



Deodorization.
The key to high-quality recycled plastics.



Reduce odors, increase business

Unpleasant odors in recycled plastics caused by surface contaminants, solvent residue, additives, foreign materials, or the lingering smell of the original contents must be completely removed. It is a difficult, very multifaceted process – but we have the solution.

Coperion and Herbold Meckesheim have combined their unrivaled plastics processing expertise to develop highly efficient deodorization solutions for every stage of the plastics recycling process chain, including:

- washing
- bulk material handling
- extrusion and compounding
- finished product handling.

Suitable for post-industrial and post-consumer waste recycling, Coperion-Herbold deodorization solutions remove the source of noxious smells, including volatile organic compounds (VOCs). Our deodorization technologies are tailored to match your application requirements and desired product quality – boosting recycle value and opening up new markets.

Single supplier, many benefits

Sourcing all your deodorization needs from a single, trusted supplier brings big benefits.

Technological compatibility between each deodorization stage is ensured with the certainty of achieving the greatest possible effect. The processes run smoothly to maximize up-time and throughput. Procurement is simplified, installation and commissioning are speeded up. Plus, thanks to our test centers and mobile testing capabilities, we can prove that the final deodorization design will meet your requirements, deliver exceptional reliability and energy efficiency, as well as a high-quality end product.



Benefits of Coperion plastics deodorization solutions

- Overall process approach for optimum end product quality and optimized productivity
- End-to-end equipment compatibility
- Added value to recycled plastic products
- Deodorization with highest effectiveness
- Technology tailored to your process
- Achieve better return on investment
- Lower operating and maintenance costs
- Open up new markets for plastics recyclates
- Worldwide service network for maximum performance of your systems in the long term

End-to-end deodorization of recycled plastics

From start to finish, Coperion-Herbold deodorization solutions provide optimal return on your investment. We offer a complete concept for odor reduction, starting with pre-washing, continuing with degassing in the extruder, and ending with EcoFresh silo deodorization. Depending on customer requirements, any or all of these process stages can be applied to remove VOCs and other sources of odor and improve the quality of your recycled plastic products.

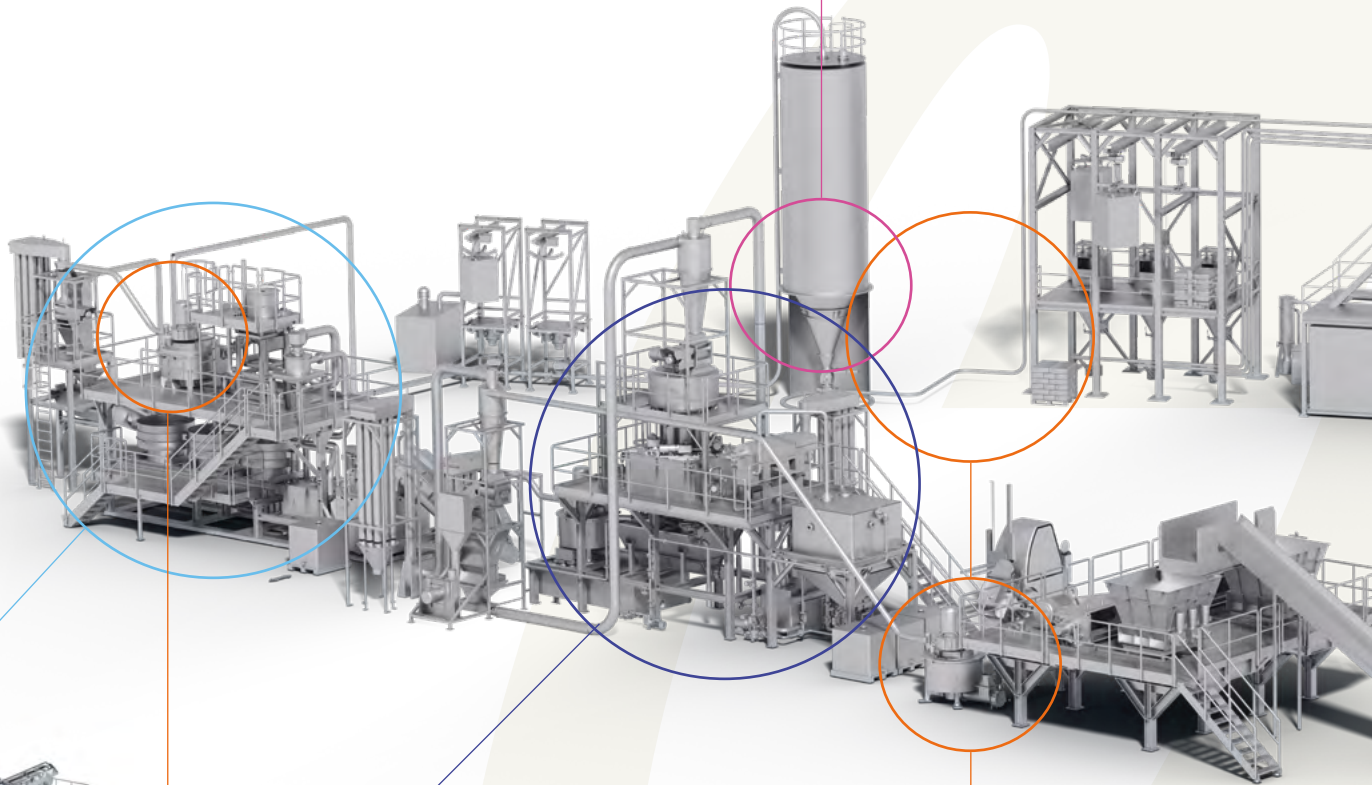


Single-source solution for your requirements



Pre-washing is an additional option to remove large impurities and is particularly important on washing lines for soiled films. Our **Pre-Washing Drum** features baffles that constantly rotate the contaminated plastic material in a stream of water to achieve effective particle removal.

Flake degassing after hot washing as optional process step.



Final-washing, separation and rinsing removes finer particles from plastic using friction and other mechanical methods. Our **Hydrocyclone Technology** generates high centrifugal forces to achieve excellent separation results. At the same time, this process step achieves the highest washing intensity. The pollution of the circulation water is permanently removed.

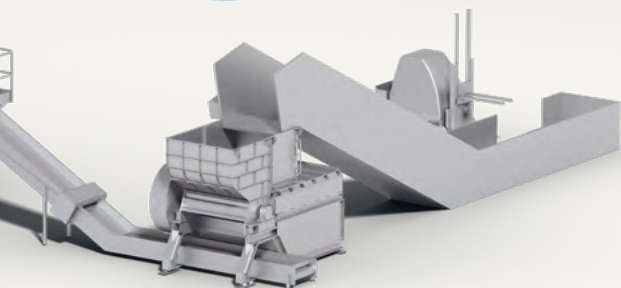
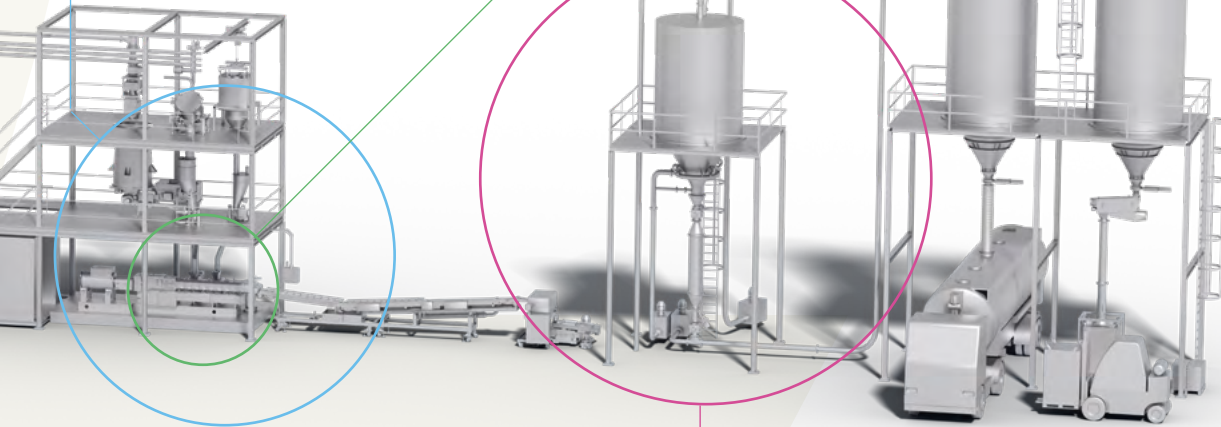


Herbold Hot Wash, designed as a real batch process is fully adjustable, allowing fine-tuning of the dwell time, temperature, and detergent dosing to deliver perfect results. Optimal parameter adjustment for processing a very large range of materials is possible.

During extrusion and compounding in the **ZSK Recycling Extruder**, the used plastic is melted and homogenized. Volatile organic compounds (VOCs), a major cause of odors, are released. Highly efficient vacuum devolatilization technology ensures the reliable removal of dissolved gases, enhancing the sensory quality of the product. Adding liquid stripping agents intensifies degassing and makes VOC removal even more efficient. By adding water as stripping agent the VOC can be further lowered by 20-35 %.



Our **ZS-EG Side Devolatilization Unit** further enhances the devolatilization effect in the ZSK Recycling Extruder. It achieves a stable and effective degassing process that is particularly beneficial when dealing with high gas volumes.



The combination of **mechanical** and **thermal drying** using hot air eliminates moisture after washing and prevents the growth of odor causing bacteria, which purifies the recycled plastic material before further processing.

Herbold Mechanical Dryers are highly efficient machines which work on the centrifuge principle and achieve excellent drying results.

The energy-efficient **FLUIDLIFT ecodry® flash drying process** reduces moisture remaining in recycling grinds following the washing process during material transportation.



Final Material Handling of the recompounded plastics may include the use of hot air silos as a final deodorization stage. Coperion's EcoFresh silo devolatilization solutions ensure that any residual odors are removed, resulting in a product that is on par with new plastic in terms of odor quality. We offer the option of a unique twin silo or a single silo design.

Our **Twin Silo** solution uses one silo to heat and deodorize the granulate and another to cool the granulate with cold air. This configuration is highly energy efficient because the process heat from the cooler is 100% used to heat the pellets in the deodorization silo. The devolatilization medium (dry or humid air, pressure) and the temperature can be set individually. Located inside or outside the production building, our twin silo system is optimized for continuous processing. Additionally, a solution for batch processes is available.

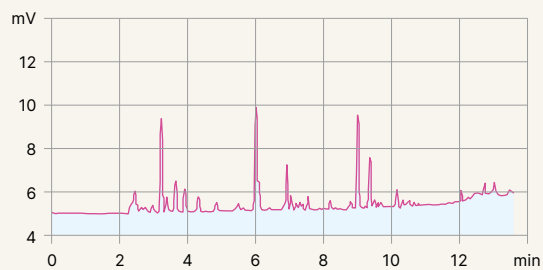
Our **Single Silo** solution uses two Bulk-X-Change heat exchangers so heating, degassing and cooling can take place in one unit. This continuous process setup is very energy efficient in applications where the product is already heated and only requires a low purge air flow.

Degassing performance after the individual process steps

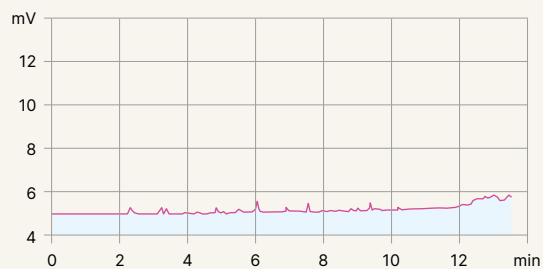
Recyclate



After extruder



After deodorization



100

24,5

1

ppm

- **Total VOC** is measured for post-consumer recyclate, for pellets after the extruder and for pellets after deodorization with 4h treatment at 105°C and 0% moisture content*
- Gas chromatography shows the decreasing peak intensity after each treatment step

* GC measurements made in Coperion's test laboratory

Degassing in the ZSK Recycling Extruder

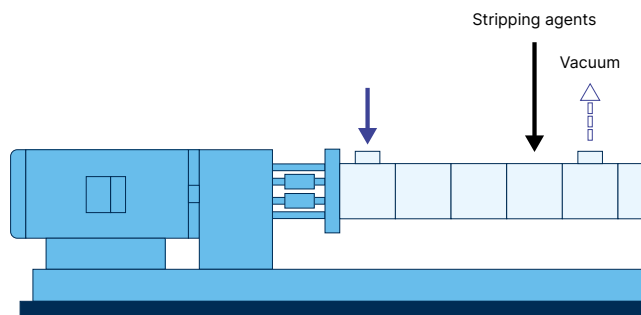


→ Twin screw extruder ZSK 70 Mc¹⁸

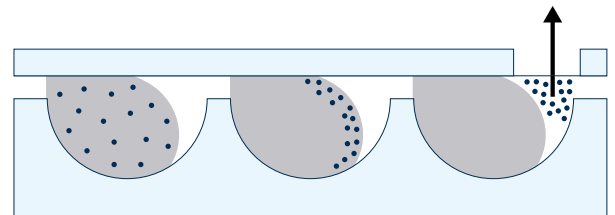


Advantages of degassing in a ZSK twin screw extruder

- Intensive mixing behaviour – better distribution and release of trapped gas
- Frequent surface renewal – more melt surface area for gas escape
- Highly efficient vacuum devolatilization technology
- Incorporation of liquid stripping agents possible to intensify degassing
- Addition of water as stripping agent lowers the VOC by another 20–35%

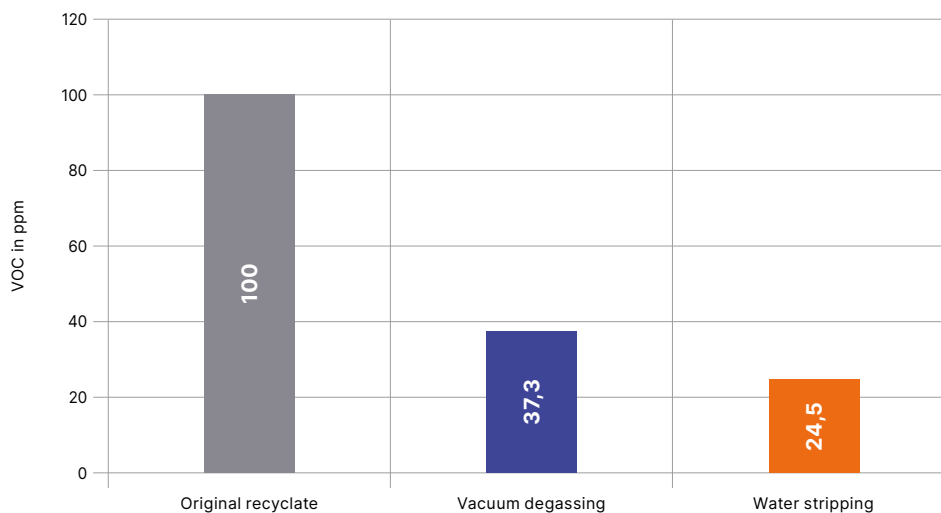


→ Degassing principle of the ZSK recycling extruder



→ Removal of VOCs within the extrusion processes

Reduction of VOC within the extrusion process



→ Reduction of VOC within the extrusion process

Energy efficient silo deodorization EcoFresh

Continuous Twin Silo Process:

- Complete deodorization system with two process silos
- Hot air flows through the material in the degassing silo for a specified residence time
- Bulk material heating and degassing in upstream silo
- VOCs diffuse into the air
- Transport of the bulk material into cooling silo to flush the bulk material with air and to cool it down
- Process heat of the bulk material cooler (cooling silo) is used to preheat the supply air
- Low energy consumption
- Energy is retained within the system
- The highest possible product temperatures can be achieved, for best deodorization results



Your advantages

- Compact design and low footprint of the system
- Heat recovery concept ensures very low specific energy consumption during continuous operation
- Flexible deodorization system based on proven design parameter
- Variable selection of the deodorization medium (dry or humid air, pressure) and temperature
- System can be located outside the building, no space requirement in production
- Stand alone solution available with integrated control system
- Extension of existing lines possible
- Delivered as pre-assembled system to minimize installation time and costs on site
- Odor sensors available for continuous process and product quality control

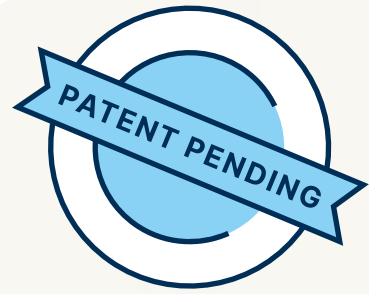
Technical data

Size	Throughput max. [t/h]*	Volume of Degassing Silo [m³]	Residence Time [h]
2	1.45	24	9-10
2.6	2.5	42	9-10
3	3.3	57	9-10
3.5	4.7	80	9-10
4.2	6.8	132	9-10

* at 550 kg/h and 100°C

Continuous Single Silo Process:

- Coperion Bulk-X-Change as material heat exchanger for efficient cooling and heating
- Only one degassing silo required to diffuse the VOCs into the air
- Less condensation in the subsequent degassing silo
- Lowest air flow required



→ Twin Silo set-up for deodorization
of recomponds

Optimized deodorization solutions

Deodorization brings a major benefit to the plastic recycling business. Coperion deodorization equipment delivers the quality you need, reliably and cost-effectively, for years to come. Coperion's experts will help you identify the best deodorization methods for your recycling process to achieve the desired product quality, always keeping investment (CAPEX) and subsequent operational costs (OPEX) in mind. Your nearest Coperion and

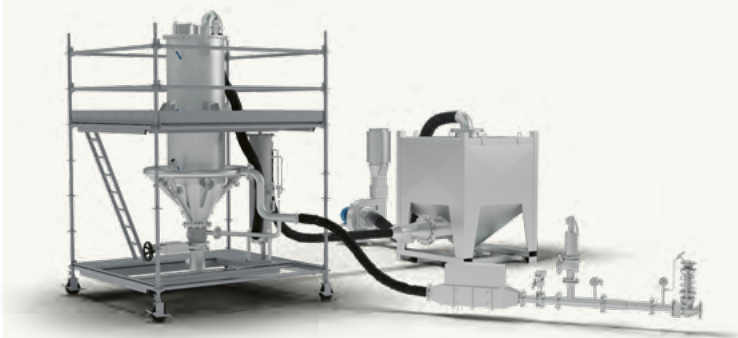
Herbold Meckesheim Test Center offer the possibility to test potential deodorization methods in advance and to ensure that your process achieves maximum efficiency before you make a final financial commitment.

So, you can be confident that your customized Coperion deodorization system will work perfectly and deliver maximum return on investment (ROI).



In our strategically located Test Centers we can confirm different deodorization equipment combinations to optimize performance before final purchase. This ensures that your investment is focused on the best technological solution and is results-driven.

EcoFresh Silo Degassing Solution



Recycling Innovation Center

At the Recycling Innovation Center in Weingarten, Germany, we have installed a silo degassing system that allows to intensively test the degassing performance of plastics compounds at medium production scales – in batch and continuous operation. Accurate data about your silo processes under real operating conditions are obtained so we can identify the best deodorization approach. Additionally, medium pellet batches can be deodorized for further product processing tests at customer site.



Mobile Test Unit

Our Mobile Test Unit allows to test the deodorization performance at your production facilities. Using this mobile solution the possibilities for reducing recyclate odor can be thoroughly investigated directly at your plant with freshly produced product. This standalone unit can test deodorization processes in temperatures of up to 150°C.

Working in partnership



At Coperion, we partner with our customers to deliver outstanding deodorization solutions at every stage of the plastics recycling process.

Choosing to work with us gives you access to unparalleled expertise in industrial-scale plastics recycling all in one place. Coperion and Herbold Meckesheim offer strength in depth, providing world-leading engineering skills and industry experience to solve your plastics deodorization challenges.

We employ more than 5,000 people worldwide and have a comprehensive network of sales and aftermarket service centers across the globe, enabling us to provide local support wherever and whenever it is required. We aim to provide our customers with a seamless experience, from initial concept, through equipment design and commissioning, to aftersales support.

Working in partnership, we make innovative process solutions that represent a new benchmark in the journey toward a circular economy in the plastics industry.

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