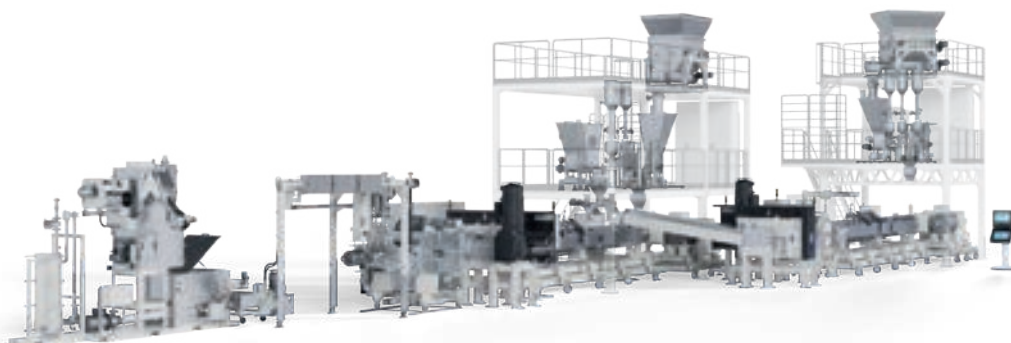




BE PART OF
the plastic change!

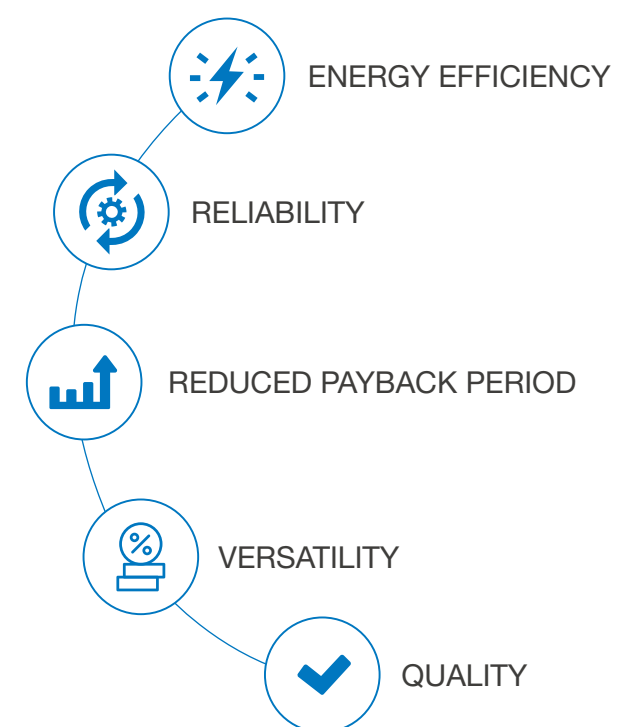


BANDERA
EXTRUSION INTELLIGENCE®

UP-CYCLING

Bandera Recycling Technologies are the definitive answer to the growing demand for extrusion recycled, with the same range of quality and quantity of traditional raw material.

Recycled becomes a new raw material, for a high-end result with high added value.



BANDERA areas of expertise in **RECYCLING**

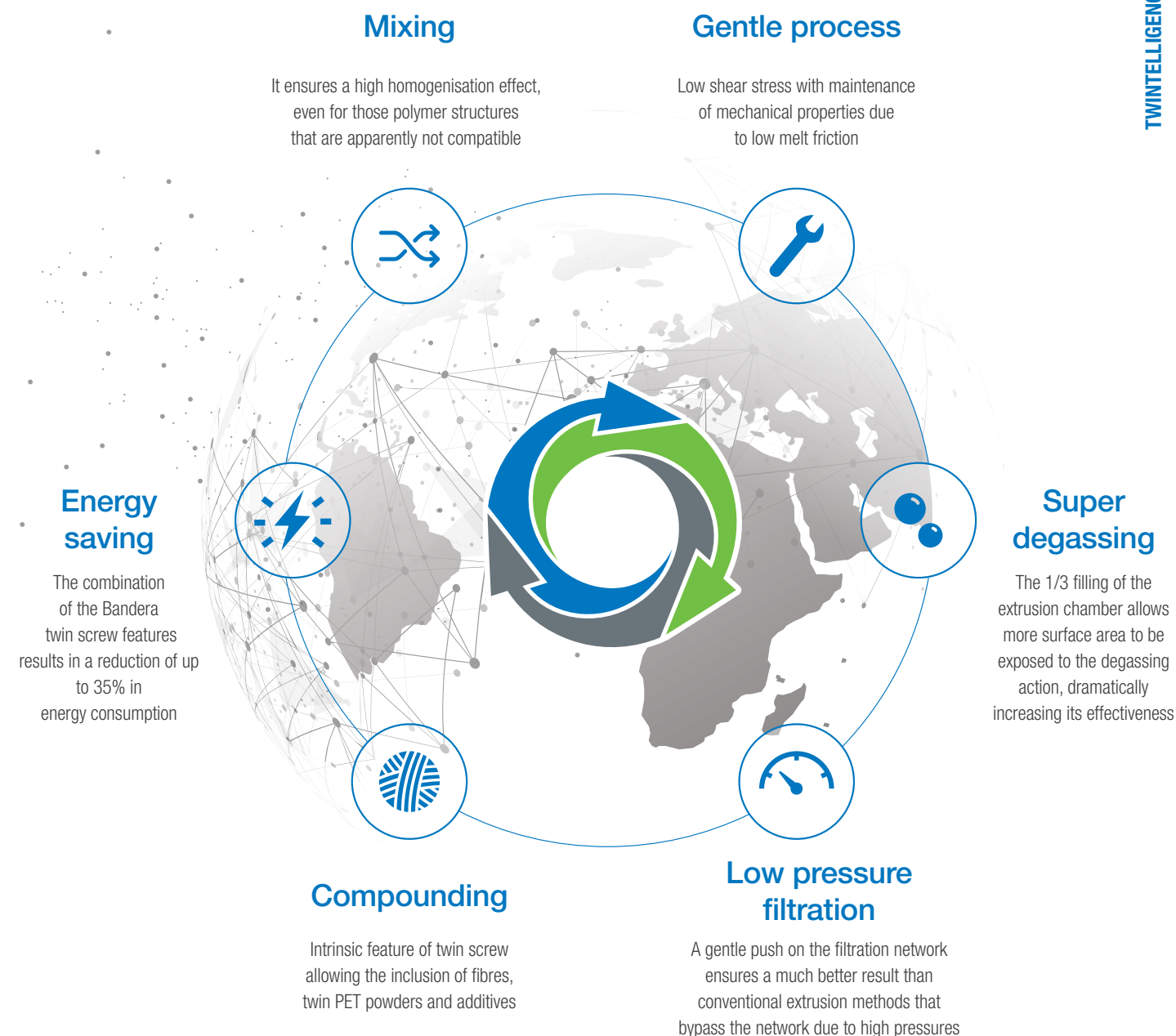


Twintelligence™

Co-rotating twin screw

The best technology on the market to enhance the characteristics of the starting material.

Bandera recycling technologies can process post-industrial waste and/or post-consumer to obtain a recycled polymer with quality and purity comparable to virgin (up-cycling), with the possibility of understanding also special features such as mineral fillers or fiber inclusion.



Extruding Future Plastics Now®



01

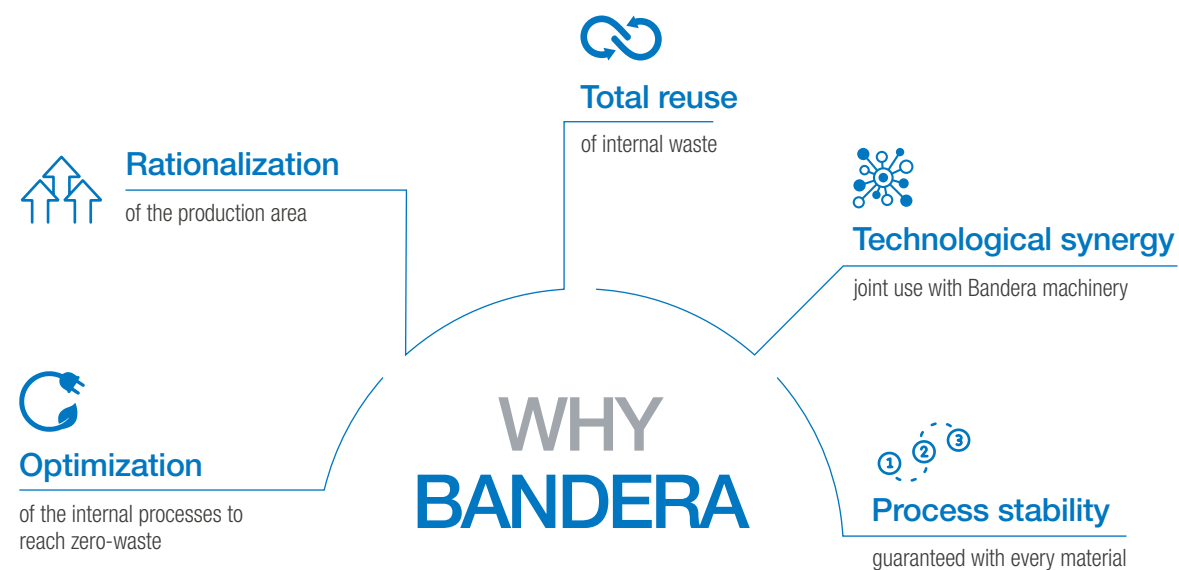
IN-HOUSE FLEXIBLE FILM

Technology

Bandera in-house product range is based on the experience and leadership gained in over 70 years of excellence in the field of extrusion of plastics for packaging and converting. From this synergy comes the recycling technology strongly oriented to the quality of the final product.

Aim

Offer in-line and off-line solutions for industrial waste data from refills/contouring, line production change, quality control.



TRIM FLEX®

- In-line solution for trimming operation
- Output up to 80 kg/h
- Counter rotating twin screw technology
- Possibility of use in synergy with Bandera Blown Film/cast line



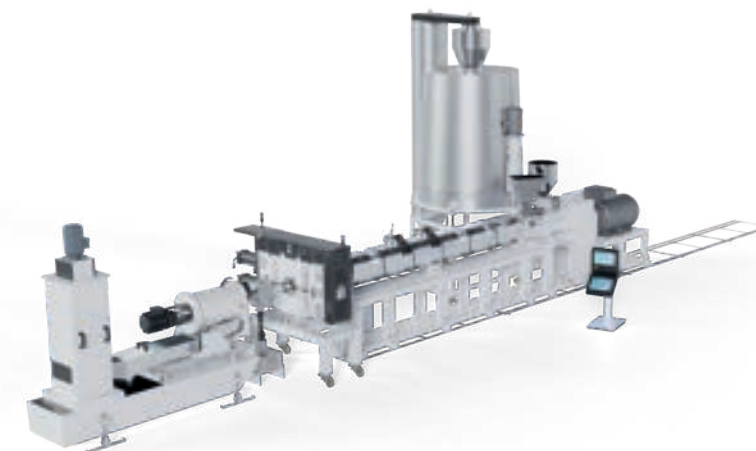
REEL FLEX®

- Off-line solution for faulty reels and waste production
- Output up to 150 kg/h
- Counter rotating twin screw technology



TWIN FLEX®

- Up-cycling line
- Extruder with co-rotating twin screw for the recovery of waste of Blown Film and cast lines
- Recovery and reuse up to 100% of production waste



The machines

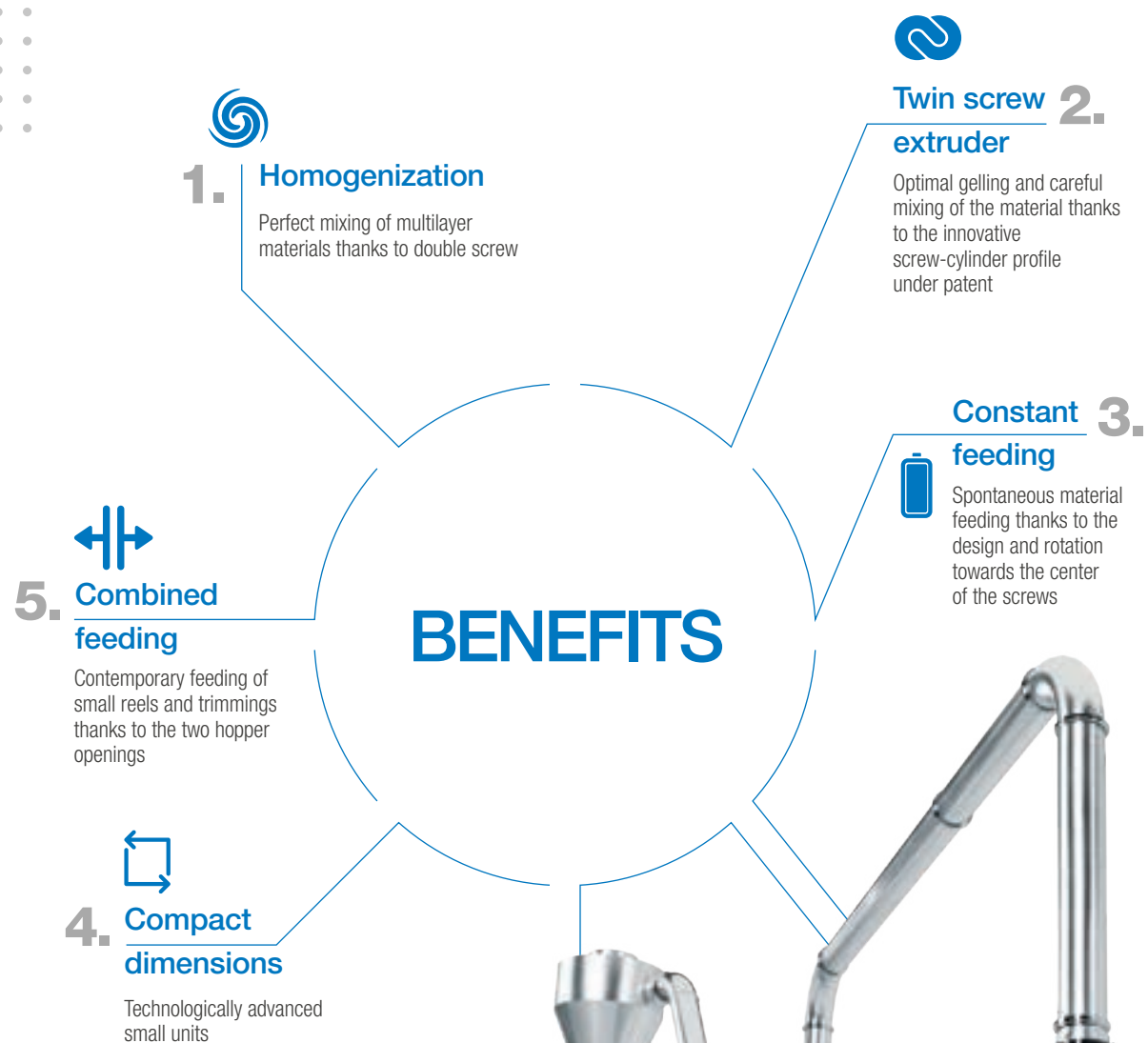
Raw materials

Product	Biobased plastics	Lightly printed film	Edge trim (e.g. PE/PA/EVOH)	BOPP film	Multiple layer film reels (e.g. PE/PA/EVOH)	PP non woven	PE crosslinked film	PP sacking/ raffia
Trim FLEX®	X		X					
Reel FLEX®	X	X			X	X		
Twin FLEX®	X	X		X	X	X	X	X



TRIM FLEX® i61/i72

Trim FLEX® comes from the deep knowledge of flexible packaging



MATERIALS

- Bioplastic
- Edge trim (PE/PA/EVOH)



SIZES

- Trim FLEX® i61: up to 40 kg/h
- Trim FLEX® i72: up to 80 kg/h

LINE SUPERVISOR SYSTEM ANY MA®

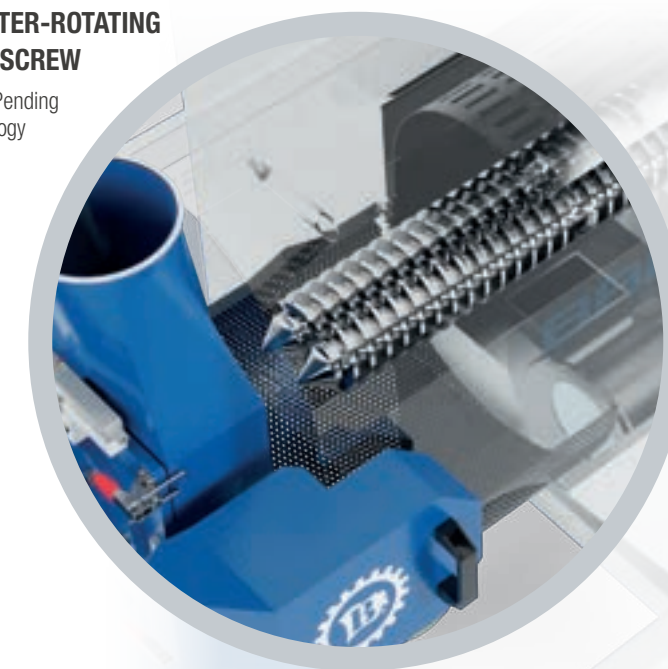


AIR CUTTING SYSTEM



COUNTER-ROTATING TWIN SCREW

Patent Pending Technology



REEL FLEX®

Compact and flexible unit for recycling

Reel FLEX® has been specially designed for complex productions where the quantity of lines implies a high accumulation of production waste.

It is a very flexible solution that adapts to any form of plastic waste solving the disposal problems.



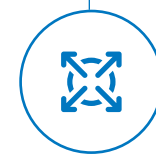
FEEDING SYSTEMS

- Forcing silo with horizontal auger
- Inclined auger feed for rigid materials



MATERIALS

- Biobased plastics
- Lightly printed film
- Multiple layer film reels (e.g. PE/PA/EVOH)
- PP non-woven



SIZES

- Reel FLEX®: up to 150 kg/h

1.



Complete gas evacuation

Advanced degassing system for simultaneous humidity extraction and VOC (optional)



Counter-rotating twin screw

Optimal gelling and careful mixing of the material thanks to the innovative screw-cylinder profile under patent

2.



Homogenization

Perfect mixing of multilayer materials thanks to double screw

3.



Adaptability

Configurable feeding for all types of waste: reels, bulk, trimmings, folders, fluff, etc

4.

6.



Filtration

Manual filtration device to remove dust or other contaminants that may have deposited on the material during storage (optional)

BENEFITS

5.



Water cutting system

Water cutting and pelletizer with dedicated supply chain for superior granules quality even at increased productivity



WATER CUT

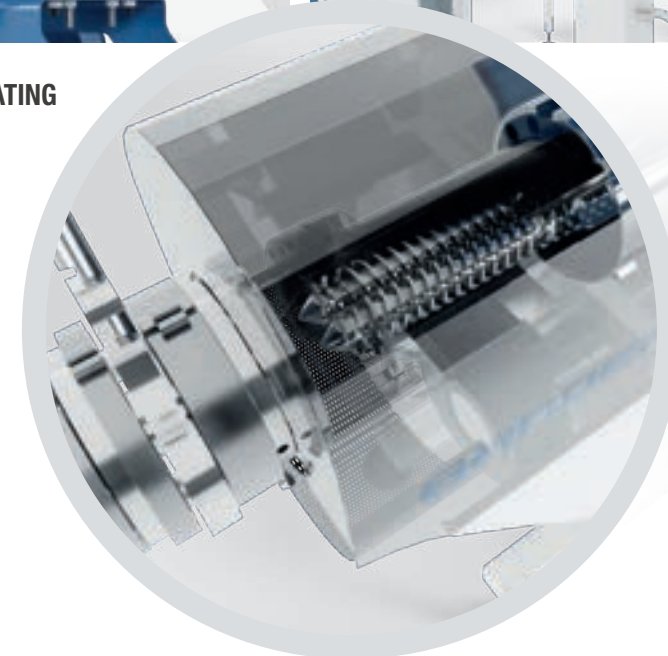


FEEDING SYSTEM



COUNTER-ROTATING TWIN SCREW

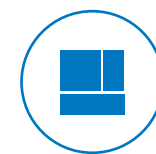
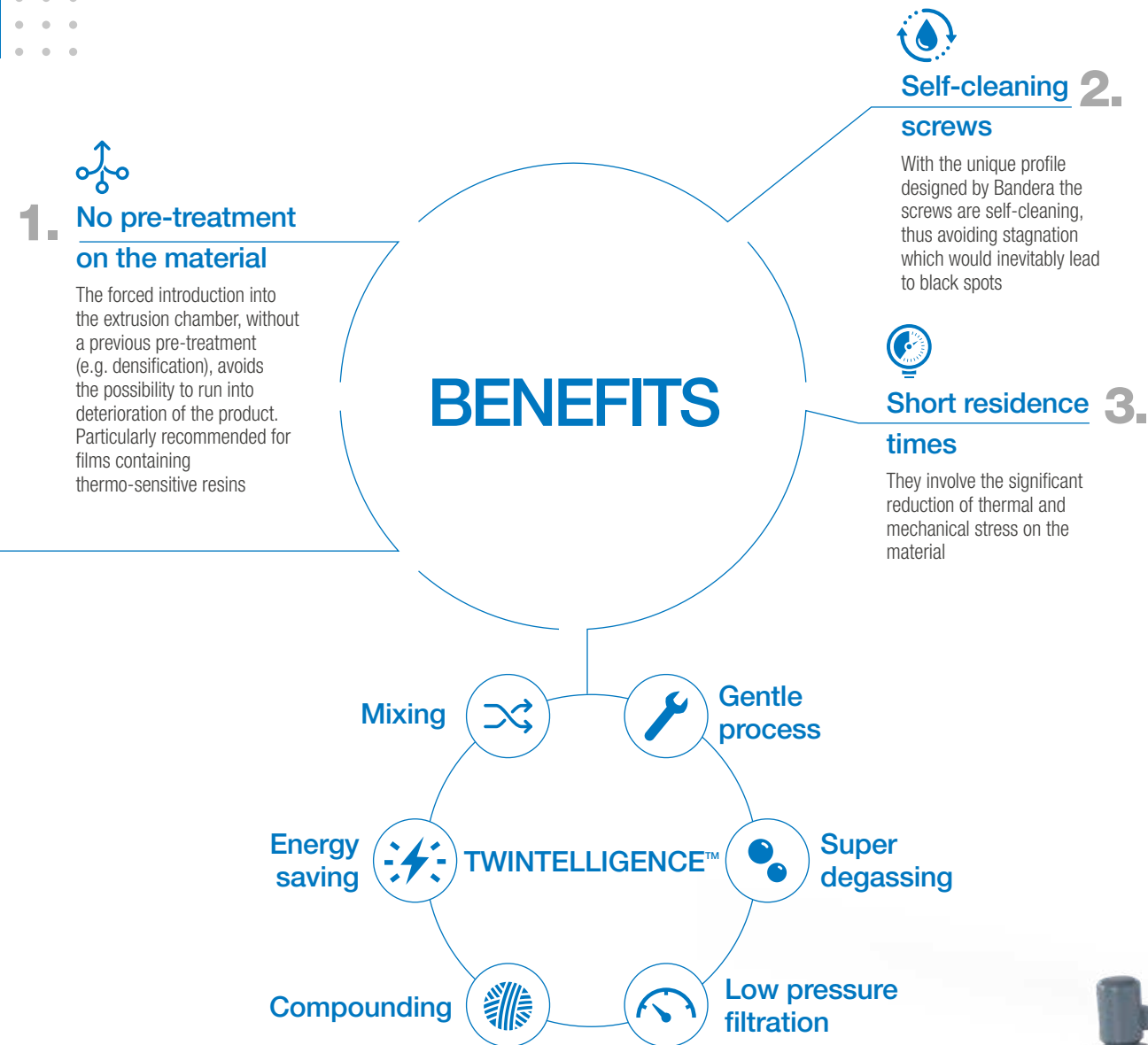
Patent Pending Technology





Recovery and up-cycling of industrial waste

The Bandera co-rotating system is able to reprocess up to 100% of waste, convertible into a high added value product not dissimilar from the raw material and particularly recommended for the recovery of technical films (cross-linked) or barrier multi-material films (PE/PA/EVOH).



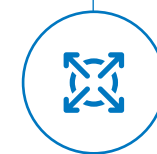
OPTIONAL

- Grinder
- Silo-Buffer
- Oil cooled extruder
- Water cooled engine
- Melt pump
- Vibrating screen for granule cooling separation
- Granule storage



MATERIALS

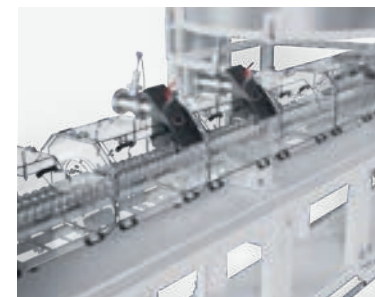
- Bioplastic
- Lightly printed
- BOPP film
- Multiple Layer film
- PP non-woven
- PP sacking /raffia
- PE crosslinked-film



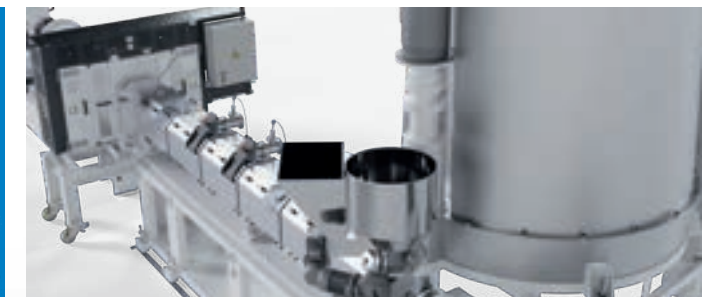
SIZES

- Twin **FLEX®** 70: 150-300 kg/h
- Twin **FLEX®** 85: 350-600 kg/h
- Twin **FLEX®** 105: 650-1000 kg/h
- Twin **FLEX®** 135: 1100-1500 kg/h

DEGASSING



DOSING SYSTEM RAW MATERIAL + ADDITIVES



Comparison

Product	Single screw	Twintelligence™
Multi material (PE/PA/EVOH)	• Inhomogeneity • Processable in low % • Burn marks on the final product	• High homogenization degree • Gas evacuation • 100% reusable
Barrier with EVOH	• Black spots • Stagnation on the screw	• Self-cleaning screws • Low shear stress: no degradation
Cross-linked film	• Not processable • Non-recoverable	• Processable • Up to 50% reusable



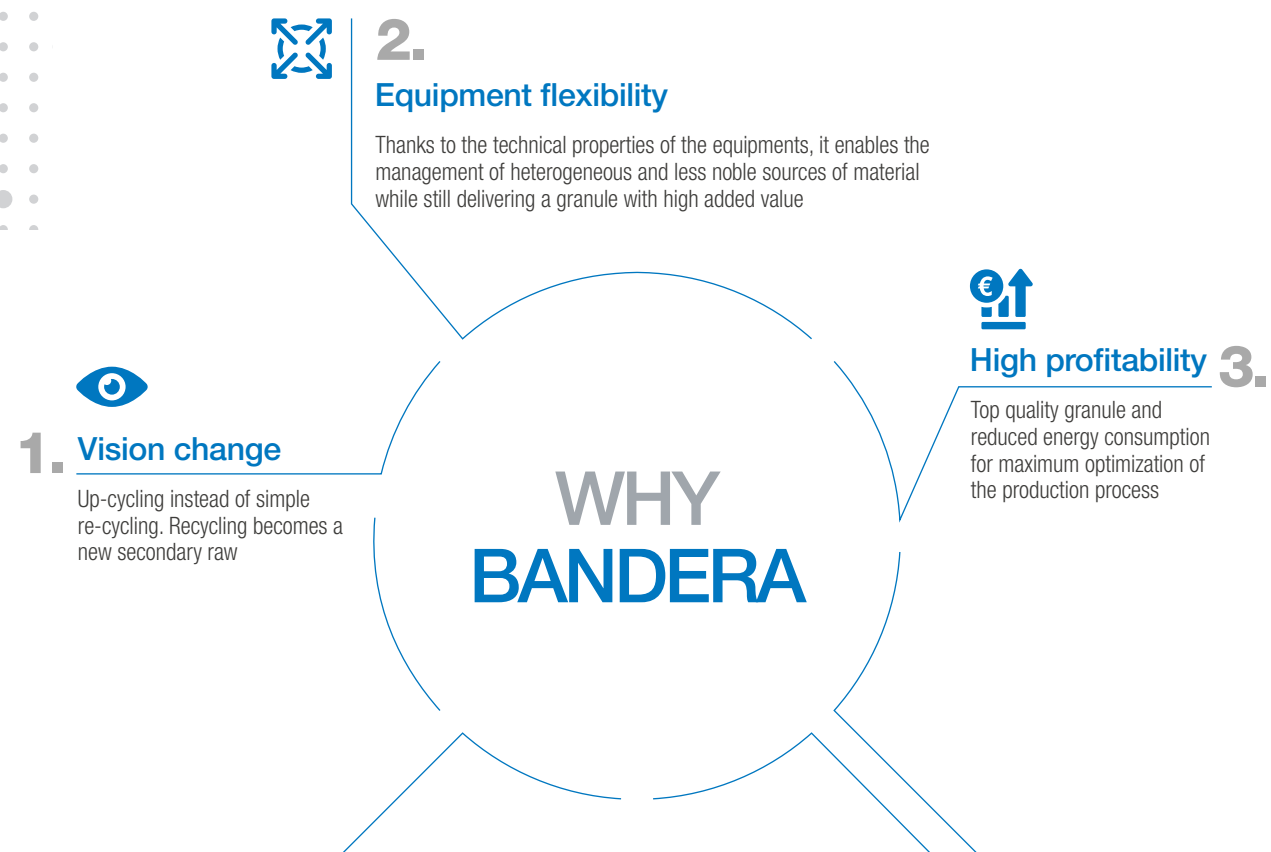


02

PCR POLYOLEFINS

In post-consumer recycling, the flexibility of the Bandera equipment allows to manage heterogeneous materials, even non-noble, producing high added value granules.

Bandera meets the specific needs of this sector with solutions that combine flexibility, stability, reliability and high flow rates to improve economies of scale and energy efficiency.



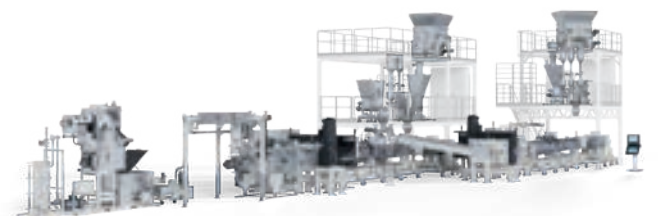
TWIN PCR

- Simple and versatile equipment, able to adapt to all forms of polyolefin waste; the ideal tool even for companies that have just entered the world of recycling
- Twintelligence™ technology with capacity up to 3000 kg/h



TWIN TANDEM PCR

- Customizable and flexible equipment, able to obtain a real secondary raw material
- Twin screw cascade technology with high capacities



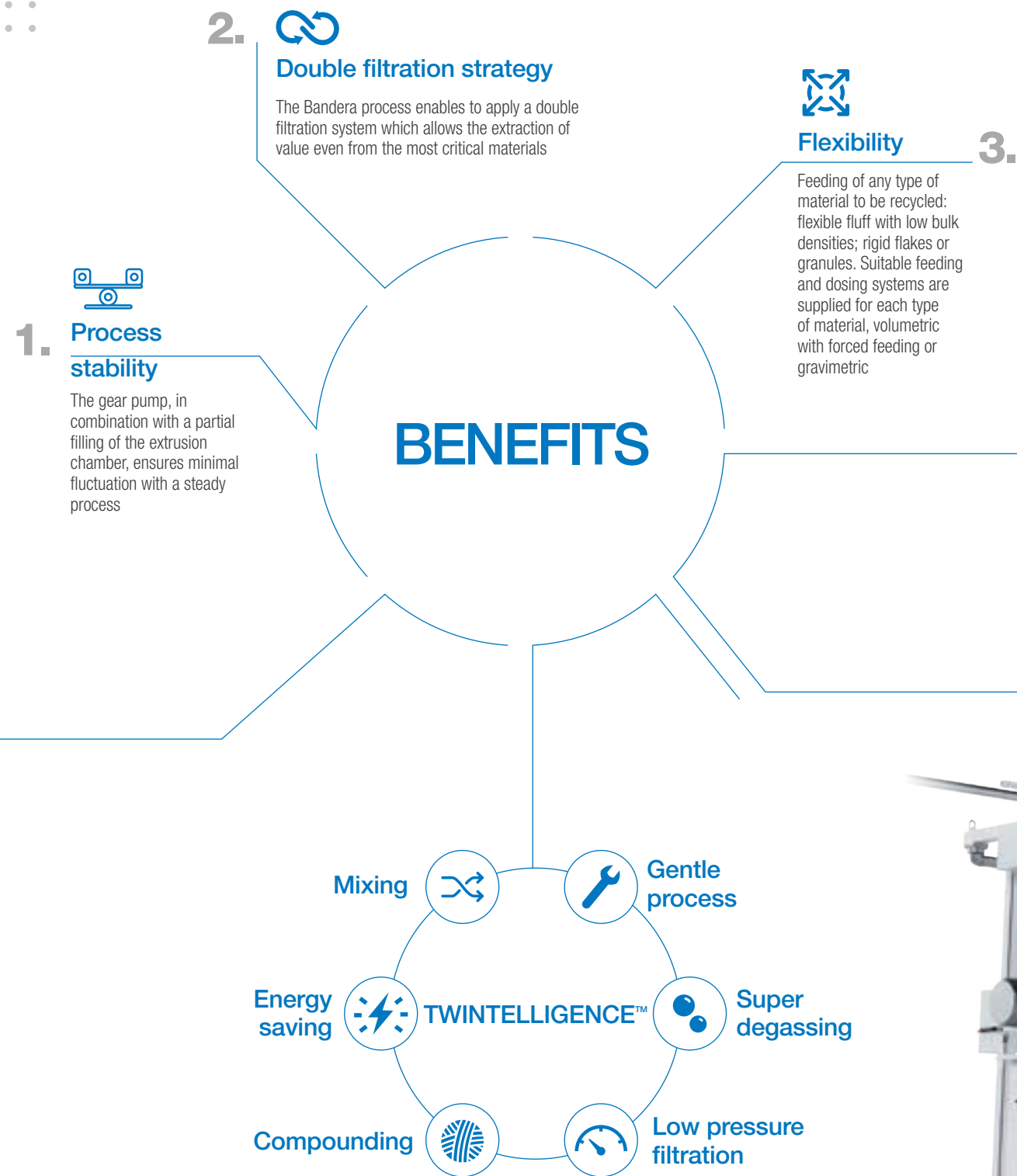
Raw materials

Product	HDPE PCR	PC/ABS PCR (e.g. automotive or RAE)	PP PCR	PS PCR	Heavily printed metalised	Heavily contaminated	Flexible film PCR (e.g. Agri & Geo)
TWIN PCR	X	X	X	X			X
TWIN TANDEM PCR	X	X	X	X	X	X	X

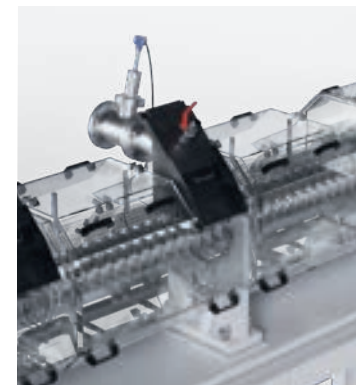
TWIN PCR

Smart solution for treating polyolefins

Solution that allows processing the blends of heterogeneous materials while maintaining all the original characteristics unaltered. Ideal equipment for the production of premium materials.



ADDITIONAL TWIN SCREW FOR COMPOUND



DEGASSING SYSTEM FOR ODOR REMOVAL



DOSING SYSTEM FOR CONSTANT AND STABLE RECIPES



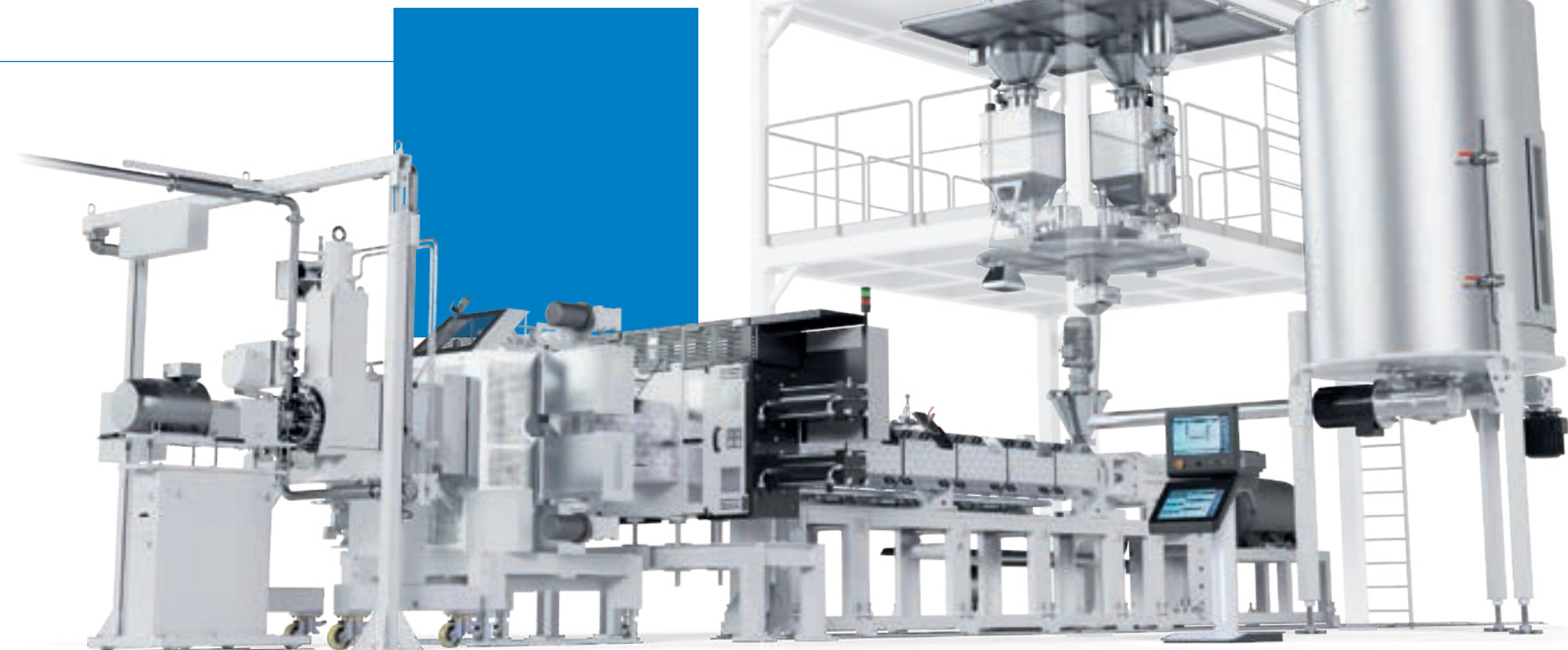
MATERIALS

- HDPE PCR
- PC/ABS PCR (e.g. automotive or RAEE)
- PP PCR
- PS PCR
- Flexible film PCR (e.g. Agri & Geo)



SIZES

- TWIN PCR 105: capacity 650-1000 kg/h
- TWIN PCR 135: capacity 1100-2000 kg/h
- TWIN PCR 170: capacity 2100-3000 kg/h

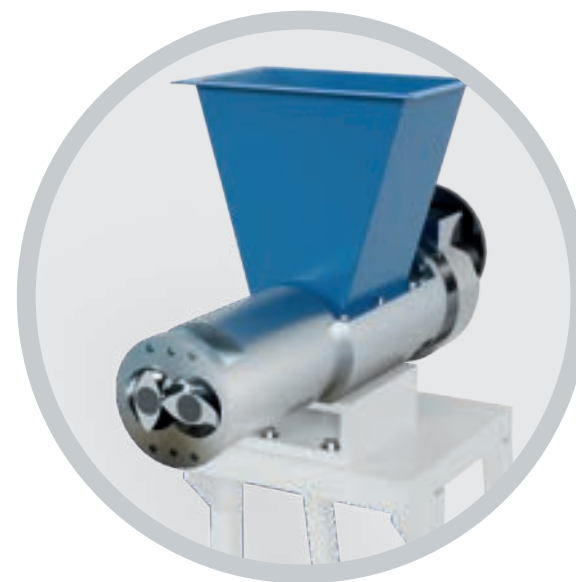


TWIN TANDEM PCR

Top solution for treating polyolefins

Solution with the highest technological content: a pair of co-rotating twin screws working in “cascade” mode, with a double dosing station and lateral feeders for adding new materials.

ADDITIONAL TWIN SCREW FOR COMPOUND



MATERIALS

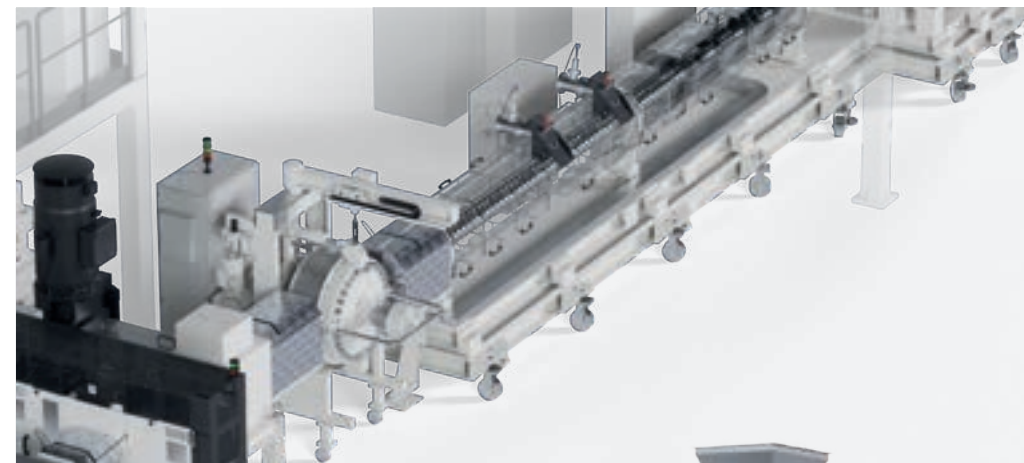
- HDPE PCR
- PC/ABS PCR (e.g. automotive or RAEE)
- PP PCR
- PS PCR
- Heavily printed metalised
- Heavily contaminated
- Flexible film PCR (e.g. Agri & Geo)



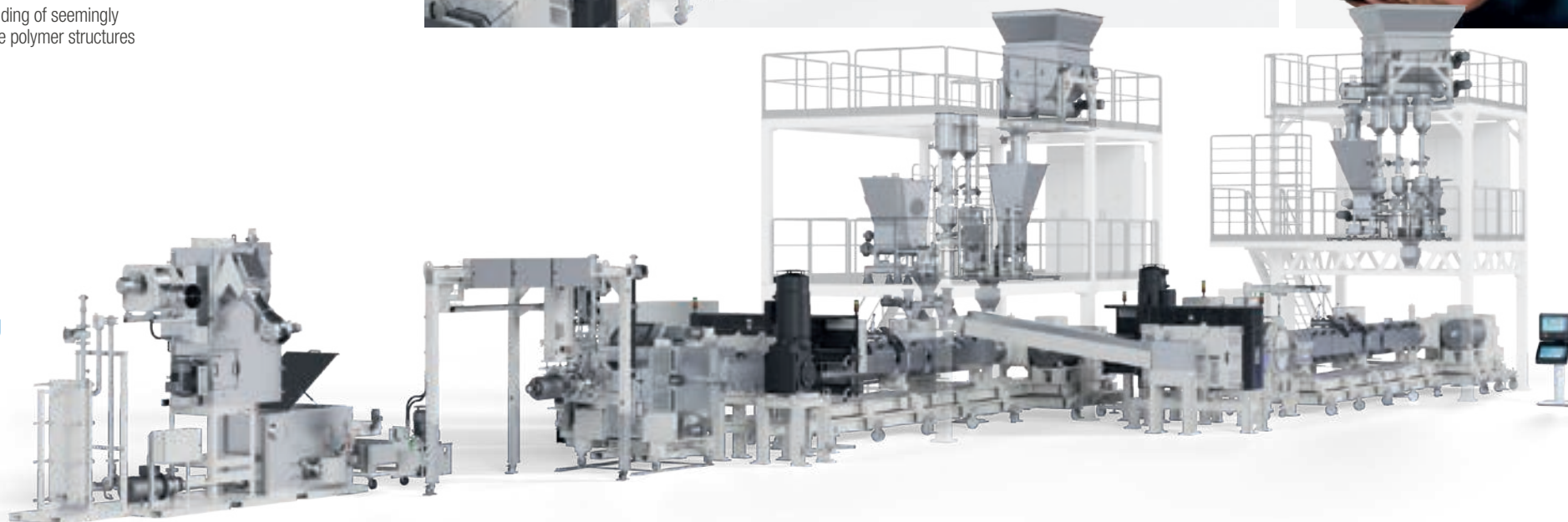
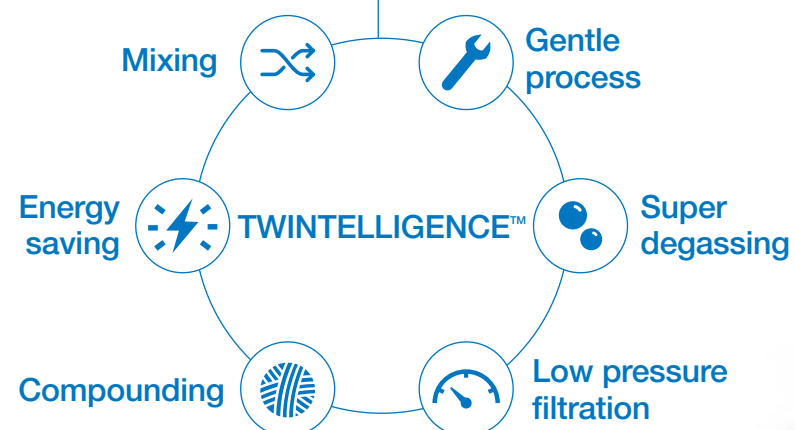
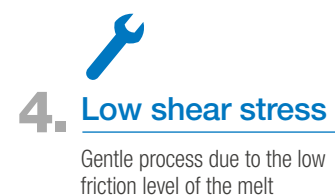
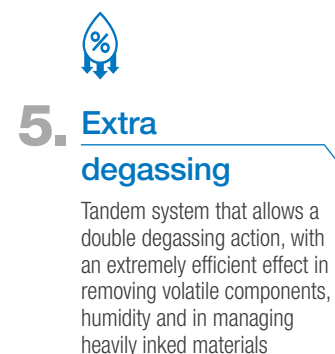
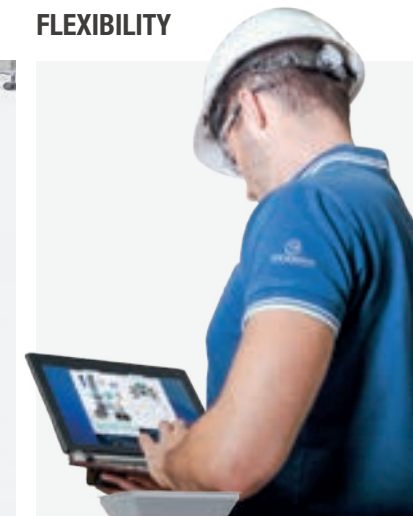
SIZES

- TWIN TANDEM PCR 105: capacity 650-1000 kg/h
- TWIN TANDEM PCR 135: capacity 1100-2000 kg/h
- TWIN TANDEM PCR 170: capacity 2100-3000 kg/h

CUSTOMIZATION



FLEXIBILITY



03

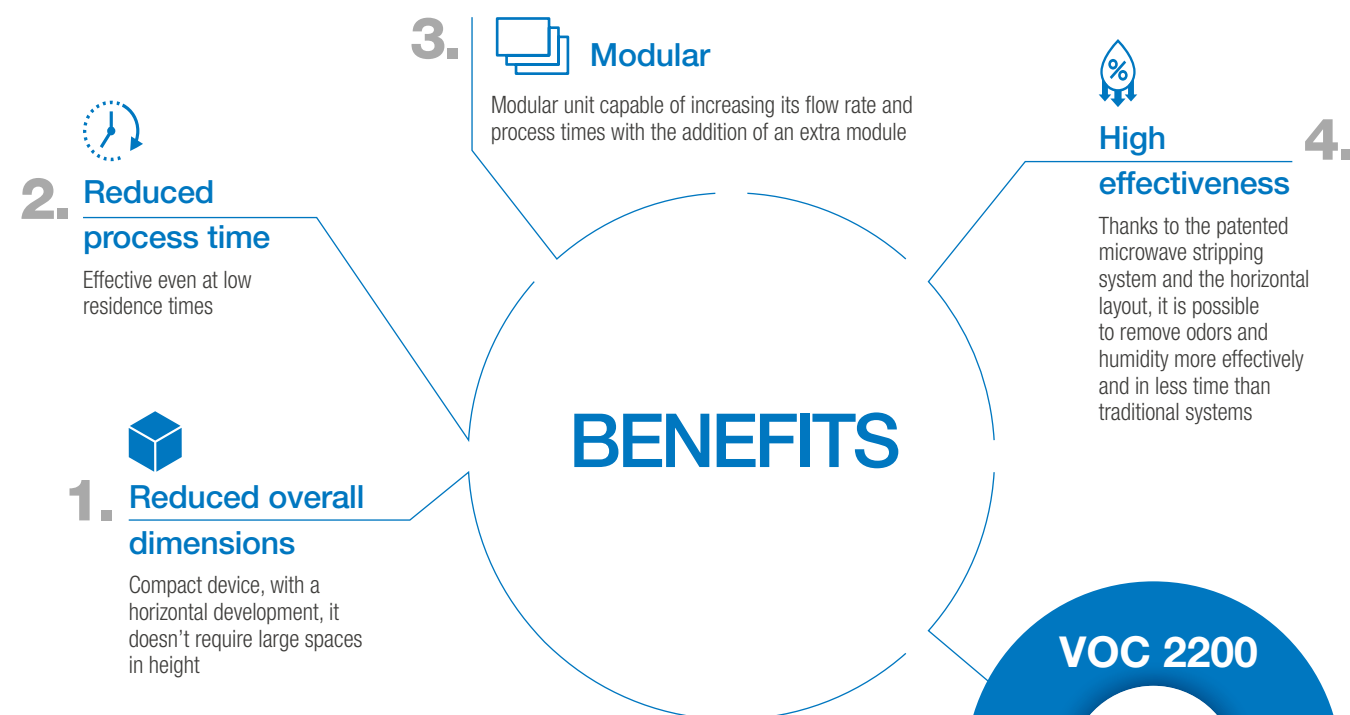
VOC & ODOR REMOVAL

New life to the PCR pellet

Heterogeneous materials and contaminations can compromise the quality of the extruded granule due to the accumulation of unwanted materials on the filter, leading to the development of by-products and bad odor.

Up-cycling: Bandera has developed a system for the removal of humidity and volatile organic components through a patented microwave system that acts on pellet, thus obtaining a secondary raw material suitable for even the most demanding industries.

The process is able to work in-line and off-line to optimize work times and reduce machine downtime.



VOC 2200

Modules	Capacity 2 h (kg/h)	Capacity 4 h (kg/h)	Capacity 6 h (kg/h)
1	1440	720	480

VOC 4400

Modules	Capacity 2 h (kg/h)	Capacity 4 h (kg/h)	Capacity 6 h (kg/h)
2	3000	1500	1000

VOC 6600

Modules	Capacity 2 h (kg/h)	Capacity 4 h (kg/h)	Capacity 6 h (kg/h)
3	4500	2250	1500

VOC 10000

Modules	Capacity 2 h (kg/h)	Capacity 4 h (kg/h)	Capacity 6 h (kg/h)
4	6000	3000	2000

MICRO-ONDE VS VOC & ODOR

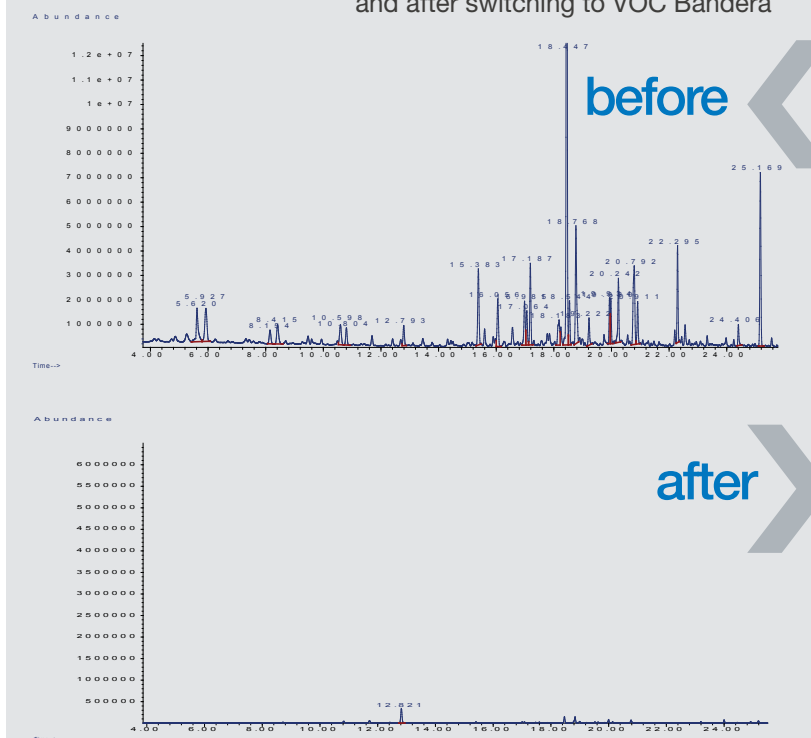
The revolutionary Bandera patented technology is based on the concept of stripping which acts through a series of micro-wave devices (patented); have the ability to reach in an extremely specific way only the offending molecules, together with a counter-current flow of hot air.

Sizes



ODOR REMOVAL

Gas chromatography results before and after switching to VOC Bandera

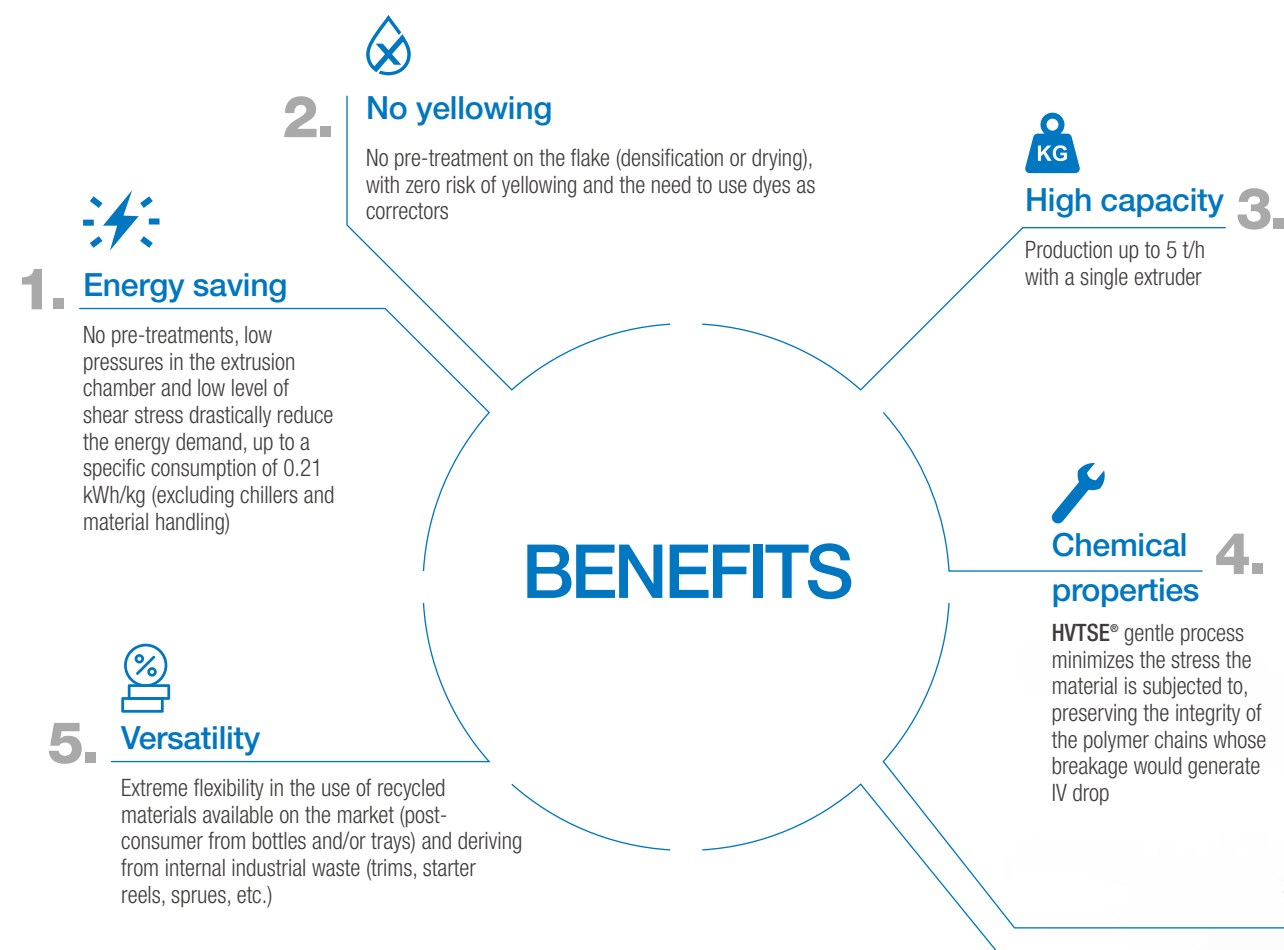


04 PET PCR

Rewriting quality standards

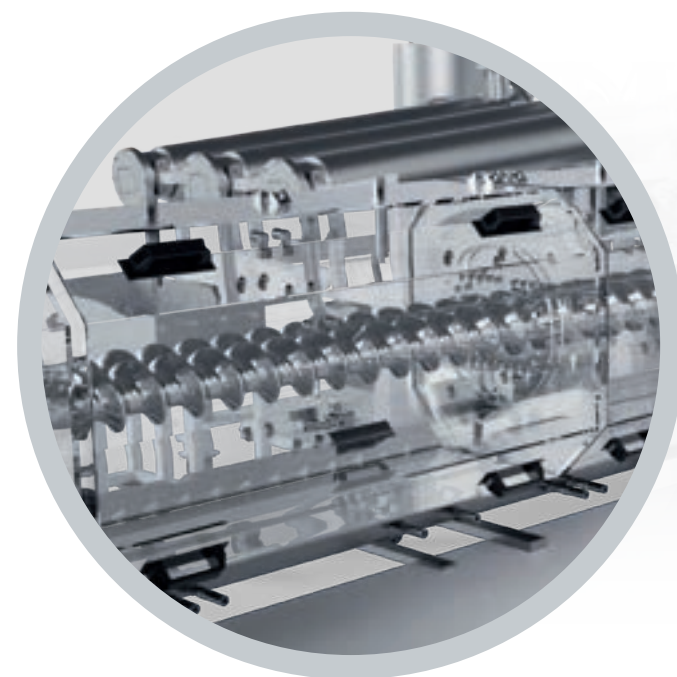
Bandera's long experience in the world of PET, with over 300 flake treatment plants worldwide, has allowed the development of a technology not only capable of delivering a quality granule, but also of redefining new market standards, offering plants with high capacities and with a minimum kWh/kg energy incidence for being able to prime economies of scale to ensure a better return on investment.

The patent **HVTSE®**, patent is based on the co-rotating twin-screw extrusion technology, with a length ratio of 52 diameters, designed to ensure a very high degassing efficiency while minimizing material degradation.

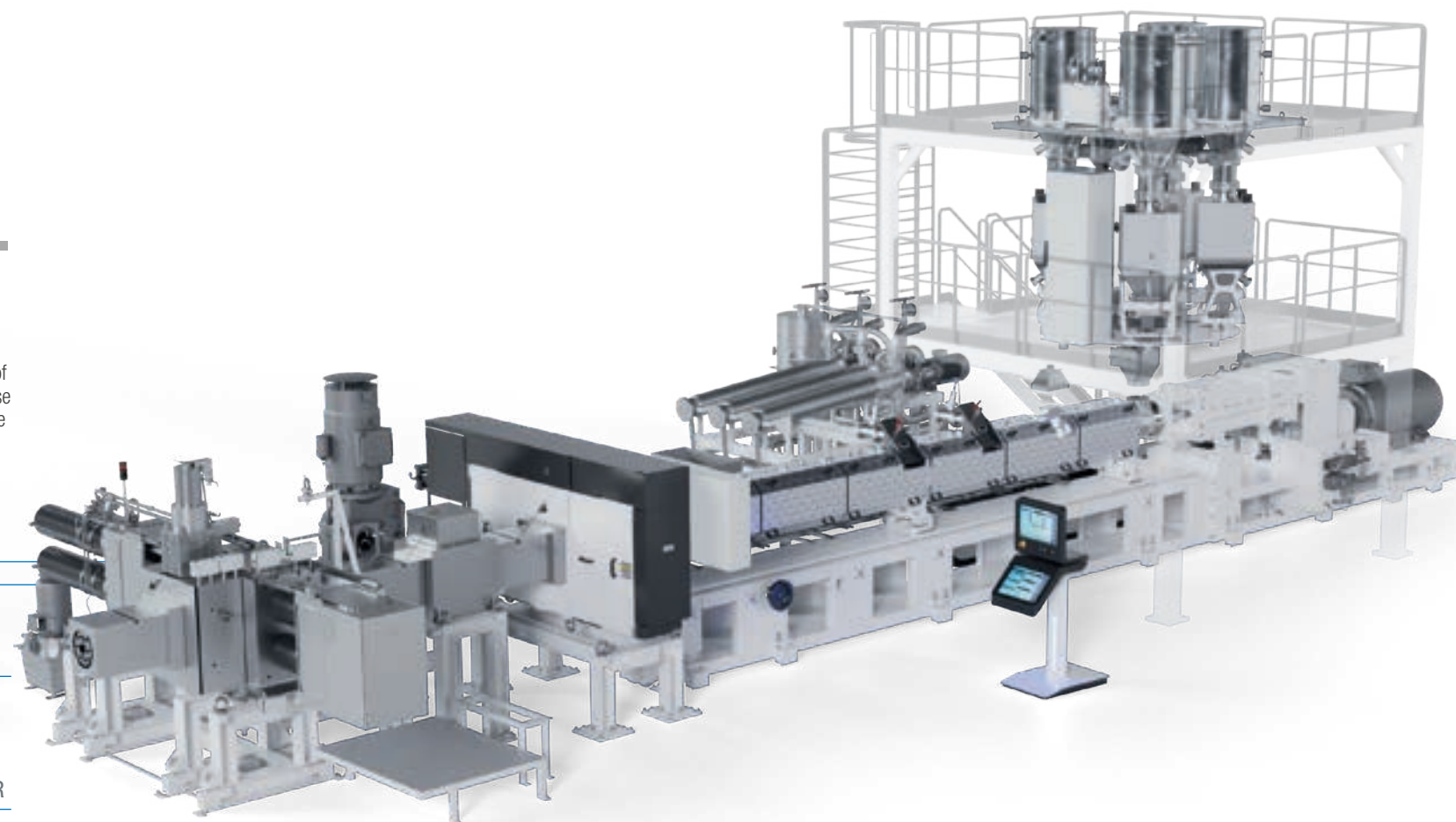


Raw materials

Product	PET bottle flakes PCR	PET Flat Film waste PIR	PET skeleton waste PIR	PET dust/fines PCR	PET trays PCR	PET washing plant waste PCR
TWIN PET	X	X	X	X	X	X



- MATERIALS**
- PET bottle flakes PCR
 - PET flat film waste PIR
 - PET skeleton waste PIR
 - PET dust/fines PCR
 - PET trays PCR
 - PET washing plant waste PCR
- SIZES**
- TWIN PET 1600: capacity 1100-1600 kg/h
 - TWIN PET 2300: capacity 700-2300 kg/h
 - TWIN PET 3000: capacity 2400-3000 kg/h
 - TWIN PET 4000: capacity 3100-4000 kg/h
 - TWIN PET 5000: capacity 4100-5000 kg/h



05

BOTTLE-TO-BOTTLE APPLICATION

Easy, stable, circular

Thanks to the synergy between Bandera technology and Polymetrix, market leader in the production of SSP, it is possible to reach the “bottle grade” through the process of solid state postpolycondensation.

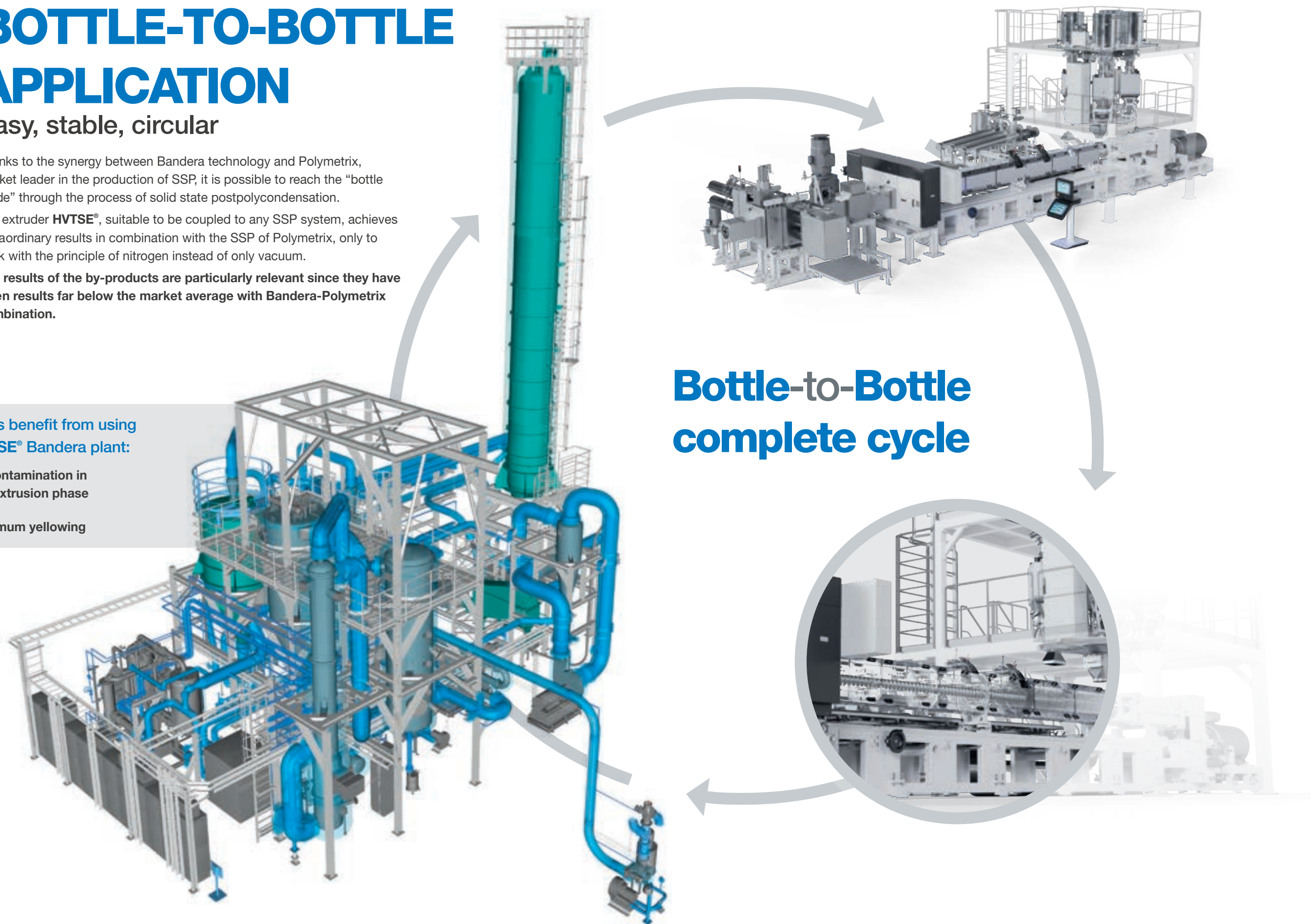
The extruder **HVTSE®**, suitable to be coupled to any SSP system, achieves extraordinary results in combination with the SSP of Polymetrix, only to work with the principle of nitrogen instead of only vacuum.

The results of the by-products are particularly relevant since they have given results far below the market average with Bandera-Polymetrix combination.

SSPs benefit from using **HVTSE®** Bandera plant:

1. Decontamination in the extrusion phase
2. Minimum yellowing

Bottle-to-Bottle complete cycle



06

HOUSE OF EXTRUSION®

Test the material | **Prove** the result | **Lead** the market

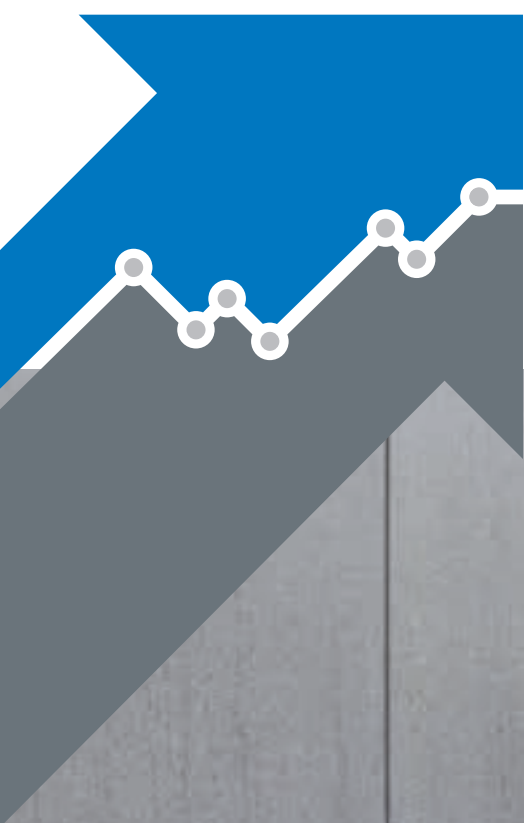
The **House of Extrusion®** Bandera is the most innovative European center for extrusion in the packaging & converting sector.

The 6000 m² area is dedicated to R&D activities and extrusion tests on complete production lines where to create new solutions capable of anticipating market demands together with customers, the academic world and research centers.

The R&D activity in the **House of Extrusion®**, protected by accurate NDA, can be carried out in partnership with Bandera or independently.

SUSTAINABILITY IS ALREADY BENEFICIAL

ECOlogically sustainable = **ECO**nomically advantageous



ENGLISH 2023



RECYCLING

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