

Starlinger
RECYCLING
TECHNOLOGY



Starlinger – Key Data



World market leader in the fields of woven plastic packaging and PET recycling and refinement



Founded 1835 in Vienna (Headquarters)
Production sites in Weissenbach/Austria, St. Martin/Austria and Taicang/China
Sales & Service Centre in: Brazil, China, India, Indonesia, Mexico, Russia,
South Africa, Thailand, USA, Uzbekistan



Approx. 860 employees worldwide (710 in Austria)



Annual turnover: approx. EUR 310 million
Export quota: over 99%



Starlinger customers in over 130 countries produce approx. 30 billion sacks per year

Starlinger: CSR and Sustainability

- Starlinger has implemented a number of measures in the areas of CSR and sustainability, from simple steps up to comprehensive projects.
- Since 2020, Starlinger is also a member of respACT, Austria's leading platform for Corporate Social Responsibility (CSR) and Sustainable Development.



Starlinger: CSR and Sustainability Projects



Social commitment

We promote social development projects and programmes such as women in technical professions, support regional fire brigades and sports clubs and provide assistance in the event of natural disasters.



Technical experience

Thanks to our extensive experience as a machine manufacturer in the plastics industry, we are aware of the potential of plastics in the fields of processing and recycling. This combination allows us to actively promote a better integration of plastics as a valuable resource within the material loop.



Attractive opportunities

For decades, we have supported young talents and have been training apprentices. We also support our employees with financial contributions to childcare, additional capacity building and training, and by offering health care benefits. These measures contribute to a safe and fair working environment with the possibility to acquire new skills and qualifications.



Resource-efficient production

Through efficient operations in our production plants, optimized processes within the company, and e-mobility in the areas surrounding our facilities, we reduce our energy consumption and emissions.



Long-term partnerships

By placing emphasis on long-term relationships with customers, suppliers, employees and partners, we promote an open and welcoming atmosphere, which facilitates cooperative and solution-oriented teamwork, enabling us to carry out even more complex projects.



Innovative process technologies

Our unique process technologies enable the recycling and refinement of plastics, and thus ensure a safe reuse of plastic packaging, even allowing for food contact.



Nurturing communication

Starlinger organizes regular company events to promote communication among employees, as well as team building exercises. These events are also an opportunity to communicate the topics of sustainability and CSR to the entire workforce. An interdepartmental exchange is the best way to work on effective concepts and make operations more sustainable.



Global presence

As world market leader, we bear a far-reaching responsibility and are in constant contact with our customers to jointly carry out sustainable projects, to optimize production processes, and to establish improved waste management systems in their area.



Effective packaging concepts

With innovative development concepts and design for recycling (DfR), we offer our customers not only unique opportunities to capture new markets, but also to design their production efficiently and in a resource-saving way. Examples of such concepts are bottle-to-bottle, bag-to-bag, and tray-to-tray projects in the field of circular packaging.



Regional anchoring

As a family business, we are firmly anchored in Austria. As a client and purchaser, we contribute to promoting employment and economic development in the region.

Company Structure - 3 main divisions:



textile
packaging



recycling
technology



viscotec



Division textile **packaging**:

Production machinery for sacks, packaging fabrics, and technical textiles woven from plastic tapes made out of PP, HDPE, PET, rPP, rPET and rPET flakes

50 years of global market experience

Experts in the fields of

plastics processing, R&D, software, engineering and project management, service, product management, marketing, sales and financing

Worldwide

> 35,000 circular looms, > 1,000 extrusion lines,
> 200,000 winders, > 1,800 conversion lines installed; trend is rising



Factory I, Weissenbach/Austria

Division recycling **technology**



Recycling technology,
Weissenbach (AT)



division of Starlinger & Co Ges.m.b.H., **Austrian family owned business founded in 1835**



Specialised on recycling lines for thermoplastics
and applications such as PET flakes, fibers, nonwovens, films and several specialties.



Recycling lines since 1987
(originally for PP tapes) introduction of the recoSTAR product line 2001



> 80 employees
experts in engineering, design and development, process technology, electrical and software engineering.
Additional sales and service staff in: Brazil, USA, Uzbekistan, China, Indonesia, India, Thailand



> 90 million EUR turnover
> 600 installed lines worldwide
> 550 for Polyolefines, > 60 for PET
> 2 million tpa plastics processing on recoSTAR lines,
five lines in Technical Center in Austria plus one in USA for test runs

Recycling issues

- kind of scrap: production, industrial and/or post-consumer scrap
- amount of scrap: inhouse-recycling or third party
- re-use: in same product or new end application
- quality: downcycling or upcycling (property improvement)



Application Portfolio recycling **technology**

production & industrial scrap

post-consumer scrap

woven bags



film



PET flakes



fibre & nonwovens



specialities



odor reduction



recoSTAR product line

recoSTAR direct



- for heavy regrind (> 300 g/l)
- Output 130 - 1.200 kg/h

recoSTAR dynamic



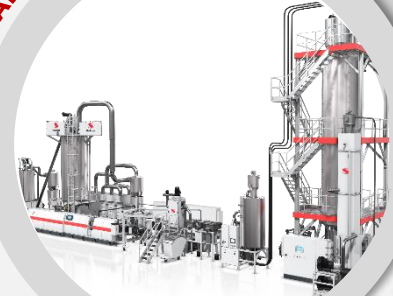
- for hygroscopic and humid materials, film, fibres, non-wovens, mono-/multi-filaments, washed post-consumer waste, a.o.
- Output 150 - 2.600 kg/h

recoSTAR universal



- for hard to grind materials, film, fibres, non-wovens, mono-/multifilaments, solid lumps, big injection moulding parts, a.o.
- Output 150 - 1.300 kg/h

recoSTAR PET + SSP



- for the preparation of PET-flakes as well as for btb-recycling with PCR Flakes incl. IV-increase + decontamination ⇒ food contact approvals,
- Output 150 - 3.600 kg/h

Recycling Lines:

recoSTAR direct

- for the cost-effective processing of pre-ground materials with high bulk density ($> 300 \text{ g/l}$) – production and post-industrial scrap from materials such as PE, PP, PS, PA and PLA.
- Six sizes available, output from 130 to 1.200 kg/h; optional degassing, choice of melt filter and pelletizing units



Recycling Lines:

recoSTAR dynamic

- for high-value processing of films, fibres and thermoplastic inhouse production scrap and washed post-consumer waste, from materials such as PE, PP, PET, PES, PA, PLA, PS, PPS and foamed products.
- The most efficient solution for hygroscopic and wet materials.
- The SMART feeder optimally prepares the material prior to extrusion
- Seven sizes available, for output of 150 up to 2.600 kg/h; optional degassing, choice of melt filter, pelletizing units



Odor reduction – **Smell** the Difference...!



Permanent smell reduction without additives!



smell from: migrated product or packaging (paper, printing ink)



customized up-cycling of post-consumer scrap



for polyolefines,
e.g. detergent bottles, fuel tanks,
meal trays, consumer + industrial
films



Odor reduction in 3 individual steps



- 1 SMART feeder:** material is prepared and homogenised by a rotating disc while being constantly flushed with hot air
- 2 C-VAC extrusion module:** increases the melt surface by 300% which leads to excellent degassing performance
- 3 Smell extraction unit:** gives the regranulate the final touch



Recycling Lines:

recoSTAR universal

- for efficient processing of all different kinds of films, fibres, nonwovens, mono- and multifilaments, tapes, and fabrics, as well as solid lumps, start-up waste and injection moulding parts, from materials like PE, PP, PS, PA , PES, PET, PPS, PLA, and more.
- The recommended solution for hard-to-grind material and high automation.
- With ACTIVE shredder - ideal material preparation before the extrusion process
- Six machine sizes available; for output range of 150 – 1.300 kg/h. Optional with degassing, high vacuum, backflushing filter and any one of three pelletising systems.



PET applications

flake to sheet



deCON or viscoSTAR reactors convert any conventional sheet line into a full PCR PET sheet line without compromises

flake to FG flake (preform)



Decontamination in the deCON or viscoSTAR and direct use of rPET flakes in a preform machine reduces conversion costs dramatically

Flake to pellet (BtB)



Sufficiently high level of decontamination and suitable flexibility for high demanding applications

flake to fabric

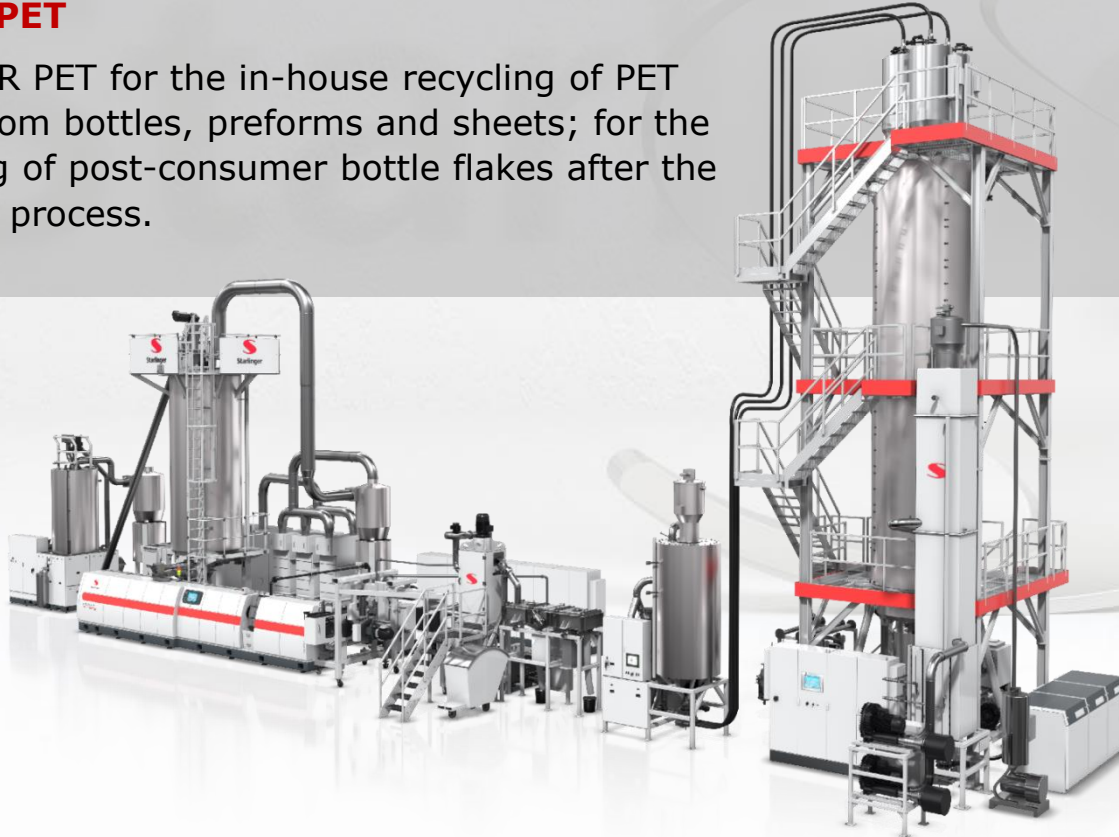


Woven bags made of 100% rPET flakes: higher fabric strength, high creep resistance, long term form stability

Recycling Lines:

recoSTAR PET

- recoSTAR PET for the in-house recycling of PET flakes from bottles, preforms and sheets; for the recycling of post-consumer bottle flakes after the washing process.



- The end product is melt-filtrated, uniform granulate and can be used for a wide range of applications.
- Seven sizes available, output from 150 to 3600 kg/h; high-vacuum degassing, choice of melt filter and pelletizing units
- Optional inline crystallisation and SSP (iV+) for IV increase and decontamination

PET refinement, PET sheet lines:

Solutions for 100% food grade PET sheet and PET refinement for the use of 100% recycled post-consumer material which exceeds multi-national food grade standards

Founded 2005

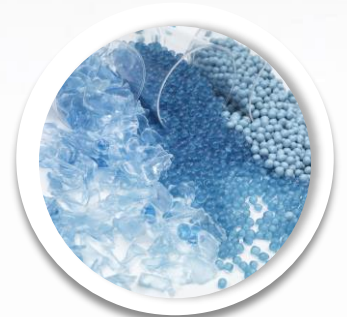
(for Solid State Polykondensation)
since 2012: Production site / technical center in St. Martin (OÖ)

Highly motivated and qualified team

offers quick-to-use, uncomplicated and tailor-made solutions. Patentee for several technologies.

> 150 lines worldwide

1,093,500 to installed capacity



SSP Equipment:

viscoSTAR

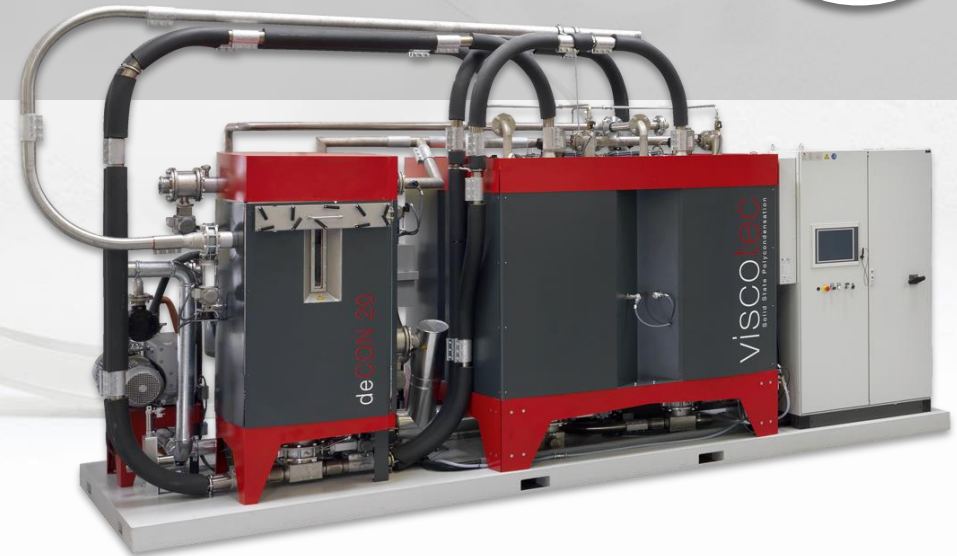
- Solid state polycondensation plant for iV increase and decontamination of polyester pellets and/or flakes to be used after a pelletizing extruder, stand alone, or in front of a production extruder.
- Increase of IV, decontamination of post consumer material acc. to EFSA and FDA for direct food contact
- Brand owner approved
- Elimination of acetaldehyde, glycol and other VOC



Decontamination Dryer:

deCON, deCON 20

- Decontamination dryer for production of food grade flakes (and/or pellets: deCON 20) or skeleton waste directly in front of a production extruder.
- Decontamination of PCR flakes according to EFSA and FDA
- Controlled and consistent residence time (FIFO)
- Excellent dedusting, drying to below 50 ppm
- Low power consumption and maintenance
- Optional iV increase



PET sheet line:

viscoSHEET

- In-house waste / skeletal / edge trim – processable undried up to 100%
- Virgin material undried up to 100% (with iV in final sheet approx. 0.7 dl/g)
- rPET flake, 100% food-grade (EFSA / FDA) in combination with a deCON through precisely defined residence time for decontamination
- rPET can be added up to 100% during process
- Very fast and flexible material or formulation changes during process
- Width: 1200/2000mm, Thickness: 150-1800µm



Starlinger recycling technology

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A large, 3D, metallic-looking letter 'S' is positioned in the center of the slide, casting a shadow on the surface below it. The background features a faint, large watermark of the word 'Starlinger' in a light grey color.

*Smell the
Difference!*