RECYCLING LINE recoSTAR PET

for production and post-consumer scrap, preforms, bottle and sheet flakes, **integrated pre-drying,** dust-free processing, optional inline solid stating, **energy efficient,** high ROI, **full automatisation**

Starlinger

RECYCLING LINE recoSTAR PET

State-of-the-art recycling technology for the in-house recycling of PET flakes from bottles, preforms, strapping bands and sheets as well as for the **recycling of post-consumer bottle flakes** after the washing process. The **end product is melt-filtrated, uniform granulate** that can be used for a wide range of applications.

The PET flakes are fed into the pre-drying unit on top of the extruder. The material is dried, heated and crystallised, either by application of hot (dessicant) air, or vacuum.
This treatment already contributes to outstanding decontamination results.

The high-vacuum degassing extruder reduces viscosity loss during extrusion and purifies the melt from volatile contamination. The water-free vacuum pump reduces production and maintenance costs.

Continuous filters for dirt particle removal are available with or without backflushing. The direct material flow reduces stress on material. Finest filtration available on request.
The inline viscosimeter optionally measures the IV for immediate quality control.

The underwater pelletiser is energy-saving, features a simple start-up procedure and can replace the strand pelletiser or automatic strand pelletiser. Pellet size and bulk density are adjustable for all pelletising systems.

The optional inline crystallisation after underwater pelletising ensures optimised foot-print, energy saving and high crystallinity.
Inline colour measurement guarantees first-class colour values.

Machines pictured may include equipment sold as options.

Solid state polycondensation – optionally for the **IV increase of PET and outstanding decontamination.** The regranulate after the Starlinger iV+ process is suitable for **food contact applications** such as bottle-to-bottle or bottle-to-sheet. The process has achieved several national and brand-owner approvals.

SSP technology
enables constant and adjustable IV increase with the FIFO principle. Outstanding decontamination values qualify for food contact applications. AA level and other VOCs are reduced to the levels of virgin resin.

Alternative energies
such as natural gas or steam can be used as a cost-friendly alternative for heating. The energy recovery kit uses the residual heat of the PET regranulate for drying and heating the input material, achieving considerable energy savings.

Resin-like characteristics
of the rPET in terms of form, flow behaviour, crystallinity, humidity, VOC, AA and EG levels, IV, dust content, etc. Consequently, the material is suitable for all PET applications.

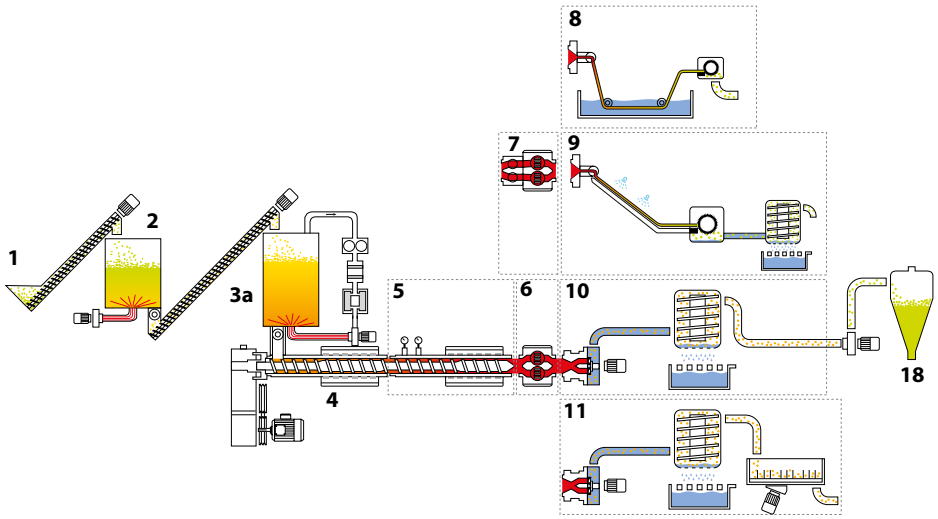
Advantages

- FIFO ensures uniform treatment
- Outstanding decontamination
- Adjustable IV increase
- Energy saving through inline processing
- Improved production efficiency
- User-friendly touchscreen and high automatisation
- Modular design provides flexibility, single mode extruder operation for recoSTAR PET 330

Starlinger recycling technology allows **utmost flexibility** for the customer and adjustment to the ever changing requirements in the market or applications through **modular design**.

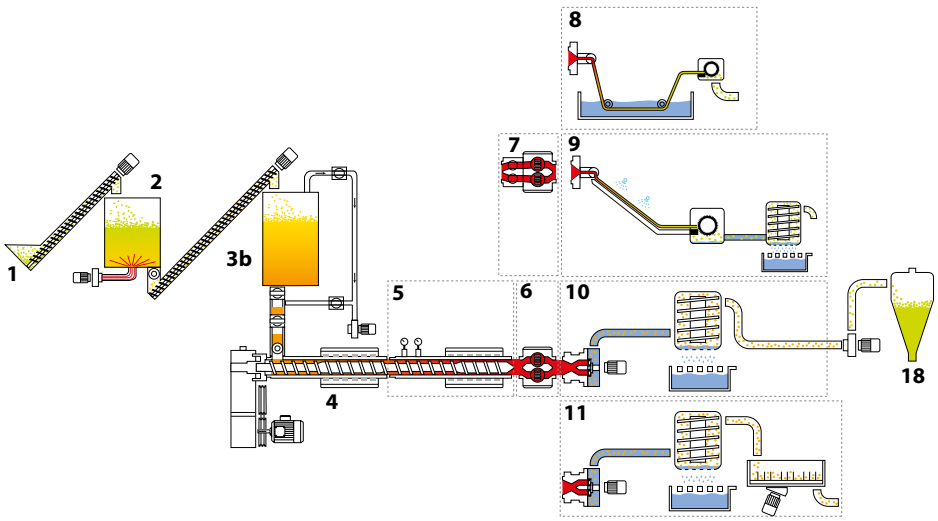
recoSTAR PET FG	Food contact	FDA/EFSA	Decontamination/ VOC	Brand owner approved	Low AA level	IV increase
	✔	✔	✔		optionally	✔ with reduced output

PET flakes are heated and dried in a two-stage process, first with hot air, then with dry air. The special design of the dryer outlets results in center flow prevention, consistent residence time and FIFO processing. This ensures decontamination for food contact applications and ideal preparation for the extrusion process with maintained IV level. A choice of filtration and pelletising systems is available. Once installed, the unit can be equipped with an SSP reactor (iV+) to increase viscosity and decontamination levels.



recoSTAR PET FG+	Food contact	FDA/EFSA	Decontamination/ VOC	Brand owner approved	Low AA level	IV increase
	✔	✔	✔✔		✔	✔✔ with full output

PET flakes are heated and dried in a two stage process, first with hot air, then by means of vacuum. The special design of the dryer outlets results in center flow prevention, consistent residence time and FIFO processing. This ensures decontamination for food contact applications and ideal preparation for the extrusion process with IV increase. A choice of filtration and pelletising systems is available. Once installed, the unit can be equipped with an SSP reactor (iV+) to increase viscosity and decontamination levels.

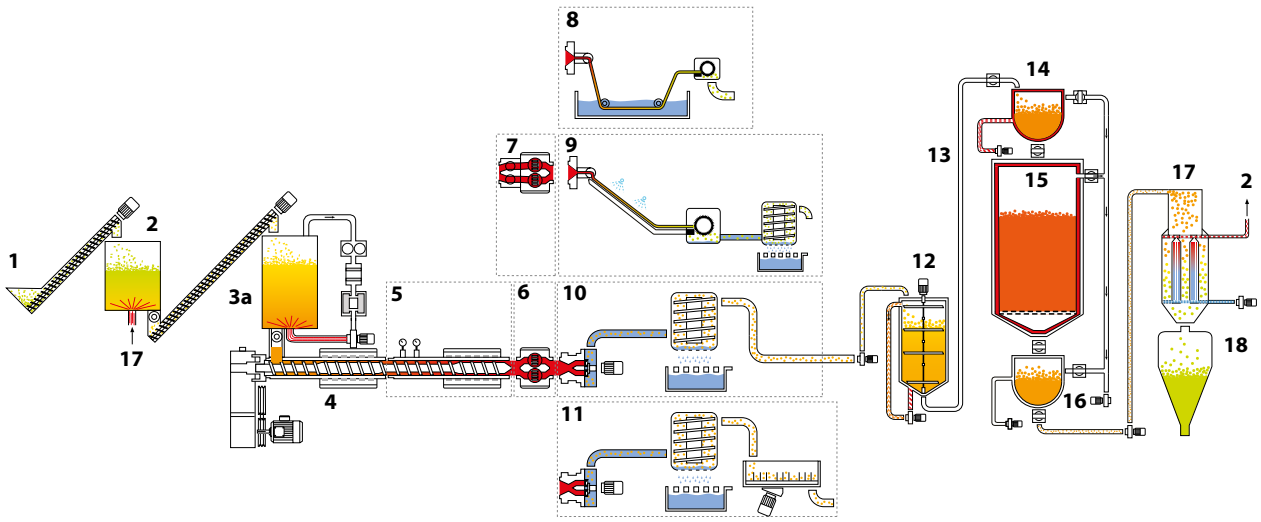


1. Conveyor screw
2. Hot air drying unit
3a/b. Pre-drying unit/pre-drying unit under vacuum
4. Extruder
5. High-vacuum degassing extruder
6. Melt filter without backflushing
7. Melt filter with backflushing
8. Strand pelletiser
9. Automatic strand pelletiser

The final product fulfils a variety of characteristics comparable to virgin resin.
PET recycling – equipment designed to fit your requirements.

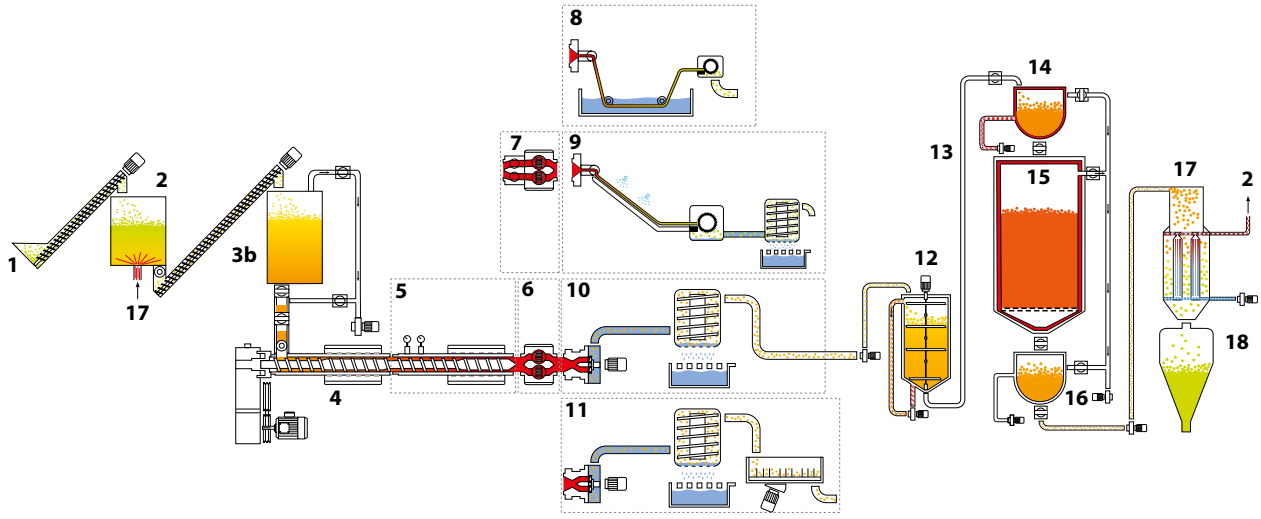
recoSTAR PET iV+	Food contact	FDA/EFSA	Decontamination/ VOC	Brand owner approved	Low AA level	IV increase
	✔	✔	✔✔✔	✔	✔✔	✔✔✔ with full output

PET flakes are heated and dried in a two stage process, first with hot air, then with dry air. The special design of the dryer outlets results in center flow prevention, consistent residence time and FIFO processing, ensuring ideal preparation for the extrusion process. A choice of filtration and pelletising systems is available. The downstream inline vacuum SSP reactor uses the energy of the previous step. Special FIFO design ensures consistent reaction parameters, adjustable IV increase as well as highly effective decontamination (ultra low VOC, AA < 1 ppm) for food contact applications.



recoSTAR PET iV+ *Superior*	Food contact	FDA/EFSA	Decontamination/ VOC	Brand owner approved	Low AA level	IV increase
	✔	✔	✔✔✔✔	✔	✔✔	✔✔✔ with full output

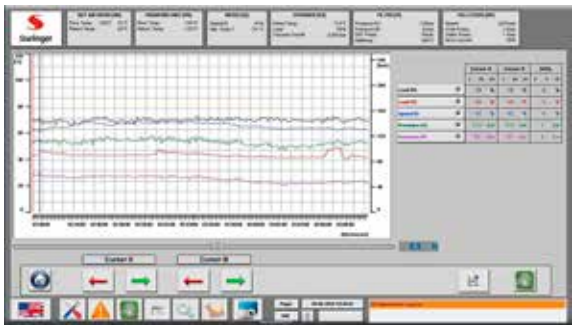
The combined decontamination steps – first the flakes in the vacuum dryer upstream of the extruder (FG+), then the pellets in the SSP reactor downstream of the extruder (iV+) – result in the highest possible pellet quality. This superior decontamination reduces AA and VOC to a minimum. Optionally, the two steps can be separated to double the capacity: Food-contact flakes and/or food-contact pellets can be produced.



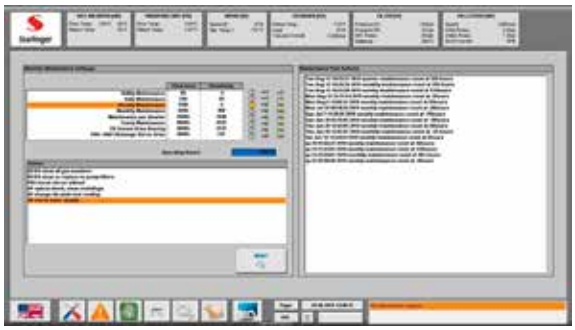
10. Underwater pelletiser
11. Underwater pelletiser with inline crystallisation
12. Crystalliser/post-crystallisation unit
13. Vacuum transport
14. Preheating unit
15. SSP reactor
16. Cooling unit/vacuum sluice
17. Energy recovery kit
18. Storage silo

Special features and services

Recipe control
All settings required for a certain type of production are stored in the control system of the line together with the chosen recipe name and the date.



Trend reporting
One feature of the colour touch panel is the integrated storage of main production parameters (extruder load, melt pressures, etc.), which can be displayed within seconds.



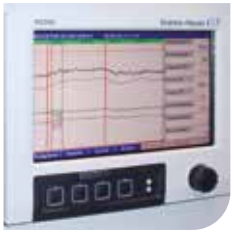
Maintenance list
As a support for maintenance personnel and the operator, each line is programmed with a customized maintenance system.

recoSTAR technology is designed for **high automatisation** and **userfriendliness.** The touch screen enables a simple start-stop procedure, password controlled user levels, and screenshots (USB port). This ensures **highest efficiency** and consequently **fast ROI.** Features are either standard or can be added according to customer's requirements.

Optional online support
Based on a DSL connection, the online support establishes a connection from Starlinger to the customer line – wherever in the world it is installed.

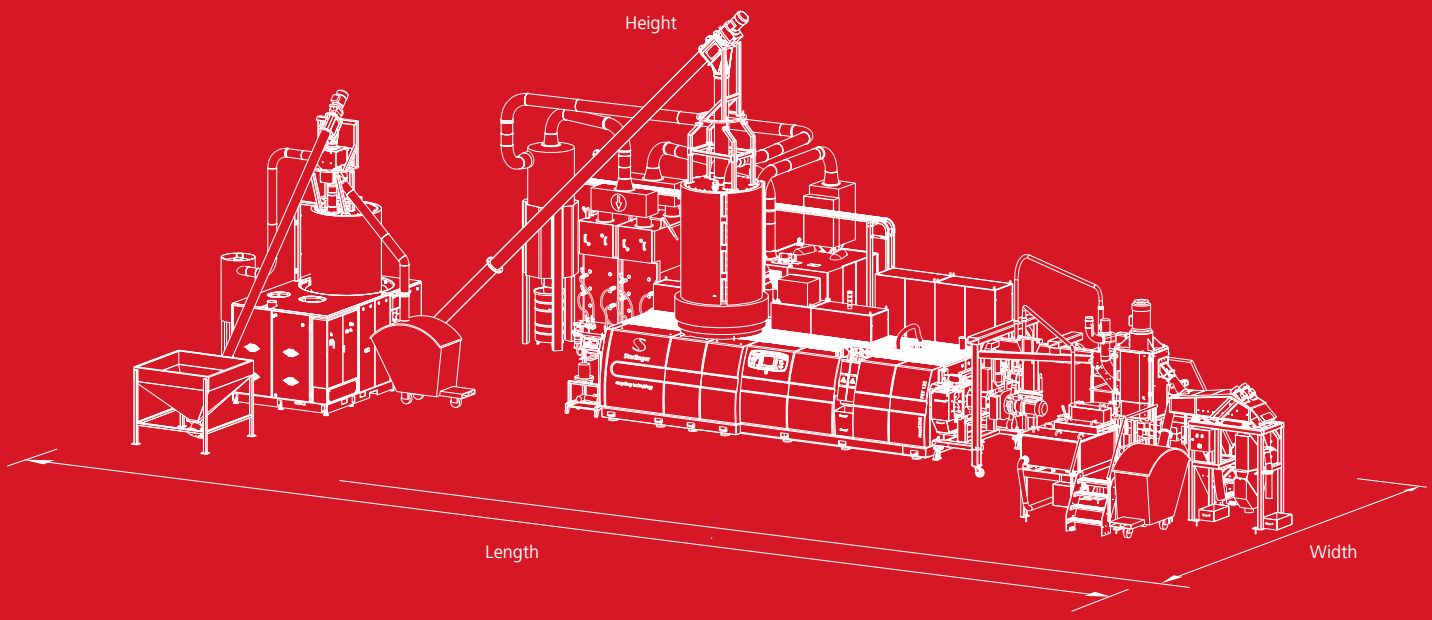
Optional inline viscosimeter
The continuously measured IV of the PET melt during extrusion helps to control quality and indicates any required change of the residence time in SSP.

Optional inline colour measurement
Colour deviations from a set standard are detected and serve as an inline quality control of the input material: Off-spec material is rejected. Deviations can also be offset by adding additive (either liquid or masterbatch).



Optional online writer and archiving
The online writer collects all relevant production data for secure traceability. Up to 50 parameters can be stored in short sequences in an internal memory and thus are saved in the event of a power cut.

recoSTAR PET/PET HC (High Capacity)
recoSTAR PET FG/FG+



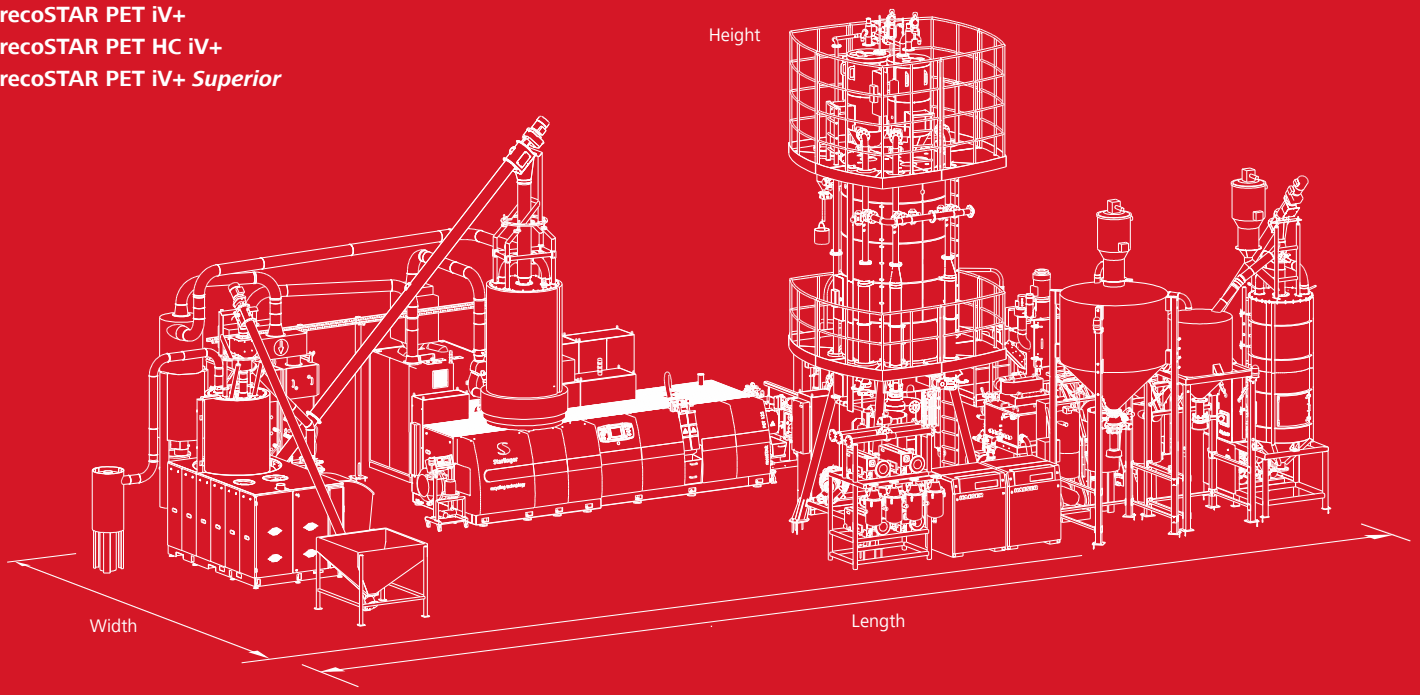
Dimensions in mm						recoSTAR PET FG / PET FG+	
Type	**65**	**85**	**105**	**125**	**165**	**215**	**330**
Height	5200	6200	7000	7250	7250	11700	11700
Height in inches	200	240	280	290	290	460	460
Width	8760	10100	11100	11100	13400	16000	11700
Width in inches	340	400	440	440	530	630	460
Length	14750	16350	17000	21600	22800	32000	27100
Length in inches	580	640	670	850	900	130	1070

Technical data							
Type	**65**	**85**	**105**	**125**	**165**	**215**	**330**
recoSTAR PET FG / FG+							
Output [kg/h]	150 – 220	250 – 400	450 – 650	650 – 900	1200 – 1650	2000 – 2400	2500 – 3300
*Output [lbs/h]**	*330 – 490*	*550 – 880*	*990 – 1430*	*1430 – 1980*	*2640 – 3640*	*4400 – 5300*	*5500 – 7280*
AC drive [kW]	45	90	132	160	315	530	630 (2x315)
Extruder							
Screw diameter (L/D) [mm]	65 (40)	85 (40)	105 (40)	125 (40)	165 (40)	215 (40)	2x165 (40)
Screw diameter (L/D) [inch]	*2.5 (40)*	*3.3 (40)*	*4.1 (40)*	*4.9 (40)*	*6.5 (40)*	*8.5 (40)*	*2x6.5 (40)*
Energy consumption [kWh/kg]	0.25 – 0.35	0.25 – 0.35	0.25 – 0.35	0.25 – 0.35	0.25 – 0.35	0.25 – 0.35	0.25 – 0.35
High-vacuum [mbar]	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Downstream equipment							
Strand pelletiser	●	●					
Underwater pelletiser	alternative	alternative	●	●	●	●	●
Automatic strand pelletiser	alternative	alternative	alternative	alternative	alternative	alternative	alternative

● standard

All data depending on design!

recoSTAR PET iV+
recoSTAR PET HC iV+
recoSTAR PET iV+ *Superior*



Dimensions in mm	**recoSTAR PET iV+ / PET HC iV+ / PET iV+ *Superior***						
Type	**65**	**85**	**105**	**125**	**165**	**215**	**330**
Height in mm	6500	6800	11200	12300	14200	14200	15700
Height in inches	*260*	*270*	*440*	*480*	*560*	*560*	*620*
Width in mm	12000	11000	15000	17000	19000	20000	18000
Width in inches	*470*	*430*	*590*	*670*	*750*	*790*	*710*
Length (with degassing) in mm	13000	18000	22000	24000	28000	42000	40000
Length (with degassing) in inches	*510*	*710*	*870*	*940*	*1100*	*1650*	*1570*

Technical data							
Type	**65**	**85**	**105**	**125**	**165**	**215**	**330**
recoSTAR PET iV+							
Output [kg/h]	150 – 200	250 – 350	450 – 600	650 – 800	1250 – 1450	2300 – 2500	2500 – 2900
*Output [lbs/h]**	*330 – 440*	*550 – 770*	*990 – 1320*	*1430 – 1760*	*2750 – 3200*	*5070 – 5500*	*5500 – 6400*
AC drive [kW]	45	75	110	160	250	470	500 (2x250)
recoSTAR PET HC iV+							
Output [kg/h]	150 – 250	350 – 500	550 – 700	700 – 1050	1600 – 1800	2500 – 2700	3200 – 3600
*Output [lbs/h]**	*330 – 550*	*770 – 1100*	*1200 – 1540*	*1540 – 2310*	*3530 – 3970*	*5500 – 5950*	*7050 – 7940*
AC drive [kW]	55	90	132	200	315	530	630 (2x315)
recoSTAR PET iV+ *Superior*							
Output [kg/h]	-	-	-	650 – 900	1200 – 1650	2000 – 2400	2500 – 3300
*Output [lbs/h]**	-	-	-	*1430 – 1980*	*2640 – 3640*	*4400 – 5300*	*5500 – 7280*
AC drive [kW]	-	-	-	200	315	530	630 (2x315)
Extruder							
Screw diameter (L/D) [mm]	65 (40)	85 (40)	105 (40)	125 (40)	165 (40)	215 (40)	2x165 (40)
Screw diameter (L/D) [inch]	*2.5 (40)*	*3.3 (40)*	*4.1 (40)*	*4.9 (40)*	*6.5 (40)*	*8.5 (40)*	*2x6.5 (40)*
High-vacuum [mbar]	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Downstream equipment							
Strand pelletiser	●	●					
Underwater pelletiser	alternative	alternative	●	●	●	●	●
Automatic strand pelletiser	alternative	alternative	alternative	alternative	alternative	alternative	alternative
Solid state polycondensation							
IV increase [dl/g/h]							0.01 – 0.04
Plant energy consumption [kWh/kg]	0.40 – 0.53	0.40 – 0.53	0.40 – 0.53	0.40 – 0.53	0.40 – 0.53	0.40 – 0.53	0.40 – 0.53
Energy Recovery Kit (ERK): Reduction of energy consumption [kWh/kg]							up to 0.03

● standard

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All data depending on design!