

Recycling solutions for raffia, like tapes woven fabrics, FIBC

May 2017 Helmut Fliesser, recycling Sales

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Agenda

- Overview Starlinger and production portfolio
- Production waste recycling of woven fabric and FIBC's
- Post-consumer recycling of woven fabric
- rPET flakes to PET fabric
- Summary





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Starlinger – Key Data



Starlinger

- 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
- Branches in the USA, India, Russia, Uzbekistan, Indonesia, China, South Africa and Brazil
- Over 600 employees
- Annual turnover (2016/17): approx. € 210 million
- Export quota: over 98%
- Starlinger customers in over 130 countries produce approx. 15 billion sacks per year

Company Structure: 5 Divisions





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Product Range

- Tape extrusion lines
- Circular looms
- Coating lines
- Printing machines
- Tubing lines
- Sack conversion lines
- Laboratory and testing equipment
- Plastics recycling lines
- PET decontamination and Solid State Polycondensation
- PET sheet lines







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30 years Starlinger recycling technology



Series 2 "Recostar" 1999



- four different models in various throughput sizes from 130 – 3,600kg/h
- recycling solution for virtually all thermoplastics, standard to high end applications



1987

Series 1 "Indumat"

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Starlinger solutions

Starlinger as leading woldwide A-Z turnkey supplier for all woven bag applications knows the complete production process and requirements in detail

- complete solutions for inhouse production waste
- post-consumer FIBC recycling
- NEW recycling of washed PET bottle flakes for the direct production of rPET tapes rPET fabric and FIBC's





The recycling solution

INHOUSE production waste – from PP woven fabric and FIBC production

- lose tapes, tapes cut-offs from reels
- cutting and conversion waste, edge trims
- doffing waste
- belts and out of spec products
- off-spec fabric rolls
- PE film waste (from inliner)
- start-up lumps from the extrusion
- dry, clean, with/without additives
- sometimes, slightly contaminated with labels
- from above we produce 1st class quality
 PP (PE) granules, to replace virgin material







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Tapes, fabric and bags and Big bag / FIBC recycling with recoSTAR universal

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Recycling with recoSTAR universal with ACTIVE Shredder (AS)

- Solution for all kind of production waste, from PP and HDPE tapes, via woven fabric, PE film, laminated and heavy printed fabrics, up to FIBC's and start-up lumps
- Easy to operate solution
- Prepared to process also materials with contamination up to 0,5% depending on selected filter type







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recycling techn@logy

PRESET MACHINE RECIPIES

- The operating software is already prepared with receipies (shown with icons) for all common materials used in a bag production plant.
- The individual icons show production-waste materials in form of photos.









High performance ACTIVE SHREDDER for hard to grind material without pre-cutting with Integrated load controlled dosing screw

- **A** accessibility & quick material change
- **C** controlled cutting & dosing
- **T** tight knife clearance & high performance
- **I** intelligent & innovative
- **V** versatile & wide material range
- **E** easy start & stop operation

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Operation and maintenance

- cold cutting in ACTIVE shredder
- rotor reverses automatically and cuts loose
- feeding with load controlled dosing screw
- three individual drives for shredder, feeding screw and extruder
- pressure constant extrusion
- innovative process adaption
- easy to clean
- good and fast access to the rotary and stator knives for maintenance







Options: Power backflush filter, camera and monitor for cutting section

- hydraulically operated power backflush filter with increased filter area for highest filter cleaning and longer filter life time.
- observation of material behavior in single shaft cutter
- increased confidence due to optical supervision







Technical data	universal 65	universal 85	universal 105	universal 125	universal 165
Output [kg/h]*	150-230	280-380	400-600	650-850	900-1300
Output raffia [kg/h]*	150-200	280-380	400-600	650-850	900-1300
Energy Consumption [kWh/kg]	0,20-0,35	0,20-0,35	0,20-0,35	0,20-0,35	0,20-0,35
Installed Power [kW]	140	245	315	390	710
Single shaft cutter					
Shaft width [mm]	800	800	1200	1200	2000
Drive Power [kW]	55	55	90/110	90/110	132/160
Extruder					
Screw Diameter [mm]	65	85	105	125	165
L/D (w/VAC)	24(40)	24(40)	24(40)	24(40)	24(40)
AC Drive [kW]	55/75	90/110	160/200	200	315/345/355
Downstream equipment					
Degassing	Option	Option	Option	Option	Option
Filtration Area [cm2]	180	290	490	490/980	980/1940
Hydraulic backflush filter	Option	Option	Option	Option	Option
Water ring pelletiser	Х	X	Х	Х	Х
Strand pelletiser	Alternative	Alternative	Alternative	Alternative	Alternative

* Depending on input material





Compacting unit - compSTAR

- this unit helps for easy handling and compacting the endless tapes
- to provide compressed bricks
- reduce the handling volume
- easy handover to the recycling line
- this helps you to reduce the contamination of your waste tapes, i.e. less dust accumulation
- easy to handle
- option for starEX tape extrusion line
- also available to serve 2 tape extrusion lines



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compSTAR - lose PP tapes handling/ compacting

- endless tape cause handling issues
- storage contaminates material
- solution: compSTAR







- \checkmark produce compressed blocks
- ✓ easy to handle
- \checkmark need only 10% of the volume



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Post consumer FIBC and woven bag recycling with dynamic and C-VAC

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Big Bag recycling with recoSTAR dynamic + C-VAC

- more and more FIBC producers have to take back used FIBC's from the market (national regulations needs to be considered).
- postconsumer FIBC recycling

Starlinger prepares the specific solutions











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Post consumer recycling – from PP woven FIBC's, dry or wet cleaned

- infeed of little contaminated FIBC's lose tapes, tapes cut-offs from reels
- cut-out, and conversion waste
- belts and out of spec products
- PE film waste
- pre-cut and cleaned material
- often with higher moisture and contaminated
- from above we produce 2nd class quality PP (PE)
 pellets to replace virgin material for some applications





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- We only recommend this process if customer has a separate grinder (shredder) installed!!!
- Solution with pre-ground production waste HDPE and PP fabric, with VAC also printed materials
- Prepared to process also materials with high moisture content,
 - standard up to 4%,
 - with optional equipment up to 10% moisture











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Mode of operation

- material gets cut, dried, mixed and thermally compacted in the SMART feeder
- suitable for pre-cut material or if customer use an existing shredder
- also for material with higher moisture content
- pre-heating of material by friction
- temperature raised to compacting temperature
- with dynamic automation package
- side feed compounding optional available
- with C-VAC degassing system
- and typically with laser filtration and WRP pelletizer









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Technical data	dynamic 65	dynamic 85	dynamic 105	dynamic 125	dynamic 165	dynamic 215
Output [kWh/kg]*	150-250	300-450	450-700	650-900	1000-1600	2200-2600
Output raffia [kWh/kg]**	120-180	280-420	380-600	450-750	760-1300	760-1300
Energy Consumption [kWh/kg]	0,20-0,35	0,20-0,35	0,2-0,35	0,20-0,35	0,20-0,35	0,20-0,35
Diameter [mm]	900	1100	1350	1650	1650	2050
Drive Power [kW]	37/45	75/90	132/160	160/200	200/250	315/400
Extruder						
Screw Diameter [mm]	65	85	105	125	165	215
L/D (w/VAC)	24(40)	24(40)	24(40)	24(40)	24(40)	24(40)
AC Drive [kW]	45/55	75/90	110/132	160/200	250/315	500/560
Downstream equipment						
Shredder	AS 800	AS 800	AS 1200	AS 1200	EWZ 1600	EWZ 2000
Degassing	Option	Option	Option	Option	Option	Option
High Vacuum Execution	Option	Option	Option	Option	Option	Option
Filtration Area [cm2]	180	290	490	490/980	980	1960
Water ring pelletiser	Х	Х	Х	Х	Х	Х
Strand pelletiser	Alternative	Alternative	Alternative	Alternative	Alternative	Alternative

* Depending on input material and application

** Depending on input shape/requires shredder precutting of < 80mm, $/[kg/h]^{**}$



Recycling of postconsumer PET bottle flakes with starEX 800 / 1600 PF

the reconomic solution

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NEW PET Recycling for rPET FIBC's





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PET recycling of washed PET bottle flakes for the direct production of rPET tapes

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rPET FIBC's – the eco-friendly option

- For recycling of washed PET bottle flakes direct to process the PET tapes
- with same properties as virgin PET

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endless recyclable



- PET provides higher creep resistance
- PET is the material of choice for **hot fill applications**
- improved abrasion resistance







Economic and technical view - PET flakes versus virgin PP

- with very attractive economic outlock for the material costs
- is world wide available
- PET is widely used for packaging

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 FIBCs made with Starlinger rPET equipment help to leave a green footprint on this world



Visit us at Interpack Hall 11 / C20

Material costs for PP, rPET, rPET flakes



Raw material price development Europe, 2014 - 2016. Sources: myCEPPI, KIWEB



Conclusion for success

- > Reuse the material which you have once already bought for money...
- Recycling of inhouse production waste material
- to reduce the material/production costs
- Recycling of post-consumer waste for a second use
- > to prepare the material according the needs (wash, and recycle with right filtration)
- > rPP and rPET are important alternative rawmaterials don't handle it as waste
- Reuse up to 100% of the material for a better environment
- Proofed with more than 100 installations for such applications
- recycling with Starlinger recoSTAR technology your longterm partner for one stop processing for woven packaging materials





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Starlinger recycling technology: Solutions first

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