



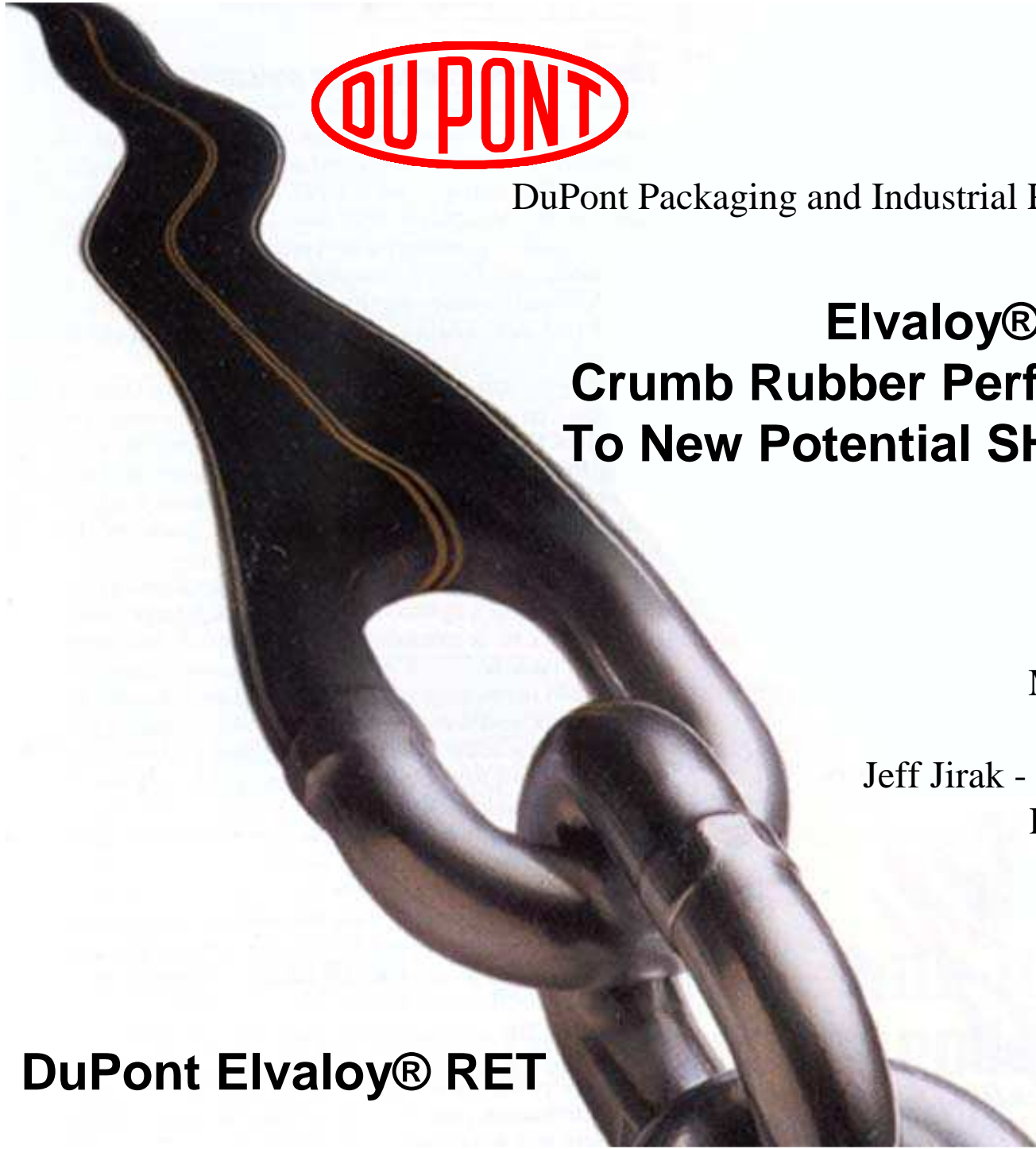
DuPont Packaging and Industrial Polymers

Elvaloy® RET & Crumb Rubber Performance Relative To New Potential SHRP Test Methods

May 9, 2001

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DuPont USA

DuPont Elvaloy® RET





Elvaloy® RET
reactive elastomeric terpolymer

**STUDY OF BINDER AND MIXTURE
PROPERTIES OF CRUMB RUBBER MODIFIED
BLENDS COMPARED TO A PG 58-28
UNMODIFIED CONTROL AND A PG 70-28
MADE WITH ELVALOY®**

STUDY MATERIALS

BASE ASPHALT PG 58-28
6% 80 MESH CRUMB RUBBER BLEND
12% 80 MESH CRUMB RUBBER BLEND
18% 80 MESH CRUMB RUBBER BLEND
1.5% ELVALOY 4170 BLEND

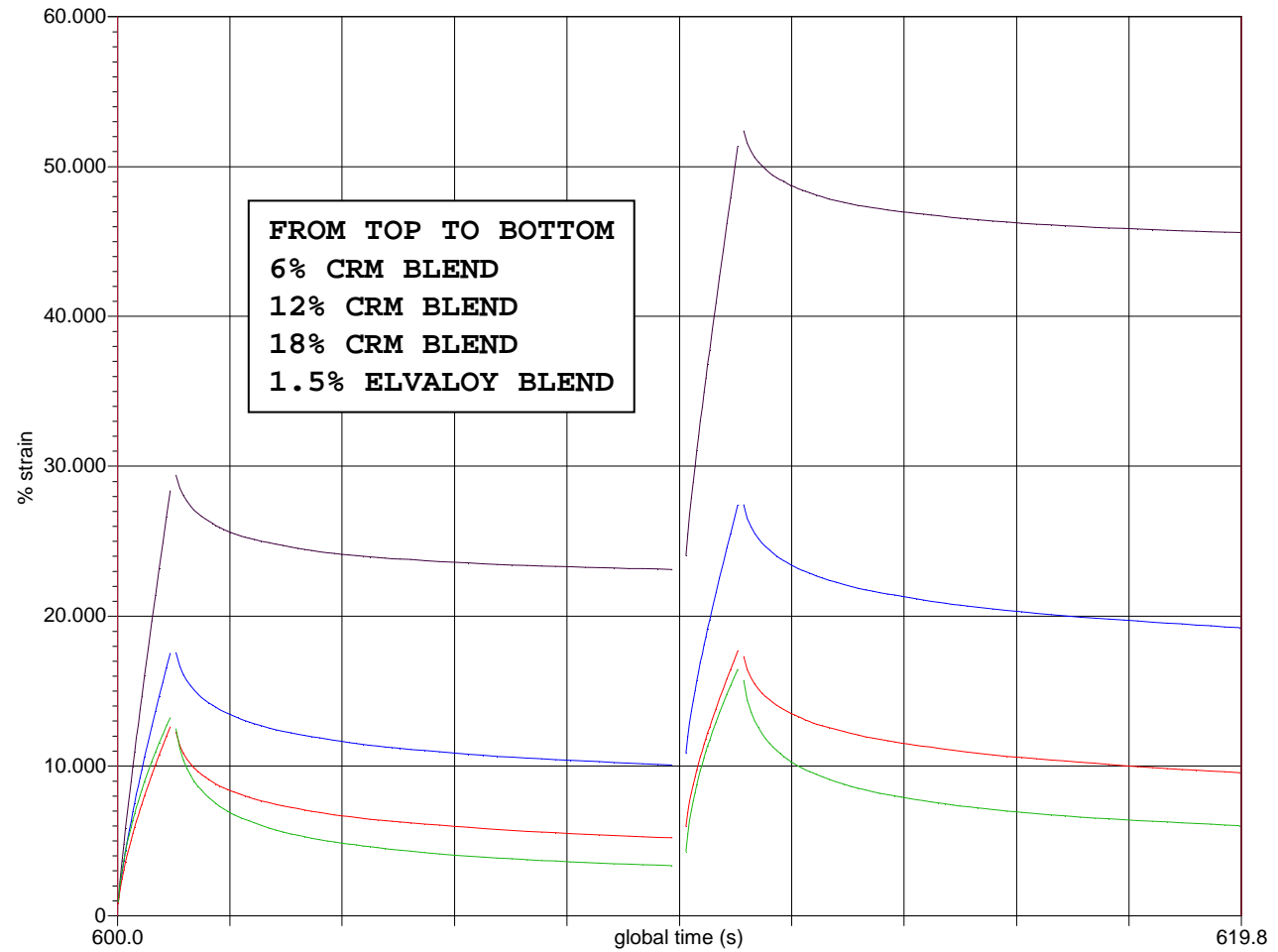
**TO INVESTIGATE BINDER AND MIX PROPERTIES RELATIVE TO RUTTING
RTFO RESIDUES OF BINDERS WERE EVALUATED FOR:
% CUMULATIVE STRAIN, DSR PROPERTIES (PHASE ANGLE & $G^*/\sin(d)$)**

**MIXES WERE EVALUATED FOR HIGH TEMPERATURE RESISTANCE TO
PERMANENT DEFORMATION USING A TORSIONAL FLOW TIME PROCEDURE
DEVELOPED FOR USE ON A DSR**



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reactive elastomeric terpolymer

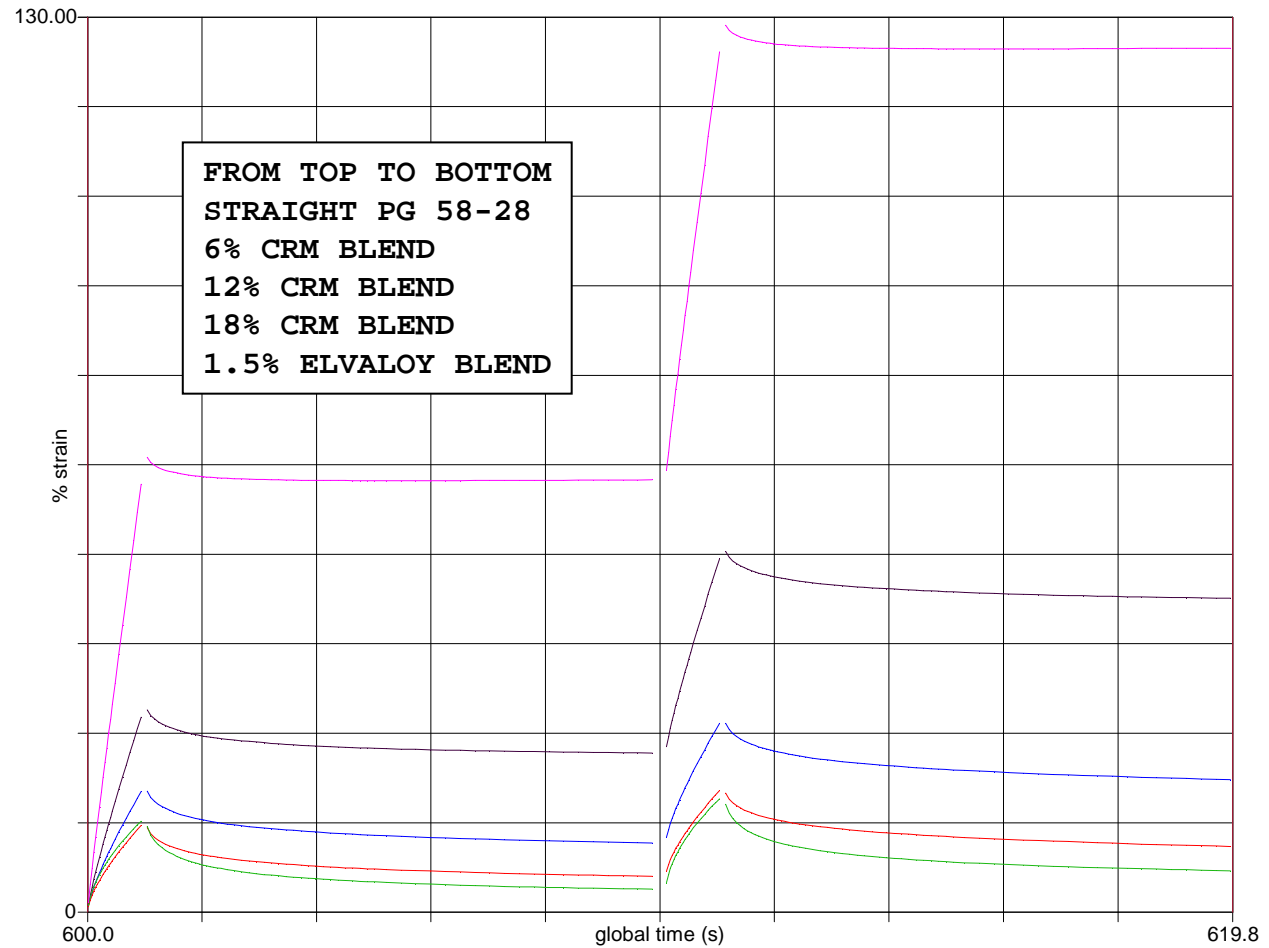
DH123B & 124A, MIF 58-28, 6% Rouse GF-80AE, 58°C, 300PA, CUM CRT





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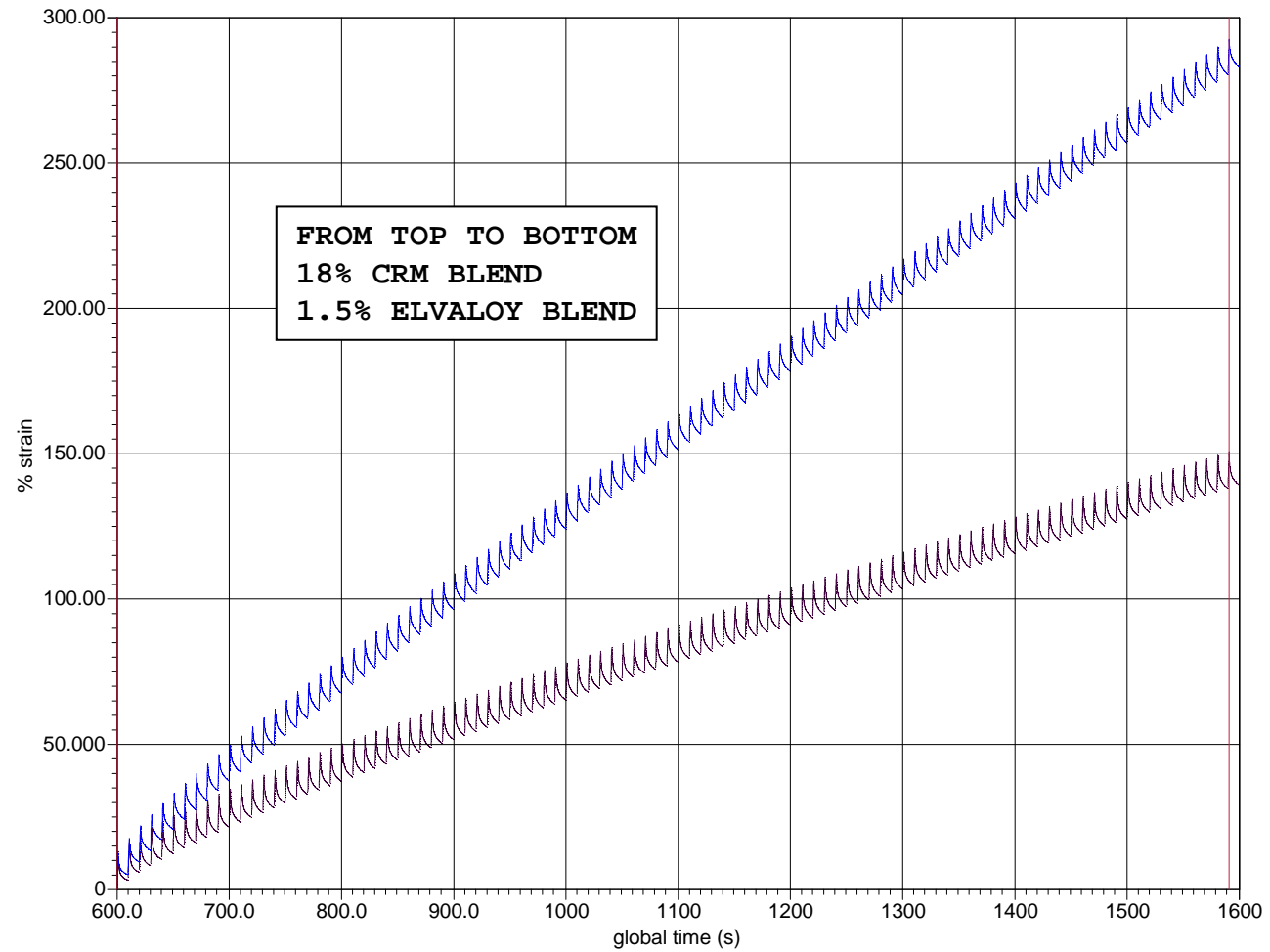
DH123B & 124A, MIF 58-28, 6% Rouse GF-80AE, 58°C, 300PA, CUM CRT





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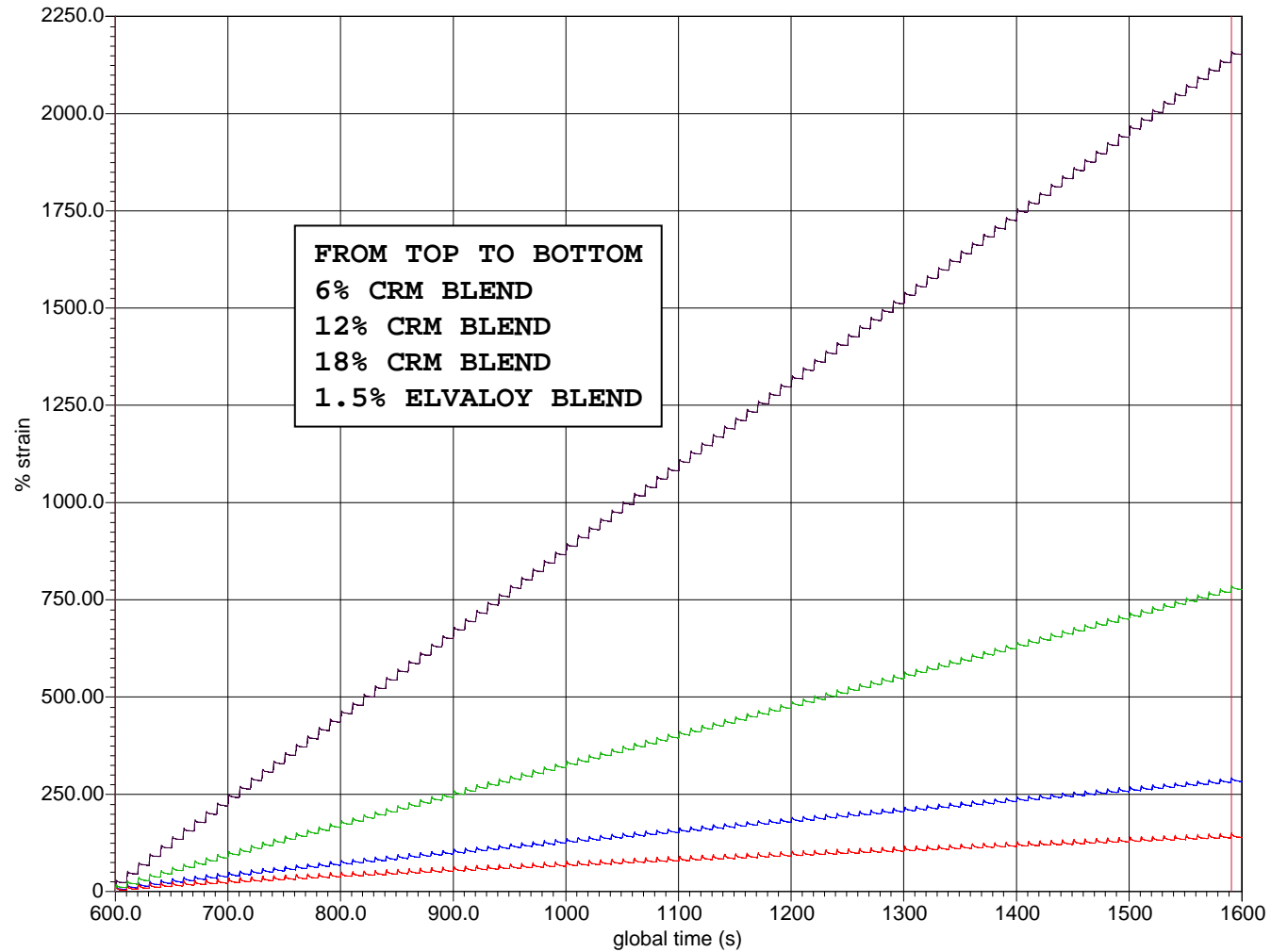
DH147C & 148A, MIF 58-28, 1.5% 4170, .5% SPA (105), 58°C, 300PA, CUM CRT





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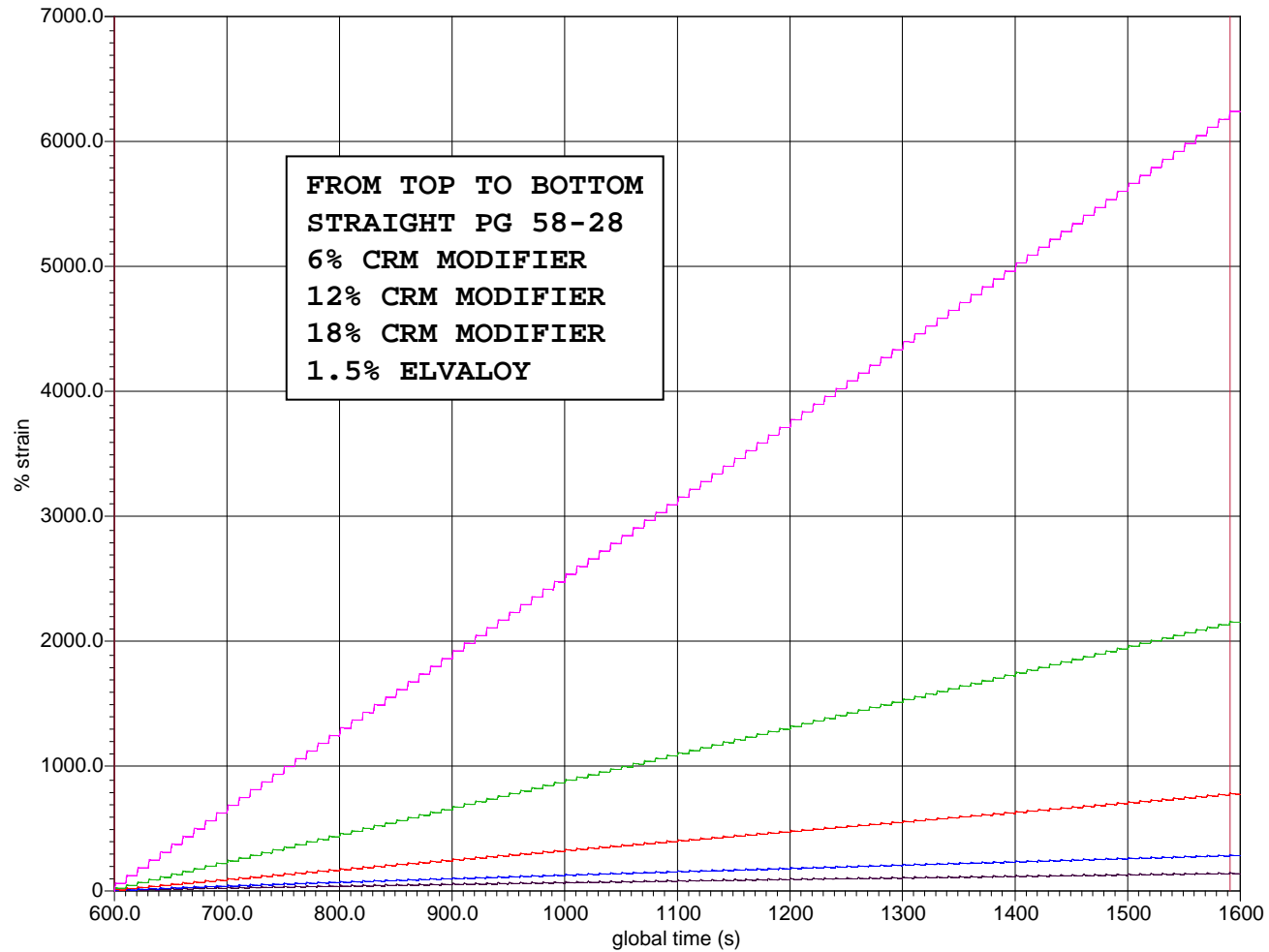
DH123B & 124A, MIF 58-28, 6% Rouse GF-80AE, 58°C, 300PA, CUM CRT





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COMPARE PG 58-28 & MODIFIED BLENDS @ 58°C, 300PA, TOTAL CREEP





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Crumb Rubber Mix Testing



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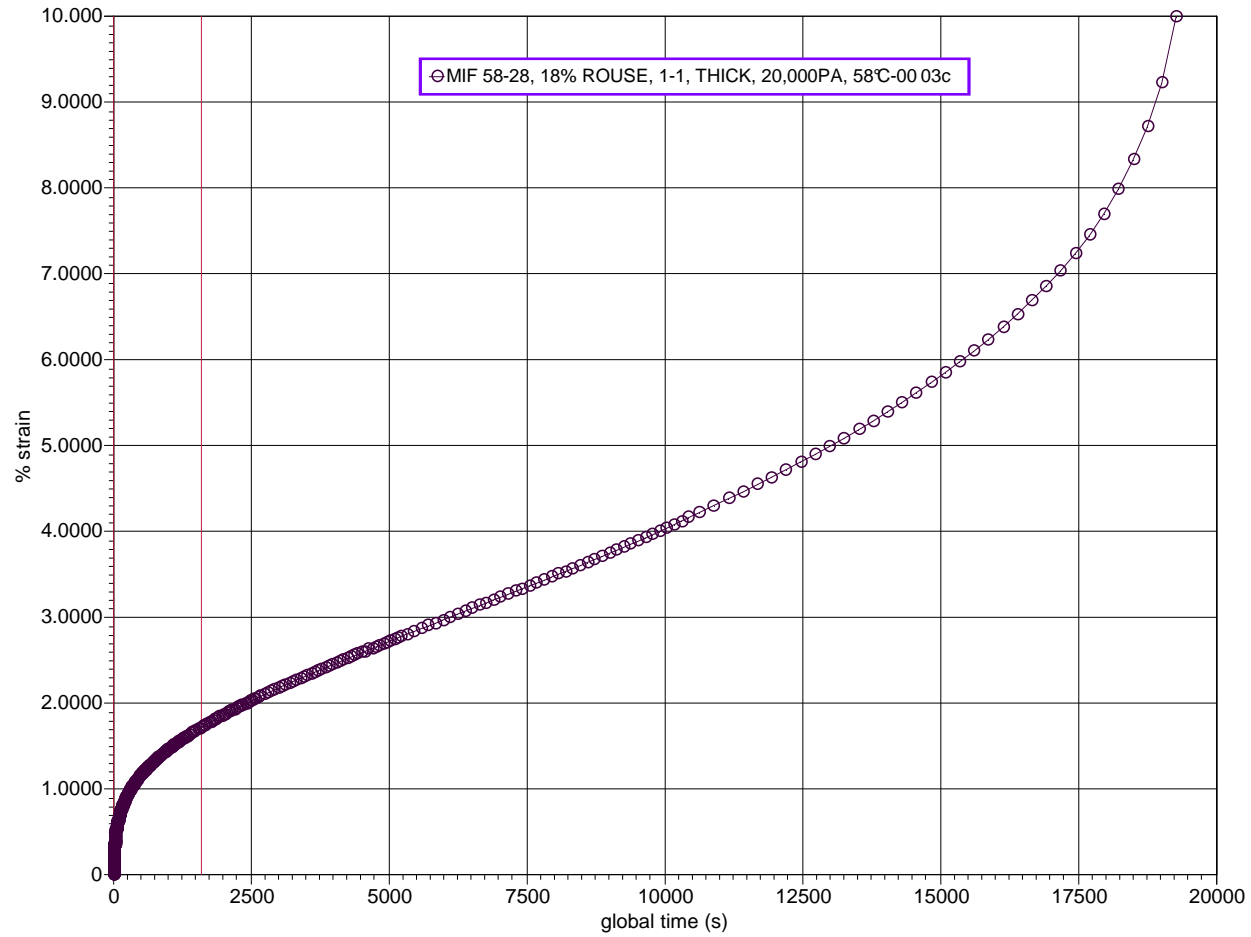
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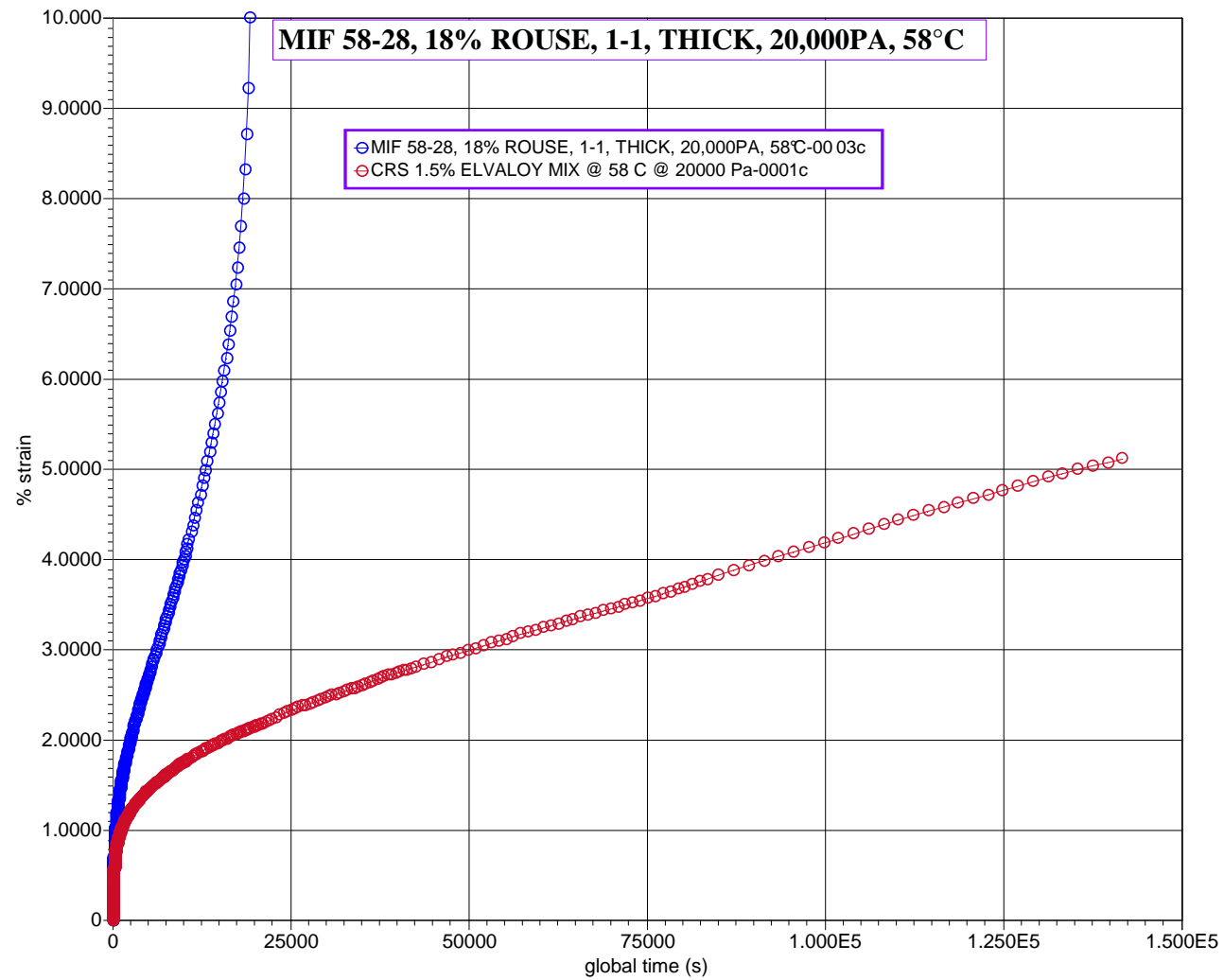
Elvaloy® RET
reactive elastomeric terpolymer

MIF 58-28, 18% ROUSE, 1-1, THICK, 20,000PA, 58°C



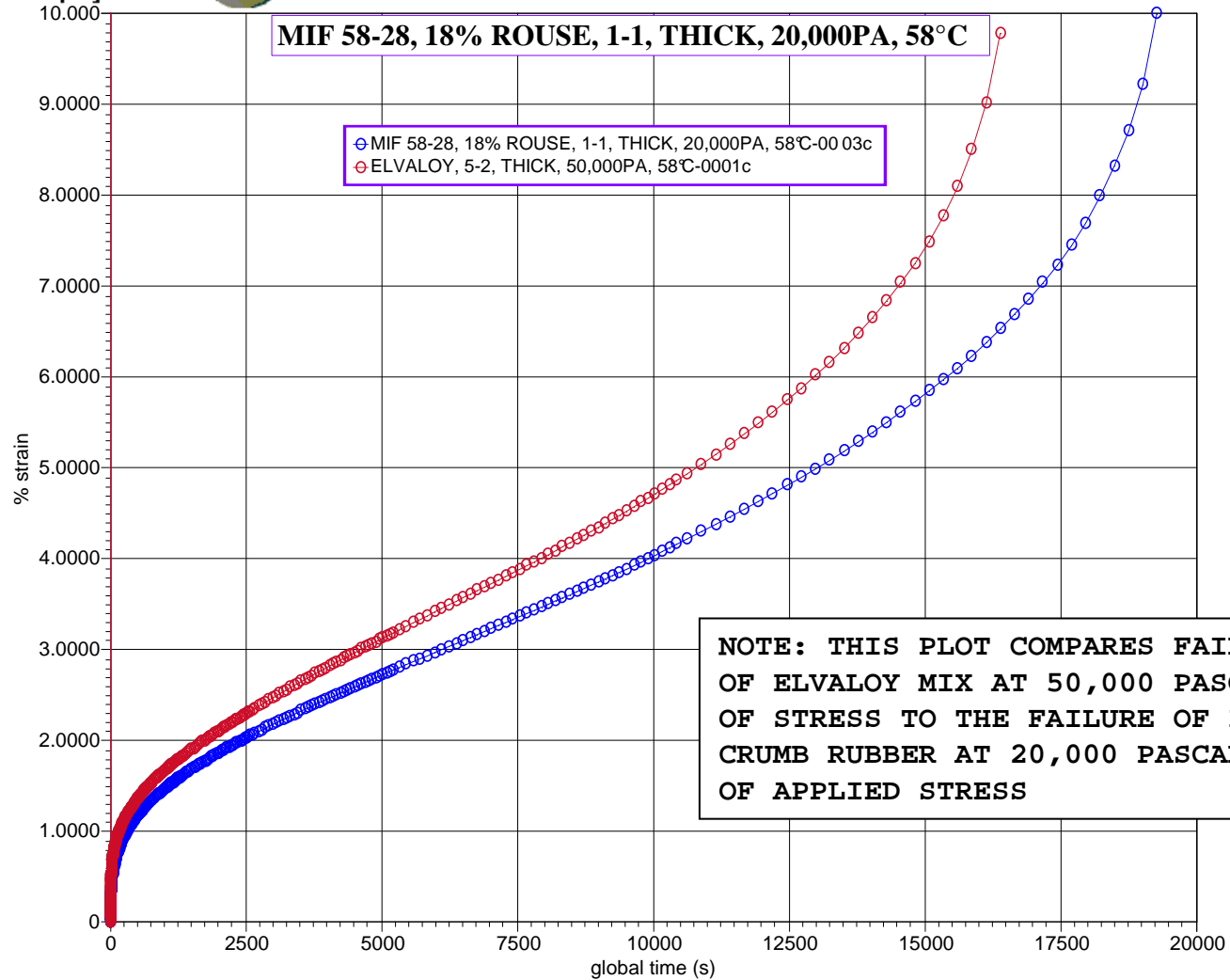


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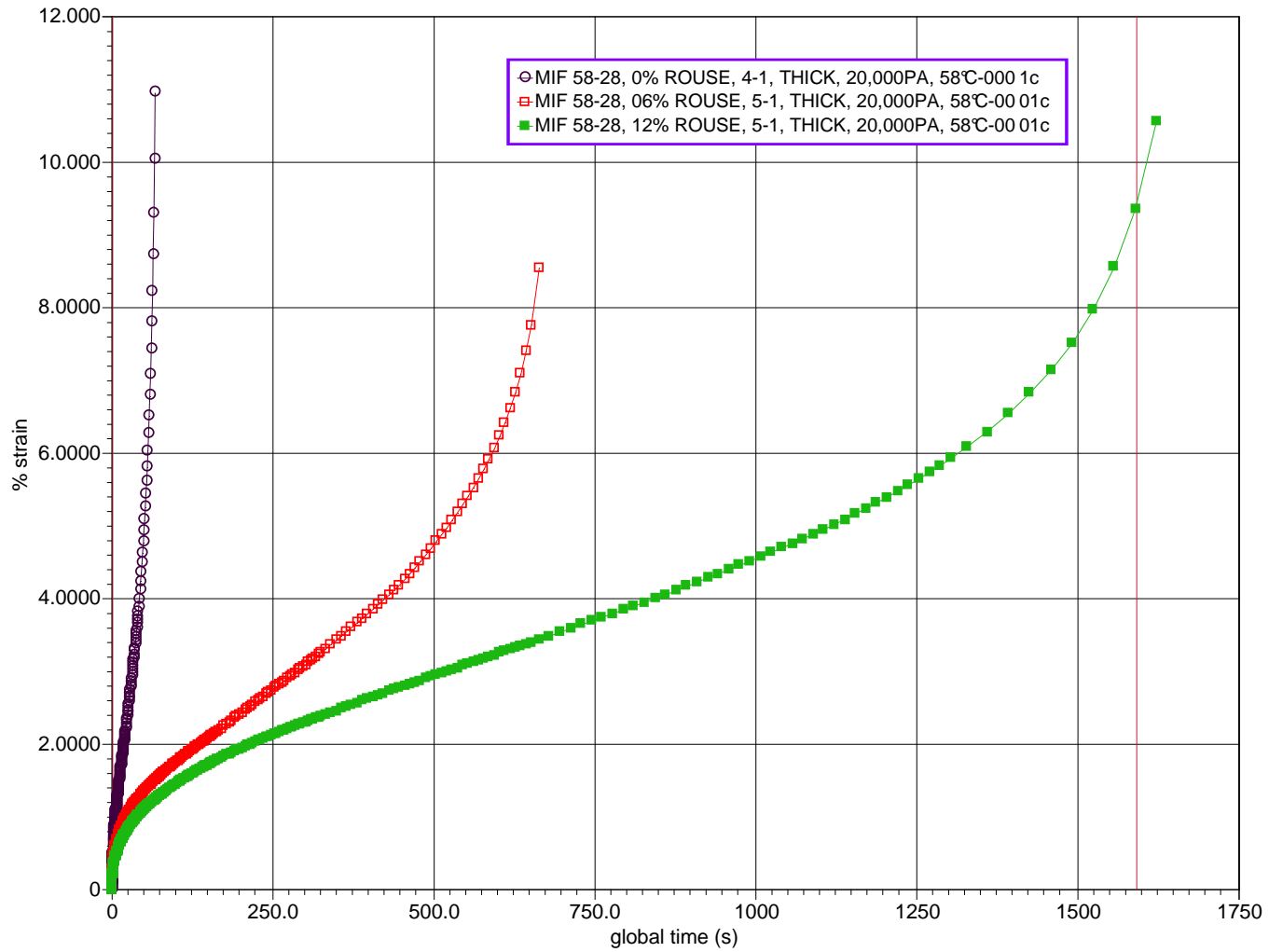
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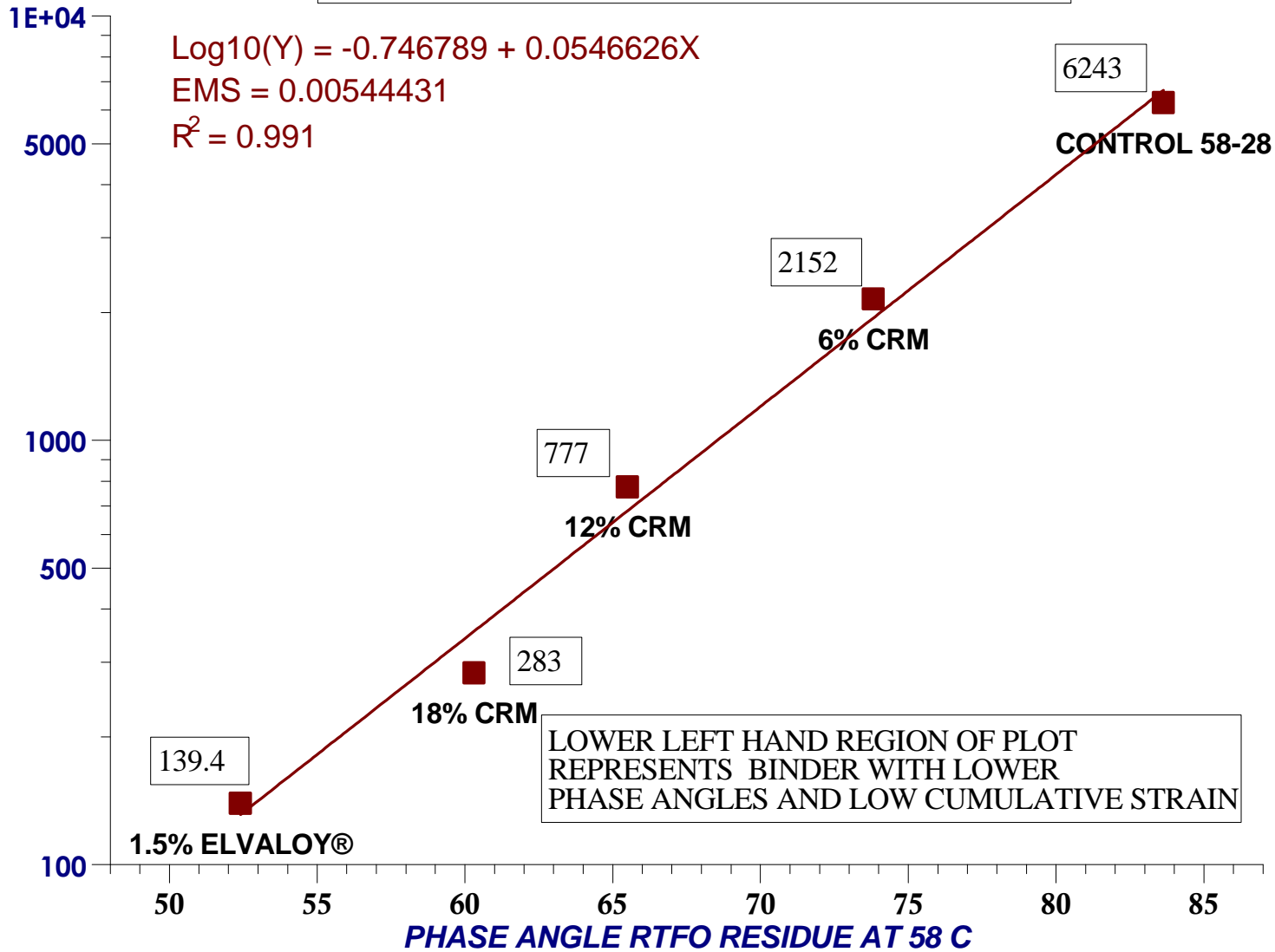
Elvaloy® RET
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MIF 58-28, 0% ROUSE, 4-1, THICK, 20,000PA, 58°C

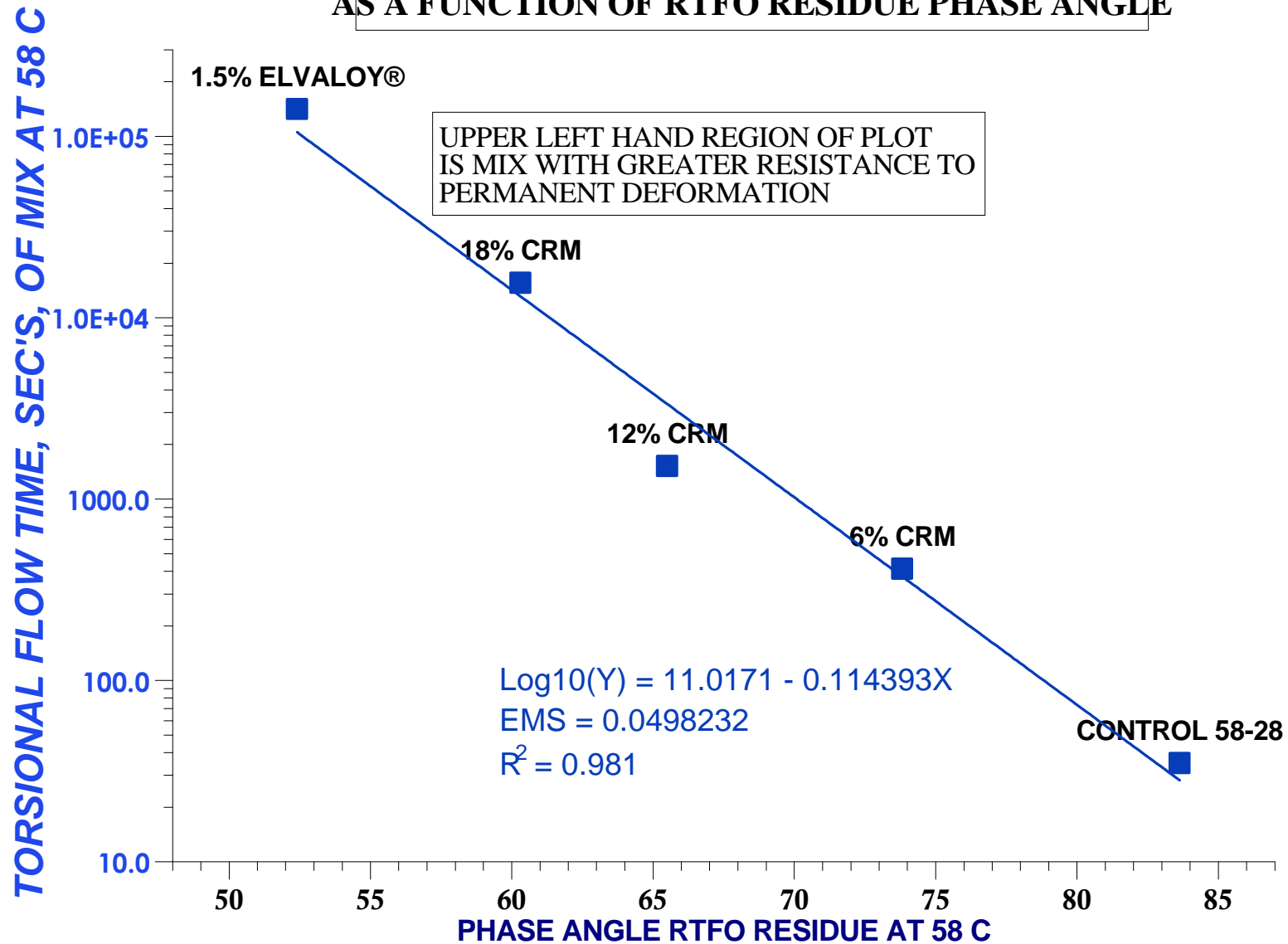


BINDER % CUMULATIVE STRAIN AS A FUNCTION OF BINDER RTFO RESIDUE PHASE ANGLE

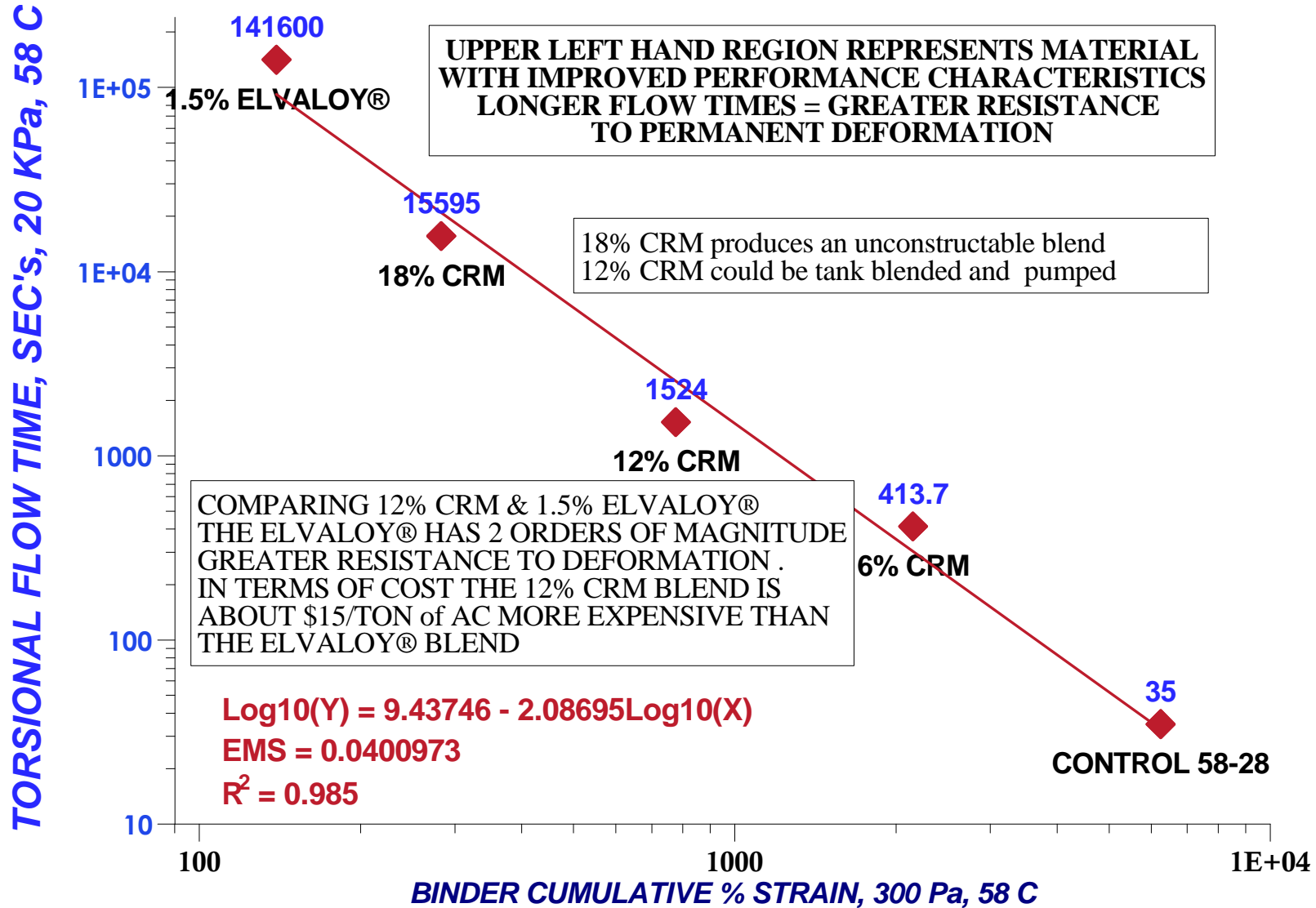
CUMULATIVE % STRAIN RTFO RESIDUE AT 58 C



CRUMB RUBBER STUDY: TORSIONAL FLOW TIME AS A FUNCTION OF RTFO RESIDUE PHASE ANGLE



TORSIONAL FLOW TIME OF MIX @ 58 C AS A FUNCTION OF BINDER % CUMULATIVE STRAIN





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Elvaloy® RET & Crumb Rubber Formulation Cost Estimates for PG76-22 for Florida

- Crumb Rubber Formula Example
 - 12% GTR @ \$0.17/lb =
\$40.80/Ton*
 - *Note - Rouse Rubber quoted \$0.36/lb for 80 mesh GTR - April 2001. Price of \$0.17/lb was "Heard on the Street" for more course grades*
 - 1% SBS @ \$0.72/lb =
\$14.40/Ton
 - 0.25% Stabilizer @ \$0.50/lb =
\$2.50
- Total Estimated Cost Per Ton =
\$57.70

- DuPont Elvaloy® RET Example
 - 1.2% Elvaloy 4170 @ \$1.75/lb
= \$42.00/Ton
 - 0.4% Catalyst @ \$0.65/lb =
\$5.20/Ton
- Total Estimated Cost Per Ton =
\$47.20

Better Performance & Formulation Costs With
Elvaloy® RET Polymer Modifier



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Florida Specification Path Forward?

- Should Florida Have Access To Other Performing Polymer Modifiers That Demonstrate Better Performance Than GTR?
- New Research & Testing Is Showing New Innovative Technology That Can Provide Longer Lasting Roads
- Increased Competition Drives Lower Costs And Greater Technology
- Let SHRP Performance Tests Be The Judge of PMA's