The Solution:

KMA ULTRAVENT® exhaust air filter system

ULTRAVENT® is the modular waste air filtration system by KMA. Its finely tuned elements allow for accurate adjustment of the filter system to meet requirements. In this way, emulsion mist, fumes and sticky or oily aerosols can be removed very effectively. In the development of ULTRAVENT® filters the main focus has always been to deliver highly effective separations, energy efficiency and durability. KMA filters stand out due to a very low energy consumption and low-wear operation. This does not only reduce operation costs, it also improves the carbon footprint of the company through low energy consumption and prevention of waste by frequent filter replacement.

Centralised or decentralised?

ULTRAVENT® filters enable a centralised and a decentralised extraction concept. A comparison of both solutions shows the advantages and features of each approach. KMA offers compact filters suitable for one CNC machine for an exhaust air volume of 1,000 m³/h to 5,000 m³/h and larger filters connected to multiple machines for a volume flow of 5,000 m³/h to more than 100,000 m³/h.

Advantages of decentralised extraction:

- No expensive and complex air exhaust ducts required
- Filter only runs simultaneously with the tooling machines
- Flexibility when scaling up the production capacity by installing additional machines

Advantages of centralised large filter systems:

- Low investment costs per 1,000 m³/h of exhaust air
- Integration of an automatic filter cleaning system (CIP) as an option
- Integration of a highly efficient heat recovery system as an option



The centralised filter system UV 30000 (30,000 m³/h) with an automatic filter cleaning system

Recirculating or exhaust air mode?

The KMA ULTRAVENT® is suitable for recirculating as well as exhaust air mode. In the recirculating air mode the purified air is led back into the production hall. Therefore, a highly effective separation is essential. In exhaust air mode the purified air is conducted outdoors. Before this occurs, the energy is extracted out of the exhaust air by a heat exchanger. By the use of an additional Ambitherm® heat pump the degree of the heat recovery can be increased significantly. Which system is applied, will be decided according to the specific needs of the customer.

Recirculating air mode:

- No installation of complex air exhaust ducts
- No heat loss

Discharge air mode:

- Permanent air exchange with fresh air from outdoors
- Heat recovery through highly efficient heat exchangers and a heat pump

Protecting the Environment and reducing costs – the efficiency factor



Highly efficient heat recovery

Provided that the purified air is to be conducted outdoors, the ULTRAVENT® filtration system can be upgraded by a heat exchanger cell. In this case there are two different methods of heat exchange.

① Air-to-air heat exchanger:

With the air-to-air heat exchanging concept, the heat exchanger cell is located above the filter module and comprises a flange for the fresh air duct. The warm exhaust air flows through the integrated air-to-air heat exchanger from the bottom to the top.



Cool air from outdoors is directed horizontally through the device and is heated up. Both air flows have to be led through the heat exchanger in a counter current way. Thereby the incoming air and the exhaust air are separated by a heat-conducting surface, so the two cannot be mixed with each other

② Fin tube heat exchanger with highly efficient heat pump:

COP > 6

The waste air from the machinery is extracted through the exhaust duct and led out to a centralised ULTRAVENT® filter system with integrated fin tube heat exchanger. After filtering aerosols (oil smoke, dust, grease etc.) out of the exhaust air, the KMA Ambitherm® heat pump, which is connected to the filter system, extracts the energy out of the purified air.

The energy is transferred in the condenser of the heat pump to a heating water circuit. Then the heating water (30 - 40 °C) is led to a second heat exchanger, which is installed in the fresh air duct. With this method the incoming fresh air is heated in an energy efficient and economical way and flows into the production hall.

Compared to traditional outdoor air heat pumps, the Ambitherm® heat pump always draws the energy out of the relatively warm exhaust air of the production hall - even on cold winter days. At the same time the heat transfer needs only a relatively low water flow temperature of 30 - 40 °C. The result: an extremely economical operation. The Ambitherm® system ensures a direct transfer of the energy, which is recovered from the exhaust air, to the incoming air without a buffer tank. The performance (COP) is significantly higher than from an outside air heat pump or the use of geothermal sources.

But efficiency is more than just a high COP: KMA Ambitherm® heat pumps are equipped with durable and high-quality compressors, evaporators and condensers as well as electronically controlled refrigerant valves.

Summer operation

In summer, or in typically hot climates, the Ambitherm® system simply turns the principle around: Now the heat is not extracted out of the exhaust air anymore, but instead the incoming air is cooled down. This way, even in hot summer months comfortable room temperatures can be ensured. The heat pump transfers the energy to the purified exhaust air, which means the exhaust air is heated up before it is conducted outdoors. Alternatively the heat released from the makeup air can also be used for heating up domestic water.



Pict.: ULTRAVENT® air filter with demister, electrostatic precipitator and heat exchanger (from the bottom upwards). The automatic filter cleaning system is placed between the electrostatic filter and heat exchanger module.

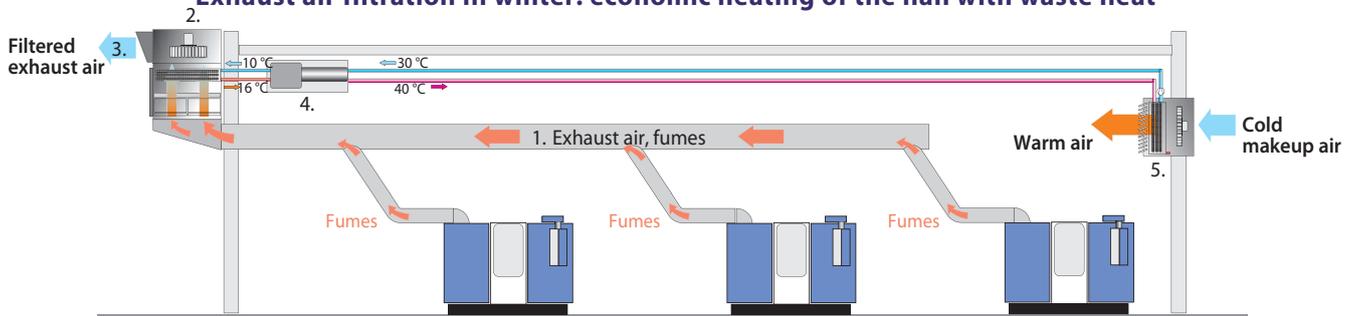
Economical efficiency in line with environmental compatibility



ULTRAVENT



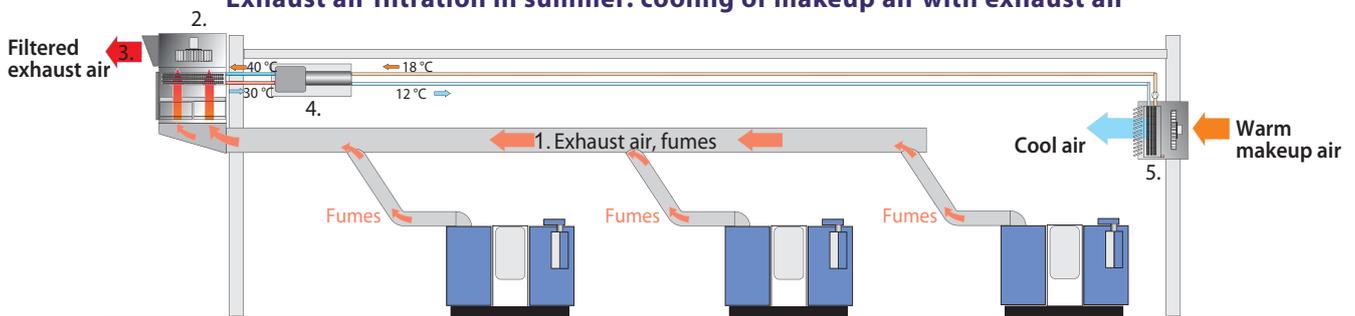
Exhaust air filtration in winter: economic heating of the hall with waste heat



Exhaust air filtration with heat recovery by heat pump:

1. Fumes and exhaust air from tooling machines
2. Central filter with precipiator and heat recovery system
3. Exhaust air flows out into the open
4. The heat pump generates hot water (40 °C) for heating
5. Makeup air passes through an air heat exchanger into the hall (example data)

Exhaust air filtration in summer: cooling of makeup air with exhaust air



Exhaust air filtration with makeup air cooling by heat pump:

1. Fumes and exhaust air from tooling machines
2. Central filter with precipiator and heat exchanger cleans and heats up exhaust air
3. Exhaust air flows out into the open
4. The heat pump generates cool water (12 °C) for cooling
5. Makeup air passes through an air heat exchanger into the hall (example data)

The ULTRAVENT[®] air filtration system – flexible and cost efficient



KMA air filtration modules for separating oil and emulsion mist

The KMA ULTRAVENT[®] exhaust system allows the highly efficient collection and separation of emissions, such as release agents and oil mist, plasticizer fumes and emulsion mist. KMA offers three types of filter modules which also can be combined with each other.

1 Demister:

The ULTRAVENT[®] demister units consist of robust 50 mm thick stainless steel mesh wire elements. This wire is held in position by expanded metal mesh, both on the incoming and outgoing side of the gas flow. The special shaping of the wire allows for a high separating capacity for aerosols, droplets and mist. The units can be washed for cleaning. Changing the demister elements is not necessary.



This drips off the collection plates and is collected in a recuperation tank. The oil separated here can often be reused. The second type forms a greasy, oily or encrusted deposit on the filter surface. Unsuitable filter types can quickly clog and become ineffective, leading to excessive costs associated with filter replacement and disposal. However, electrostatic precipitators never obstruct the air flow through the exhaust system.



Automatic filter cleaning system (CIP)

From a volume flow of 5,000 m³/h or more, the integration of an automatic filter cleaning system into the ULTRAVENT[®] is possible. It is suitable for cleaning all washable filter media such as demister, electrostatic collector and mechanical filter units. The automatic ULTRAVENT[®] washing system is unmatched in terms of comfort and cleaning results – due to its movable nozzle bar that moves back and forth above the collection cells during the filter washing process. It allows the regular and labour-saving cleaning of the filter cells and thus ensures minimal maintenance requirements. The intelligent control of the washing system simultaneously reduces the consumption of water and of purifying agents.

3 Mechanical Filters:

The ULTRAVENT[®] modular system offers a wide range of mechanical filter cells for almost any application. They are available as a pre-filter (filter class G), as a powerful main filter (filter class F), and as a HEPA filter (filter class H) with enormous precipitation performance. For use with machine tools special filter cells with drainage fabric for emulsion separation are available.



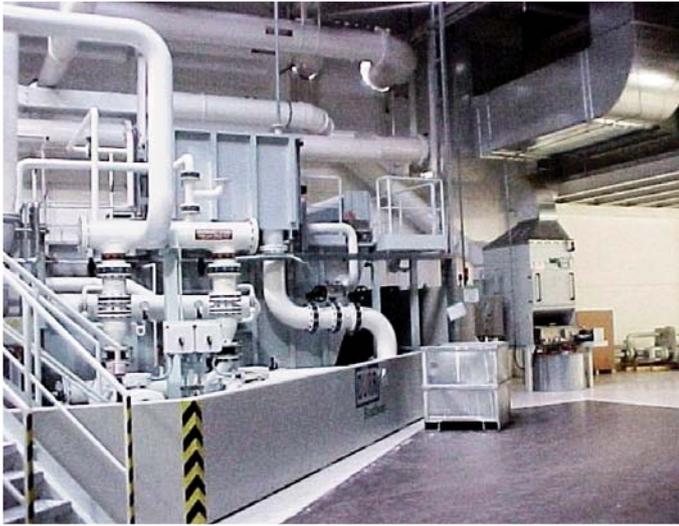
2 Electrostatic precipitator:

ULTRAVENT[®] electrostatic filter cells assure the highly effective separation of smoke, dust and fine mist. "Blue haze" caused by the use of release agents gets separated effectively as well. The filter cells are characterised by the particularly robust design: frame and carrying bars made of stainless steel, insulators in oil-resistant ceramics, optimised design for the separation of liquid or viscous substances. These features make sure that the electrostatic filter is an economical and durable filter medium for many applications. Often two categories of contaminants are captured in the electrostatic collection cell. One fraction of the filtered substances is liquid.

Fire protection and fire extinguishing system

During the extraction of oil mist, there is an increased possibility of fire. Therefore, all ULTRAVENT[®] systems are available with fire sensors and fire extinguishing systems as an option. CO₂ or Argon are used as extinguishing gases.

Please ask our consultants for the suitable KMA cell for your appliance.



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