Heat Recovery & Air Filtration at

Stenter Frames

KMA ULTRAVENT® heat recovery and air filtration systems:

- ✓ High separation
- ✓ Energy efficient
- ✓ Reduction of operation costs
- ✓ Short payback period

KMA ULTRAVENT

Exhaust air filtration & Heat recovery for stenter frames

KMA ULTRAVENT®: cleaning the air and recovering the heat

The exhaust air from stenter frame systems consist to a considerable extent of dust and oily aerosols but also of a valuable amount of heat from production processes. Nowadays, the textile industry is confronted with strict regulations in terms of occupational health and safety as well as environmental protection.

KMA ULTRAVENT® exhaust air filter systems accommodate these requirements already: they are suitable for separation of oily, greasy or pasty aerosols from the exhaust air and are characterised by high separation efficiency, durability and very low energy consumption.

Due to the integrated heat recovery technology, the textile manufactory can also handle ambitious goals for improving its carbon footprint and put high amounts of energy savings into practice. Depending on the mixture of exhaust air the ULTRAVENT® electrostatic filter cells can be combined with UV light tubes for the oxidation of odors. The oil contained in the exhaust air is separated and discharged via a drainage opening.

The integrated heat recovery technology can be designed to heat up the supply air of the stenter frame and process water.

The operating temperature of a stenter frame can be up to more than 200°C depending on the actual production mode and fabric. For its operation the stenter requires a high consumption of electrical energy (e.g. for motors and ventilators) as well as a high consumption of heat – as intake for the cost intensive gas and thermal oil heating.

When faced with polluted exhaust air derived from a stenter an unsuitable filter cell would wear out rapidly and entail high cost for filter exchange or replacement. In addition to that the exhaust air of the stenter frame contains valuable heat which can be utilised for subsequent processes.

KMA Filter are suitable for all kind of textile fabrics which are processed in a stenter frame:

- natural fibers: wool, cotton
- synthetic fibres: polyacrylic, polyamide, polyester
- natural chemical fibres: viscose/ acetate

The energy efficient KMA ULTRAVENT system reduces the energy costs of the stenter frame machine.

A compact system – two goals

As leading solution provider KMA offers energy efficient exhaust air filter systems for the textile industry. The application of an KMA exhaust air filter system is pursuing two goals: Clean air in the textile industry and the reduction of energy consumption through heat recovery.

Clean Air – Excellent air quality in accordance with legal requirements

The exhaust air is loaded with pollutant emissions as a result of the chemical treatment of the textile during the textile production and thermo fixation.

Legal requirements and a sustainable business policy put a strain on air pollution. The electrostatic filter cells of KMA Filter allow high-grade separation even when faced with highly polluted exhaust air and sticky or greasy aerosols.

Reduced energy costs – Our contribution to economic efficiency

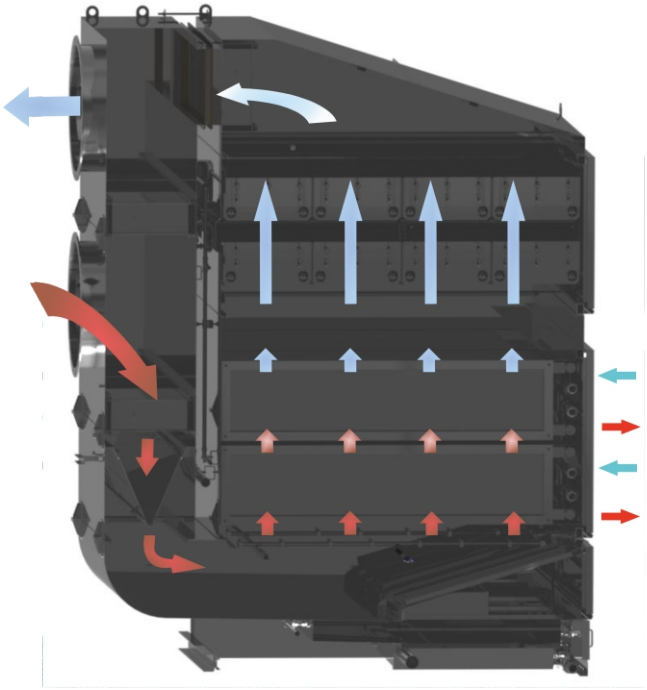
Energy recuperation is an effective instrument to reduce operating costs in the textile industry challenged by energy intensive production processes. In effect energy costs can on average account for more than 20 percent of overall operating costs in the textile industry.

KMA Filter make use of the valuable heat derived from the productional exhaust air and reduce the energy consumption of the production facilities thanks to the integrated heat recovery system.

Heat recovery

With KMA ULTRAVENT® the valuable waste heat is energy efficiently reused. The integrated heat exchangers in ULTRAVENT® enable a recovery of the process heat. The recovered heat is used for follow-up processes. The recovered heat can be used to heat the supply air (for example: for the stenter frame) and / or to heat up water (for example: for the washing water in the dyeing mill).

Generally, the recovery potential is very large and can result in payback period of the entire system of less than two years! Here, environmental sustainability is linked in an ideal way with increasing profitability.



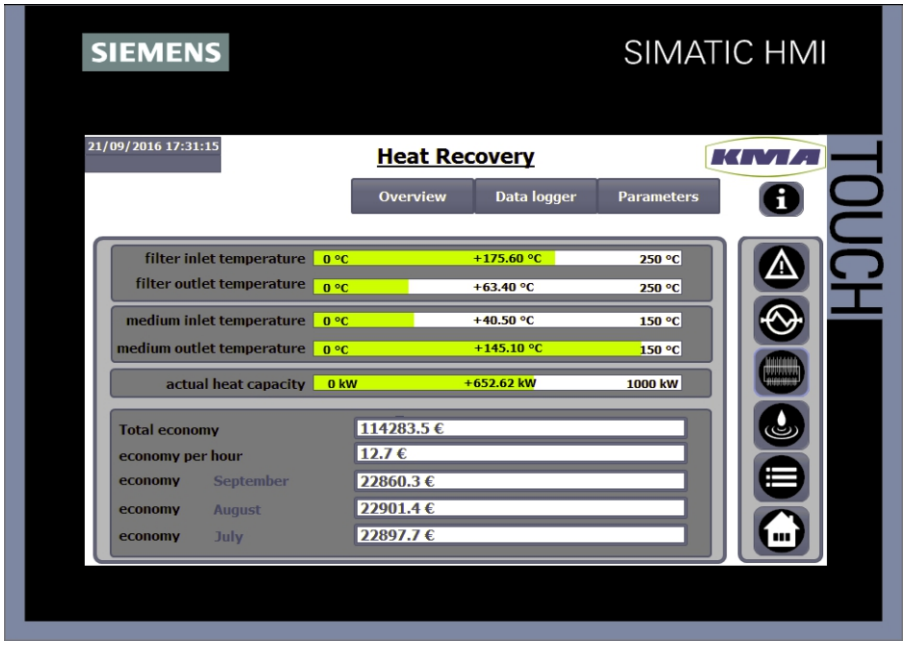
Example of use:
The amount of savings that can be achieved by using a KMA ULTRAVENT® system can be demonstrated by looking at a practical example. A customer has a stenter frame (6 fields) with an exhaust air volume of 20,000 m³ /h and 5,000 operating hours per year. The average air temperature is 180° C and the average outdoor temperature is around 20° C. The recovered energy is used for heating up supply air as well as water. By using market gas prices, the savings potential is:

Heat recovery potential	**513 kW**
Saved energy costs per hour	**13€**
Saved energy costs per year	**65.676 €**

Payback period less than 2 years

Energy savings at a glance

KMA ULTRAVENT® comes with a programmable intelligent controller, which also controls the filter cleaning in addition to the extensive monitoring of all filter functions. A forwarding of all relevant information to a central control system or integration in a remote maintenance system is possible (optionally).



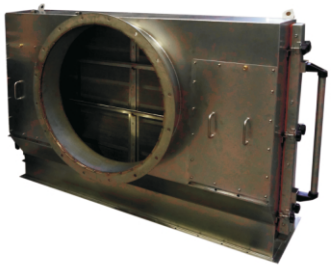
ULTRAVENT® systems – the modules for sustainable operation

ULTRAVENT® Modules

KMA ULTRAVENT® systems can be equipped with various modular components for the separation of smoke and aerosols at stenter frames and for the recovery of waste heat. All housing parts are made in durable stainless steel.

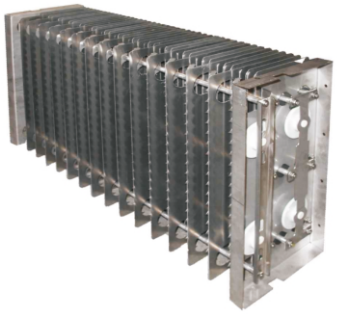
Pre-filtration – lint separation

Processing rough materials from coarsely woven fibers usually create high amounts of lint ball particles. Here, a pre-filtration of the exhaust air is an imperative. Therefore, KMA offers in this case a lint filter. This consists of robust stainless steel wire mesh elements. The special shaping of the wire allows for a high separating capacity for coarse dust particles, for example lint balls.



Particle filtration and oil recovery by high-performance electrostatic precipitators

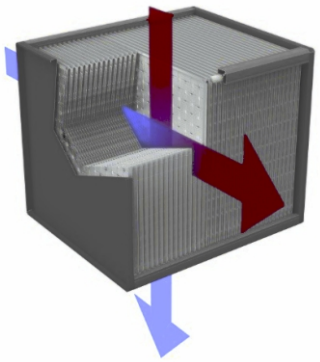
ULTRAVENT® electrostatic filter cells assure the highly effective separation of smoke, dust and fine mist. The filter cells are characterised by the particularly robust design: frame, electrode and carrying bars made of stainless steel, collector plates optionally in aluminum or stainless steel, insulators in oil-resistant ceramics and an 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 kind of the filtered substances is liquid, drips off the collection plates, and is collected in a recuperation tank. Here, the oil released during the process can be recovered and reused.
The second type forms a greasy or solid deposit on the filter surface. Unsuitable filter types can quickly plug and become ineffective, leading to excessive costs associated with filter replacement and disposal. However, KMA electrostatic precipitators never obstruct the air flow through the exhaust system.



Heat recovery by highly efficient heat exchanger

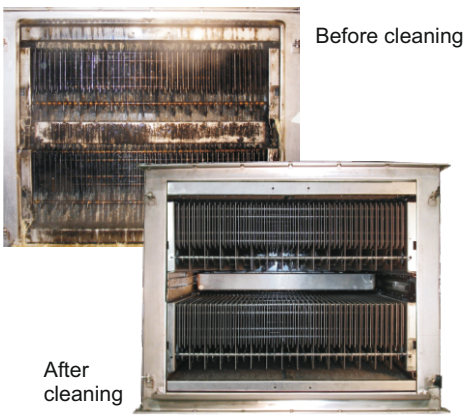
By integrating a heat exchanger in the ULTRAVENT® filter system a recovery of the process heat is made possible, in addition to the air purification. The recovered heat from the exhaust air heat can be used afterwards for follow up processes (e. g. water or air heating). The immediate installation of the heat exchanger next to the filter zone allows regular cleaning by the automatic filter cleaning system.

For pre-heating of supply air a cross-flow heat exchanger in the air-to-air operation mode can be used. The regular cleaning is carried out by the automatic washing system of ULTRAVENT® here as well.



Low maintenance by automatic filter cleaning system (CIP)

An automatic filter cleaning system is available for ULTRAVENT® emission control systems. It is suitable for cleaning all integrated filter media such as electrostatic collection cells or heat exchanger 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 cleaning system simultaneously reduces the consumption of water and of purifying agents. In the standard version the washing water is heated up by steam. Alternatively, the wash water can be electrically heated.



Before cleaning

After cleaning

Additional options

Programmable Controllers – PLC

A programmable control (Siemens S7 1500) monitors all the filter functions and controls the flow rates of the heat transfer fluid inside the heat exchanger depending on exhaust air temperature, volume and further target parameters. The display shows the actual heat recovery (current yield in kW) and the accumulated value of the recovered energy.

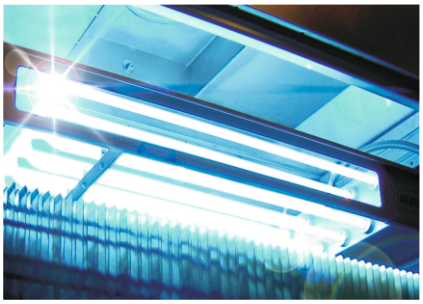
The safety monitoring integrated in the PLC permanently controls the temperature at the inlet of the system and switches automatically to bypass operation in case of excessive temperature in the stenter frame. Simultaneously a signal will be given (e.g. to start the extinguishing process).
Furthermore, the PLC controls the CIP cleaning system and enables the comfortable programming of cleaning intervals, washing water temperature and many more parameters. All operation data is stored for a long period and can be provided if required (e.g. in the course of an ISO 14000 management).
The comfortable touch display offers an intuitive operator guidance. A traffic light system (green-yellow-red) shows the current operating status of all the components.
The forwarding of all relevant information to a central control system or integration in a remote maintenance system via profinet is possible. The system is equipped with an air-conditioned control cabinet from Rittal.

Fire protection by fire extinguishing systems

ULTRAVENT® systems can be optionally equipped with fire sensors and fire extinguishing systems if there is a risk of fire. In case of fire, the system ensures that the filter device will be flooded with an extinguishing gas. As a result, further damage to the equipment can be avoided.

UV light for odour abatement

For odour problems the KMA filter system can be equipped by an integrated UV light module for energy-efficient odour abatement. For this, KMA uses vacuum UV tubes in moisture-resistant design. Due to the intense light treatment odorous VOC molecules are chemically oxidised. The result is a significant improvement in the odour situation.



Ventilators

As further optional accessories, ventilators with silencers and frequency convertors are available. Generally, the original ventilation system of the stenter frame often can be used further because of the low pressure loss inside the filtration system.

The benefits of KMA ULTRAVENT® at a glance:

- **Highly efficient separation of oil smoke and dust - ensures high standards of environmental protection**
- **Low energy consumption**
- **Innovative heat recovery system (integrated) and the possibility of oil recovery (hence low payback period)**
- **Automatic filter cleaning system (integrated)**
- **Filter replacement is not required**
- **Robust components (stainless steel housing) and no wearing parts**
- **Available in different capacity sizes**
- **Optional: highly efficient odour abatement**
- **Optional: Integrated fire protection system**

Filter sizes and modules

KMA ULTRAVENT® systems are available in three sizes with a filter exhaust air capacity of 10,000, 15,000 and 20,000 m³/h. For larger exhaust air volumes two or more KMA systems can be easily connected to each other.

The KMA exhaust air systems are assembled on a modular system, which combines several system´s components.Therefore ULTRAVENT® system allows a precise adaptation to the needs of the stenter. According to the customer´s request each system can be equipped with several heat exchanger modules. Thus, a KMA exhaust air system with two heat exchanger modules and two electrostatic filter stages is a common example.

Depending on the quantity of equipped module elements the height of the KMA system varies. With a fully equipped KMA ULTRAVENT® the maximum height can be up to 4.4 m. Is there not enough spatial height given in the plant, the tandem model can be selected instead of the KMA standard tower version. For the Tandem model the modular units are divided into two housings, which are connected to each other. In this case, the overall height is approximately 3.5 m. Here, both housings are sharing one automatic cleaning system.

TANDEM MODULE

The tandem module for the transfer of thermal energy to air and water.

Heat recovery for the heating of air & water

With the energy saving KMA tandem module the recovered heat can be utilized to heat up supply air and process water.
As a result, the overall energy consumption of the stenter is reduced, since less energy from the cost intensive conventional heating methods such as gas or thermal oil heating is required.

KMA exhaust air filter in the tandem module are equipped with electrostatic filter cells for particle separation, heat exchangers for heat recovery, an automatic cleaning system for the cleaning of the filter modules and optionally UV-light for odour separation.

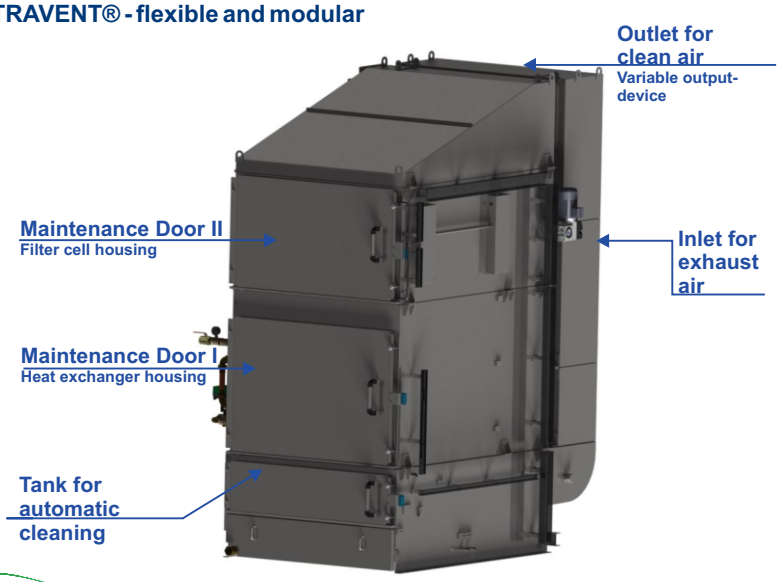
TOWER MODULE

Heat recovery for energy saving water heating

The KMA tower module employs the recuperated heat from the exhaust air for the heating of process water. Consequently, the overall energy consumption for water heating used in the dye house or laundry facilities is decreased.

KMA exhaust air filter in the tower module are equipped with electrostatic filter cells for particle separation, heat exchangers for heat recovery and an automatic cleaning system for the cleaning of the filter modules.

KMA ULTRAVENT® - flexible and modular



The tower module utilizes the recovered heat for process water heating.

Case study – Double heat recovery for double efficiency

A 10-field stenter frame realized an energy recovery of 720 kW per hour and saved € 90,000 in energy costs annually. At the same time, CO2 emissions have been reduced by over 950 tons per year.

A customer from Turkey processes many types of different textiles in his production plant.

Client application

A customer was looking for an energy-efficient way of heat recovery and exhaust air purification for his new stenter frame with an exhaust air volume of 30.000 m3/h.

The goal was to reduce the high energy consumption of the stenter frame and to use the valuable heat from the exhaust air. The temperature of the exhaust air is 180°C on average.

KMA‘s solution

KMA supplied two ULTRAVENT filter systems, each with a double heat exchanger and a double electrostatic precipitator.
The KMA ULTRAVENT filter system uses the valuable energy of the exhaust air in an extremely energy-efficient manner. The energy extracted from the exhaust air is supplied to the production process in two ways: first, by heating the supply air of the stenter frame. In this way, more than 200 kW heating energy can be saved. In addition, the energy recovery system heats about 11 m³ of industrial water for dyeing to 58 ° C.

The result

The energy recovery of the system amounts to about 720 kW per hour and saves about 90,000 € per year in energy costs. The payback period was less than two years. At the same time, the exhaust air is effectively cleaned and the company's carbon footprint improved by more than 950 tons per year.

Case study – Heat recovery for heating process water

The KMA ULTRAVENT was installed above the stenter.

By use of a KMA exhaust air filter system, a textile manufacturer cleans the exhaust air of its stenter frames and at the same time reduces its daily energy consumption by 300€. At the same time, CO2 emissions are reduced by more than 600 tons per year.

Client application

For 6-field stenter frames with an exhaust air volume of 18.000 m3/h an energy-efficient possibility for heat recovery and exhaust air purification should be realized.The temperature of the exhaust air is 180°C on average.

The goal was to reduce the energy consumption of the overall textile production and to use the valuable heat from the exhaust air for heating

KMA‘s solution

For this customer the 20000 ULTRAVENT Filter System was equipped with lint pre-filter, double electrostatic filter and double heat exchanger.
The existing ventilators and pipelines could be kept. The recovered heat is utilized for heating water for the laundry and dye-works.
By means of the automatic filter cleaning system not only the electrostatic filter cells and the heat exchanger are cleaned, but also the reuse of the process oil is possible.

The result

Due to the high energy recovery of 450 kW per hour the company saves almost 300€ every day by the KMA Filter System.
The CO2 emissions are reduced by more than 600 tonns every year.
The daily recovery of 35 - 50 liters of process oil for a second use reduces the acquisition costs. The mentioned cost advantages enable an amortization period of less than 2 years.

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