



Starlinger

PET tray-to-tray: Viewpoint of a Machinery Supplier



Industry requirements for trays recycling

- Post-consumer plastic waste
- Separate collection and pre-sort waste
 - Food-grade
 - Monolayer (ideally)
 - Clear-to-clear
 - Colours-to-colours
- Raise awareness about the recycling potential of the thermoforms



Scope of Trials



Check for processability of the trays with Starlinger recycling technologies

**Increase IV > min. 0,7 dl/g
(up to 0,80 dl/g)**

Food-grade pellets

Filtration 50 μ m

Challenges based on previous tests

Washing



Higher losses during washing process

Different washing lines and recipes needed than BtB

During hot-washing and while in centrifuges fines may occur

Challenges based on previous tests

Extrusion



Chunks build-up during pre-drying step limit constant feeding

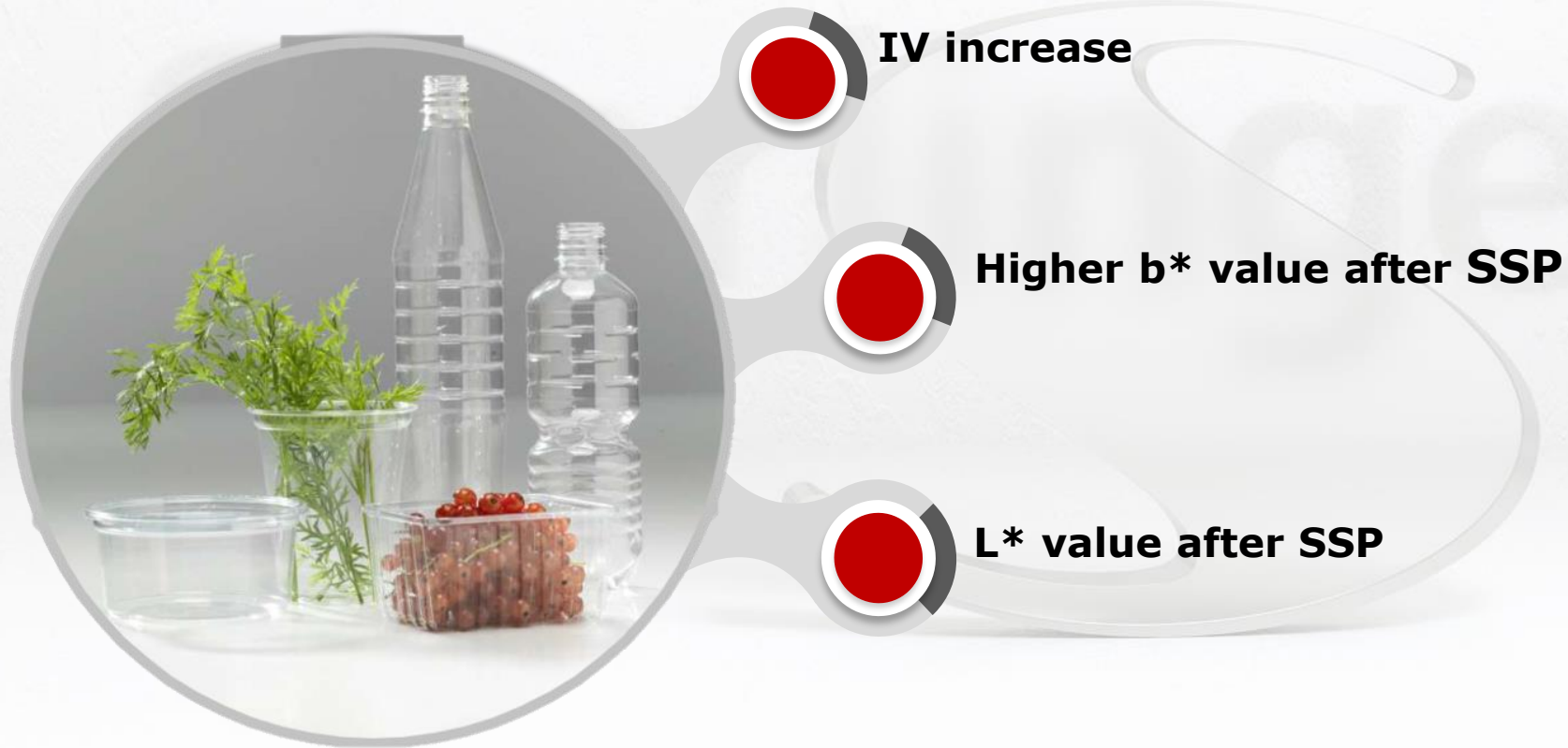
Bigger filtration is needed than for similar set-up BtB

Higher material loss during backflushing

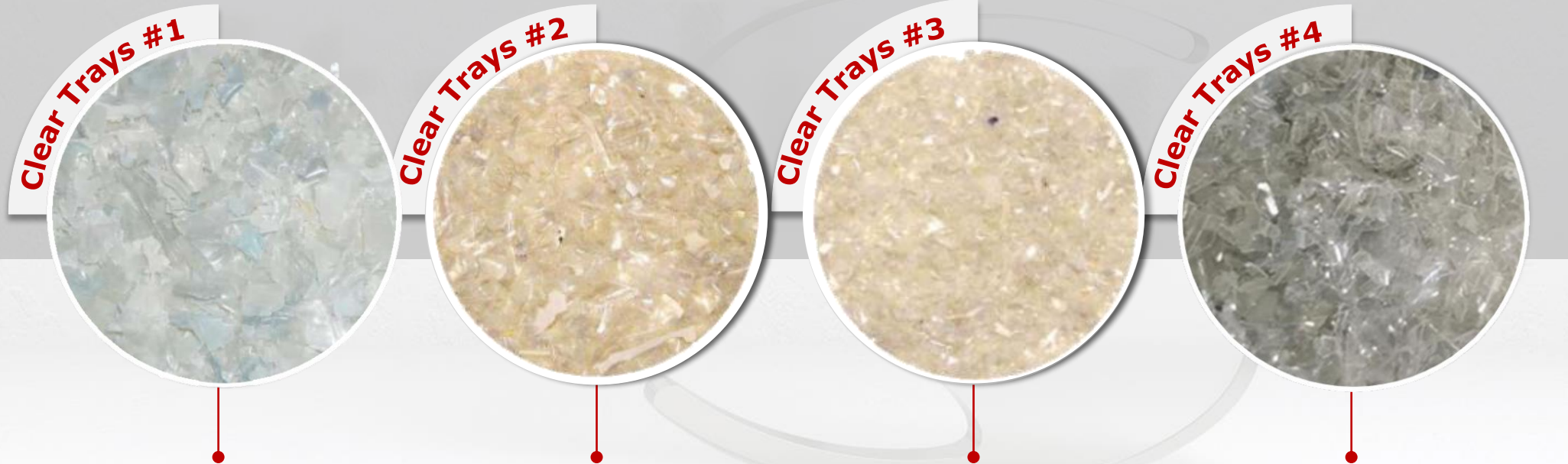
Higher residence time in the SSP required

Challenges based on previous tests

Quality



Material Trials with Food-Grade Trays



Clear Trays #1
MonoPET
Origin: Germany
Target IV > 0.72 dl/g

Clear Trays #2
With multi-layer
Flakes > 5mm
Origin: Germany
Target IV > 0.72 dl/g

Clear Trays #3
With multi-layer
Flakes > 2 mm < 5mm
Origin: Germany
Target IV > 0.72 dl/g

Clear Trays #4
With coloured trays,
sand and PVC content
Origin: Central-EU
Target IV > 0.8 dl/g

Material Trials with Food-Grade Trays

Clear Trays #5



With multi-layer, with
Al and PVC content
Origin: Central- EU
Target IV > 0.76 dl/g

Clear Trays #6



With coloured trays,
sand and PVC content
Origin: Central-EU
Target IV > 0.8 dl/g

Clear Trays #7







MonoPET
Origin: Germany
Target IV > 0.7 dl/g

Clear Trays #8

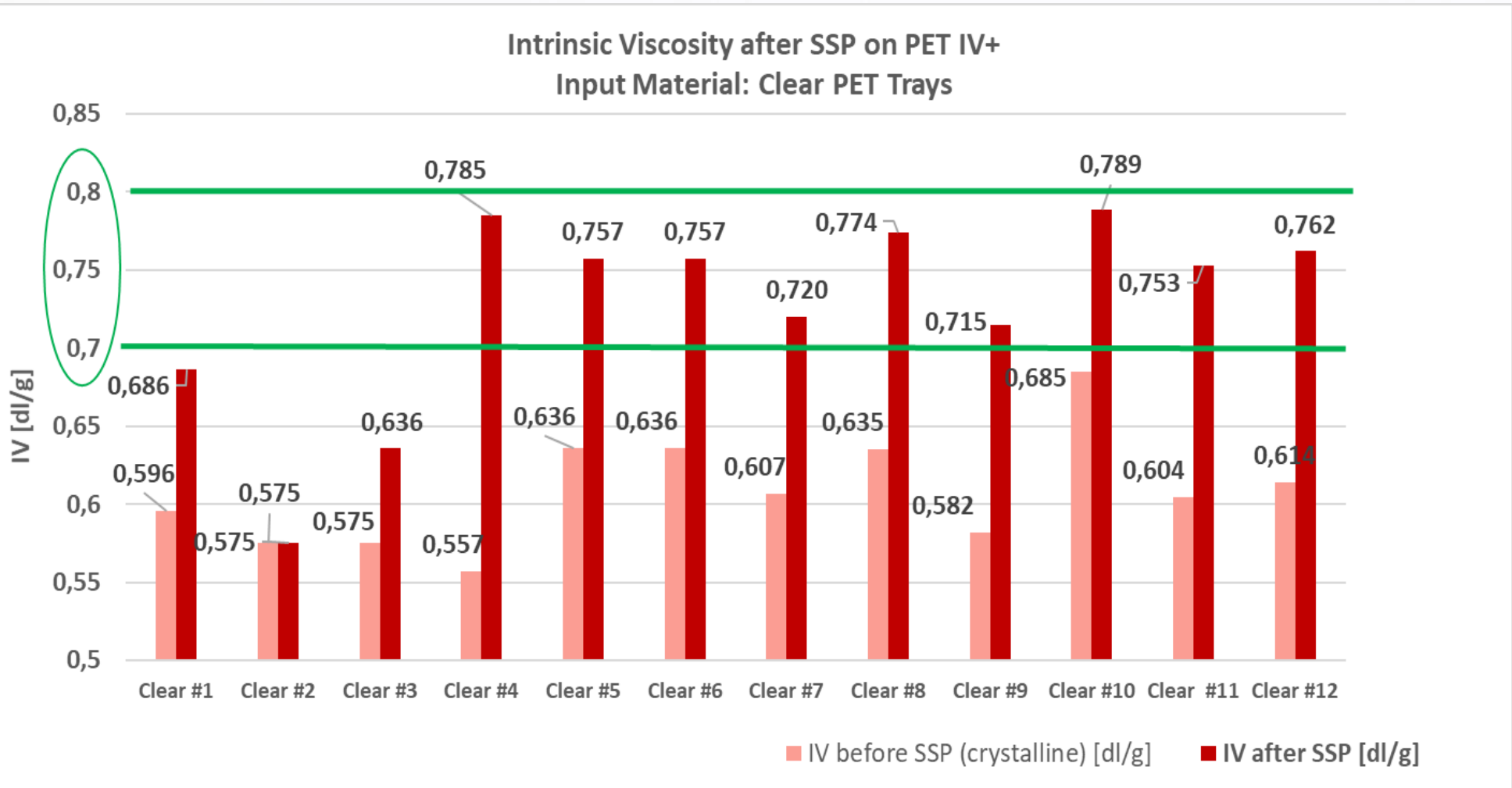


MonoPET
PVC, Al, sand content
Origin: France
Target IV > 0.78 dl/g

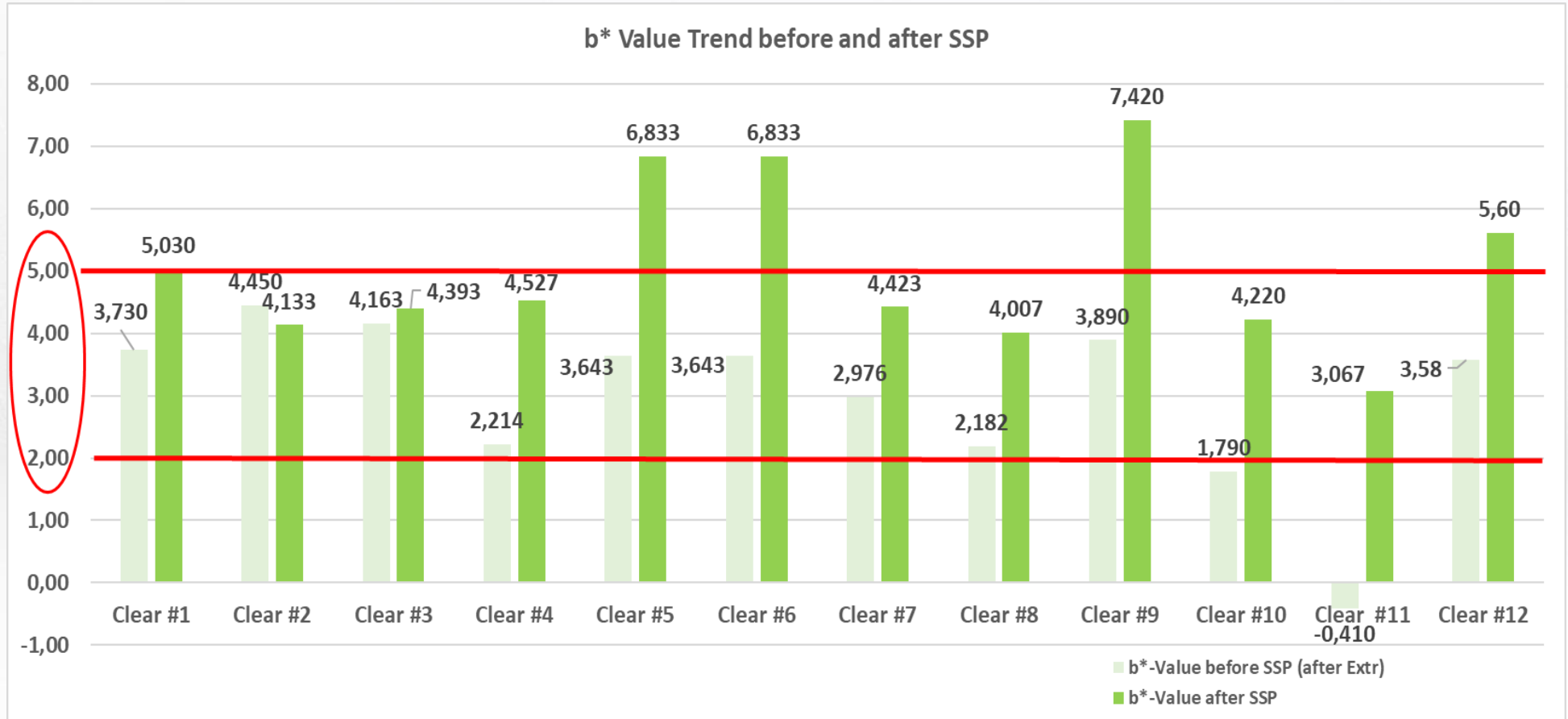
Material Trials with Food-Grade Trays

 <p>Clear Trays #9</p>	 <p>Clear Trays #10</p>	 <p>Clear Trays #11</p>	 <p>Clear Trays #12</p>
<p>With multi-layer PE/EVOH, PVC,metal,CaCO₃ Origin: Italy Target IV>0,76 dl/g</p>	<p>With multi-layer PVC, metal,CaCO₃ Origin: Italy Target IV>0,76 dl/g</p>	<p>With multi-layer PVC, metal,CaCO₃ Origin: Italy Target IV>0,70 dl/g</p>	<p>With multi-layer Sand, glass, glue Origin: France, Italy Target IV> 0,75 dl/g</p>

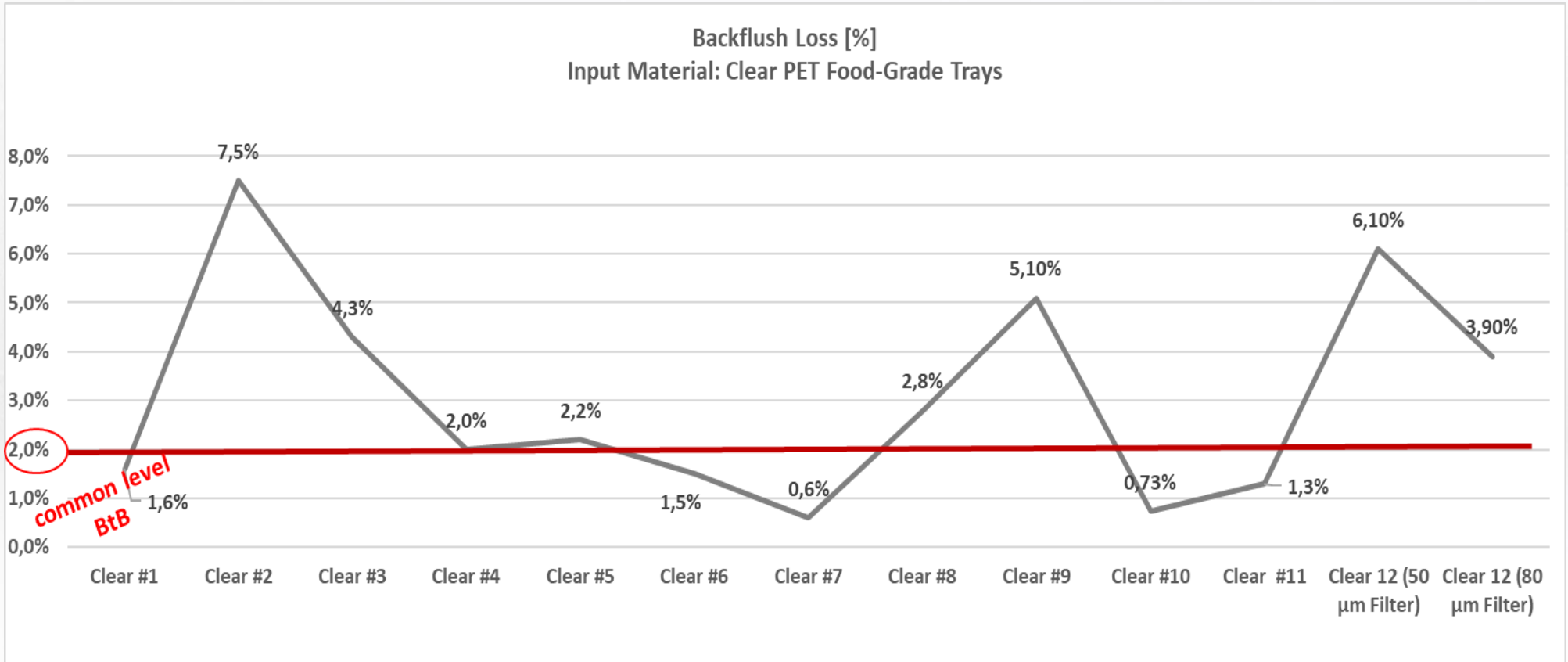
IV after residence time 6 to 9 h in SSP



b* Values

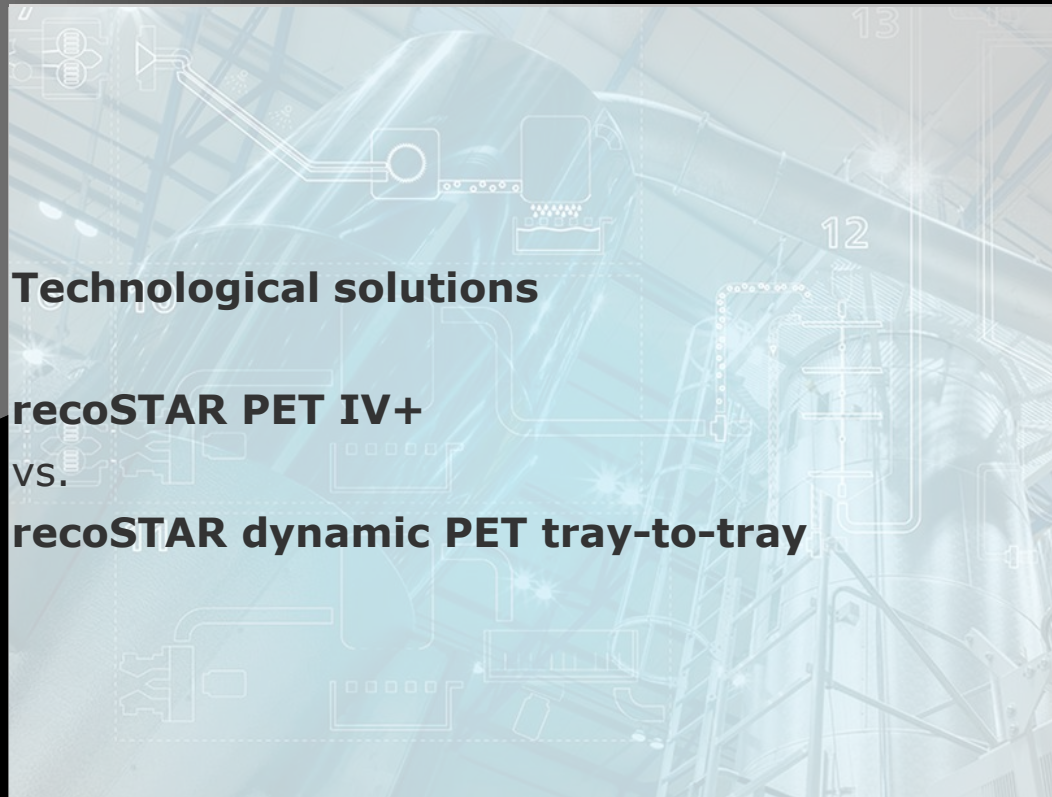


Backflush Loss



Trays vs. bottle flake input

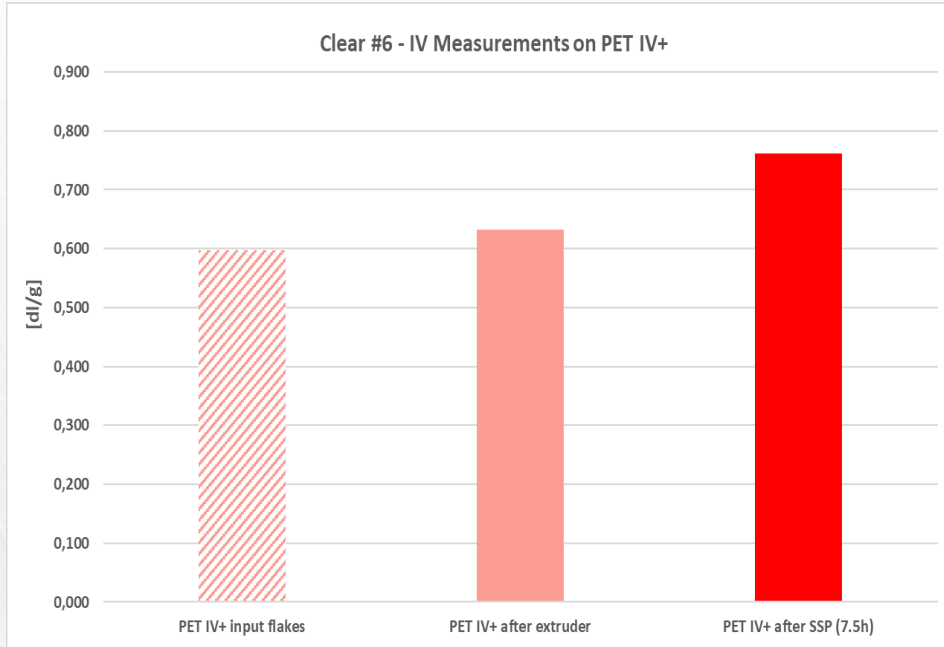
- Higher residence time required in the pre-drying unit
- Presence of the PE/EVOH (multi-layer) causes lumping
- Oversized filter required compared to bottle-to-bottle
- Potential high backflush loss
- Long residence time in SSP required (up to 9 h)
- Oversized dust and steam extraction unit needed
- Contaminated trays call for more robust degassing system than BtB



Technological solutions

- **recoSTAR PET IV+**
vs.
recoSTAR dynamic PET tray-to-tray

IV Value



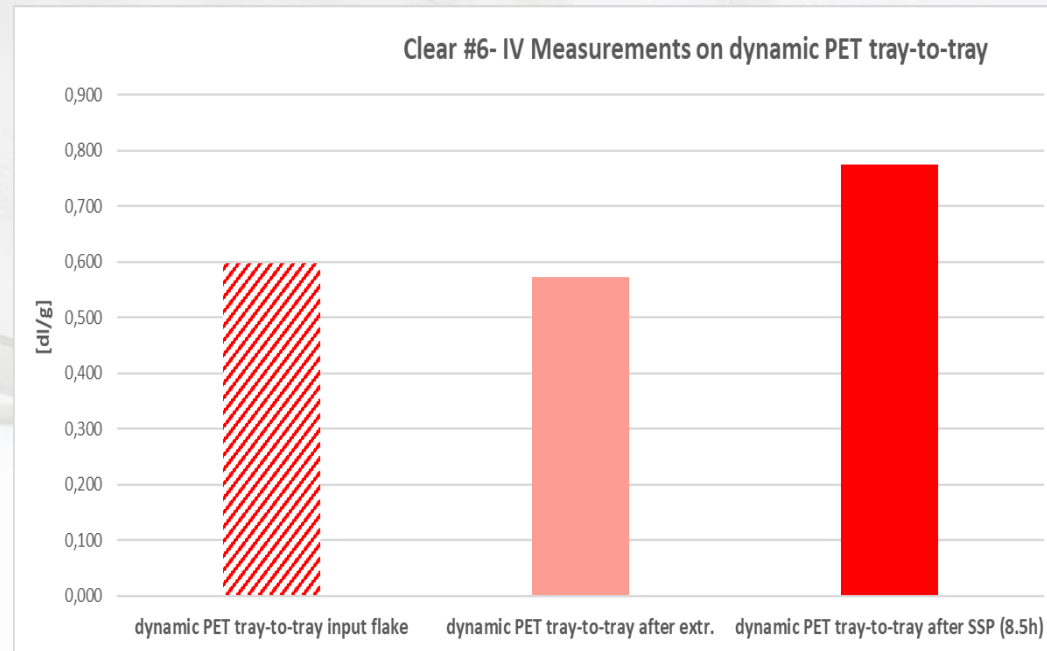
On PET IV+

IV-target reached after min. 7,5 h residence time in SSP

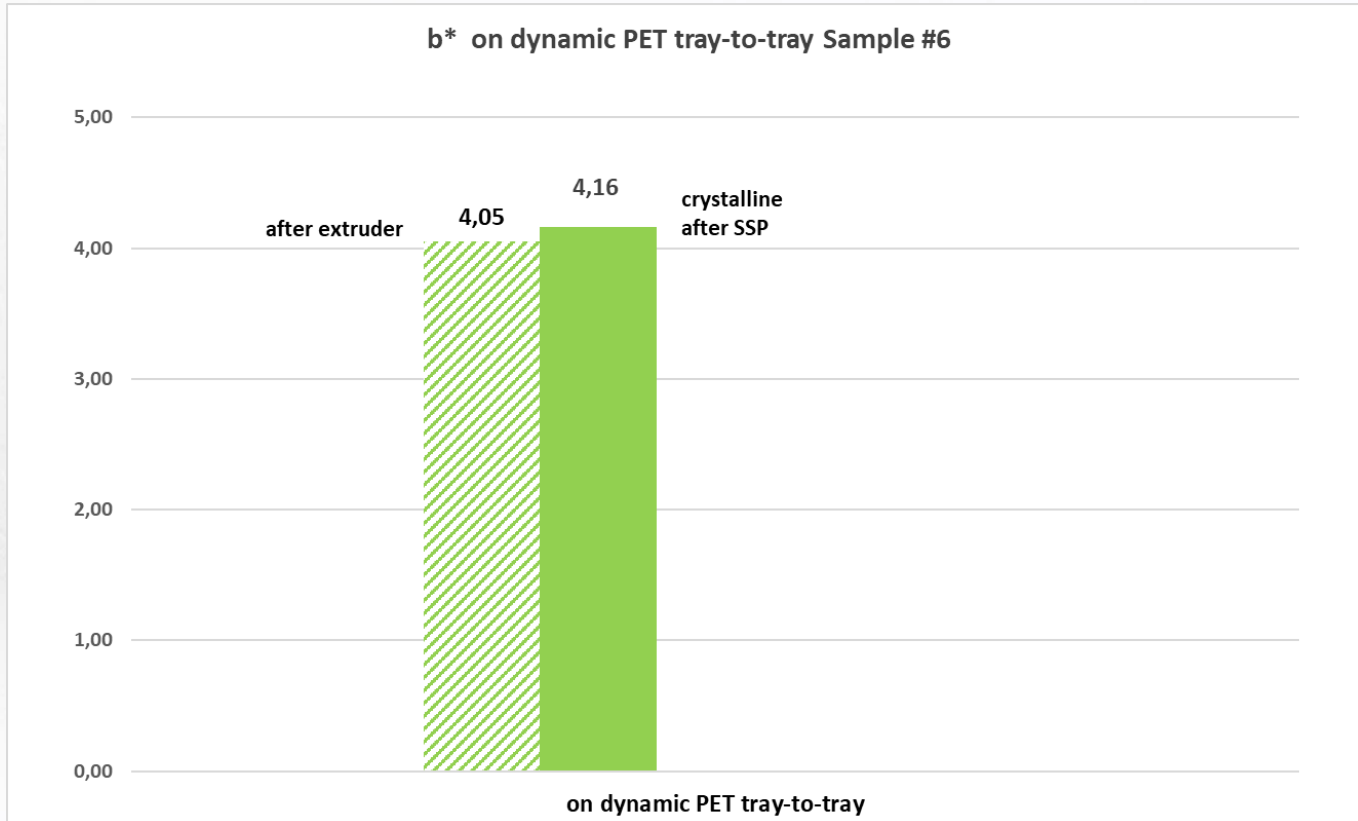
On dynamic PET tray-to-tray

Lower IV after extruder: melt pump in combination with the UWP recommended

IV-target reached after 8,5 h residence time in SSP



b*-Value




No lump formation during pre-drying

Better b*-value results on dynamic PET tray-to-tray,


All tests without anti-yellow

Summary technology comparison

recoSTAR PET IV+

- for high quality monoPET (monolayer) trays
- the system requires less operator attendance
- ensures higher uptime
- IV 
- b*

recoSTAR dynamic tray-to-tray

- wider range of input streams (bulk density and size variation)
- Processability is given also with some multi-layer content (PE/EVOH)
- b* 
- IV

recoSTAR dynamic PET tray-to-tray



Starlinger recycling technology

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