Effective, fully automated filtration technology for wet painting processes

RECLAIM system as a complete solution with two filter units

The new KLR-Filter® ensures a large airflow with very low filter resistance
Effective and energy-efficient. Filtration system suitable for 24-hour operation

The extremely high energy demand for conditioning the supply air in painting systems may not meet today’s basic standards.

Modern painting systems can be operated with significantly-reduced energy usage by controlling the recirculated air supply between the overspray separation, the filter units, and the spray booth.

RECLAIM ensures that up to 95% of the purified and re-conditioned air can be recirculated into the spray booth.

*Only 5% ambient air is added to improve air quality.

**SIMATIC controller for systems and process control**
Parameterization and all function controls.

**Adding limestone powder to pre-coat the filters**
Limestone powder is added from a Big-Bag station. As an alternative, it can also be stored in a silo (see page 8).

**Dosing Storage**
The dosing storage unit is equipped with a membrane pump and a fluidization device for continuous conveyance of limestone powder into the VARIO RECLAIM filter units.

**Collection and ductwork**
Specific air-flow optimized solutions result in low accumulation of sediments inside the ductwork.
This illustration demonstrates a fully automated RECLAIM system. Installation specifics and allocation of components dictated by specific requirements and individual conditions.

Filter unit
VARIO RECLAIM
The extracted overspray is separated by the dry operating filters. Up to 95% of the exhausted air can be reused for circulating air inside the spray booth.

Pre-coat treatment by "fluid rotor"
Used and fresh limestone powder is loosened and fluidized. Due to the rotor effect, dry limestone particles rise inside the filter area and partially bonds overspray and aerosols.

Continuous, fully automated operation
The illustrated structure ensures uninterrupted operation of the RECLAIM process.

Disposal system
Big-Bag
Disposal of the used pre-coat is carried out by exhausting the VARIO RECLAIM filter units.
As an alternative, a silo can be used as disposal system for large quantities (see page 8).
With an air recirculation ratio of 95%, RECLAIM reduces energy costs by up to 50%.

Wet painting systems require large amounts of energy. Because of the high separation efficiency of KLR-Filter® up to 95% of the separated dirty air is recirculated into the paint booth as reconditioned clean air. Ideally, the distances between the paint booth and the filter unit should be short.

Simple limestone powder can be used as pre-coating material.

Ordinary limestone powder is utilized to bond overspray particles to the filter surface. (See more on page 6.) Limestone powder is a naturally occurring substance and is available in a variety of bulk volumes. When maximum particle saturation is reached, the mixture can be easily discarded or re-used for another application.

Environmentally responsible and cost efficient.

Dry separation with RECLAIM technology offers many advantages compared to customary wet separation processes.

- Heating costs lowered by up to 80%
- Power consumption reduced by 50%
- No chemicals are used
- No foam formation
- No sludge removal
- The saturated pre-coating material can be reused
- Compressed air connection is sufficient
- Modular components provide flexible uses
- Supply air systems for VOC separation can be designed considerably smaller

Energy efficiency of painting systems because of superior air circulation.
Fully automated control

Centralized control for complete functionality

If required, touch screen monitor parameter setting is available

Depending on the size of the system, a SIMATIC S7-300 with a suitable user interface (e.g., touch screen monitor) is used as a controller. Our RECLAIM control program is modular in design and scalable according to the system configuration. Complete functionality is automatically initiated after the release of the control (e.g., initiate spraying).

The coordination of functions during commissioning is specific to the materials being utilized. Maintenance tasks can be accomplished by a VPN duct (Virtual Private Network).

Accessible modules and PROFINET-Bus

The pneumatic valves, pumps and sensors operate with control modules on valve terminals.

They are attached to the dosing storage unit (image 1) and to the VARIO RECLAIM filter units (image 2).

Despite the complexity of the system, this type of configuration, networked with a PROFINET-Bus or other Bus-system, ensures maximum reliability.

Control of filter resistance

The pressure difference between the dirty air zone and the clean air zone is calculated not to exceed the allowed filter resistance.

Detailed information for the filter and filter cleaning process is provided on the following pages.

Cross section: ↑ dirty air zone  ↑ clean air zone
Filter design for maximized air flow

KLR-Filter® was especially developed for our RECLAIM preocess technology

To take advantage of modern dry separation methods, Keller developed the new KLR-Filter® design with maximum surface area.

All materials utilized are silicone-free!

Limestone powder as a pre-coating material for the filter

Limestone powder is suitable not only for the separation of wet paint overspray, but also other adhesive materials such as film coating overspray.

The powder is added to the filter surface to bond with the overspray particles.

Optimum filtration efficiency

emission level < 0.1 mg/m³

The pleated design of the KLR-Filter® ensures a maximum filtration surface with very tight filter construction and high rigidity.

As a ‘separating layer’ between the filter surface and the adhesive material is a thin PTFE membrane on the outside of the filter.

This ensures a reliable filter cleaning and a high filtration efficiency by means of the surface filtration.
Weiche Kante außen 14
Weiche Kante innen 8
Weiche Kante außen 14
Weiche Kante innen 8
Weiche Kante außen 14
Weiche Kante innen 8

**Head gasket**

**Solid head construction**

**High rigidity created by pleated filter material that forms separate filter chambers**

Trouble-free flow of recirculated air due to high separation efficiency

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**Interruption-free operation**

The central functions of the VARIO RECLAIM filter unit

The re-use of the pre-coating layer is performed automatically

By monitoring the filter resistance or differential pressure of dirty air and clean air, or after a defined time interval, the cleaning cycle is initiated. The filters are cleaned in pairs by removing the saturated filter layers, after which they are immediately freshly re-coated.

- **Overspray particles**
  - ... bonding with pigment particles and aerosols. The overspray/limestone mixture builds up a porous layer.
- **Cleaning**
  - is accomplished by a compressed air pulse when a defined saturation point has been achieved.
- **Almost simultaneously**, the unsaturated pre-coating material is dispersed and exhausted into the filter zone.

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**The interior of the filter unit is enriched with limestone powder**

Limestone powder, which rises inside the filter area because of the rotor effect, partially bonds with the inflowing overspray and aerosol particles. They are either sedimented or are separated onto the filter's layer of pre-coating.

- **Limestone powder**
  - is loosened and continuously stirred up by the fluidization effect of the "fluid rotor."

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**Intensive application of limestone powder**

The limestone powder is in constant motion because of the "fluid rotor" (fluidization). Larger filter cakes are loosened up. That ensures optimal usage of the limestone powder for filter pre-coating, and the continuous enrichment of the filter unit interior.

- **Immediately after cleaning the filter cake**, unsaturated limestone powder is stirred up by compressed air pulses to create a new layer.

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**Pressure build-up to remove the saturated pre-coating layer is accomplished inside the Jet unit.**

- A customary compressed air connection is adequate

- **The cleaned KLR-Filter® elements**
  - discard the unsaturated limestone powder, and the pre-coating process is renewed

- **The compressed air pulse**
  - stirs up fresh limestone powder for pre-coating

- **Limestone powder**
  - is loosened and continuously stirred up by the fluidization effect of the "fluid rotor"

- **Scales**
  - to control the pre-coat’s level of saturation

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**Mechanical fluidization of pre-coat ensures highest functional reliability**

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Dosing storage of pre-coating material (limestone powder)

The dosing storage is equipped with a membrane pump. Limestone powder can be dispensed and pumped effortlessly into the storage zone of the VARIO RECLAIM filter units by a combination of the screw conveyor and limestone powder fluidization to facilitate the pre-coating process.

Dosing material storage can be equipped with a fastener for Big-Bags for easy filling (image above).

The dosing storage system also enables the direct extraction of limestone powder when using silos for limestone powder storage (image on the right).

Silo left: Filling the dosing hopper for heavy consumption using silo storage of the fresh limestone powder.
Silo right: Disposal station for used limestone powder pre-coating.

Limestone powder supplied via Big-Bag station or via silo

Blue mark indicates the course of the supply stream of fresh limestone powder – from a Big-Bag supply station to VARIO RECLAIM filter units.

Used limestone powder is removed from the filter units using suction (red mark).
**Monitored valve control**

With the use of control components which are directly installed on the valve terminals, the pneumatic operations in the dense-phase supply system and at the pre-coat provision are released and monitored.

![Valve and control terminal located at dosing storage](image1)

![Valve and control terminal on the VARIO RECLAIM filter unit](image2)

**Dual volume control with the use of a built-in scale**

Weighing device to control the fill level and to detect the amount dispensed.

![Weighing equipment at dosing storage to check fill level weight and determine quantities](image3)

![Scale on the VARIO RECLAIM filter unit. Also used to detect the degree of saturation of pre-coating material](image4)

**Disposal station for Big-Bag or as a storage silo**

The disposal station exhausts the used pre-coating material automatically from the VARIO RECLAIM filter units and fills the bulk material storage tank.

Based on the system design, the bulk material storage tank can function as a Big-Bag container or as a storage silo.

If necessary, ASP containers or drums may also be used for disposal.
References

RECLAIM system controller and disposal station Big-Bag at Scania CV AB
Overspray amount each week: 75-660 lbs (35-300 kg)

RECLAIM filter line of a recirculated air spray painting system at Scania CV AB.
Designed for an airflow of 21,000 cfm to 71,000 cfm (36,000 m³/h to 121,000 m³/h).
Dirty air volume: 10 mg/m³ up to 30 mg/m³

RECLAIM dry separation at Allgaier Automotive GmbH
Airflow: 50,500 cfm (86,000 m³/h)
Dirty air volume: up to 130 mg/m³
Amount of overspray each week: approx. 1,750 lbs (800 kg)

Recirculated air painting system with overhead conveyor at Allgaier Automotive GmbH
**Additive Supply System**

For filling one or more VARIO RECLAIM filter units

- **Capacity**: 35ft³ (1 m³) Big-Bag as well as a 440 lbs (200 kg) temporary storage for the limestone powder
- **Temporary storage** with integrated fluidization system and pump feed screw
- **Height adjustable** to fit various Big-Bags and accommodate special collection Big-Bags with up to 70ft³ (2 m³) fill capacity
- **Big-Bag handling** using a forklift, or with an integrated crane system as an alternative
- **Using silo technology** replaces Big-Bag use. The storage capacity is adjusted individually. Generally, silos have a storage volume of 1,060-2,825 ft³ (30–80 m³)

**SIMATIC Controller**

Parameterization, control and regulation of all system and process functions.

- SIMATIC HMI panels for process visibility: TP 1200 w/ 12” touch panel
- Bus technology PROFINET to network the control panel, filter units and dosing stations
- Remote control via shuttle PC possible for system support: a VPN connection shall be provided
- Process analysis with consumption data optimization
- Shuttle-PC including touch screen possible to collect data: measuring values and status reports in data file .csv

**Pneumatics**

Pneumatic elements with integrated monitoring function.

- Pressure regulation valves adjust the necessary pressure and airflows
- Vacuum ventilation of squeeze valves to optimize the transport parameter and extend service intervals
- Regulation of peak loads to stabilize the compressed air network
- Calculation of the consumed amount to observe the reduction in compressed air values
- Ventilation-free fluidization valves without dirty air return flow

**Disposal station**

The used pre-coating material is extracted from the VARIO RECLAIM filter units and disposed with Big-Bag bulk material storage.

- Round filter with vacuum blower
- Transport route: standard up to 165' (50 m), but can be longer
- Material transport monitoring and filling of the Big Bag with weighing cells
- Depending on system requirements, silo systems with a capacity of 1,060-2,825 ft³ (30–80 m³) can be used instead of Big-Bags

**Filter units VARIO RECLAIM**

Filter system for dry separation of overspray. Ensures energy-saving recirculation of air. Can also be used in manually operated configurations.

- **Compact design**
  - Base: 65" x 64" (1,646 x 1,632 mm)
  - Height: approx. 154" (3,920 mm)
- **Specially designed housing**
- **Airflow up to** 8,200 cfm (14,000 m³/h) each unit
- **Equipped with KLR-Filter®** (silicon-free)
- **Emission level** < 0.1 mg/m³
- **Lowest pressure loss**
- **Filter elements** are exchangeable individually so that there is no contamination of the clean air zone during filter exchange

**RECLAIM components**

**Data and information**
Process and project information

We will be pleased to provide you with detailed information on our RECLAIM dry separation system, and the effect of our KLR-Filter® on your wet painting processes.

Take advantage of our experience in filtration technology with dry separation and energy efficient recirculation of air during wet painting processes.

Detailed animation

See the following website for a computer animation of the RECLAIM dry separation:

www.reclaim-keller.de/index_e

With the GREEN BALANCE initiative, Keller commits to Global Sustainability.

We balance Technological, Social, and Economic resources to sustain the environment.