Materials innovation coupled with latest extrusion technologies to advance plastics packaging circularity

Presented by:
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Agenda

- Design for Recyclability
- MDO Process Fundamentals
- Property Developent and Trade-offs
- Application Development
- Outlook and Conclusions

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Technologies to enable recyclable packaging

Innovation Model: Engagement Across the Value Chain

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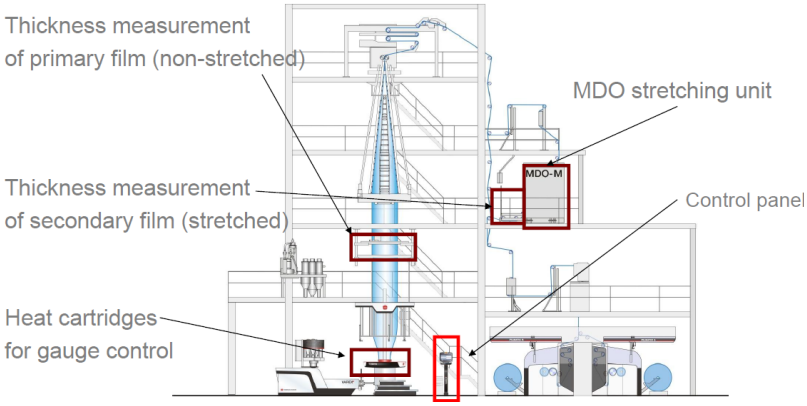
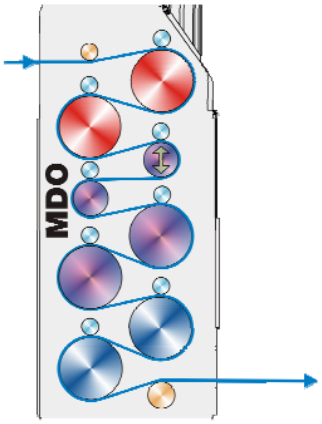
MDO Process Fundamentals

- MDO technology has been around for a very long time: more than 15 years
- All major OEMs are working on this subject: **W&H**, **H-A**, R-K, SML,…

MDO System Configuration – W&H

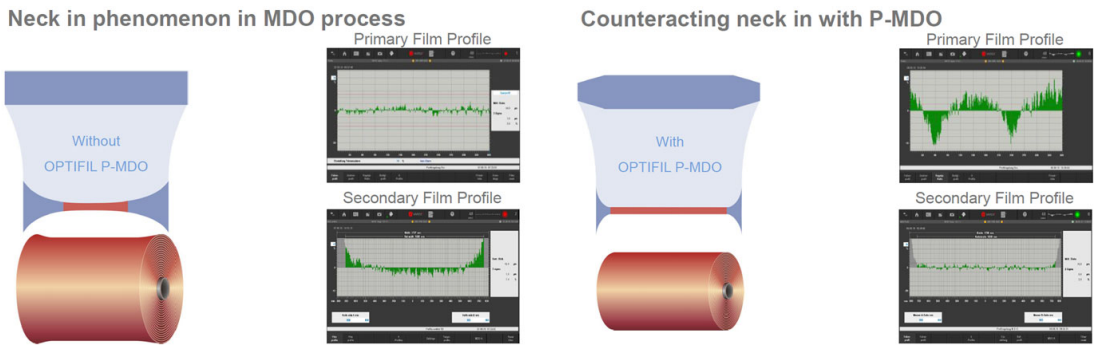
MDO stretching in blown film process



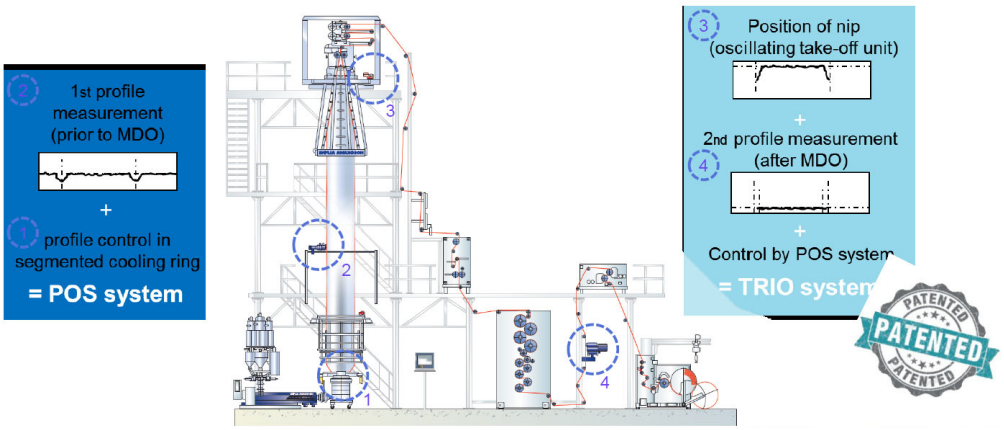


Preheating, Stretching and Annealing units are necessary

Neck-In Phenomenon



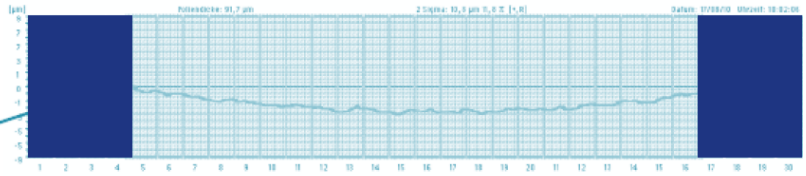
MDO System Configuration – Hosokawa Alpine



The method behind TRIO (=Trim Reduction In-line Orientation)

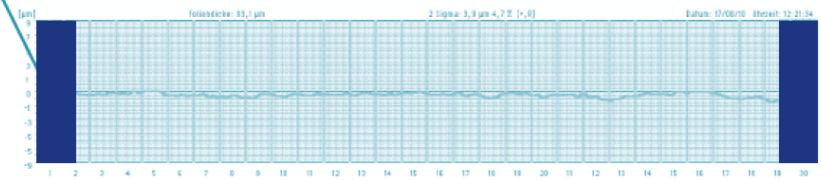
Trim Losses

Thickness profile after MDO **without** TRIO-system



Loss by trim

Thickness profile after MDO **with** TRIO-system



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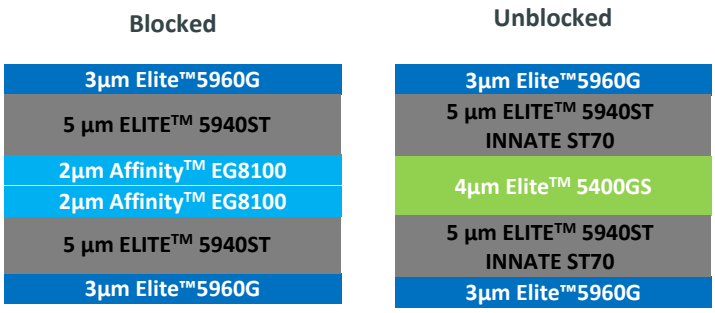
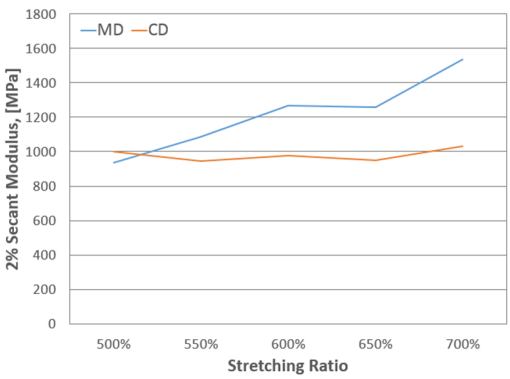
MDO Structure Design

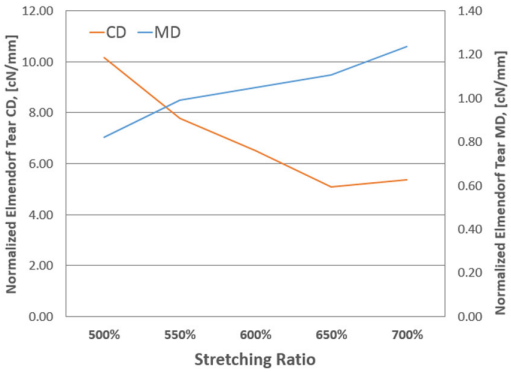


- **Leading to optimal stiffness at lower overall density**

Elite™ 5400GS 1, 0.916
Elite™ 5940ST 0.85, 0.941
Affinity™ EG8100 1.0, 0.870
Elite™ 5960G 0.85, 0.962
Innate™ ST70 0.85, 0.926

Property Trade-offs

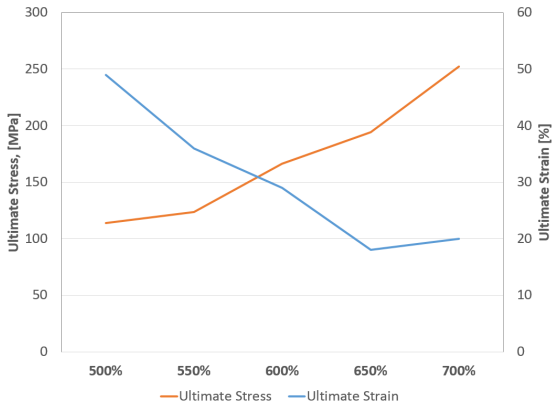


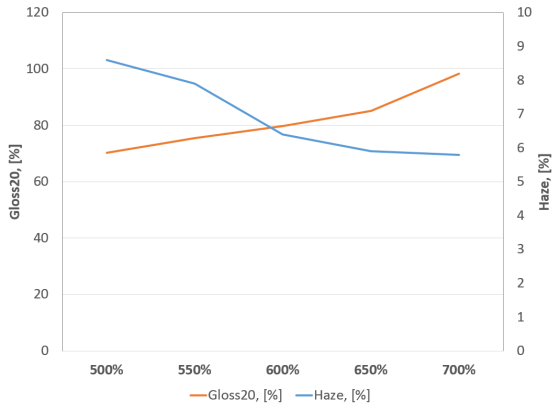


Very significant stiffening effect in both directions

Interesting phenomenon observed on tear resistance

Property Trade-offs





The best properties are obtained the closer to the stretching limit

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MDOPE as BOPP/BOPET Replacement

Key Benefits

- Sustainability — Mono-material compatible with existing recycling channels
- Cost efficiency — Material saving potential by improved toughness
- Appeal — Property profile comparable To BOPP incl. Metallization

Application Example

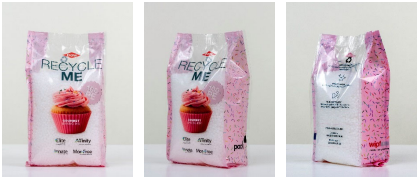
Extrusion Laminated MDO//PE structures have been fabricated at PackStudios and tested for hermeticity succesfully

Good HFFS line speed demonstrated with minimal film stretching

Property	MD	CD
2% Sec, [MPa]	1000-1350	900-1200
Elong., [%]	20-35	600-700
Ult. Str., [MPa]	140-180	30-35
Tear, [cN]	20-45	200-300
Haze/Gloss20, [%]	5-9/70-95	

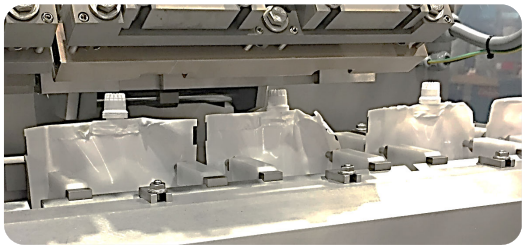
MDO25//PE80

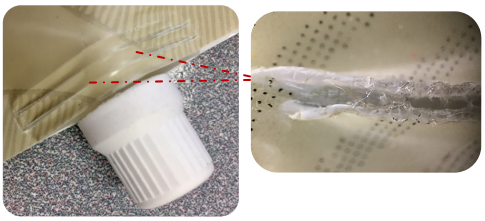
Extrusion Lamination as Enabling Technology

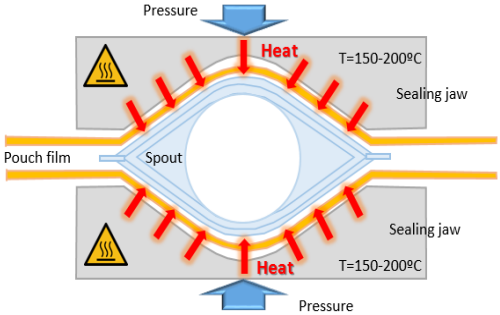


MDO25//PE80 Extrusion Laminated Prototypes Produced in PackStudios®

Reverse Spout Sealing Process



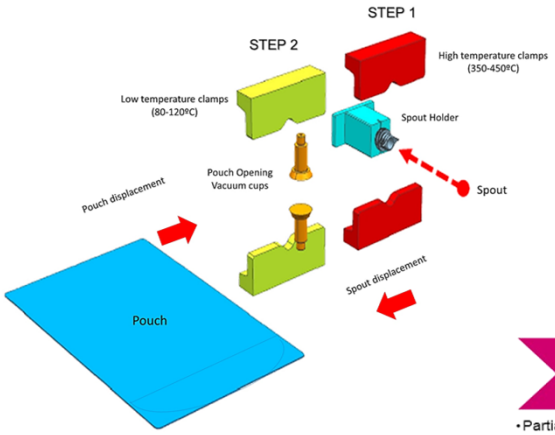




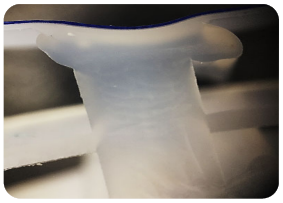
When heat is applied through the pouch film:

HEAT RESISTANCE BECOMES A CHALLENGE

The Solution: Two-Step Process



In partnership with: MENSHEN



Spout Heating / Partial Melting
- Partial melting of top areas of spout ribs
- High temperature: 400-450ºC

Spout insertion
- Placement in-between two pouch film walls

Sealing
- Pressure and Time
- Low Temperature: 80-120ºC
- Primary heat delivered by pre-melted spout

Cooling
- Potential third step

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Structure Simplification Allowing Recyclability

Outlook and Conclusions

- Proven formulations developed with major OEMs
- Demonstrated viable printing, extrusion lamination and conversion
- Proof-of-Concept of an all-PE pouch has been completed
- We are looking for partners to bring it to the market!

"Thank You"
for listening,
time for stretching out….

Presented by:

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