

APPLICATION BOTTLE

Food Contact Approved



CHOOSE THE NUMBER ONE.

ComPETence from the Number One.

Flexible turnkey systems from a single source.

Plastic – the most popular bottle packaging.

Thermoplastics such as polyethylene terephthalate (PET) and polyolefins (e.g. PE-HD) offer a multitude of benefits as bottle packaging in the food sector. They are lightweight, unbreakable, easy to handle and have a broad scope of design. PET bottles in particular are increasing in popularity among consumers of all ages and now have the largest share worldwide in the packaging mix. Constantly enhanced material properties make PET, PE-HD and PP an attractive choice for more and more applications in the food and non-food sector. We can thus expect consumption to grow rapidly in the future, too.

The future belongs to upcycling.

The increasing use of PET and polyolefins in the packaging sector also means a growing potential for recyclable plastics. Bottle flakes as a secondary raw material open up an enormous range of products in which the use of recycled pellets instead of new material is extremely worthwhile in terms of both economy and process engineering.

VACUREMA® – the leading system for bottle & in-house recycling.

With VACUREMA®, EREMA has the most proven and highest selling PET recycling technology. There are already a number of VACUREMA® systems in operation also for the recycling of PE-HD bottle flakes. All in all there are over 150 systems in use around the world, producing high-quality recycled pellets and end products with an overall capacity of over 1 million tonnes per year in a wide variety of application fields such as bottle-to-bottle, pelletising, inline sheet, strapping, fibre, etc. This wealth of experience is your guarantee for maximum operational reliability with flexibility in the application at the same time. In the form of a turnkey recycling solution which is customised for the requirements of your end product. One that also runs with the lowest possible energy and production costs.

What bottle recycling is all about:

- Flexibility of the recycling system in terms of the variety of possible end applications
- The final application determines the pellet quality in terms of IV stability, pellet colour, VOC content, AA content
- Flexible pouring sizes and shapes of the feed material (light weighting)
- Centralised collection systems require higher system capacities
- Compact system dimensions
- Food contact grade recycled pellets in accordance with the criteria of the FDA, EFSA and the major brand owners for bottle-to-bottle (filling with water, hot drinks, juices and carbonated refreshment drinks)
- Lower production and energy costs with low CO₂ consumption
- Reliability and availability
- Fully-automatic, self-regulating operation
- Process tracking by means of exact process documentation



The decisive benefits for the customer:

- 1. Decontamination and ultrafine filtration for direct food contact – in accordance with the criteria of FDA, EFSA and many major brand owners:** thanks to highly efficient and fast decontamination together with large area ultrafine melt filtration the extremely clean recycled pellets produced using VACUREMA® technology are approved for food contact.
- 2. Flexibility, variable input, ideal for mixing with virgin material:** thanks to Counter Current technology, EREMA systems are extremely flexible and process a notably wide variety of input materials (in line with the end application) such as PET bottle flakes, ground amorphous skeleton waste/edge trim, virgin material and mixtures with bulk densities of 250 to 850 kg/m³ and adjustable IV increase (depending on throughput and end material).
- 3. IV stability through vacuum treatment:** despite varying moisture levels and different IV values in the input material, stable IV values are achieved through the patented pre-treatment method. This means, therefore, that input materials with higher material moisture levels can also be recycled.



Yes we contact.

Approved for direct food contact.

From PET to rPET.

PET has established itself worldwide as the most popular packaging material for carbonated soft drinks and water. Thanks to its optimised barrier properties and high temperature stability, PET is also becoming increasingly popular for wellness drinks, beer and hot drinks. Further PET applications include thermoforming sheet for thin-walled packaging such as reusable ovenproof food trays, inserts and a wide variety of other food and non-food applications.

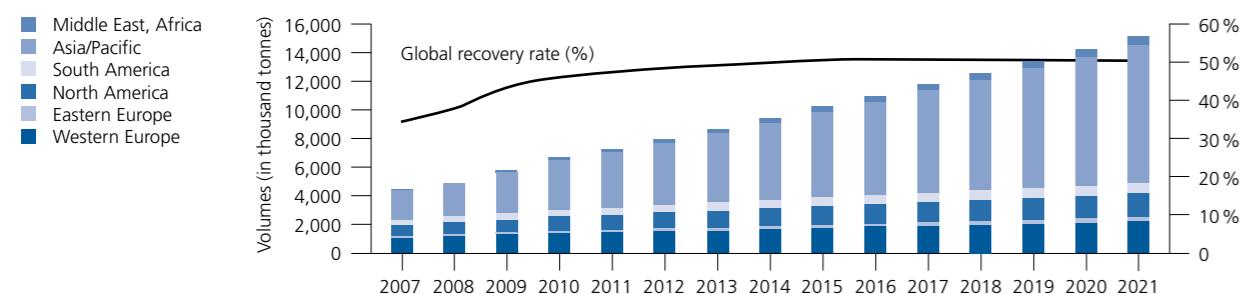
Seen in global terms, 16 million tonnes of PET packaging was used in 2012, with beverage bottles accounting for more than three quarters of this figure. And, of this figure, around half of the PET bottles are currently collected and recycled after use.

This means that there are around 8.1 million tonnes of PET flakes currently available worldwide for recycling. Some 1.5 million tonnes of PET flakes are recycled in Europe every year – more than a third with the help of VACUREMA® technology from EREMA. A total of four large-scale VACUREMA® Prime systems were supplied to the USA in the year 2011 alone and are now producing approx. 60,000 tonnes of melt-filtered, IV-enhanced and food contact approved pellets on an annual basis.

There are estimates that the global consumption of PET bottles over the next ten years will more than double. Even if, according to forecasts, the PET recovery rate balances out at around 50 % in the same period, it is to be expected for the time being that the bulk of the PET bottles collected will continue to end up in landfills.

Recovery and recycling of PET bottles

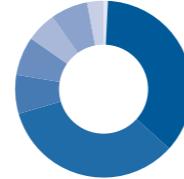
Forecast to 2021



PET packaging

Global consumption by application 2012
(total: 16 million tonnes), source: EREMA market database

35.9 %	Soft drinks
33.8 %	Water
7.1 %	Thermoforming
7.1 %	Food
6.8 %	Other beverages
5.5 %	Non-food
3.0 %	Fruit juices
0.8 %	Beer



Recycling of PET bottles 2012

(total: 8.1 million tonnes),
source: PCI

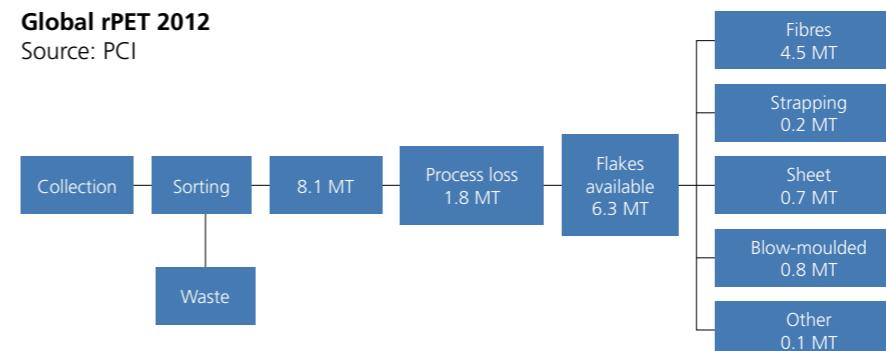
30.6 %	China
18.1 %	Western Europe
16.4 %	Rest – Asia/Pacific
9.2 %	USA
6.9 %	Japan
6.2 %	Rest – North America
6.1 %	South America
4.7 %	Middle East, Africa
1.8 %	Eastern Europe



This huge and ever growing potential of PET waste has to be processed to make valuable rPET (recycled PET) in the sense of an effective recycling loop and thus open up a multitude of applications – ranging from staple fibres, strapping for packaging and blow-moulded products to the recycling of food contact compliant PET bottles and thermoforming sheet.

Global rPET 2012

Source: PCI



VACUREMA® –
food contact compliant polyolefin recycling

PE-HD polyolefins

The most significant end applications of PE-HD (high-density polyethylene) in Europe are blow-moulded bottles, injection-moulded packaging and extruded films and tubes. In the food sector PE-HD is used primarily for milk bottles and juices whereas in the non-food sector this material is used to make large containers for chemicals and fuel tanks.

With its VACUREMA® systems EREMA offers the worldwide leading technology in the marketplace for food contact compliant recycling.

PE-HD end applications in Europe 2009

36.6 %	Blow-moulded
18.6 %	Injection-moulded
18.5 %	Pipes, profiles
17.9 %	Film
3.7 %	Other extrusion
2.5 %	Cable, wire
2.2 %	Various applications



Application-oriented.

From the input material to the desired end product.

Flexible input – maximum output.

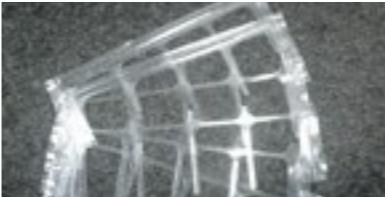
The choice of recycling technology depends primarily on the required individual characteristics of the end product. In the case of applications such as thermoforming sheet, preforms or bottles which require food contact grade recycled pellets, they have to be as contamination-free as possible with the appropriate safe-for-use approval from both international health authorities and brand owners. EREMA has the respective optimum technological solution together with all the required official approvals for all recycling requirements and for input materials with varying shapes, bulk densities and IV values such as A-PET, C-PET and PET-G.

Washed PET bottle flakes



EU legislation on waste provides in future for higher collection amounts of PET bottles and mandatory high recyclate content in PET bottles. VACUREMA® technology is ideal for the recycling of blow-moulded PET bottles from collection systems. Thanks to the patented pre-treatment of PET flakes, decontamination and IV increase is fast, reliable and thus effective and energy-saving.

PET skeleton waste



PET skeleton waste is production waste which is left over from the thermoforming of flat film to make thin-walled packaging. VACUREMA® inline sheet systems are ideal for returning this skeleton waste to the flat film production process without prior crystallisation as input material.

PE-HD bottle flakes



The regulations placed on collection and sorting systems for PE-HD post-consumer wastes such as milk bottles, for example, are particularly stringent. The required purity of 99 % for the input material can be achieved only in closed recycling loops. EREMA is once again earning itself a reputation as a pioneer in this field: the world's first VACUREMA® Advanced systems configured especially for the bottle-to-bottle recycling of PE-HD to make food contact grade recycled pellets went into operation in Great Britain. With success: the capacities for this applications are being extended all the time.

PET strapping shredded from in-house waste



With the compact VACUREMA® strapping technology, shredded PET strapping from production waste can be returned to the production process as an inexpensive, high-strength and IV-stable secondary raw material.

PET flat film



PET flat film is used as a semi-finished product for the production of thermoforming parts. VACUREMA® technology ensures that flat film rolls or edge trim which does not fulfil the required specifications can be recycled without any prior crystallisation.

PET virgin material & ground preforms



VACUREMA® inline sheet and inline strapping solutions enable the direct production of films or strapping even with the admixing of virgin PET material in pellet form or ground preforms.

Versatile.

The EREMA solution for bottle & in-house recycling.

The modular technology. For your end product.

Different requirements call for different solutions. Modular solutions which are configured exactly for your particular application. VACUREMA® gives you this flexibility in impressive style. EREMA offers VACUREMA® technology in four different systems – VACUREMA® Basic, Advanced, Prime and MPR® – according to the field of application and the requirements placed on the end product. With this patented process you can count on the best established and most used technology for the recycling of post consumer PET bottle flakes, PET in-house waste and also PE-HD bottle flakes.

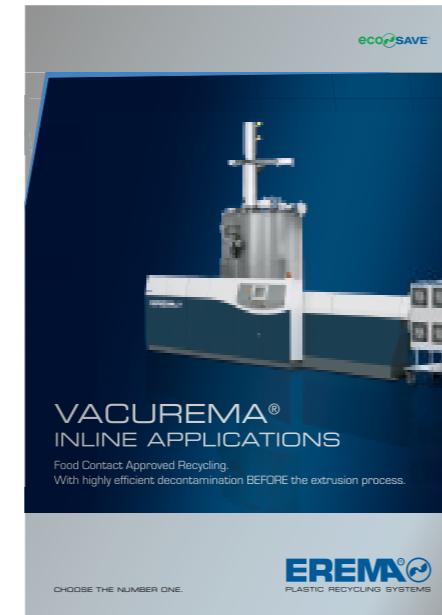
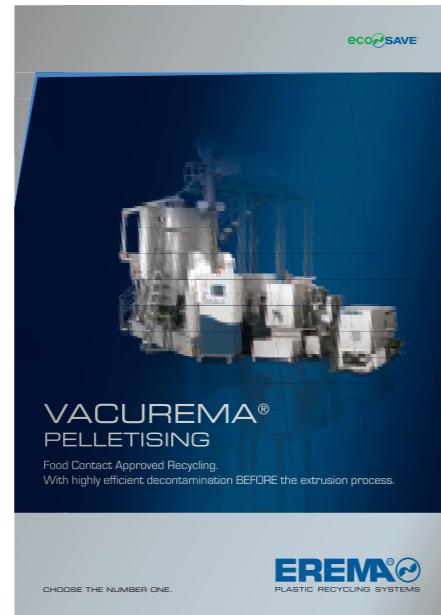
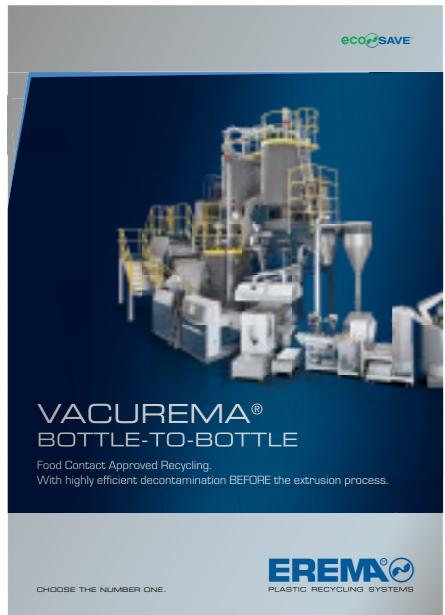


EREMA vacuum reactor. Flake decontamination BEFORE extrusion.

The patented pre-treatment at high temperature and in high vacuum before the extrusion process makes VACUREMA®

technology considerably more efficient compared to the decontamination of pellets which have already been extruded.

VACUREMA® – one system, three application fields.



decontaminates



homogenises



heats



dries



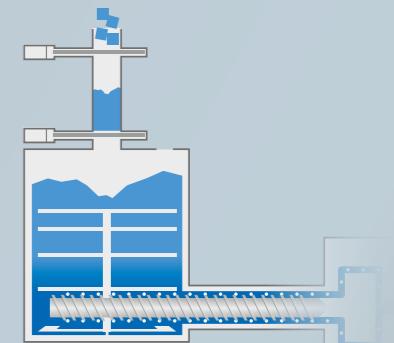
compacts



buffers



doses



Counter Current – a groundbreaking innovation.



In the past the material inside the vacuum reactor turned in the same direction as the extruder - forwards. The patented Counter Current technology now changes the direction of rotation inside the vacuum reactor: the plastic material thus moves in the opposite direction to that of the extruder screw. A simple effect with a major impact. Thanks to the improved material intake the VACUREMA® system ensures even greater flexibility and operational reliability in the processing of an extremely wide variety of materials.



VACUREMA® basic principles

Extremely flexible with input material

Depending on the end application the system processes PET bottle flakes, ground amorphous skeleton waste/edge trim and virgin material (also in mixtures), i.e. bulk densities of 250 to 850 kg/m³.

Highly efficient food contact compliant decontamination

Thanks to the patented pre-treatment of PET flakes, IV increase and decontamination are fast, reliable and energy-saving. This means that FDA quality (among other things) can be ensured for the end products produced.

IV stability through vacuum treatment

Despite varying moisture levels and different IV values in the input material, stable IV values are achieved through the patented pre-treatment method. This means, therefore, that input materials with higher material moisture levels can also be recycled.

Melting under vacuum

The patented pre-treatment at raised temperature and in high vacuum before the extrusion process removes moisture and migration materials from the feedstock very effectively and in a stable process environment. This prevents any hydrolytic and oxidative decomposition of the melt in the extruder.

Low thermal stress

The very short extruder screw without additional extruder degassing reduces the thermal stress on the material through minimised dwell time.

Large area ultrafine melt filtration

EREMA filter systems have very large active filter surfaces. This enables filtration with up to 32 µm fineness at low pressure. The result is highly clean pellets.

Compact design

Thanks to their compact design, VACUREMA® systems require much less space than other systems.

Minimum production costs with ecoSAVE®

Electricity accounts for 38 % of the costs of bottle-to-bottle recycling. Thanks to integrated ecoSAVE® technology, VACUREMA® systems stand out through the lowest production costs of all systems on the market.

Smart Start principle

The plant's software-based process control system gives you extremely easy and reliable operation and premium user-friendliness including automatic start-up at the press of a button, fully automatic continuous operation, permanent monitoring for direct food contact (FCC) and the storage of all relevant process parameters.

Turnkey solutions

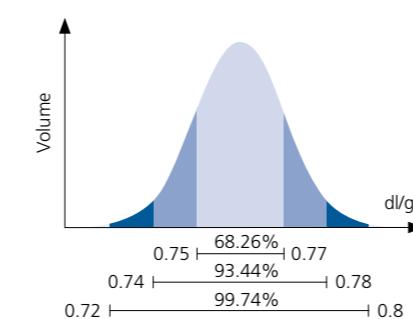
We deliver you turnkey systems with competent support from one contact for the entire recycling process: sorting – washing – decontamination – extrusion – quality control – end product.

VACUREMA® quality control

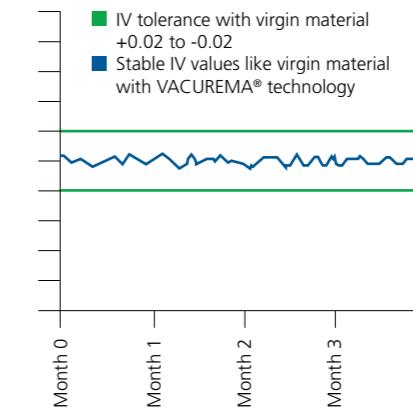
IV values in real time

The continuous online IV measurement, combined with the fully automatic plant control system, means you can influence processing parameters such as throughput, processing temperatures, etc.

Input IV – typical distribution



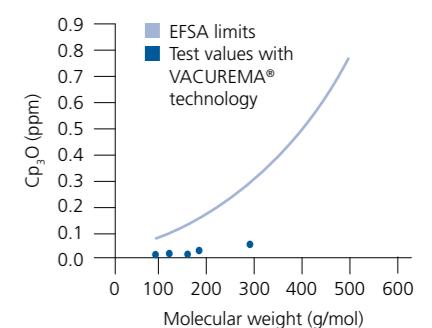
Output IV – with VACUREMA®



FCC – Food Contact Control – automatic operation mode

The parameters for direct food contact compliance are monitored and archived continuously in the recycling process on all VACUREMA® systems. Food Contact Control (FCC) supervises the recipe data stored.

This enables the flexible change to the process parameters required for the production of the respective recyclate. If levels go beyond defined limits an alarm is triggered automatically and (optionally) material flow is diverted away from the production line. This guarantees traceability.

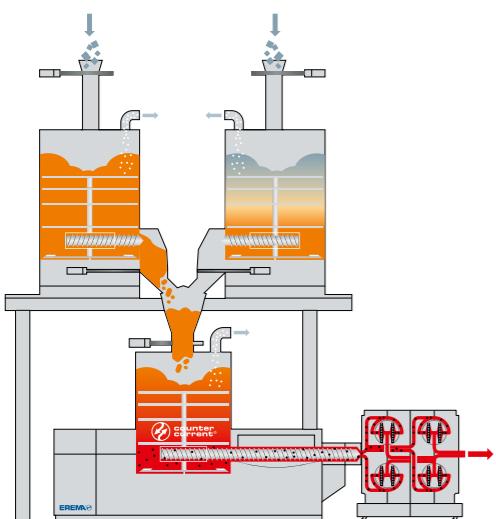


Bottle-to-bottle



VACUREMA® Prime

rPET pellets, extremely clean with IV like virgin material.



BRAND
OWNER
APPROVED

Technical benefits:

- **Minimum thermal stress and minimum discoloration** thanks to single energy input, preheated material and shortened extruder length
- **Batch operation** – guaranteed, adjustable dwell times for every single flake in the two crystallisation dryers ensure maximum cleaning efficiency
- **Highly efficient decontamination** fulfills and also far exceeds all well-known minimum purity requirements for direct food contact already after the batch process
- **FDA approved** (EFSA approval requested via customers and obtained), certification from major brand owners
- **Large area ultra-fine melt filtration**
- **Stable PET melt processing** with IV increase of up to 6 to 10 %
- **AA (acetaldehyde) content in pellets less than 1 ppm** – possible in combination with optional pellet flusher (no flusher required in the case of pre-drying before preform production)
- **Possible to process flakes from cooking oil bottles**

Economic benefits:

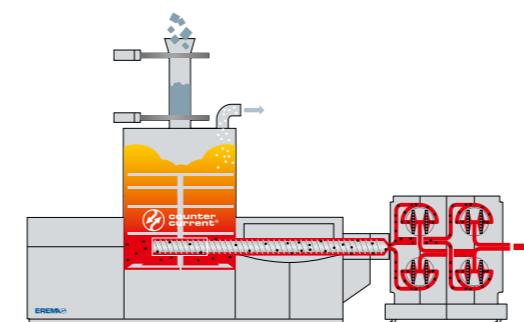
- rPET pellets identical in consistency and appearance to virgin material, choice of amorphous or crystalline
- Low production costs through specific energy consumption of 0.32 to 0.36 kWh/kg
- Total production costs for rPET from PET flake only approx. 0.10 euros per kg of finished BTB pellets
- Compact, space-saving design

Pelletising



VACUREMA® Basic

From PET waste to the finished end product with minimum energy requirements.



Technical benefits:

- **Minimum thermal stress** thanks to single energy input, preheated material and shortened extruder length
- Suitable for the production of food contact compliant, **ultrafine recycled pellets**
- **High starting material moisture content** up to 1 % and varying moisture permissible
- **Processing of PET recycled pellets melt with stable IV values**, minimum IV loss of 0 to 4 % and lowest energy requirements
- **Large area ultrafine melt filtration**
- **FDA approved** (EFSA approval requested via customers and obtained)

Economic benefits:

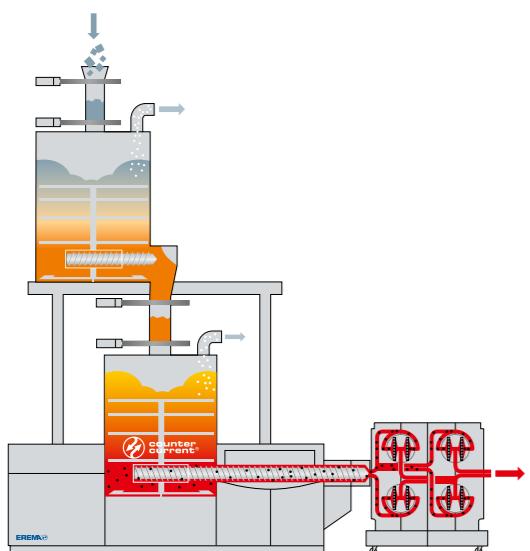
- rPET pellets identical in consistency and appearance to virgin material, choice of amorphous or crystalline
- **Low production costs** through specific energy consumption of 0.25 to 0.28 kWh/kg
- **Compact, space-saving design**

Pelletising



VACUREMA® Advanced

rPET pellets with proven recycling technology.



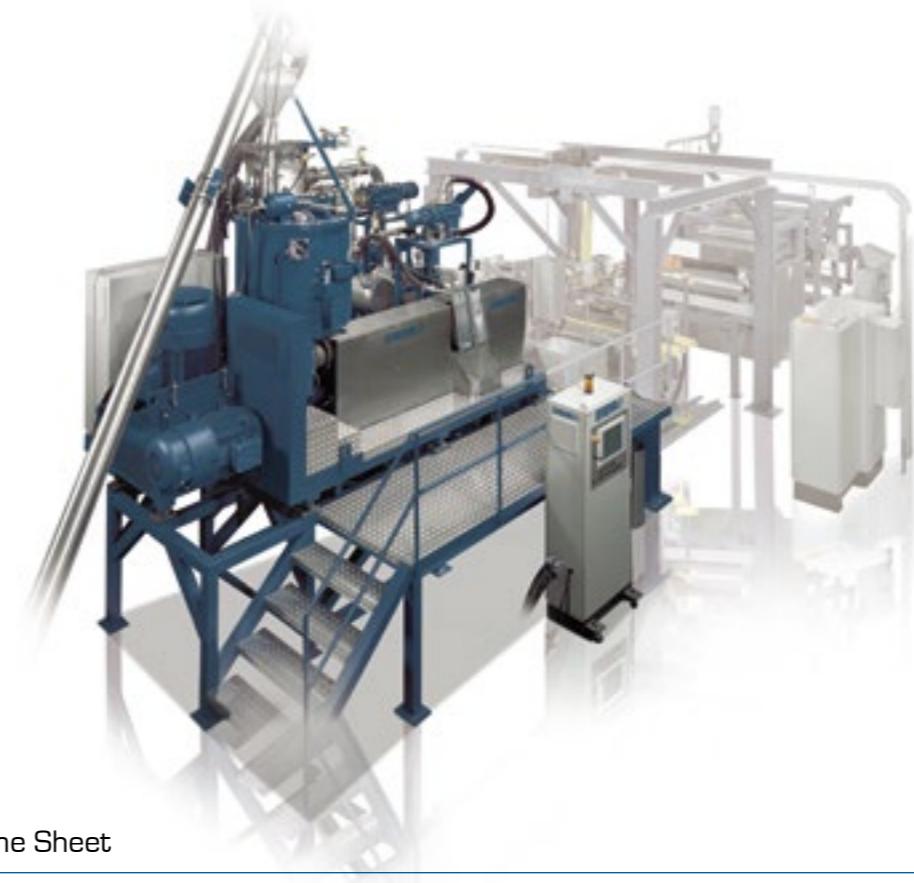
Technical benefits:

- **Minimum thermal stress and minimum discoloration** thanks to single energy input, preheated material and shortened extruder length
- **PET melt processing** with IV increase of up to 6 %
- **Stronger decontamination performance** through longer average dwell times
- **Large area ultrafine melt filtration**
- **FDA approved** (EFSA approval requested via customers and obtained)

Economic benefits:

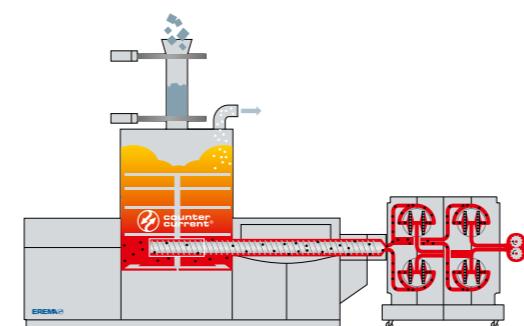
- **rPET pellets identical in consistency and appearance to virgin material**, choice of amorphous or crystalline
- **Low production costs** through specific energy consumption of 0.28 to 0.31 kWh/kg
- **Total production costs for rPET from PET flake only** approx. 0.10 euros per kg of finished BTB pellets
- **Compact, space-saving design**

Inline applications



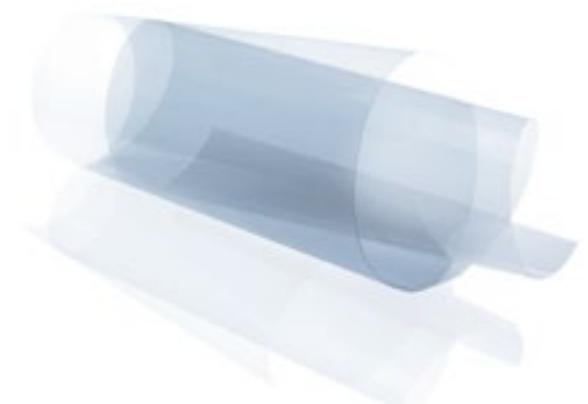
VACUREMA® Inline Sheet

Direct production of PET flat film.



Benefits:

- **Unrivalled system flexibility through the processing of a wide variety of input materials:** 100 % bottle flakes or mixtures or mixtures with virgin material, skeleton waste or edge trim
- Increase of value added through the **direct production of end products** without the detour of pelletising
- **Single-layer films are food contact compliant** in accordance with FDA categories A-H/J (EFSA approval requested via customers and obtained)



Inline applications



VACUREMA® Inline Strapping

Direct production of PET strapping.

Benefits:

- Input material: 100 % bottle flakes or mixtures with virgin material or strapping production waste
- **Top end product quality** possible with inferior quality input materials
- Unrivalled **low specific energy consumption** at 0.65 kWh/kg
- **Higher operational reliability** due to stable and high IV values
- **Stable and very tight molecular weight distribution** – important for the mechanical strength of the strapping



VACUREMA® Inline Fibre

Direct production of PET fibres.

Benefits:

- **Unrivalled system flexibility through the processing of a wide variety of input materials:** 100 % bottle flakes or mixtures or mixtures with virgin material
- **Large area ultrafine filtration** minimises the impact on the recycling process thanks to low pressure fluctuations when backflushing or changing screens

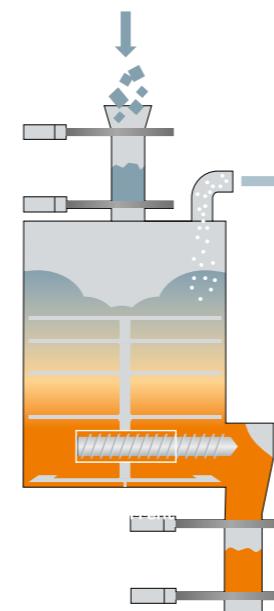


Inline applications



MPR®

Multi Purpose Reactor for the retrofitting of existing PET extrusion systems.



Technical benefits:

- High vacuum and high temperature **for effective decontamination**, drying and crystallisation of PET
- **Bulk density increase** of up to 80 % possible for PET flakes and flat film waste
- **Food contact grade end product** (such as e.g. flat film) in accordance with FDA categories A-H/J, EFSA and others
- **Possible to process feed materials with fluctuating residual moisture and bulk density**
- **Predrying to below 100 ppm moisture**
- **Slight increase of IV value possible**
- **Processing in high vacuum** achieves better flake colour results
- **Dust-free flakes** – no gelling problems
- **Materials with a low melting point** can be processed without bridge formation (e.g. PET/PE, PLA, PET-G)

Economic benefits:

- **Easy to retrofit** on existing PET extrusion plants
- **Energy requirement less than 0.1 kWh/kg**
- **Integrated ecoSAVE® technology** reduces energy consumption by up to 10 % as well as production costs and CO₂ emissions as a result
- **Compact, space-saving design**

Approvals for the food trade

	VACUREMA® Basic	VACUREMA® Advanced	VACUREMA® Prime	MPR®
Approved for direct food contact by/in: *	US FDA (category A-H & J), Austria, Switzerland, Canada, Brazil, Argentina, Uruguay, Paraguay, etc.*		US FDA (category A-H & J)	
Fulfils the following decontamination requirements/migration threshold specifications	EFSA approval requested via customers and obtained			
	European ILSI guidelines			
	German BGBl guidelines			
	French afssa guidelines			
	Brand owner guidelines			

*Other countries to follow further to applications by the respective VACUREMA® users.

SW RTF® melt filtration



The right system for all requirements

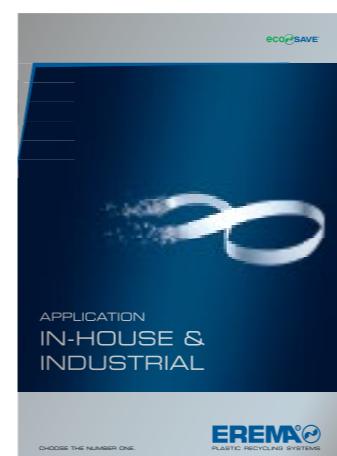
EREMA melt filter systems meet the very highest quality standards and stand out through their robustness, high degree of automation and high-performance availability. The right system with the right size and the right filtration fineness is available for all needs, depending on the field of application and the throughput range.

Customised.

The right system for every application.

EREMA's product range offers the right recycling solution for every application scenario. Besides systems for FDA-compliant bottle recycling our range also includes in particular systems for the in-house recycling of production waste and strongly contaminated post consumer waste, for fibres, nonwovens, tapes and textile fibres, plus special applications such PLA films, WPC or compounds.

Additional application brochures available



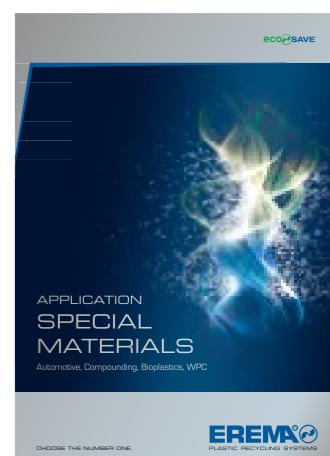
In-house & Industrial



Post Consumer

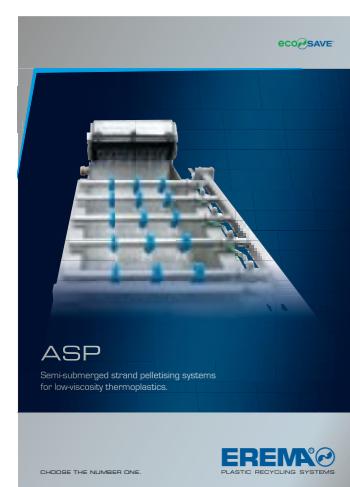


Fibre, Nonwoven, Tape, Textile



Special Materials
Automotive, Compounding, Bioplastics, WPC

ASP pelletising system



ASP

Semi-submerged strand pelletising systems for low-viscosity thermoplastics

The specialists in plastic recycling systems

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More questions?

We would be pleased to answer them!

Your EREMA advisor will be pleased to attend to your request personally and quickly. If you are interested in a demonstration or a test run with your specific material it would be a pleasure for us to make an appointment and welcome you to our EREMA Customer Centre at the headquarters in Ansfelden, near Linz in Austria.

We look forward to seeing you at EREMA!

For worldwide representatives please visit www.erema.at

Subject to technical modifications.

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APPLICATION

BOTTLE

Food Contact Approved

English

EREMA®
 PLASTIC RECYCLING SYSTEMS