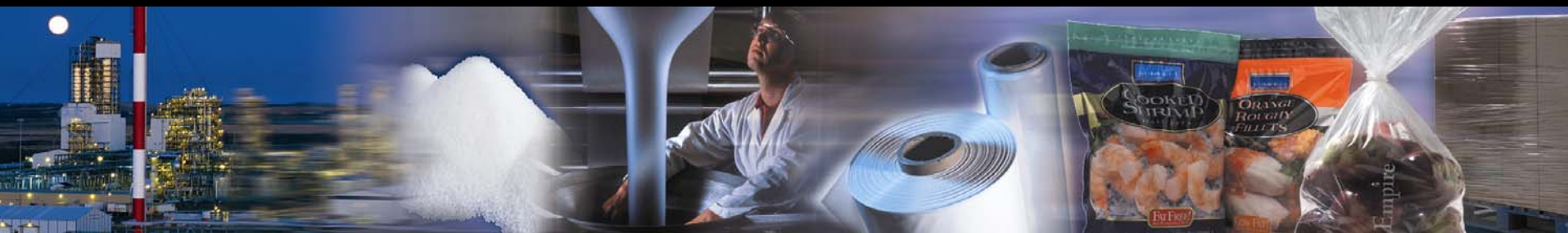


SURPASS[®] resins



New Catalyst and Reactor Technology For Polyethylene Resins

Presented to PFMA

Toronto

September 26, 2006

Al Glasspoole

Advanced SCLAIRTECH Technology

- For the last five years NOVA Chemicals has been developing and introducing new products based on Advanced SCLAIRTECH Technology
 - Developed from the classic SCLAIR solution process platform
 - Features high intensity, multi-reactor solution polymerization technology
 - Latest developments based on proprietary single-site catalyst (SURPASS sLLDPE)

NOVA Chemicals' SURPASS sLLDPE resins deliver...

- FPs117-C, PPA
- FPs117-D, PPA, SLIP, AB
- FPs117-F, PPA, AB
- HPs900-C, high clarity, PPA

d:0.917 g/cc – MFI: 1 g/10mn

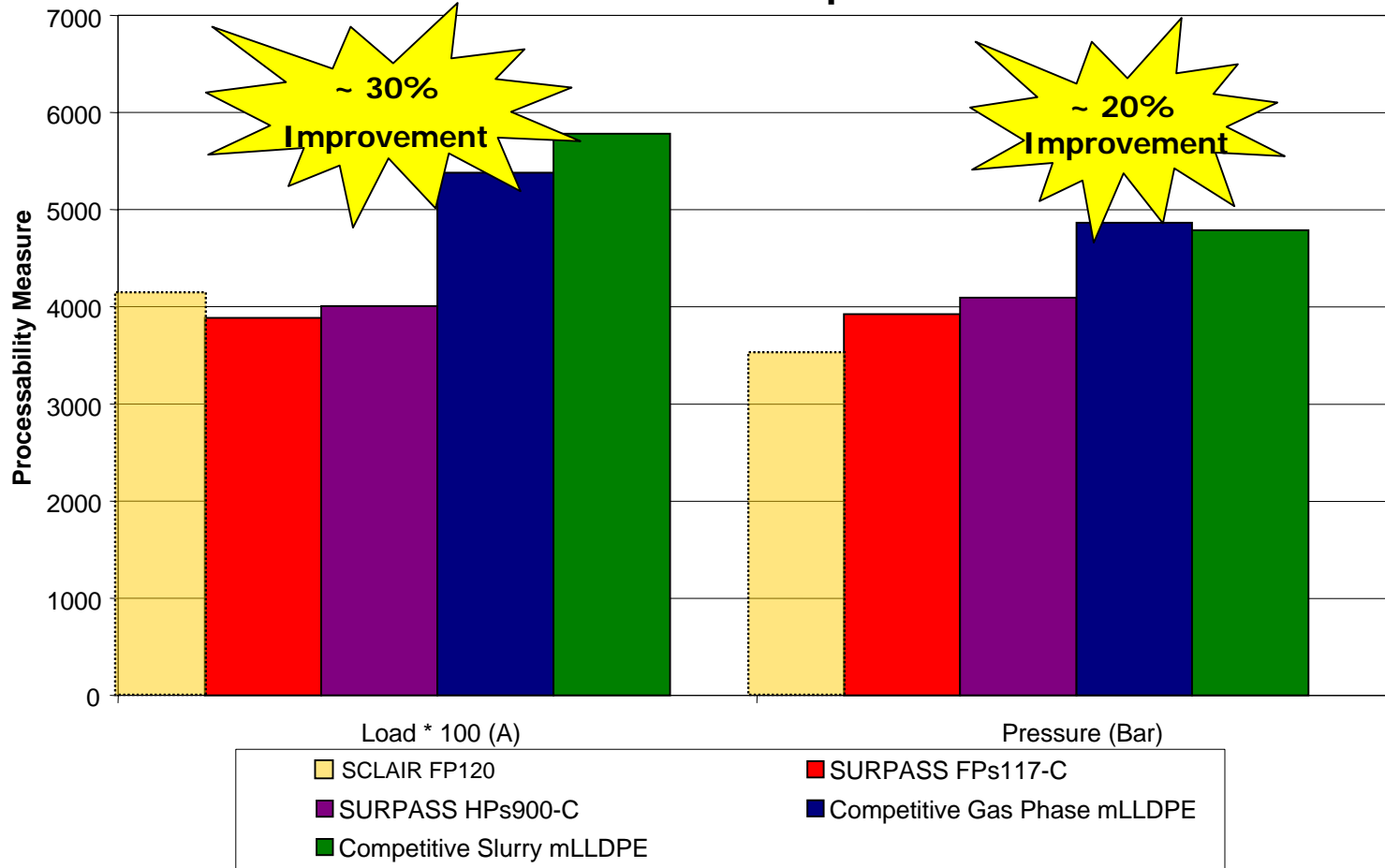
Features and Benefits

- Exceptional Processability
- Excellent Tear
- Excellent Sealability
- HPs900-C Excellent Optics
- Very Low Gel
- Low Organoleptics

Wide Range of Applications:

- Sealant and lamination film
- High clarity film
- High strength

Processability Comparison @ Constant Output SURPASS sLLDPE vs Competitive mLLDPE



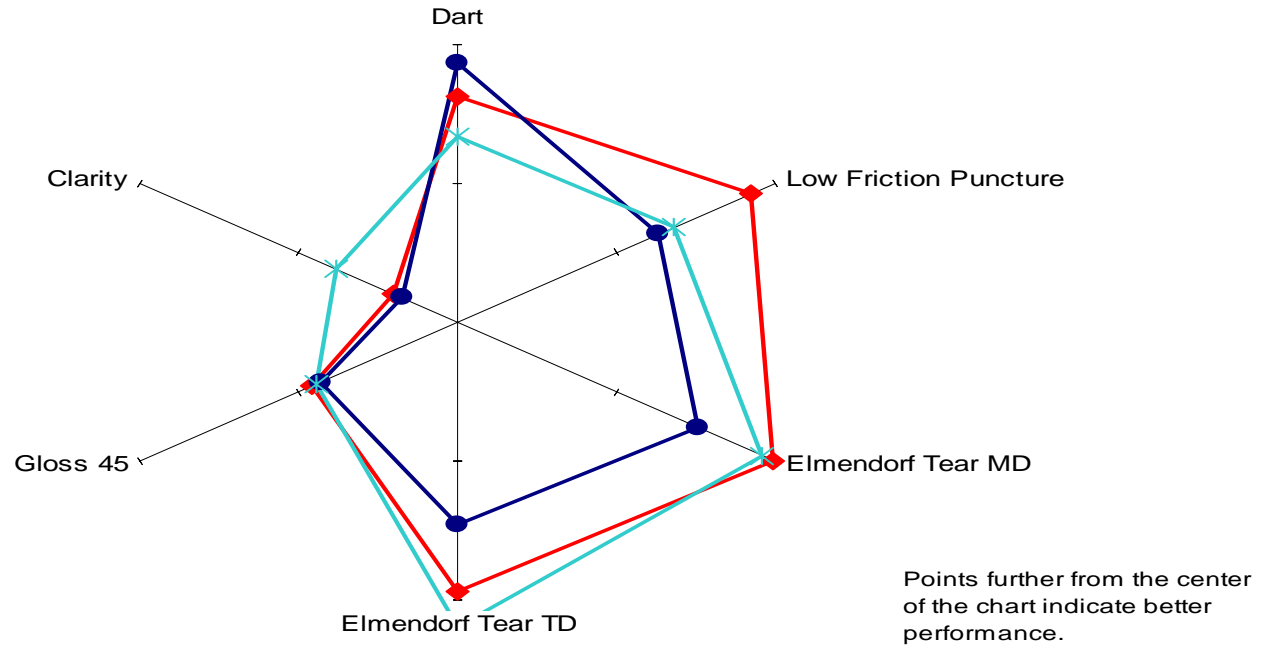
Processability Comparison Summary

- SURPASS resins feature improved processability relative to competitive mLLDPE resins. This means:
 - **LOWER** extrusion pressure and power requirements at the same output
 - **HIGHER** output on pressure- or amperage-limited extruders
 - **HIGHER** output by reducing melt temperature on bubble stability-limited lines at comparable pressure and power draw

Film Performance Comparison

- 100% LLDPE
 - Selected physical properties
 - Key film performance characteristics
- LLDPE/LDPE Blends
 - Selected physical properties
 - Key film performance characteristics

Physical Property Comparison SURPASS FPs117-C vs competitive mLLDPE

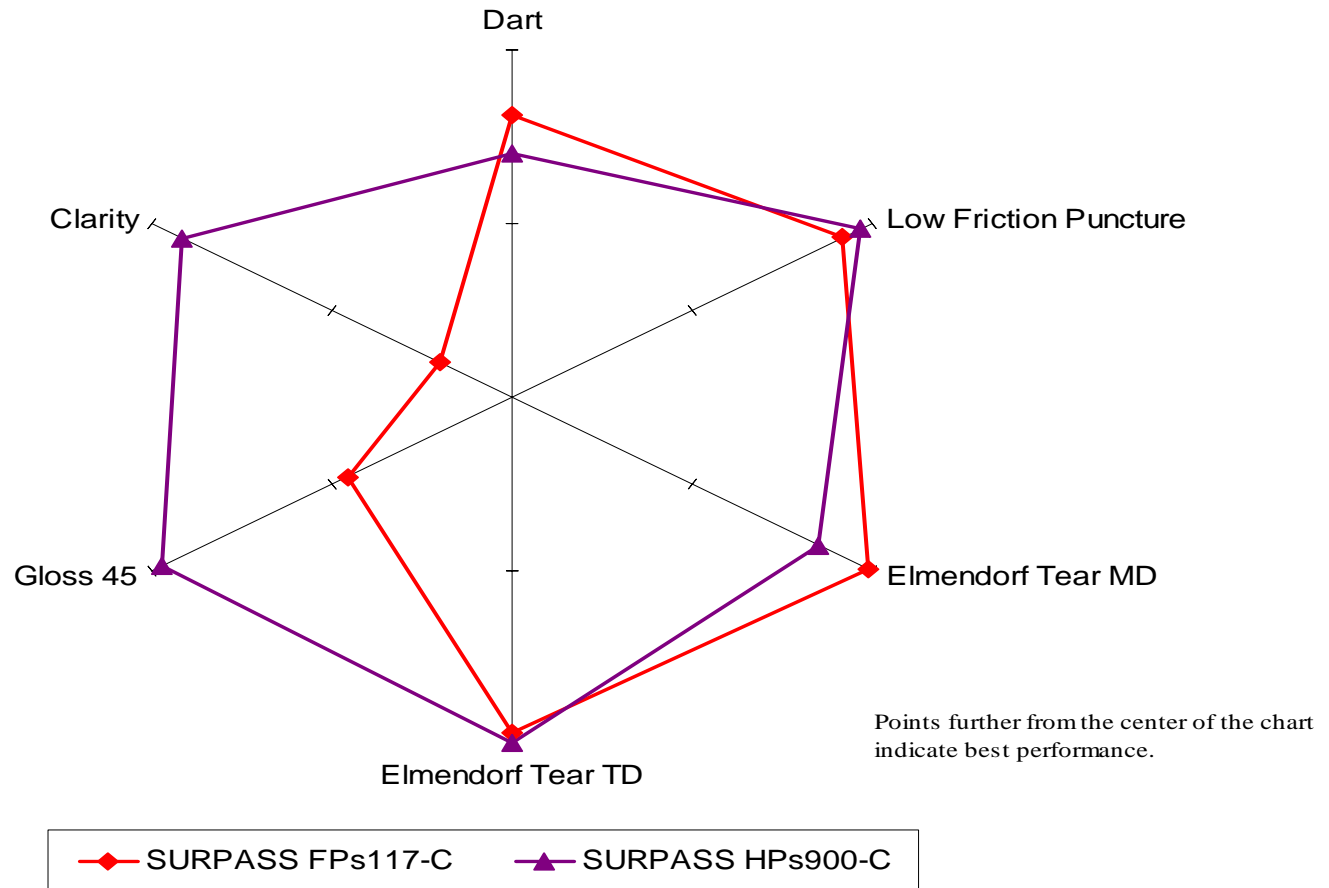


—◆— SURPASS FPs117-C

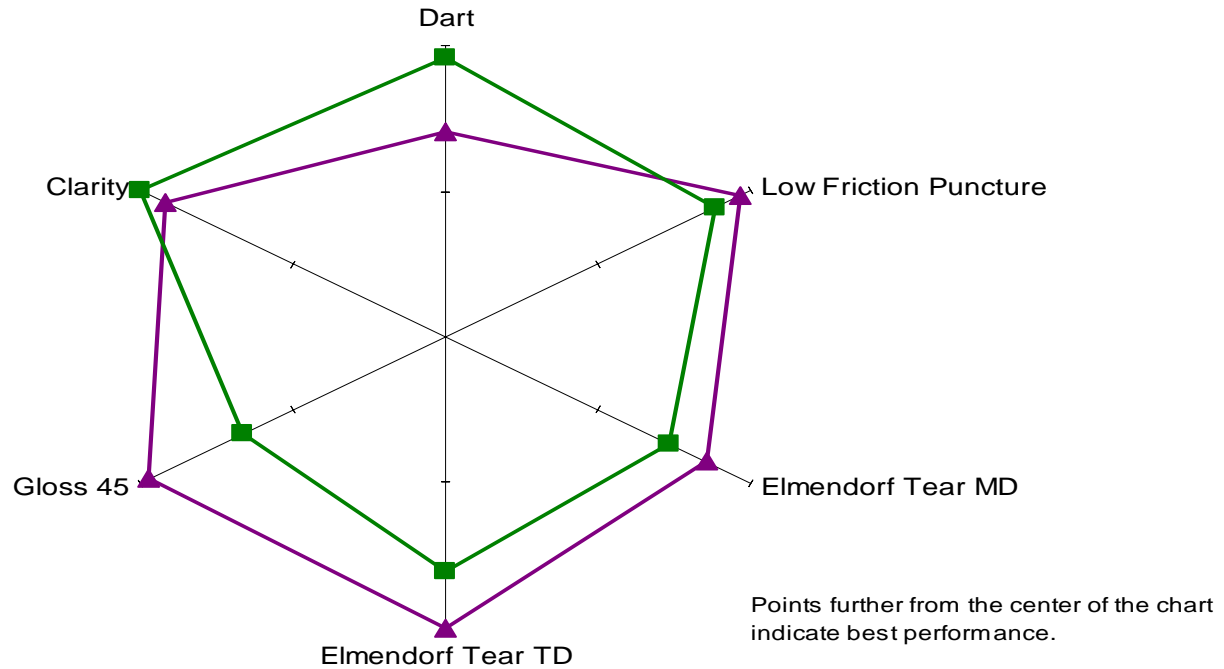
—●— Competitive Gas Phase mLLDPE

—✱— Competitive Solution mLLDPE

Physical Property Comparison: NOVA Chemicals SURPASS sLLDPEs



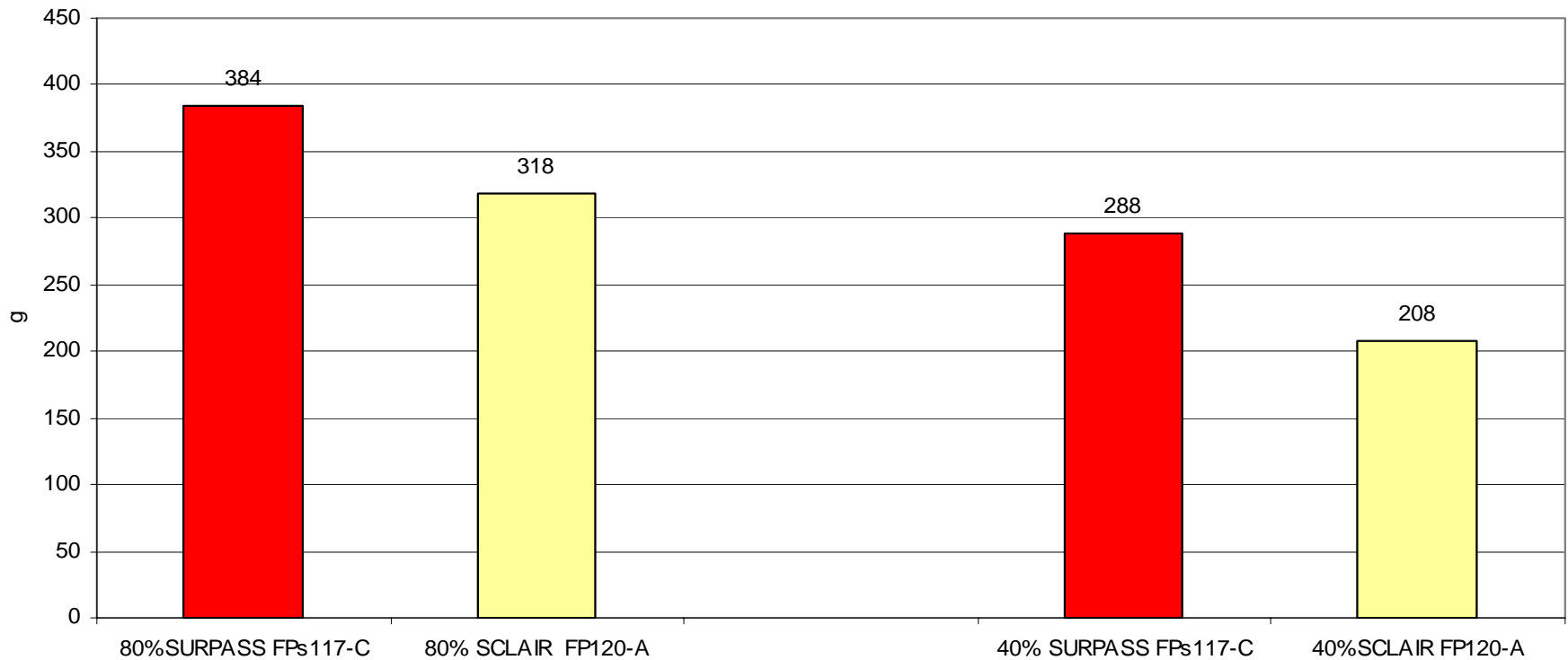
Physical Property Comparison SURPASS HPs900-C vs. Competitive resin



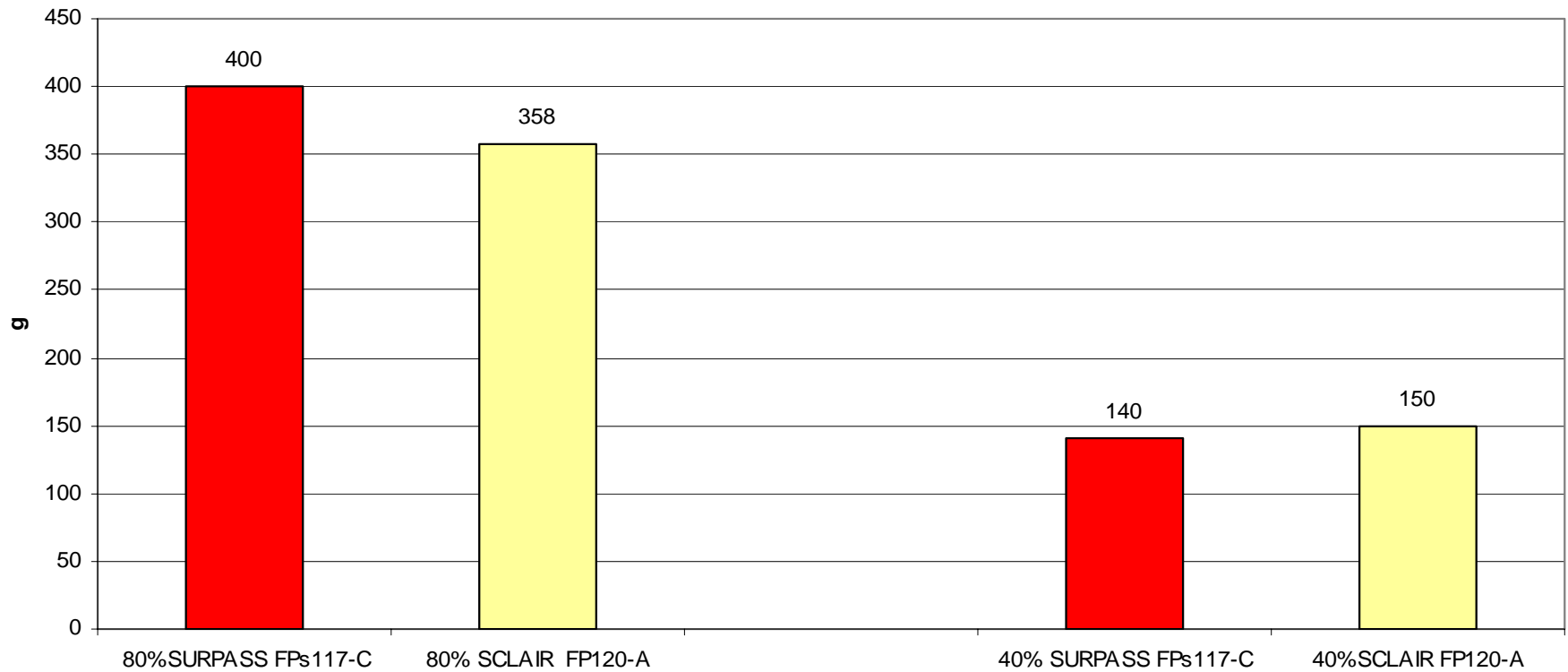
▲ SURPASS HPs900-C

■ Competitive Slurry mLLDPE

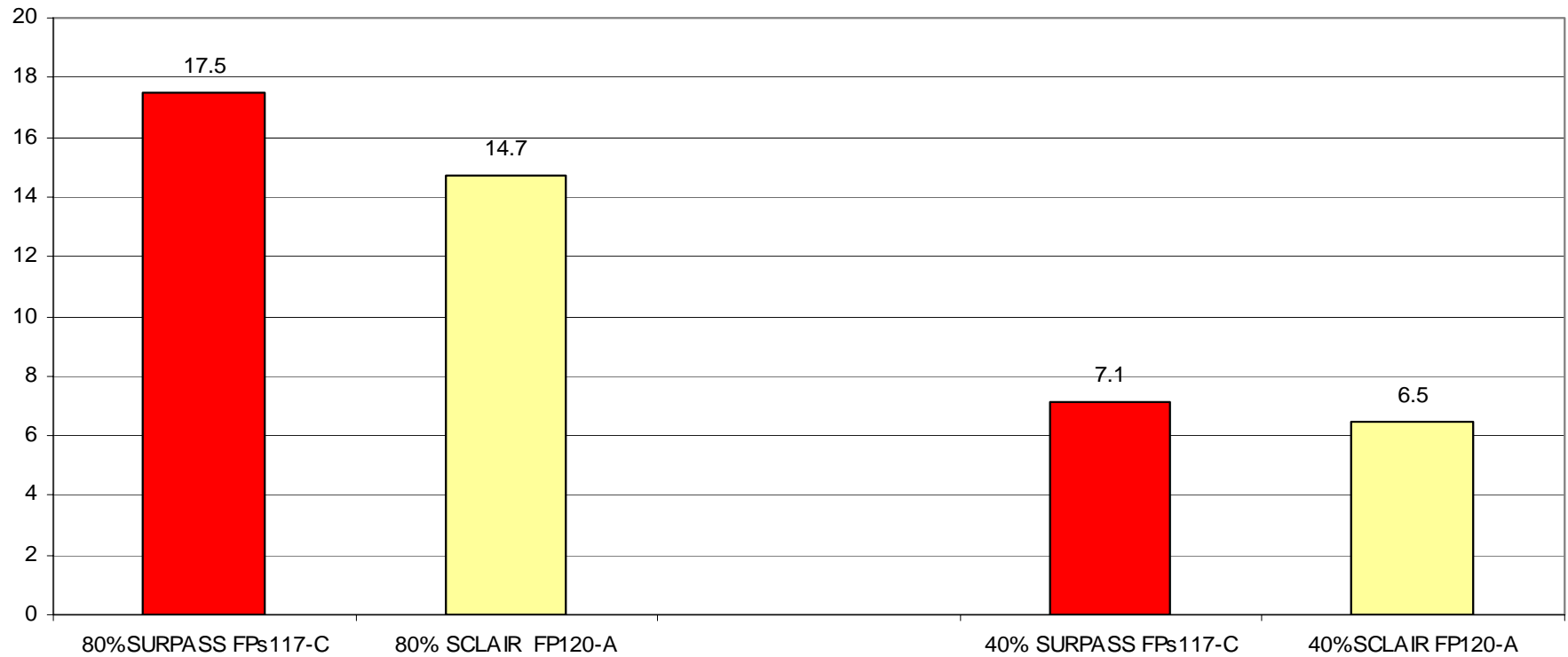
Blend Comparison - Dart Impact SURPASS vs SCLAIR C₈ LLDPE/LDPE



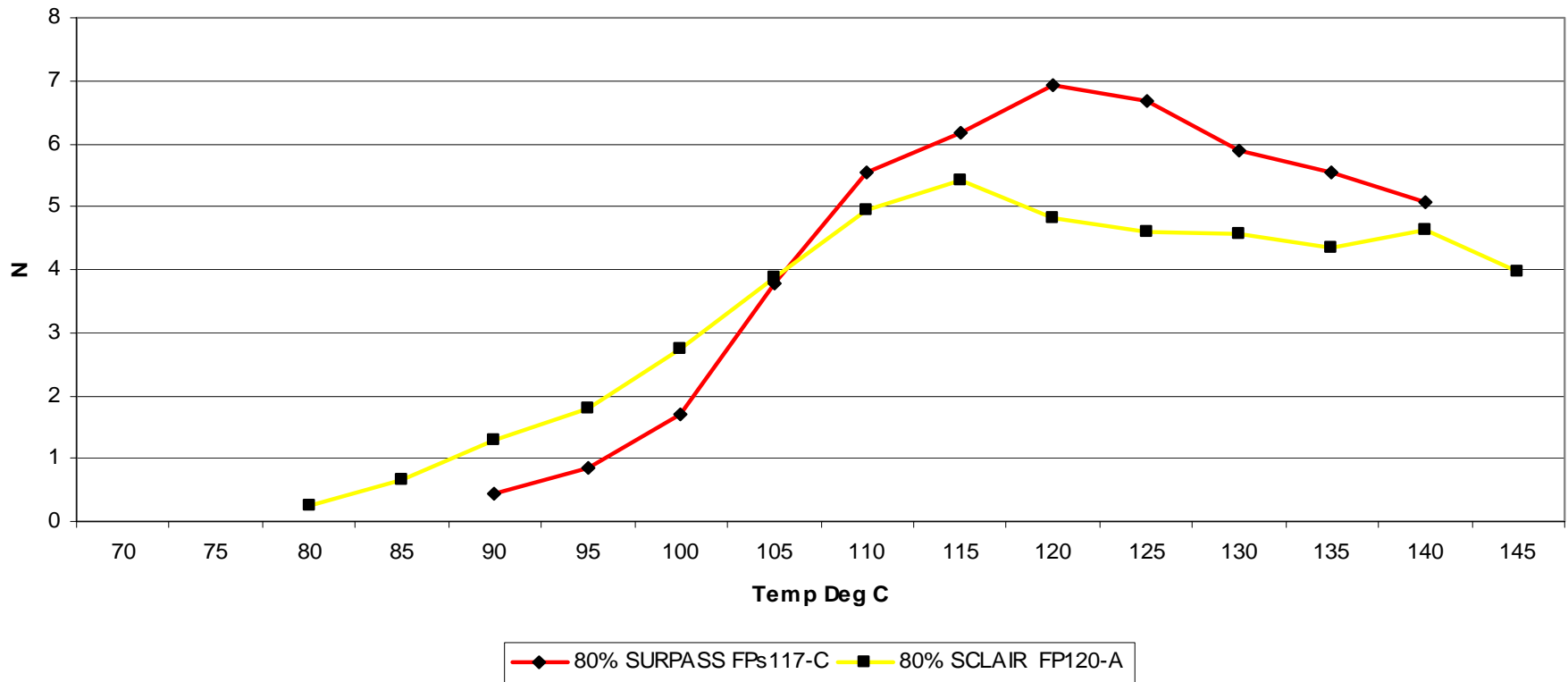
Blend Comparison - MD Tear Strength SURPASS vs SCLAIR LLDPE/LDPE



Blend Comparison - Clarity SURPASS vs SCLAIR C₈ LLDPE/LDPE



Hot Tack 80% Blends With LDPE SURPASS vs SCLAIR C₈ LLDPE/LDPE



Recommended Applications for SURPASS sLLDPE Films

- **FPs117-C/D/F**

- High seal strength, high film toughness applications, in linear rich blends; e.g., food packaging, ice bags, freezer bags, sachets, especially in thinner layers
- Alternative to conventional C₈ LL and solution phase mLLDPE

- **HPs900-C**

- Coextruded seal layer, at 100% LL where high clarity and film strength is required, in thinner layers
- Non-printed food packaging

Resin Performance Comparison VFFS Pouch

	SURPASS FPs117/ HPs900	Z-N C₈ LLDPE	mC₆ LLDPE	mC₈ LLDPE
Seal Strength	√√	√	√√	√√
Hot Tack Strength	√√	√	√√	√√
Impact Strength	√√	√	√√	√
Puncture Resistance	√√	√	√	√
Organoleptics	√√	√	√√	√
Processability	√√	√√	X	√√

Resin Performance Comparison Liquid Packaging

	SURPASS FPs117 HPs900	Z-N C₈ LLDPE	mC₆ LLDPE	mC₈ LLDPE
Seal Strength	√√	√	√√	√√
Hot Tack Strength	√√	√	√√	√√
Impact Strength	√√	√	√	√
Puncture Resistance	√√	√	√	√
Clarity (w/o blending)	√√	√	√	√√
Organoleptics	√√	√	√√	√
Processability	√√	√√	X	√√

Resin Performance Comparison Fresh Food Packaging

	SURPASS FPs117 HPs900	Z-N C₈ LLDPE	mC₆ LLDPE	mC₈ LLDPE
Seal Strength	√√	√	√√	√√
Tear Strength	√√	√	√	√
Impact Strength	√√	√	√√	√
Puncture Resistance	√√	√	√	√
Clarity (w/o blending)	√√	√	√	√√
Organoleptics	√√	√	√√	√
Processability	√√	√√	X	√√

Resin Performance Comparison Industrial Applications

	SURPASS FPs117 HPs900	Z-N C₈ LLDPE	mC₆ LLDPE	mC₈ LLDPE
Seal Strength	√√	√	√√	√√
Hot Tack Strength	√√	√	√	√
Impact Strength	√√	√	√√	√
Puncture Resistance	√√	√	√	√
Clarity (w/o blending)	√√	√	√	√√
Processability	√√	√√	X	√√

SURPASS Film

Recent Commercial Success

- **Application:** Greenhouse Film
- **Resin Used:** SURPASS HPs900-C
- **Resin Displaced:** Clarity LDPE grade
- **Structure:** Monolayer film structure with various thicknesses at 1 – 3 mil
- **Reasons for Conversion:**
 - Improved clarity
 - Excellent strength and sealability with no blending required

SURPASS Film

Recent Commercial Success

- **Application:** Food Packaging Films, including Fresh Produce
- **Resin Used:** SURPASS HPs900-C
- **Resin Displaced:** Competitive mC₆ LLDPE
- **Structure:** Three layer coextrusion- 100% HPs900 / C₄ or C₆ LLD / Plastomer
- **Reasons for Conversion:**
 - 50% haze reduction, 7% gloss improvement

SURPASS Film

Recent Commercial Success

- **Application:** Custom Roll Stock
- **Resin Used:** SURPASS FPs117-C
- **Resin Displaced:** Competitive mLLDPE (1.5 MI / 0.918 density)
- **Structure:** Monolayer, blended with 10-15% LDPE
- **Reasons for Conversion:**
 - 5% higher output

Our Newest Grade: SURPASS FPs016-C

Best in class melt strength →

Processability

Increased outputs

High toughness

→

Puncture

Tear

Dart

Excellent Sealability

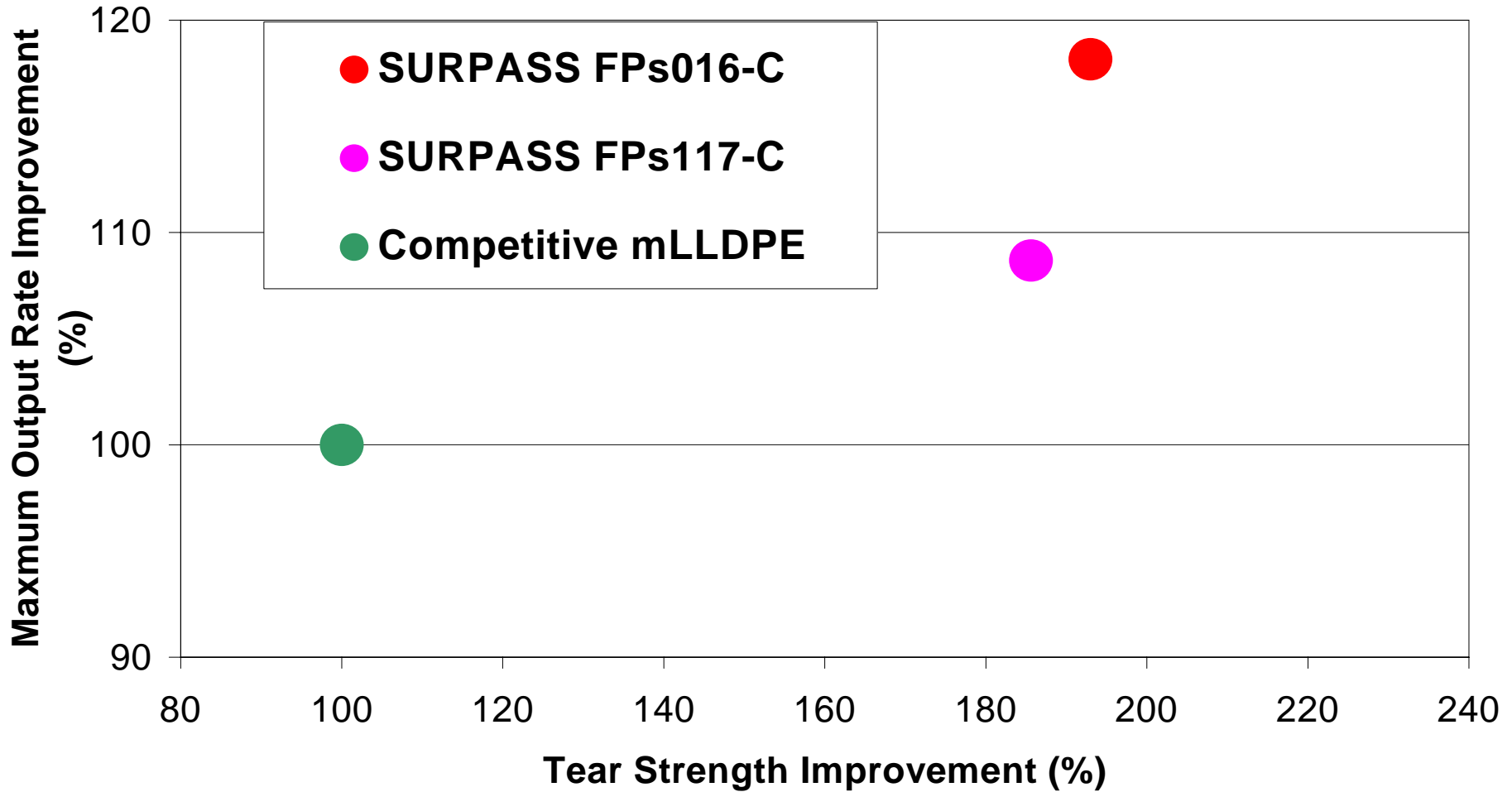
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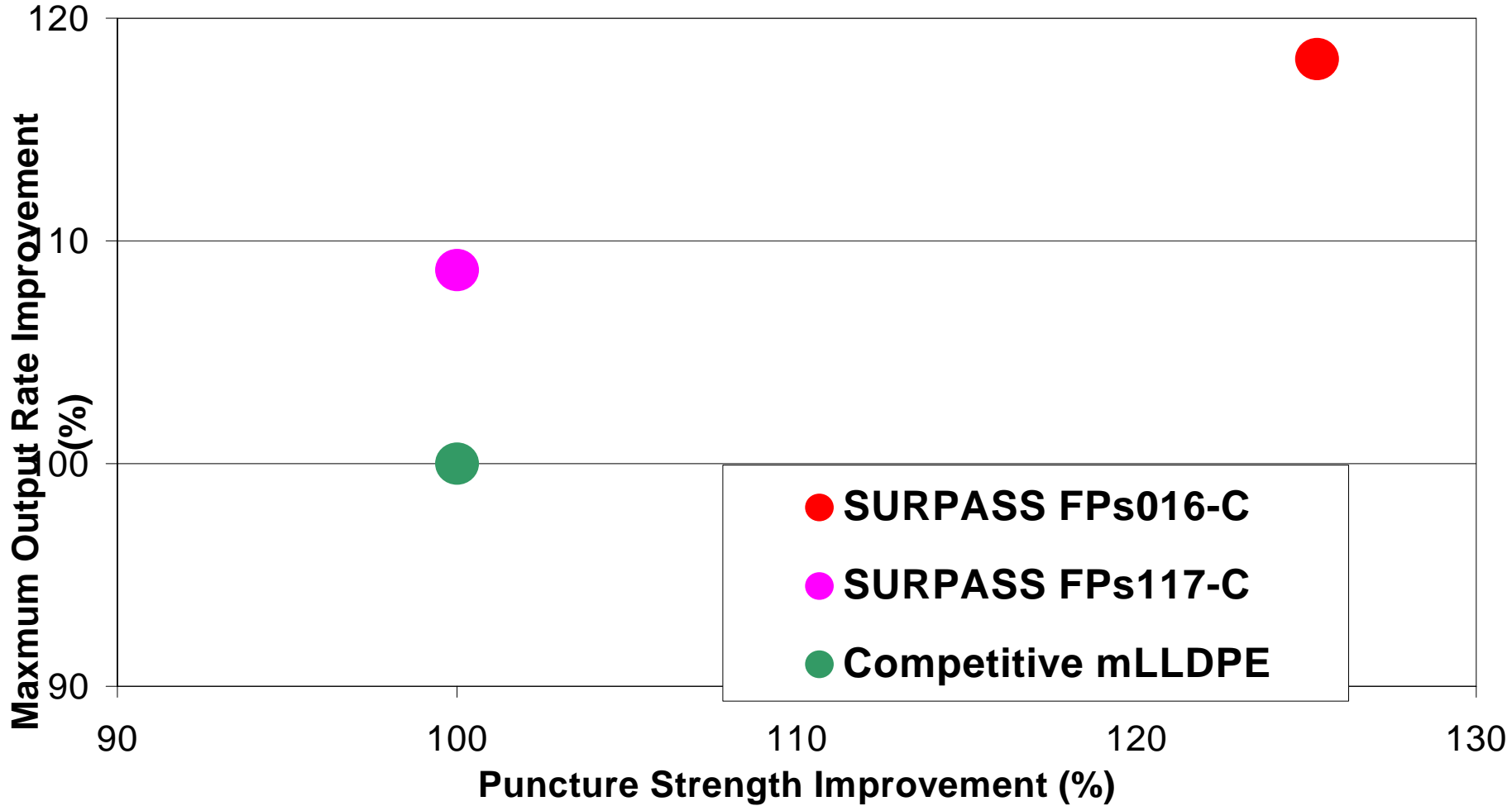
High Hot Tack Strength

High Seal Strength

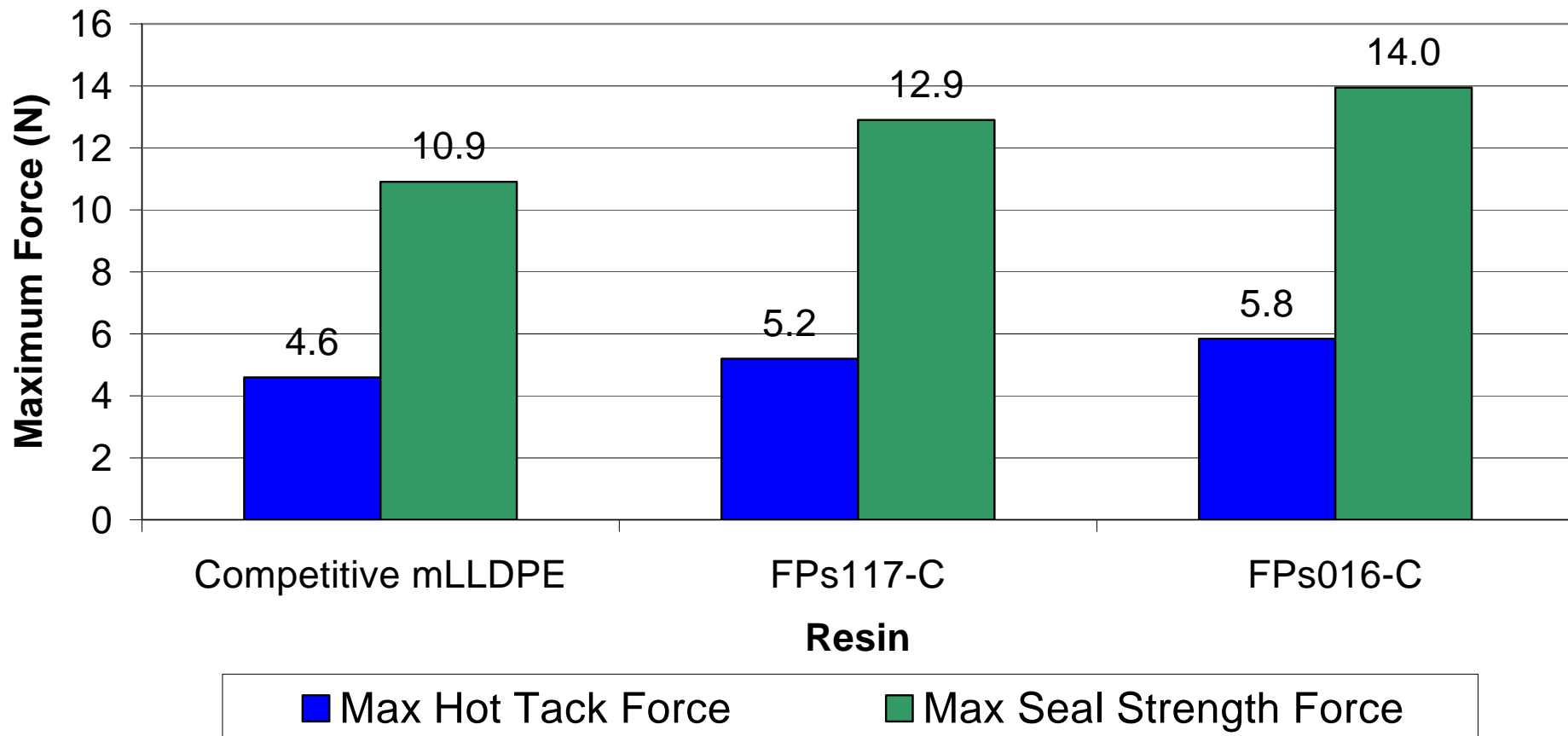
SURPASS FPs016-C

- Polyethylene: Octene sLLDPE
- Catalyst: NOVA Chemicals Single-Site Catalyst
- Density: 0.916 g/cm³
- Melt Index: 0.65 dg/min
- Additives: Process Stabilizer, PPA

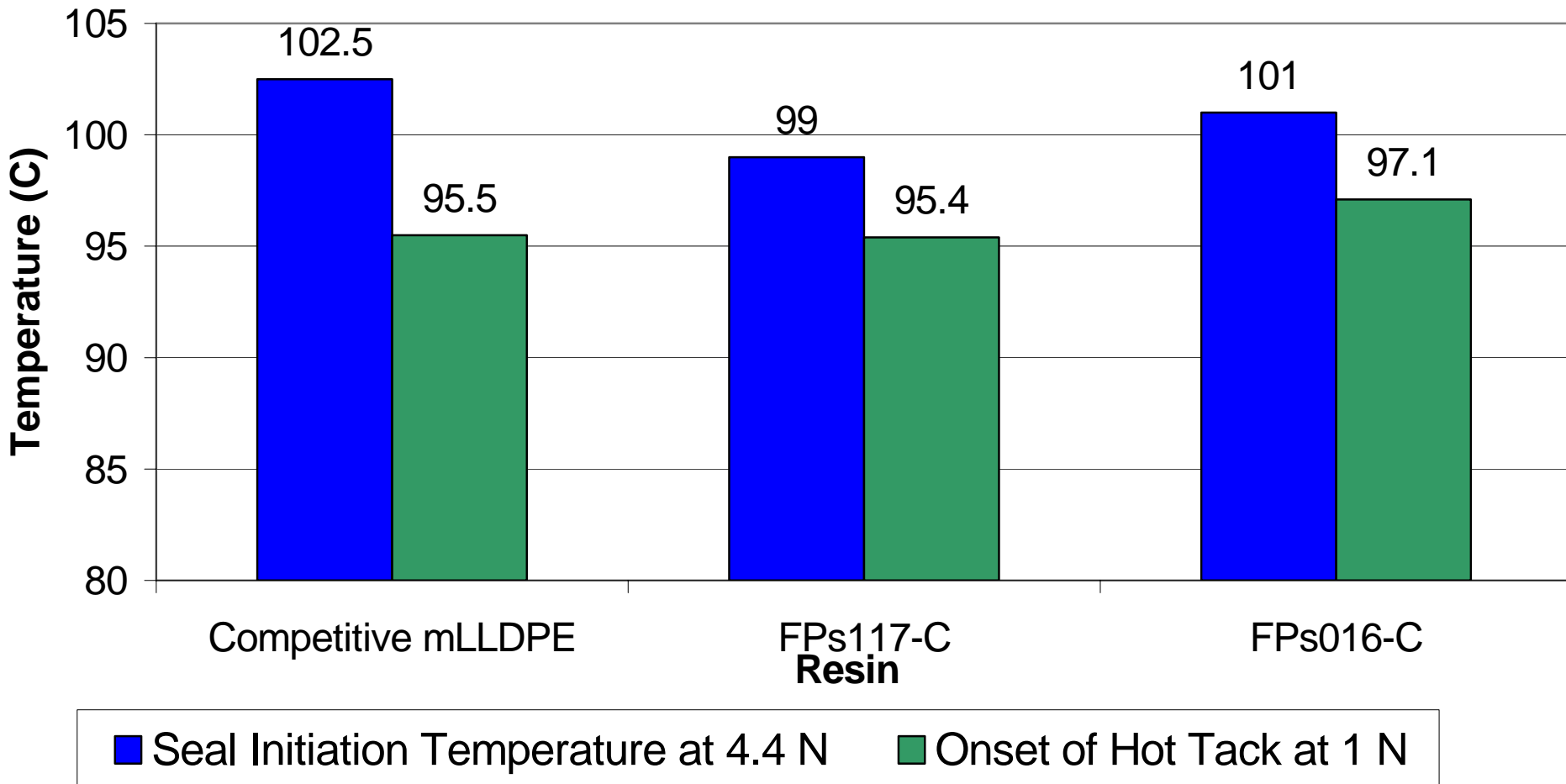




Maximum Hot Tack and Seal Strength



Seal Initiation and Hot Tack Initiation Temperatures



SURPASS FPs016-C

- Designed for best in class melt strength, high toughness and seal strength

Melt strength → Bubble stability → Production rates → \$\$\$

Toughness → Puncture and Tear → Abuse resistance →
Downgauge → \$\$\$

Seal strength → Package integrity → Fewer leakers → \$\$\$

SURPASS FPs016-C

Commercial Success

- **Applications:** Food Packaging Film (frozen meat, fresh produce), also some Industrial Films
- **Resin Displaced:** Eastman Hi-For LLD and other competitive resins
- **Structure:** Frozen meat vertical form fill seal bag. Three layer coextrusion with 90-100% FPs016 in skin layers with C₄ LLD in core
- **Reasons for Conversion:**
 - Better overall balance of properties, clarity and toughness
 - Improved hot tack

SURPASS FP_s016-C

Commercial Success

- **Application:** Protective Industrial Wrapping Film
- **Resin Displaced:** Competitive mC₆ LLDPE
- **Structure:** Three layer coextrusion with FP016-C in core and blended with other resins in the skin layers
- **Reasons for Success:**
 - 11% output increase as a minimum with potential to 20% with optimization
 - Film properties maintained with higher output rates

Features and Benefits Summary: NOVA Chemicals' SURPASS sLLDPE

- **Excellent processability provides options to achieve:**
 - Lower extrusion pressure and power requirements at the same output as a competitive mLLDPE
 - Higher output than a competitive mLLDPE on pressure- or amperage-limited extruders
 - Higher output at comparable pressures and power requirements by reducing the melt temperature on bubble stability-limited lines
 - Higher toughness by reducing the amount of LDPE in the blend and compensating for melt strength by lowering melt temperature while not exceeding the pressure and power consumption of competitive mLLDPE

Features and Benefits Summary

NOVA Chemicals' SURPASS sLLDPE (2)

- Generally superior film physical properties relative to Z-N C₈ LLDPE in blends. Linear rich blends superior to lean blends
- Comparable to superior film physicals and processability relative to competitive solution process mLLDPE
- Excellent tear strength and comparable tensile properties relative to gas phase mLLDPE
- Equivalent sealability to mLLDPE, with low seal initiation temperature and high seal strength
- Meets stringent burst test requirements for sachets and stand-up pouches when used as the major seal layer component in a multilayer structure

Features and Benefits Summary NOVA Chemicals' SURPASS sLLDPE (3)

- Optical properties suited to the needs of the application
- Very low gel for critical applications such as lamination film
- Very low grease fraction and volatiles, resulting in less contribution to film organoleptics in food packaging
- FDA and EU food contact compliance

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