

Environmentally Efficient Stretch Hoods

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OUTLINE

- Stretch Hood Structures and Requirements
- NOVA Chemical's Environmentally Efficient Solution
- Performance Comparison
- Economics
- Sustainability
- Conclusion

BASE CASE

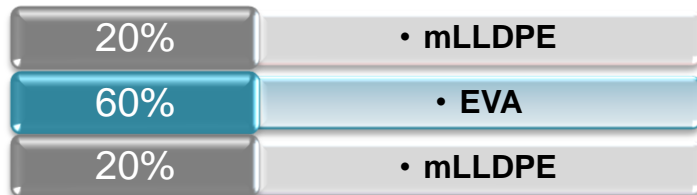
Packaging Solution Must Meet:

- Balance Between Versatility and Holding Force
- Application Requirements
- Stretching Requirements
- Packaging Needs
- Sustainable Solution



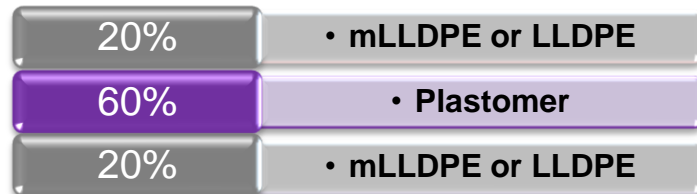
CURRENT STRUCTURE LANDSCAPE

EVA Based Solution



- Provides elasticity and stretching forgiveness
- Poor load retention
- Poor thermal stability

Plastomer Based Solution



- Mix & match system to customize per load retention and elasticity requirements
- Marginal load retention
- High cost

Copolymer Based Solution



- Mix & match system to customize per load retention and elasticity requirements
- Marginal load retention
- High cost

NOVA CHEMICALS ENVIRONMENTALLY EFFICIENT SOLUTION



- Optimal balance of toughness, puncture resistance & clarity
- Excellent load retention/holding force
- Thermal resistance
- Cost-effective
- Sustainable
 - ✓Recyclable
 - ✓Light Weight

NOVA Chemicals environmentally efficient solution is comprised of 100% Polyethylene and is 100% recyclable

STRUCTURE DETAILS



Durability Layers: SURPASS® FPs016-C blended with slip and antiblock to achieve c.o.f. targets

Performance Layer: SCLAIR® FP112-A blended with NOVAPOL® LF-Y819-A (0.8 g/10-min melt index, 0.919 g/cm³ density, barefoot LDPE).

NOVA Chemicals Advanced Sclairtech™ technology provides an enhanced platform to build high efficiency, high performance stretch hood structures

STRUCTURE COMPONENTS

SURPASS® FPs016-C

Melt Index: 0.65 g/10 min

Density: 0.916 g/cm³

Additives: PPA

Features:

- AST™ Octene SSC LLDPE film grade
- Outstanding melt strength
- Superior toughness, puncture and tear strength



SCLAIR® FP112-A

Melt Index: 0.9 g/10 min

Density: 0.912 g/cm³

Additives: Barefoot

Features:

- AST™ Octene VLDPE film grade
- High toughness
- Excellent elongation properties



NOVAPOL® LF-Y819-C

Melt Index: 0.8 g/10 min

Density: 0.919 g/cm³

Additives: Barefoot

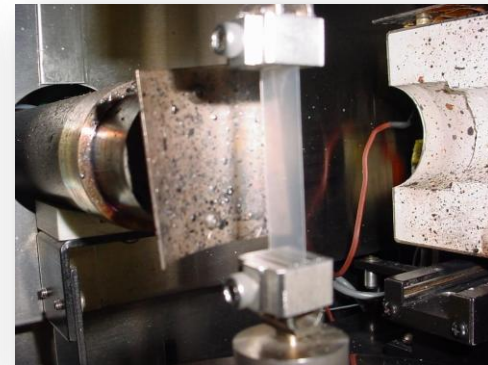
Features:

- Tubular LDPE
- Good clarity
- Excellent melt strength

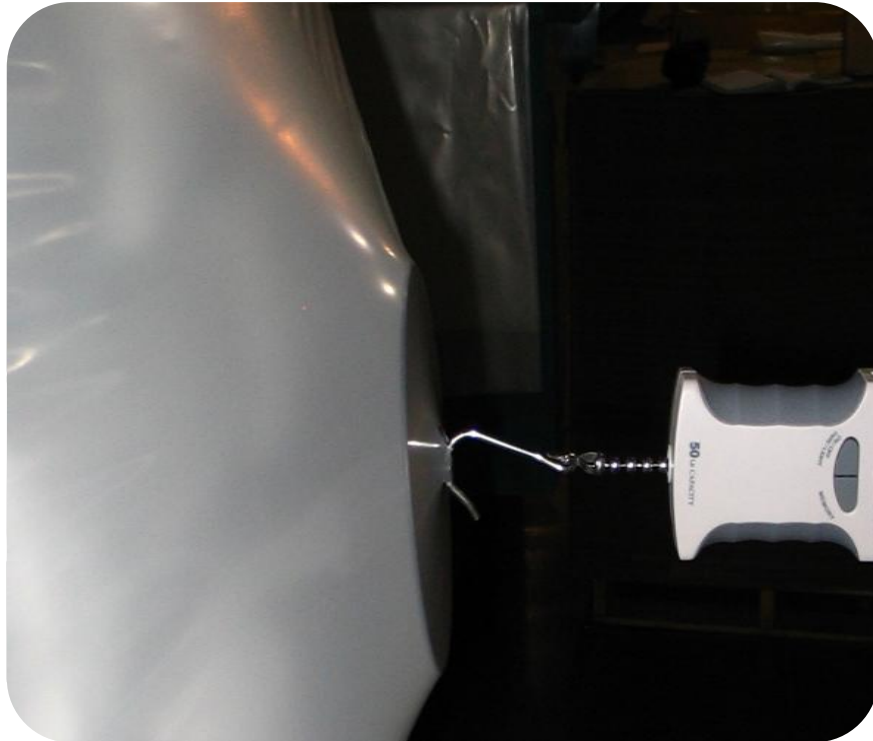


**NOVA Chemicals AST™ based solution =
Enhanced Performance, Production Efficiency, Environmentally Friendly**

COMPARATIVE PERFORMANCE



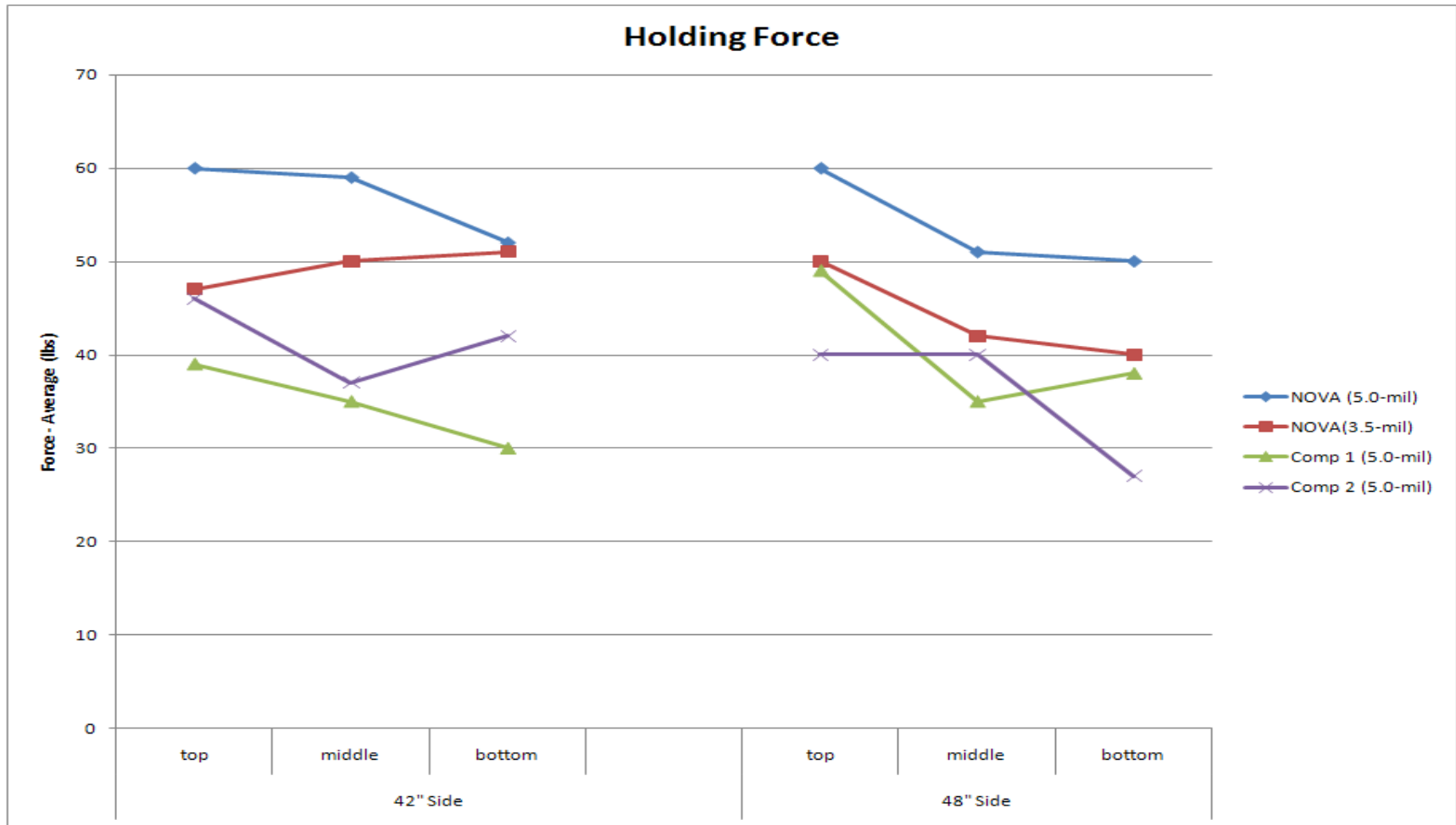
HOLDING FORCE TEST DESCRIPTION



- Pallet is stretch hooded and allowed to stand for 5-minutes
- Metal plate is inserted between film and load at specified locations
- Pull plate 6" out from load and record force applied to load.
- Pallet dimensions were standard 48" x 42" pallets
- EVA, Plastomer and EP co-polymer based structures were evaluated

NOVA Chemicals continues to create relevant tools to support ongoing advancements in the stretch hood market

CONVENTIONAL LOAD RETENTION (5.0-mil gauge films)



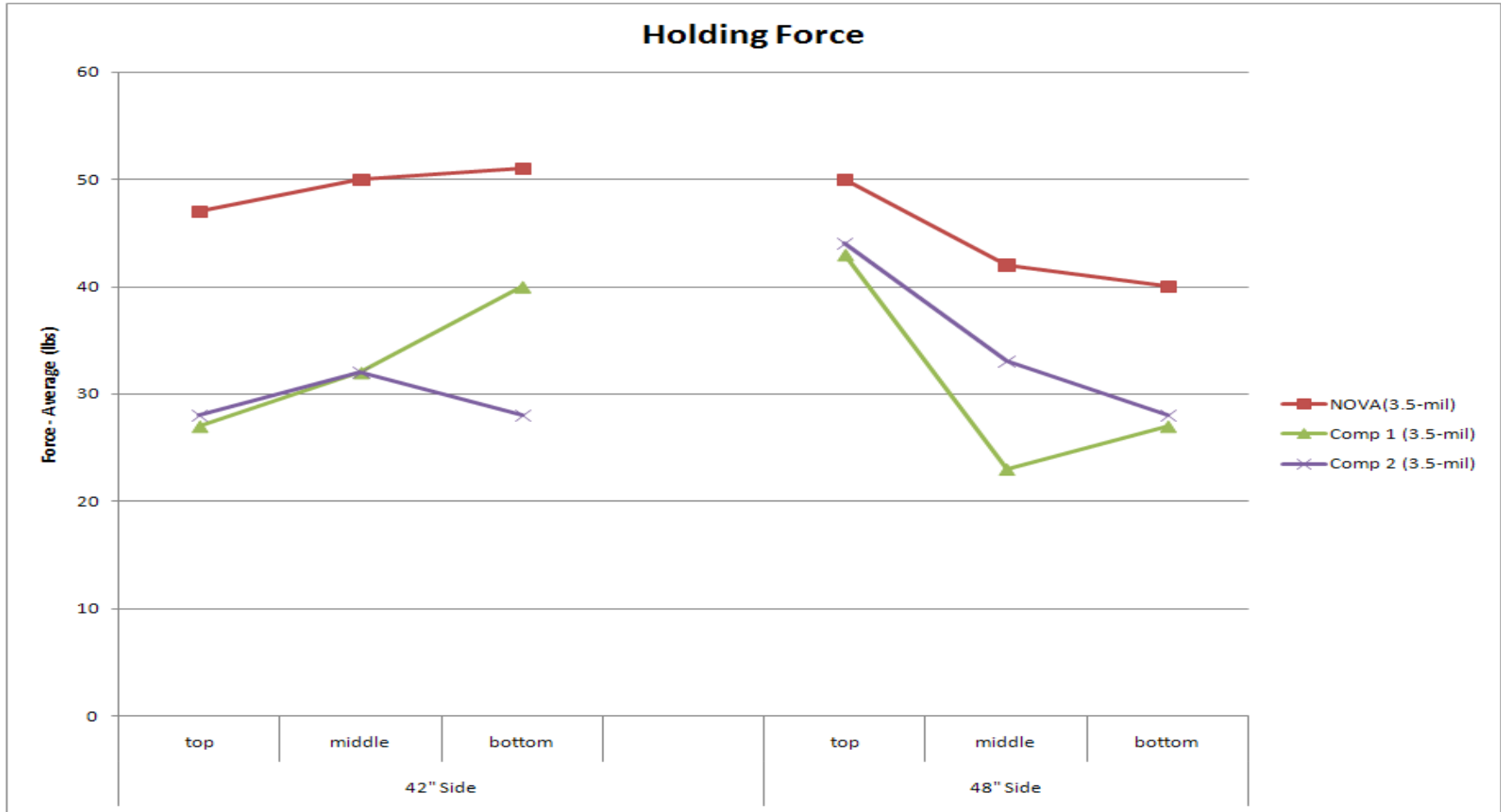
NOVA Chemicals (5.0 Gauge)

NOVA Chemicals (3.5 Gauge)

Comp #1 = EP based systems

Comp #2 = Plastomer based system

LIGHT WEIGHT LOAD RETENTION (3.5-mil gauge films)



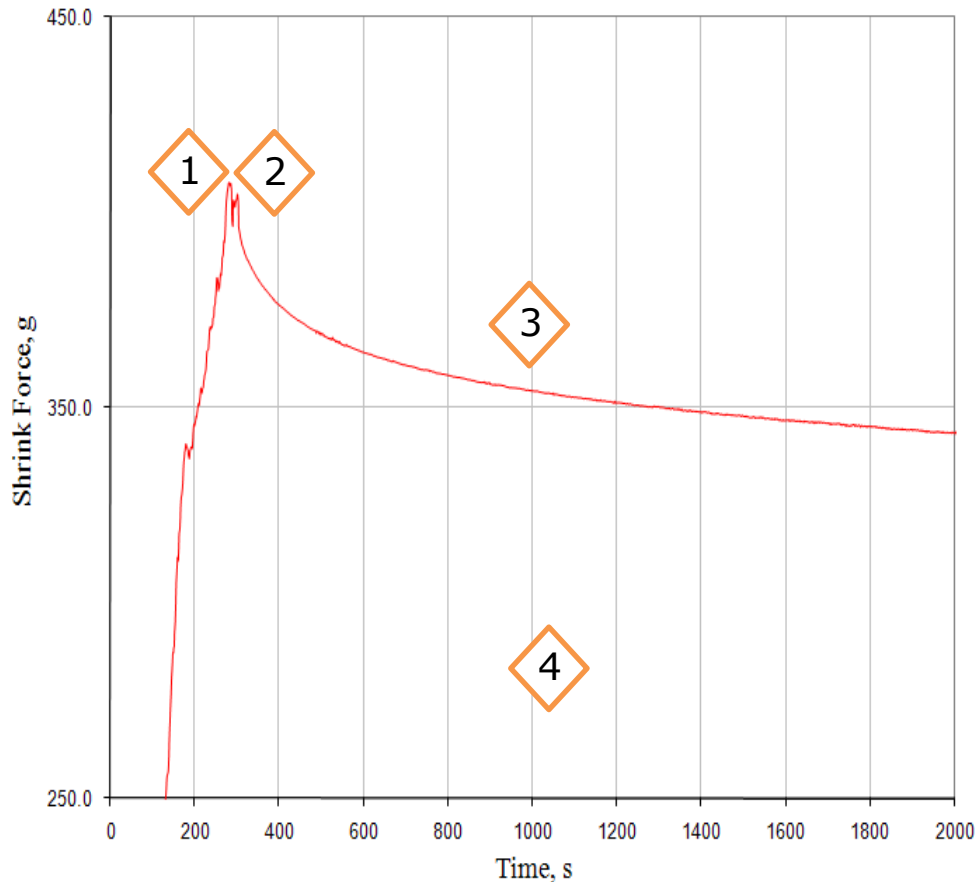
NOVA Chemicals (3.5 Gauge)

Comp #1 = EP based systems

Comp #2 = Plastomer based system

STRESS DISSIPATION

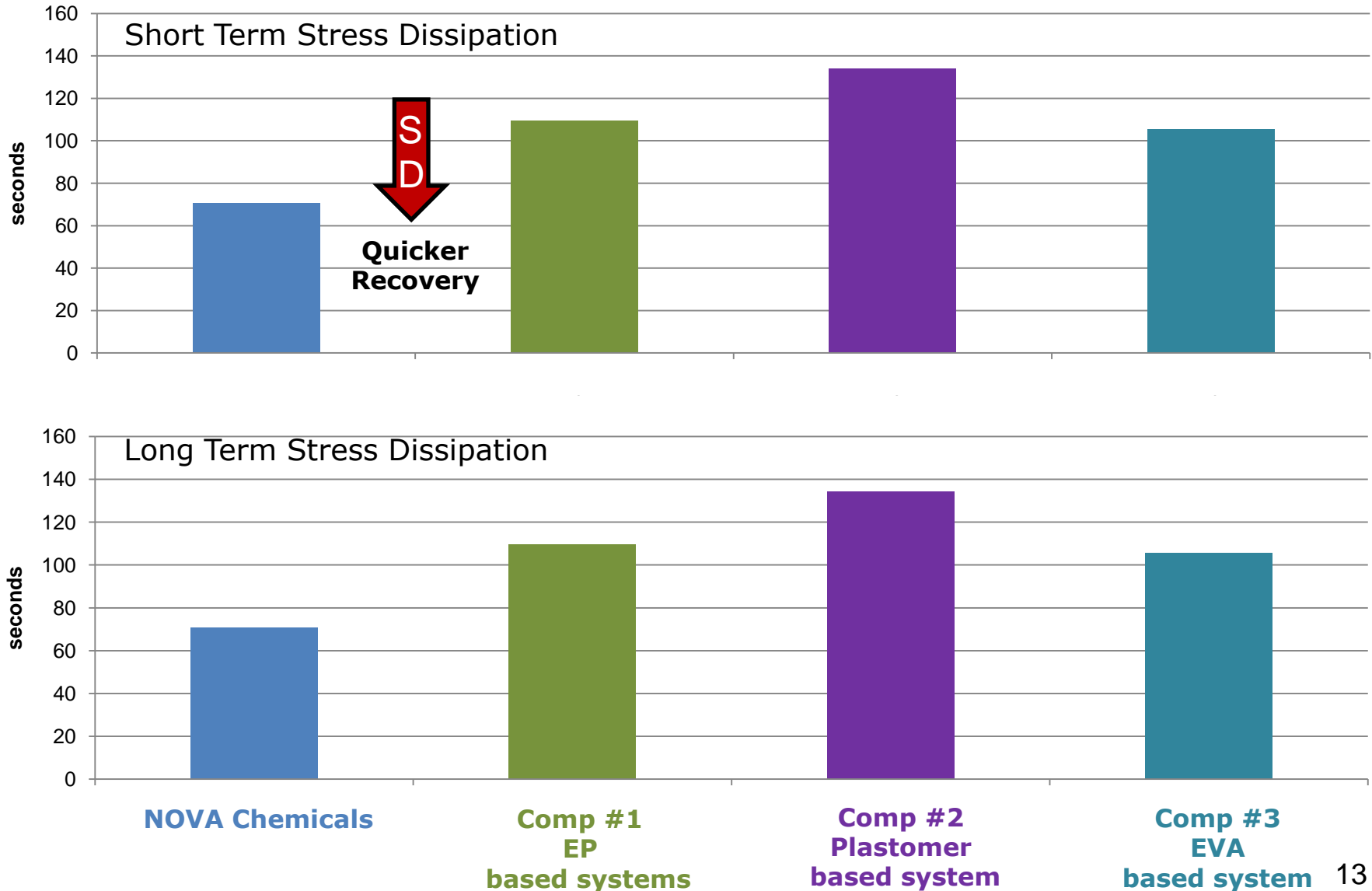
Film Stress Relaxation (Raw data)



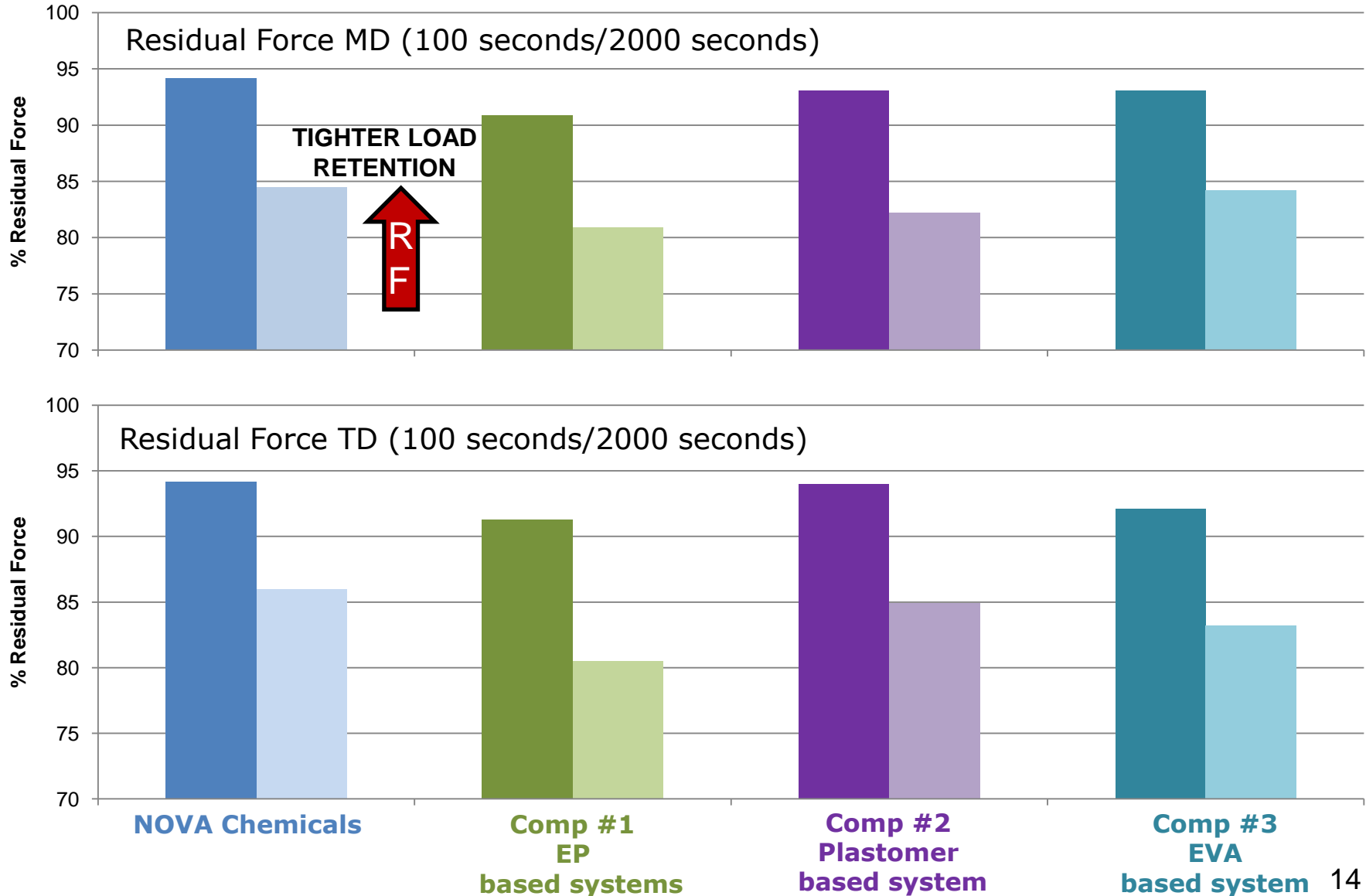
NOVA Chemicals test method

1. A film strip (1cm x 2.5 cm) is stretched to a pre-set tension at a temperature of 30°C
2. Once at pre-set tension the apparatus begin to oscillate at 0.05 Hertz putting 20% strain on the test sample
3. The decay (or reduction) of force with time is monitored and a stress dissipation value is calculated (short and long term)
4. Residual force at 100s and 2000s are measured

STRESS DISSIPATION (All 5 mil films)



RESIDUAL FORCE (All 5 mil structures)



RELATIVE COST ANALYSIS

STRUCTURE	HOOD SIZE	HOOD WEIGHT	HOOD COST MODEL
EVA SOLUTION	41" x 30" x 5 mil	2.56 lbs	X
NOVA SOLUTION	40" x 35" x 5 mil	2.70 lbs	X – 6%
PLASTOMER SOLUTION	40" x 35" x 4 mil	2.13 lbs	X – 8%
COPOLYMER SOLUTION	40" x 35" x 4 mil	2.13 lbs	X – 5%
NOVA SOLUTION	40" x 35" x 3.5 mil	1.89 lbs	X – 34%

Resin pricing normalized on mPE cost with appropriate surcharges incorporated for performance layer material(s).

Film Weight Formula

1. Film Circumference x Length of film
2. Divide this figure by 30,000 (sq. inch lbs/mil)
3. Multiply this figure by the film thickness (mil)
= Bag Weight (lbs)

Example: Bag Size 42" x 32" (148" circumference) x 108" long x 5.0-mil

1. $148 \times 108 = 15,984$
2. $15,984 / 30,000 = 0.5328$
3. $0.5328 \times 5.0 = 2.66$ lb per bag

SUSTAINABILITY: LIFESTYLE METRICS

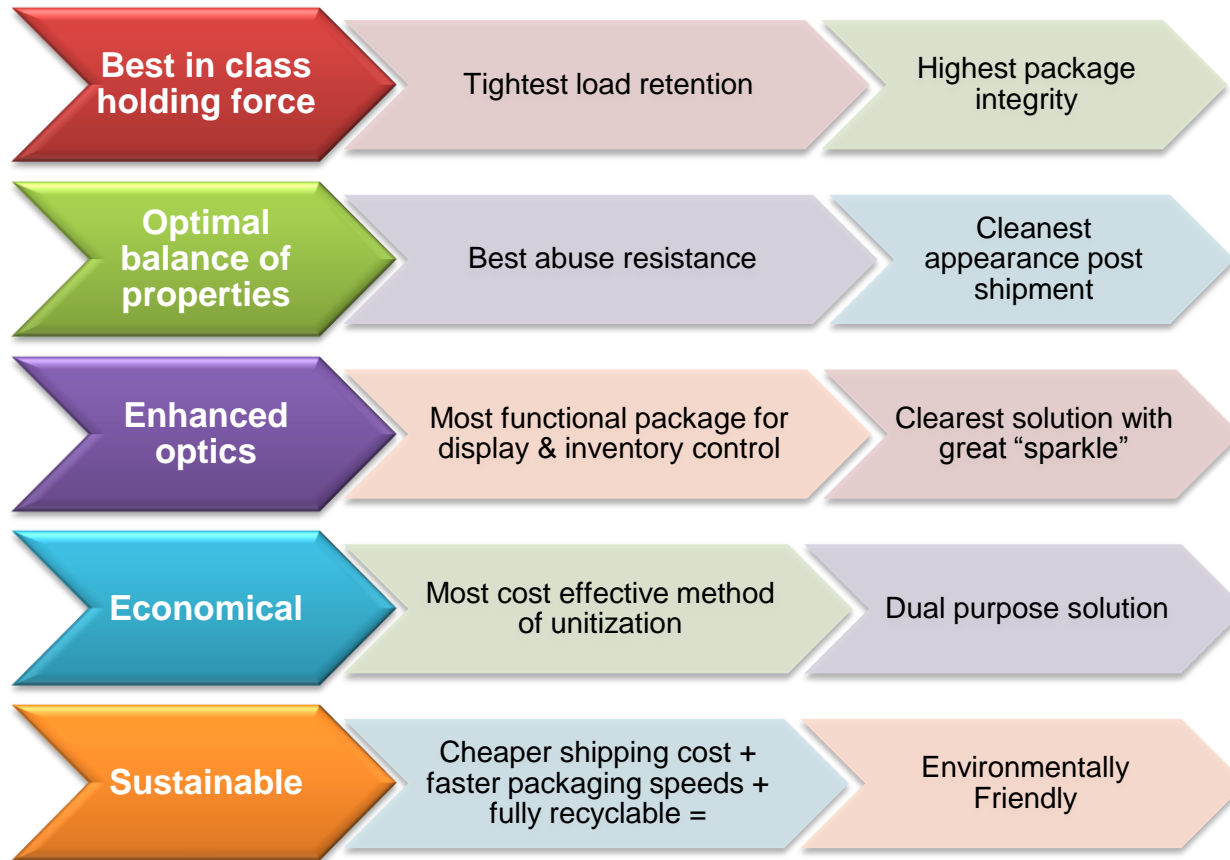
Functional unit of comparison: 1375 kg

Measured on manufacture, conversion and end of life

- 3.5 mil Hood NOVA Chemicals
- 4.0 mil Plastomer Hood
- 5.0 mil with 60% EVA



CONCLUSIONS



NOVA Chemicals Environmentally Efficient Stretch Hood utilizing SURPASS®, SCLAIR® & NOVAPOL® delivers optimal performance at a fraction of the cost

NOVA CHEMICALS STRETCH HOOD RESOURCES



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- **www.novachem.com/productservices/productservices_polyethylene.cfm**

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