



Second Technical Conference Materia Nova

“Bioplastics: (reactive) compounding and related applications”

Ghislenghien (B) May 25th

“New production technology and application field”

Futerra – E. MAZIERS

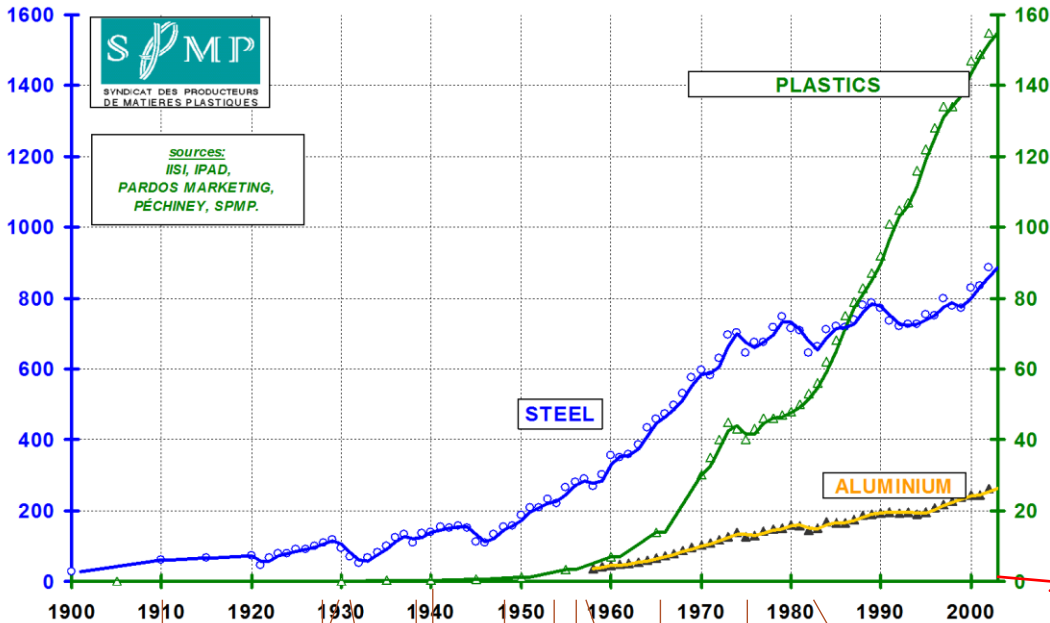
Futerro:



TOTAL PETROCHEMICALS



- Introduction of New PLA technology
- Supply of Lactic acid based products (oligomers, Lactide & PLA) for polymer and commodity markets.



Biopolymers

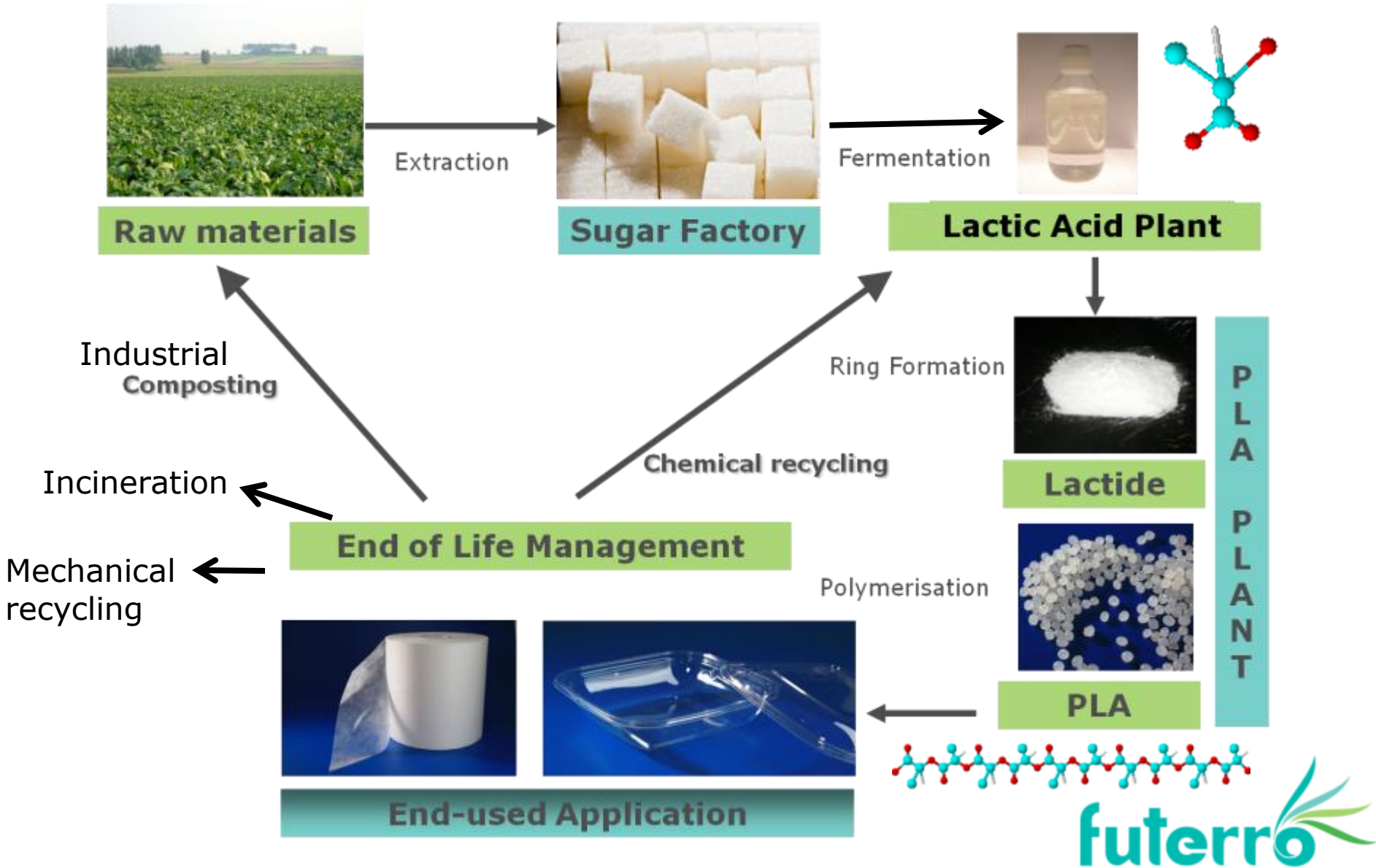


Standard plastics	Mio T	%
PE	79	37
LDPE	19	
LLDPE	24	
HDPE	36	
PP	53	25
Styrenics	23	10
PS	15	
EPS	6	
PVC	40	19
Rigid		
Flexible		
PET (bottle, film)	20	9
	213 Mio T	

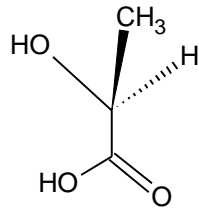
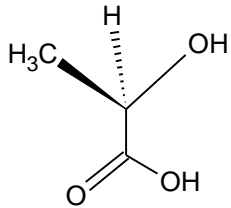
Engineering plastics	Mio T
PA	10
PC	4
PMMA	2
ABS, SAN	9
PBT	2.5
POM	
	~ 30 Mio T
	Mio T
High performance polymers	0.5-0.6

Biopolymers ~ 0.25 – 0.30 MioT

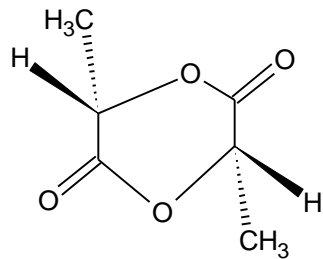
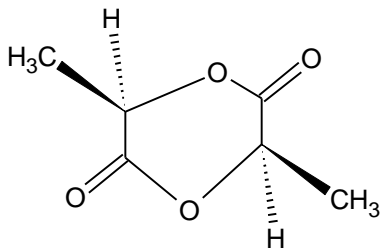
PLA : Biosourced polymer



Lactic Acid chemistry: based on chiral molecules.

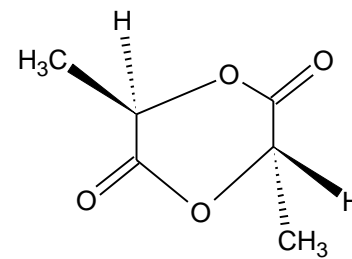


L & D - Lactic acids.



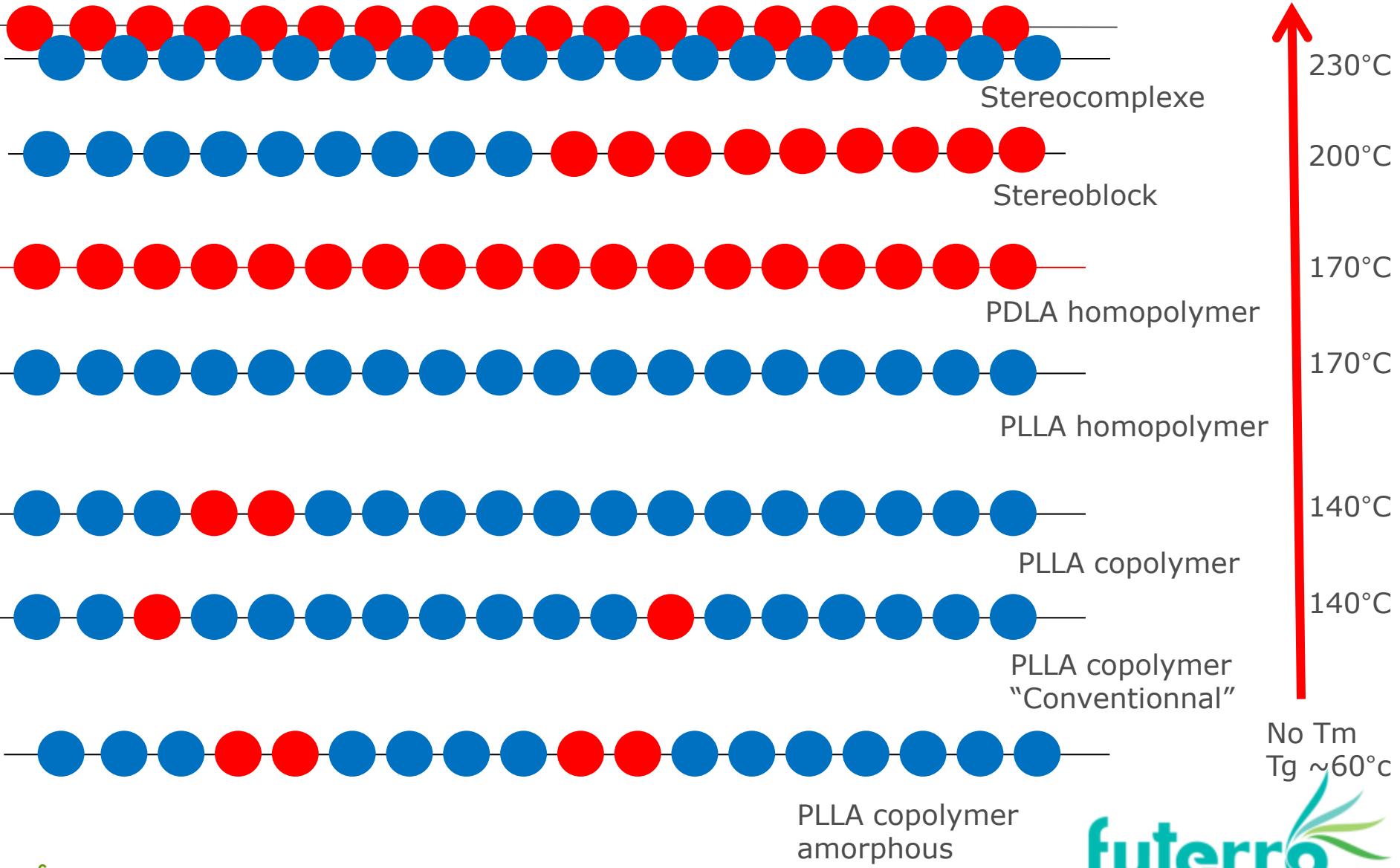
LL & DD - Lactides

Meso-lactide

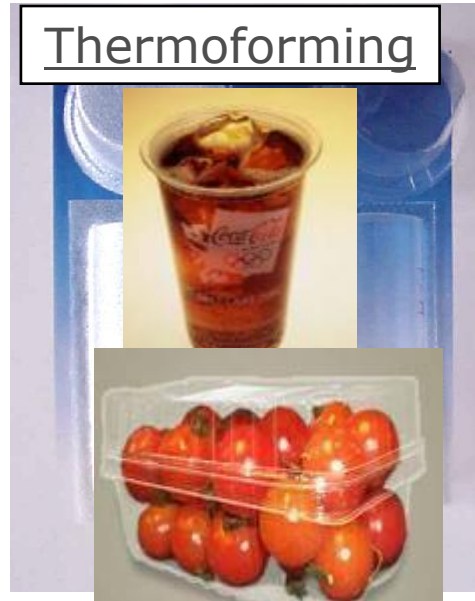


LD - Lactides

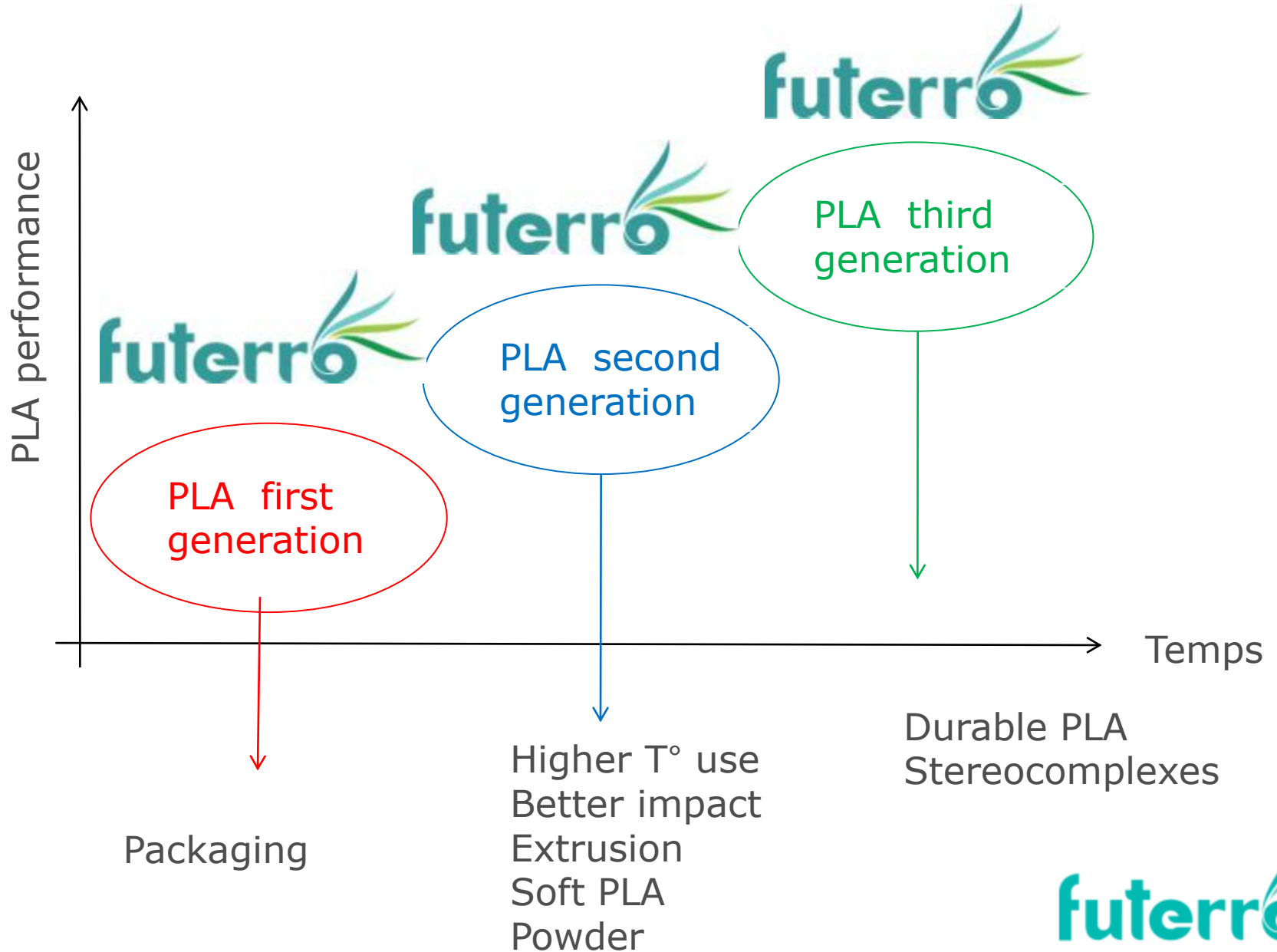
PLA structures :



PLA : the main marke on Today is packaging (non durable).



Futerra's strategy & developments:

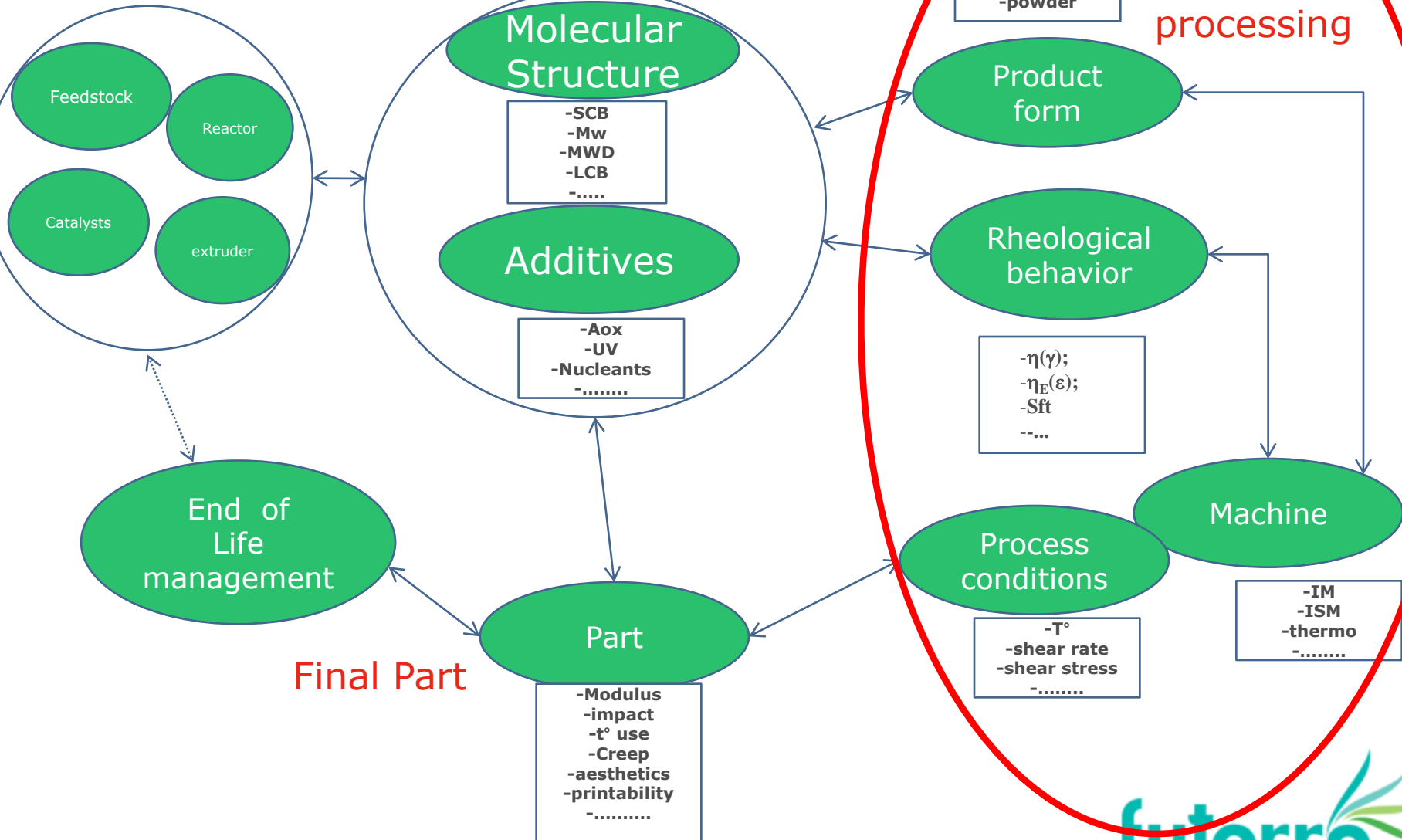


Polymer application developments: interactions.

Polymerisation

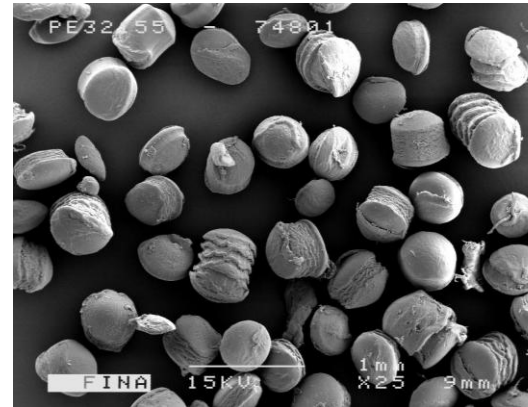
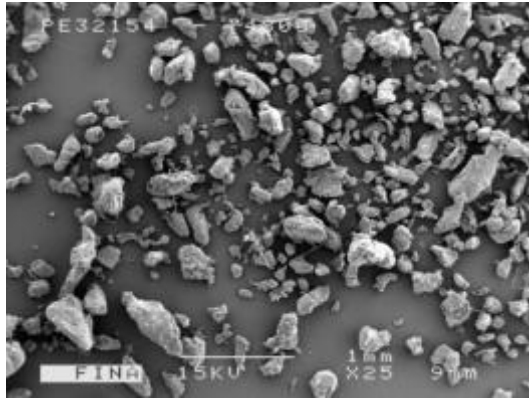
Polymer

Polymer processing

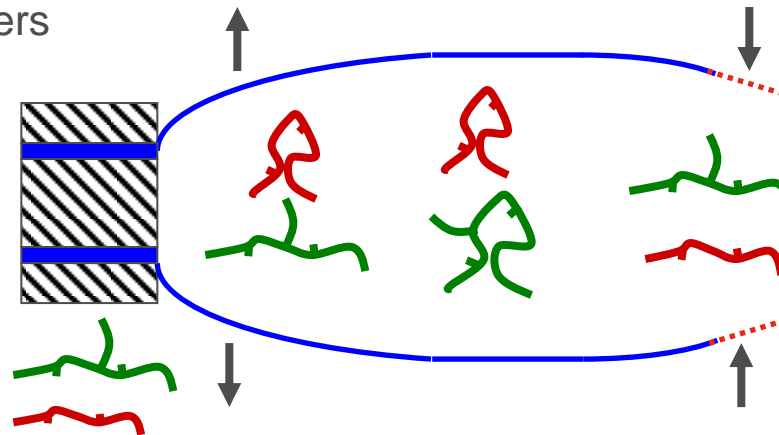


Exemple of PLA Processing:

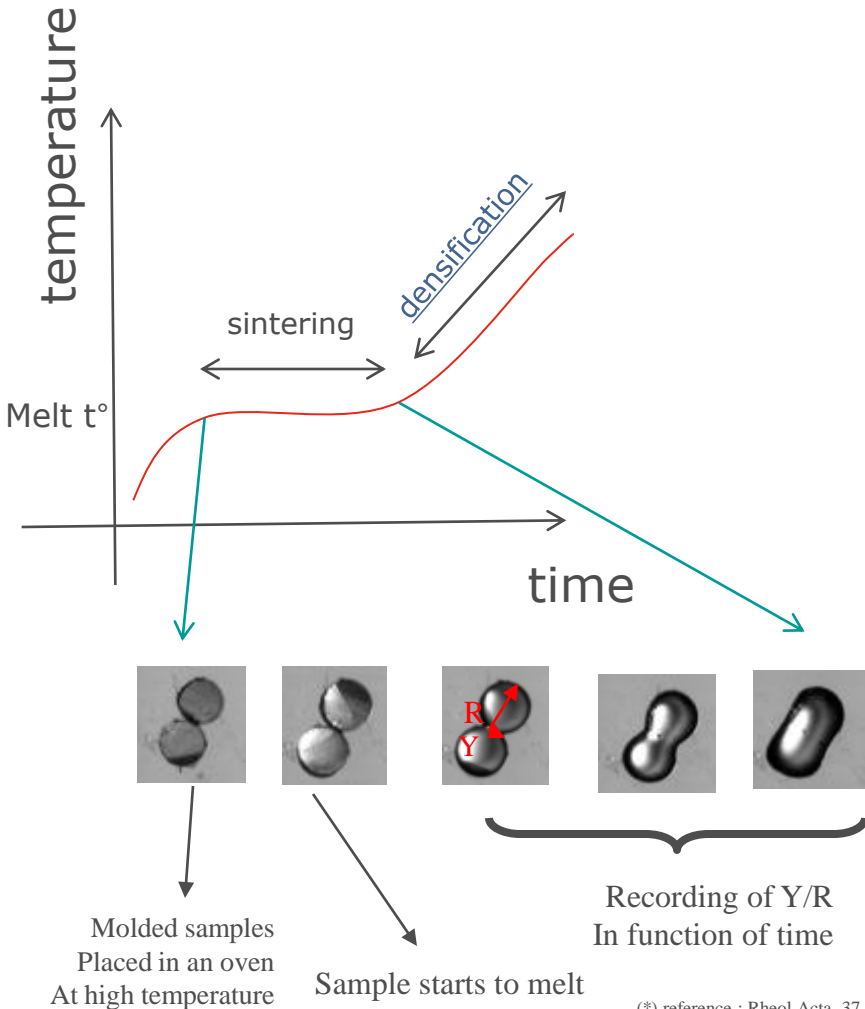
- Very low shear rate applications: powder or micropellet process.
 - Coalescence (sintering)/densification parameters.



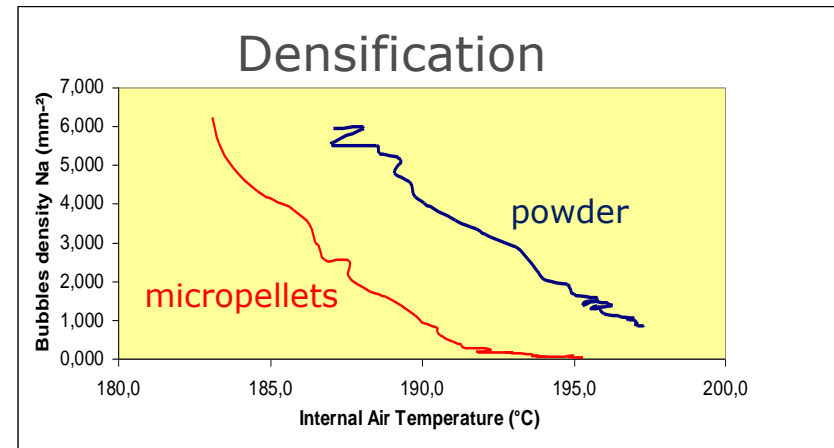
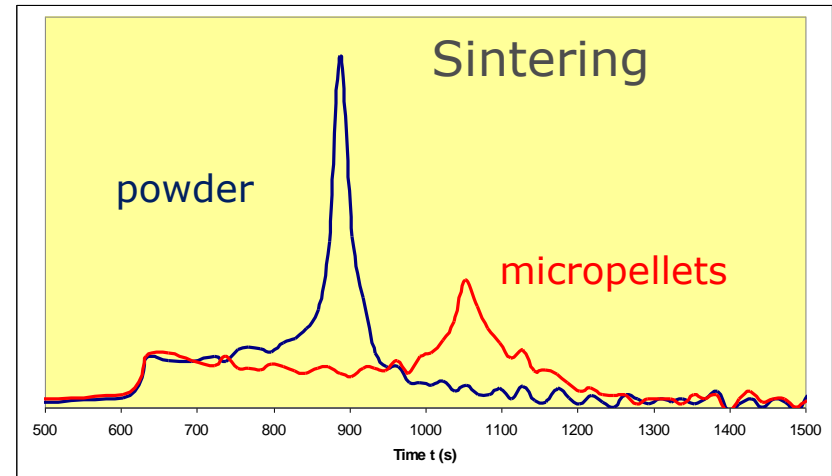
- Very high shear rate applications: extrusion.
 - Swell/sag parameters



“Zero” shear rate polymer powder melting: TP-Picture® technology.



(*) reference : Rheol Acta ,37 ,270,1998
Bellemumeur C.T,Kontopoulo M , Vlachopoulos J

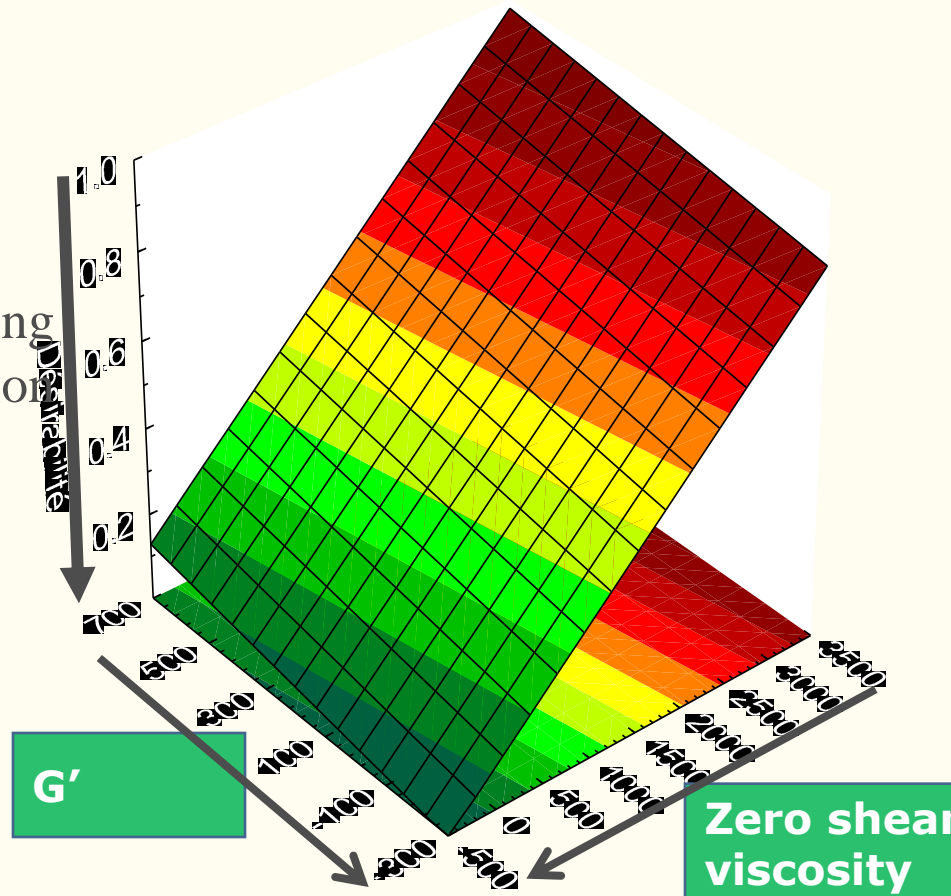


Sintering and densification related to rheology : Viscosity and Elasticity (G'), based on Total Petrochemicals model

Surface/Contours Désirabilité ; Méthode : Ajustement Quadratique

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Faster sintering
Faster densification



Futerro's powder development: exemple of design parts

- Specific molecular structure developed.
- Specific product form developed.
- Design part produced with high surface properties.

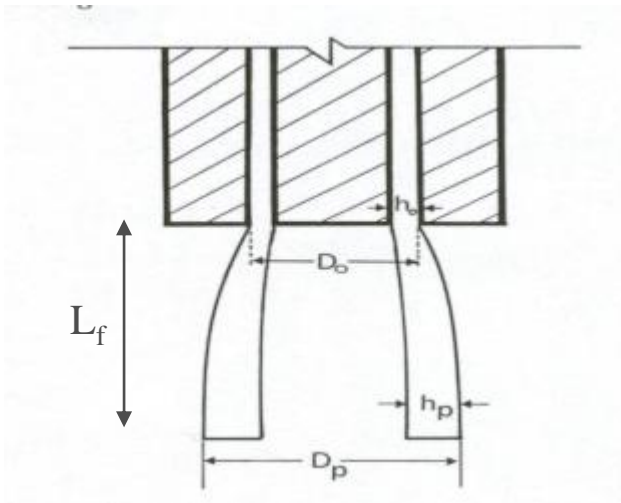


High shear rate (100 to 10000 1/sec) PLA processing: exemple of extrusion Blow-Moulding.



■ DIE SWELL:

- Fast increase of parison diameter at the die exit
- Polymer chain relaxation.
- Parison swells in diameter, weight and thickness.

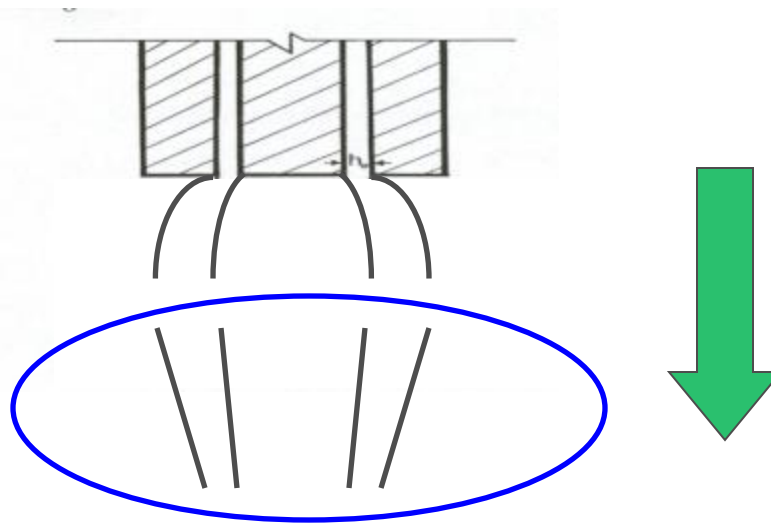


Die swell definition:

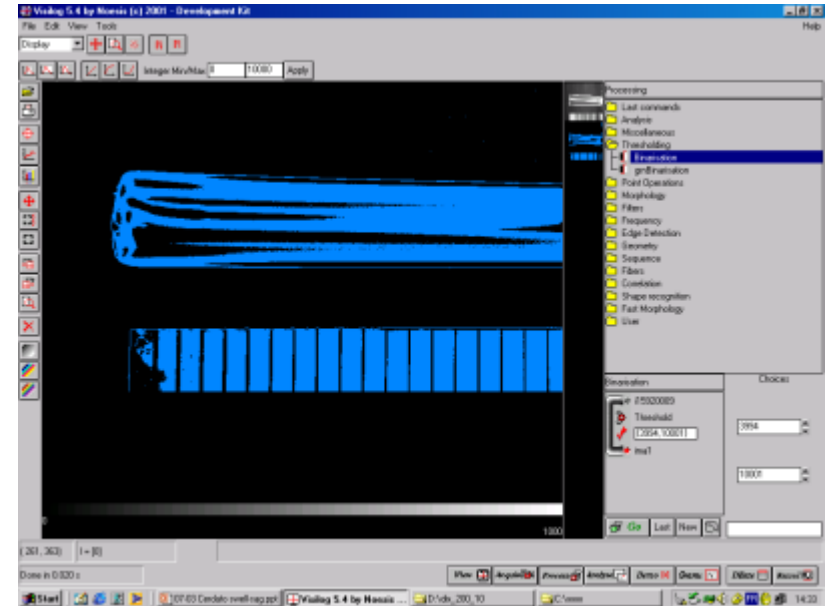
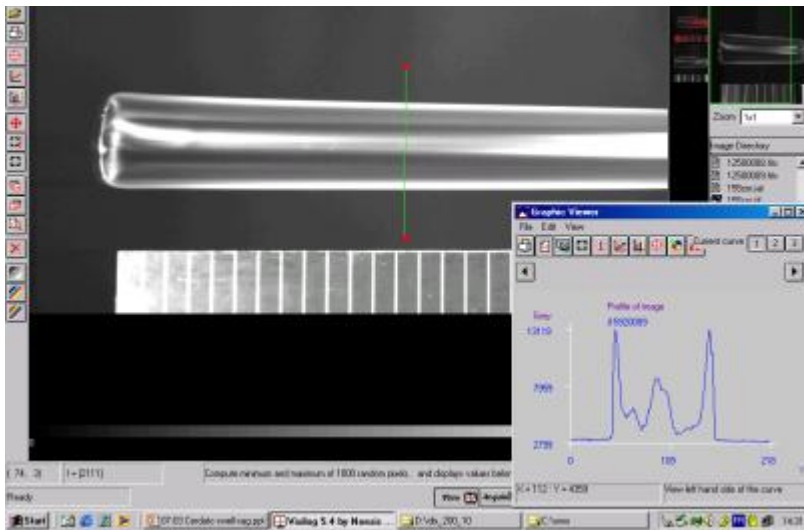
- 1) Diameter : D_p/D_0
- 2) Thickness: h_p/h_0

■ SAGGING

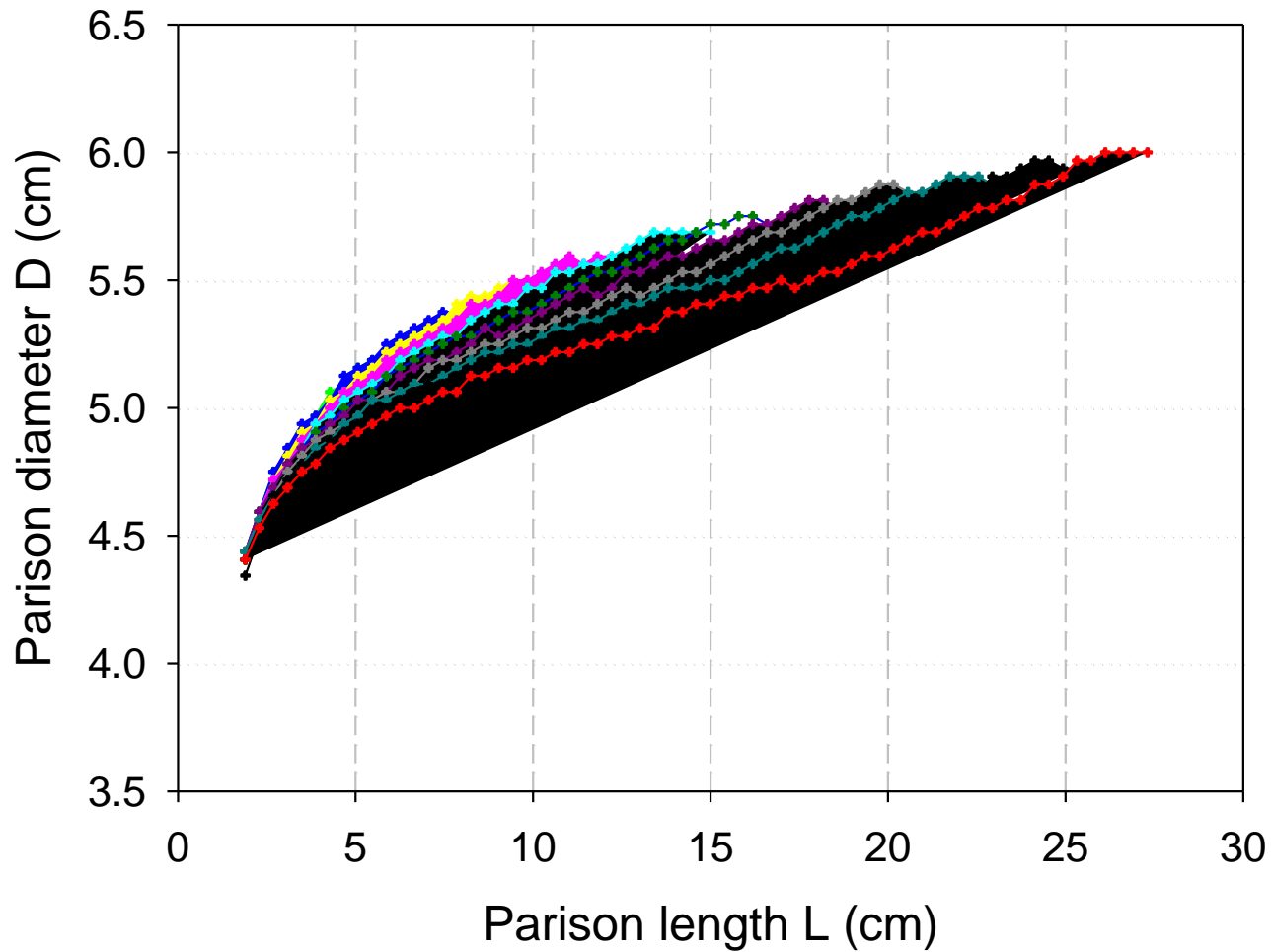
- Diameter decrease at a certain distance of the die.
- Increase of parison linear velocity.
- Chain orientation
- Gravity effect



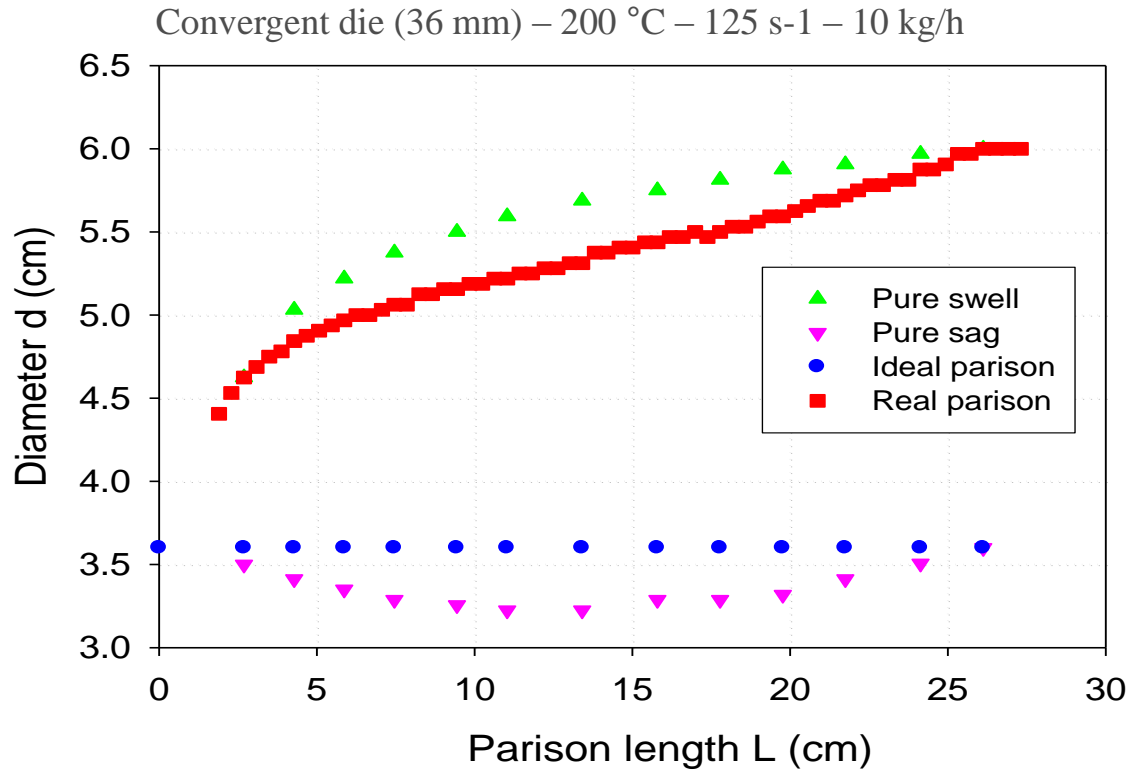
TP-Picture® technology allows to make on-line measures of Die swell and sagging parameters:



Parison diameter examples:



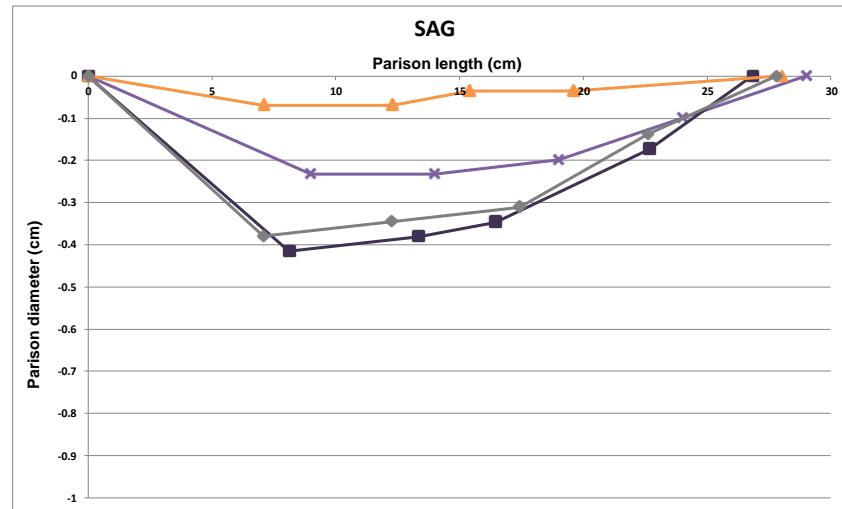
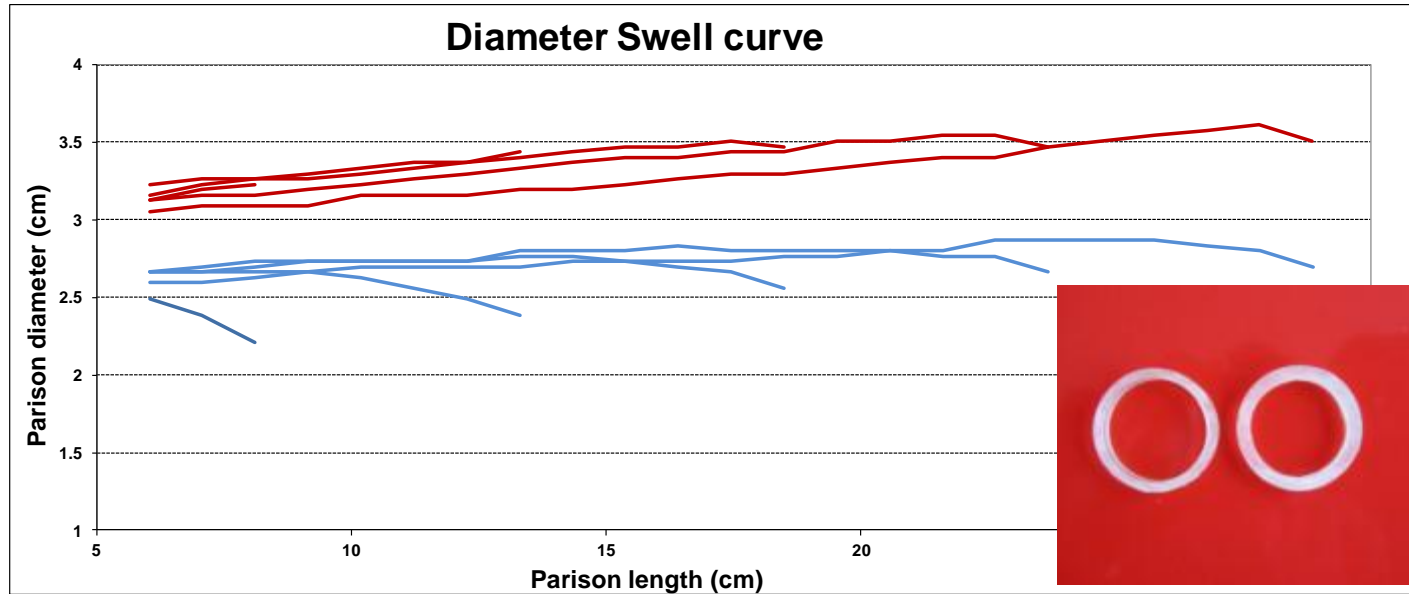
Result example:



TP-Pictures® allows to determine the two components, swells and sagging, independantly.

This allows us to desing PLA structures playing on the two commponents independantly.

PLA example:



- Futerro has many developments under progress in the field of extrusion.
- PLA structure is designed by Swell and sag behavior needed in the process.
- PLA processing is correlated to
 - -MWD,
 - -Mn,
 - $-\eta_E(\varepsilon)$
 - $-\eta(\gamma)$



Your partner

in Biorenewable polymer

