

PLACE 2016

EXPLORING
NEW FRONTIERS

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Go Beyond Adhesion: the Dual Functionality of Tie Layers

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Presented by:

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Dow Chemical Company



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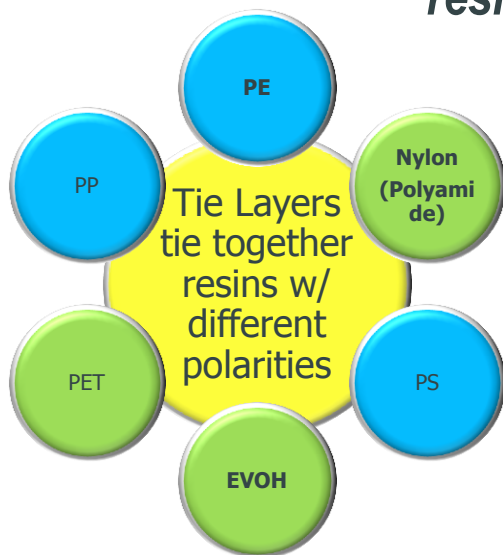
Agenda

- Introduction
 - What to expect from a tie-layer
 - Multifunctional concept
- AMPLIFY™ TY 1057H (concentrate A)
 - Adhesion
 - Toughness
 - Haze
 - Extrudability
- Conclusion

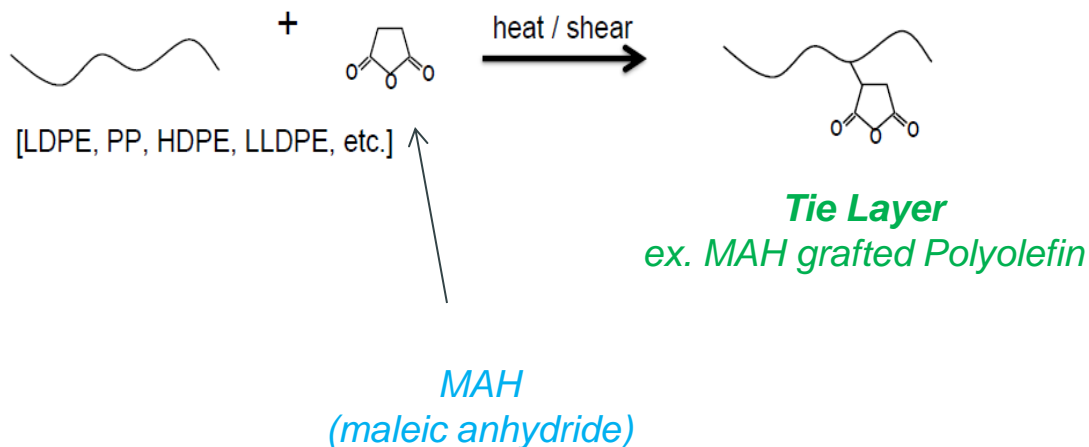
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What to Expect from a Tie Layer

*Tie Layers help **adhere polar (EVOH, PA etc.) resins to non-polar (PE etc.) resins in single-step coextrusion process***



- Production: Polymer synthesis + reactive extrusion
 - Maleic anhydride is grafted to a polymer backbone
 - Free radical process



*Polar resins (EVOH, PA (nylon)) are used for their **barrier** properties*

Polyethylene Film – Multifaceted Approach

Tie layer selection

Current: 1. Fully Formulated Grades

“Bread and butter” products

2. Concentrates

Customer customization

Future: 3. Multifunctional Tie Resins

Adhesion + toughness

Adhesion + barrier



Value in Multifunctional

- Value in building two functions in a single film layer:
 - Streamlined process
 - Down-gauging potential
 - Better film property
 - Additional values to customers
- Concentrate A: adhesion + toughness

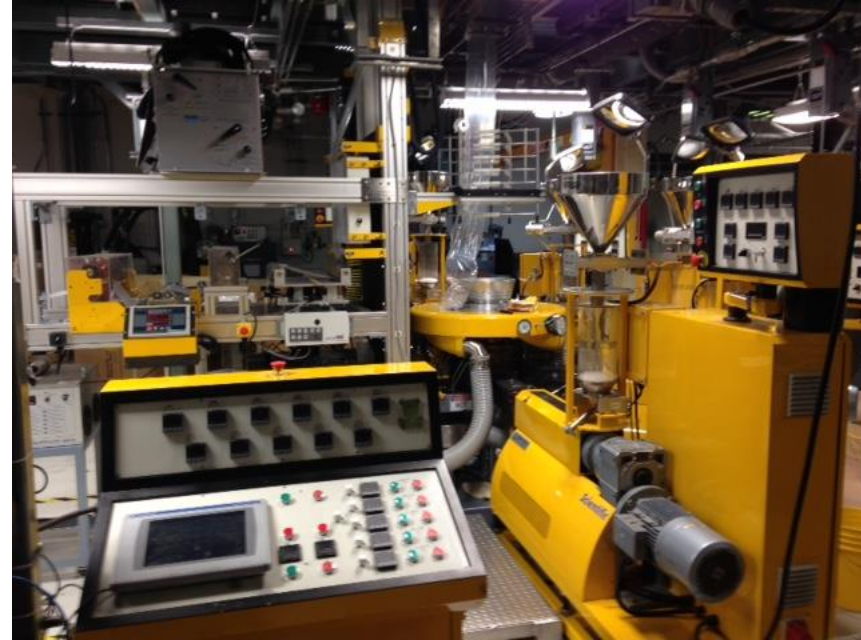


Experimental

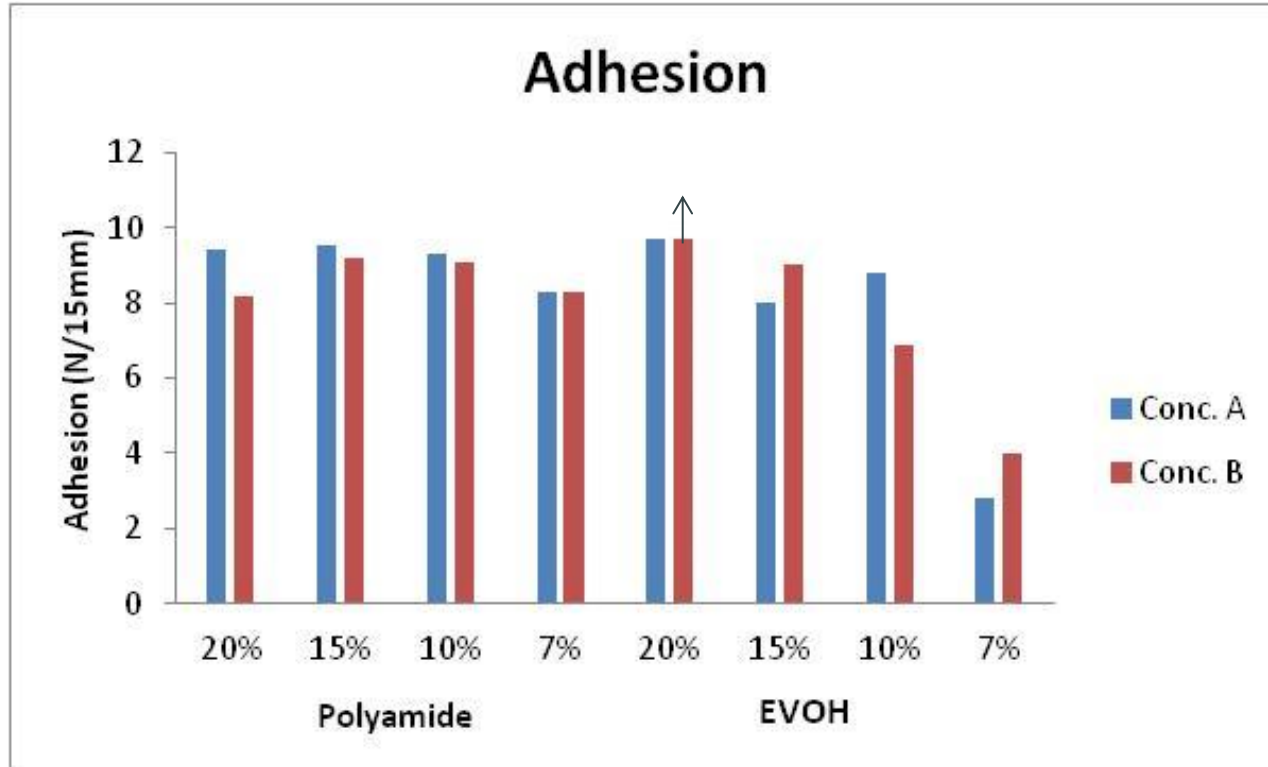
- Concentrate A vs. a competitive tie-layer concentrate (0.910 g/cc, 2.7MI) (Conc. B)
- Concentrates blended with a LLDPE let-down resin at 20%, 15%, 10% and 7% loadings.
- Comparison in a model 5-layer and 4 mil barrier film

LLDPE (30%)/Tie (10%)/EVOH or polyamide (20%)/Tie (10%) /LLDPE (30%)

- Labtech 5-layer blown film line in the Packstudio at Freeport, TX.
- Adhesion, dart, puncture and haze.

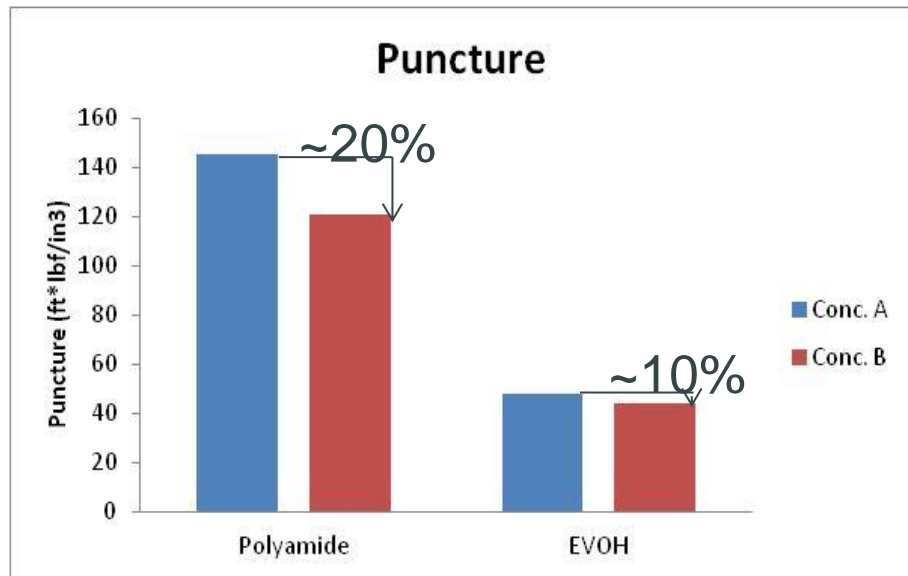
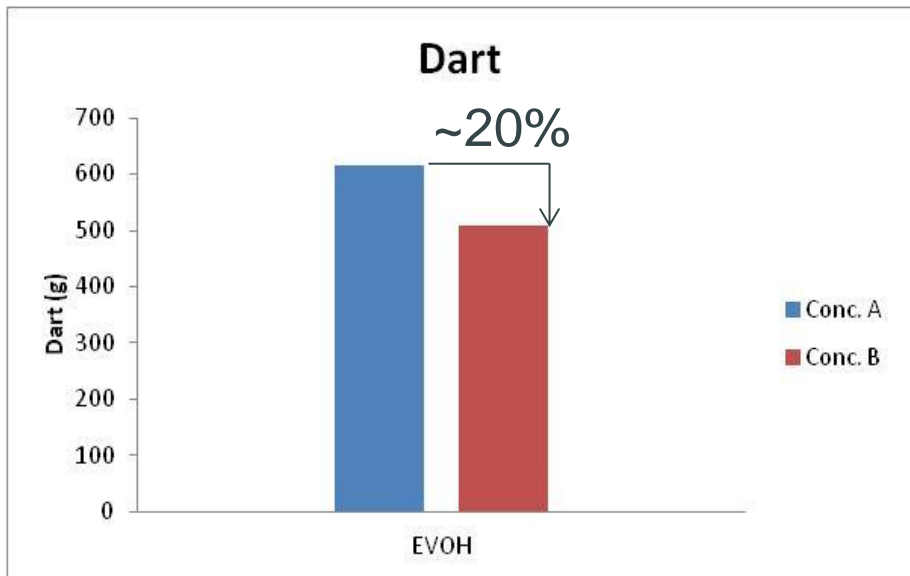


Adhesion



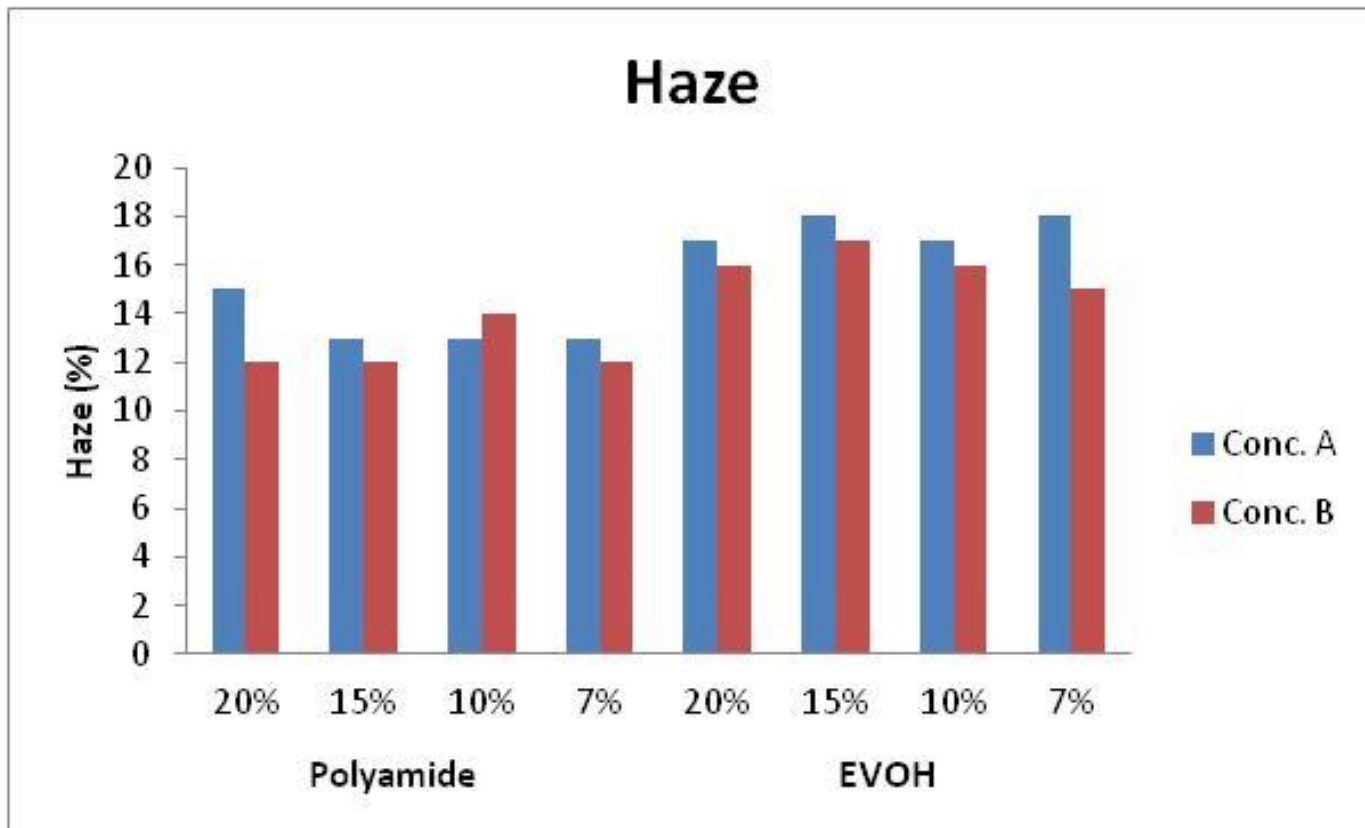
Tie-layer Conc. A and B demonstrate similar adhesion levels to polyamide and EVOH.

Toughness



At 20% loading (or ~4 wt% of the film), tie-layer Conc. A demonstrates up to 20% improvement in film toughness vs. Conc. B.

Haze



Conc. A may slightly increase total haze vs. Conc. B by an average of ~2%.

Extrusion

	Back Pressure (psi)		Torque (Current %)	
	Conc. A	Conc. B	Conc. A	Conc. B
20%	3105	3206	65	73
15%	3303	3325	70	79
10%	3343	3440	74	81
7%	3482	3514	77	77

Use of conc. A can lead to less back pressure and torque than Conc. B in extruders.

Conclusions

- Tie-layer Concentrate A can improve the dart and puncture of coextruded barrier films vs. tie-layer Concentrate B.
- Tie-layer Concentrate A and B have similar performances in adhesion, haze and extrudability.
- Concentrate A is the preferred grade to use in applications where better dart and puncture properties are desirable.



Thank you

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