

Acrylated Silicones Suitable for SLA 3D Printing

Bob Ruckle and Tom Seung-Tong Cheung

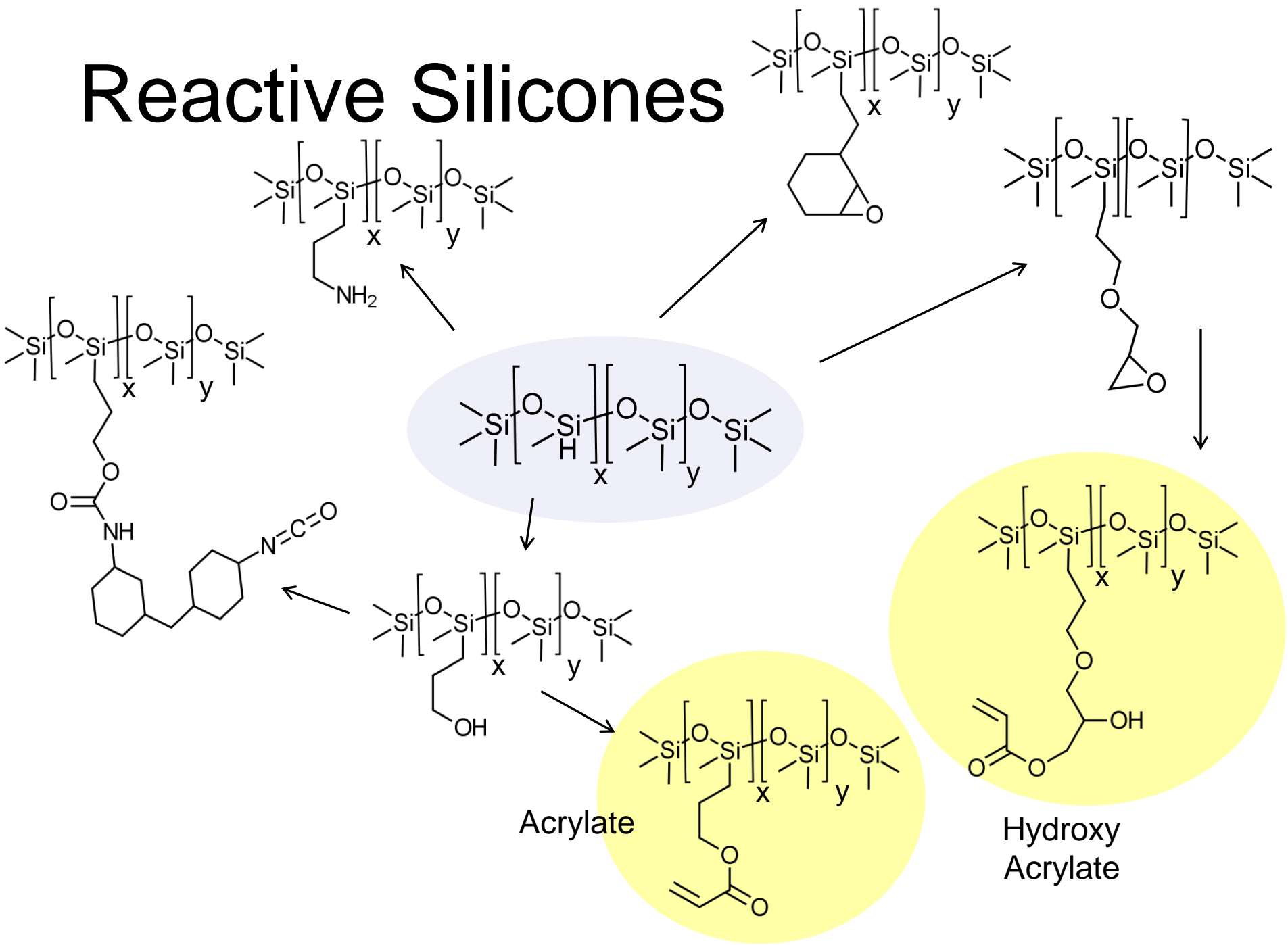
Siltech Corp, Toronto, ON

robert@siltech.com, 845-592-4075

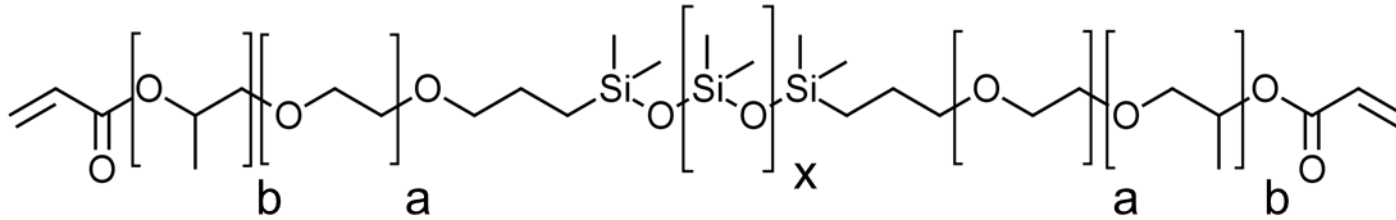
tom2@siltech.com, 416-424-4567



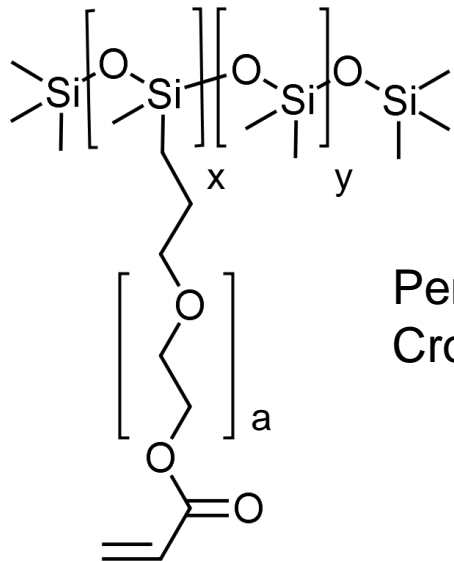
Reactive Silicones



Acrylated Silicone Types



Linear, Di-functional
Extender



Pendant, Multi-functional
Cross-Linker

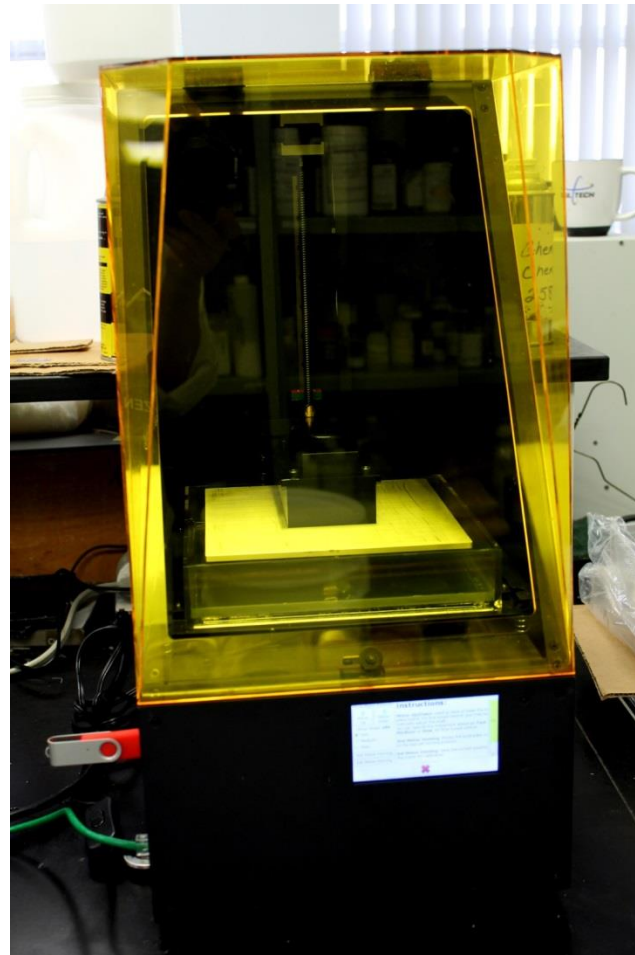
Acrylated Silicones

Name	Type	Equivalent Weight
Lin 650	Linear Di-functional	650
Lin 1000	Linear Di-functional	1000
Lin 1200	Linear Di-functional	1200
Lin 2500	Linear Di-functional	2500
Pen 300	Multi-Functional	300
Pen 600	Multi-Functional	600
Pen 1000	Multi-Functional	1000

Experimental

- Materials are cured in a TA Instrument AR-G2 Rheometer using:
 - 150 mW/cm² LCD UV lamp at 365nm
 - UV lamp turned on at 300 sec. for 600 sec.
 - Strain Set at 0.05% with normal force control
- Properties measured with an Instron 1122 according to ASTM D412 using separately cured dumbbells.
- Dumbbells were 3D printed with a SLA type 3D printer from Full Spectrum Laser

Pegasus Touch from FSL3D



Formulations

1. Soft Formulation

	5%	10%	20%	30%
Sartomer CN 991	8.40%	7.96%	7.07%	6.18%
Laromer UA-9072	47.08%	44.58%	39.61%	34.64%
Laromer LR-8887	34.40%	32.57%	28.94%	25.31%
Sartomer SR833S	3.91%	3.70%	3.29%	2.88%
Silicone Acrylate	5.00%	10.04%	20.07%	30.10%
TPO	1.04%	0.98%	0.87%	0.76%
Silmer ACR Di-10	0.17%	0.17%	0.15%	0.13%
Total	100.00%	100.00%	100.00%	100.00%

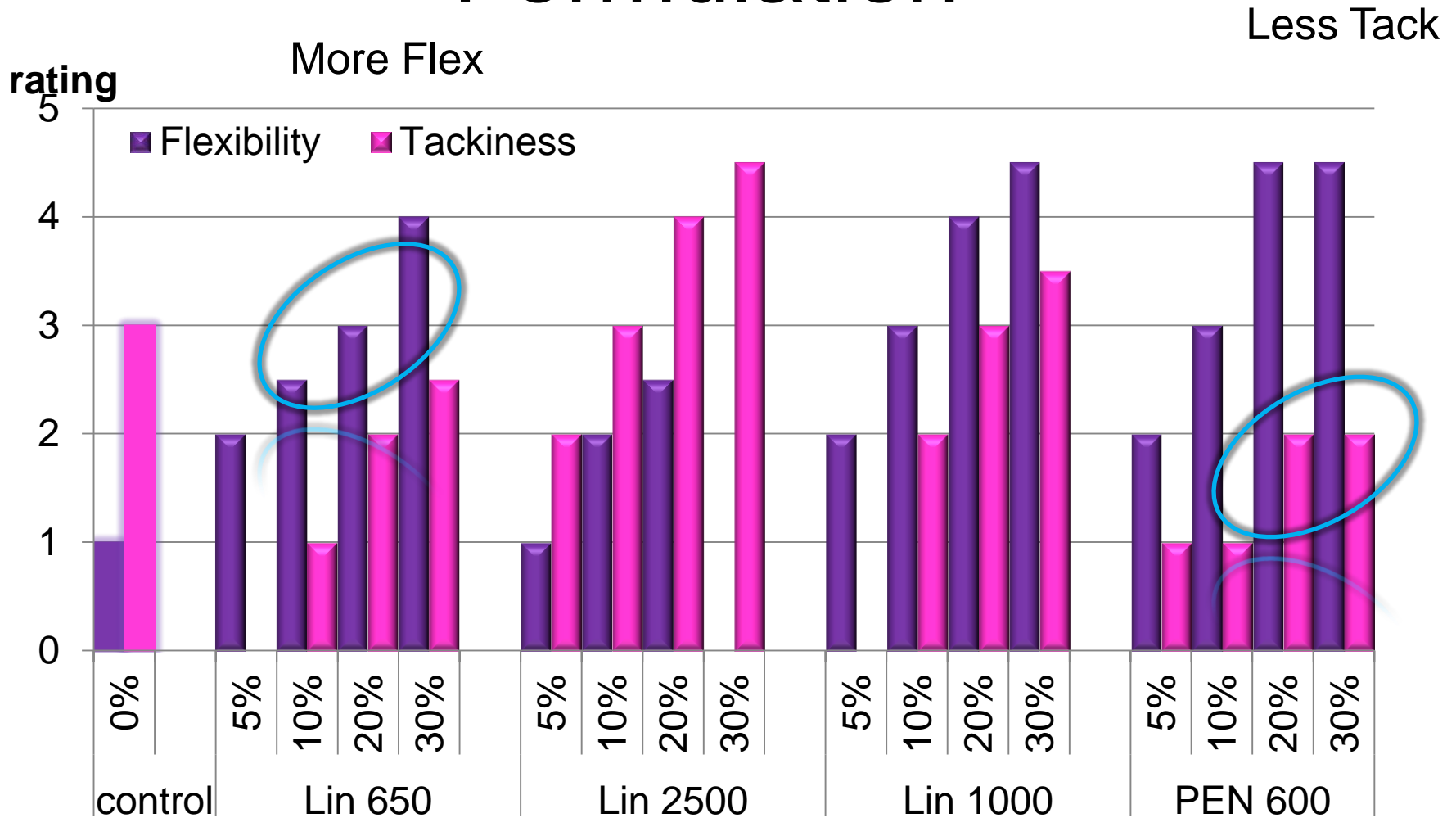
2. Proprietary In-House Hard Formulation

3. Commercial Resin from Printer Manufacturer

3D Printed Dumbbells

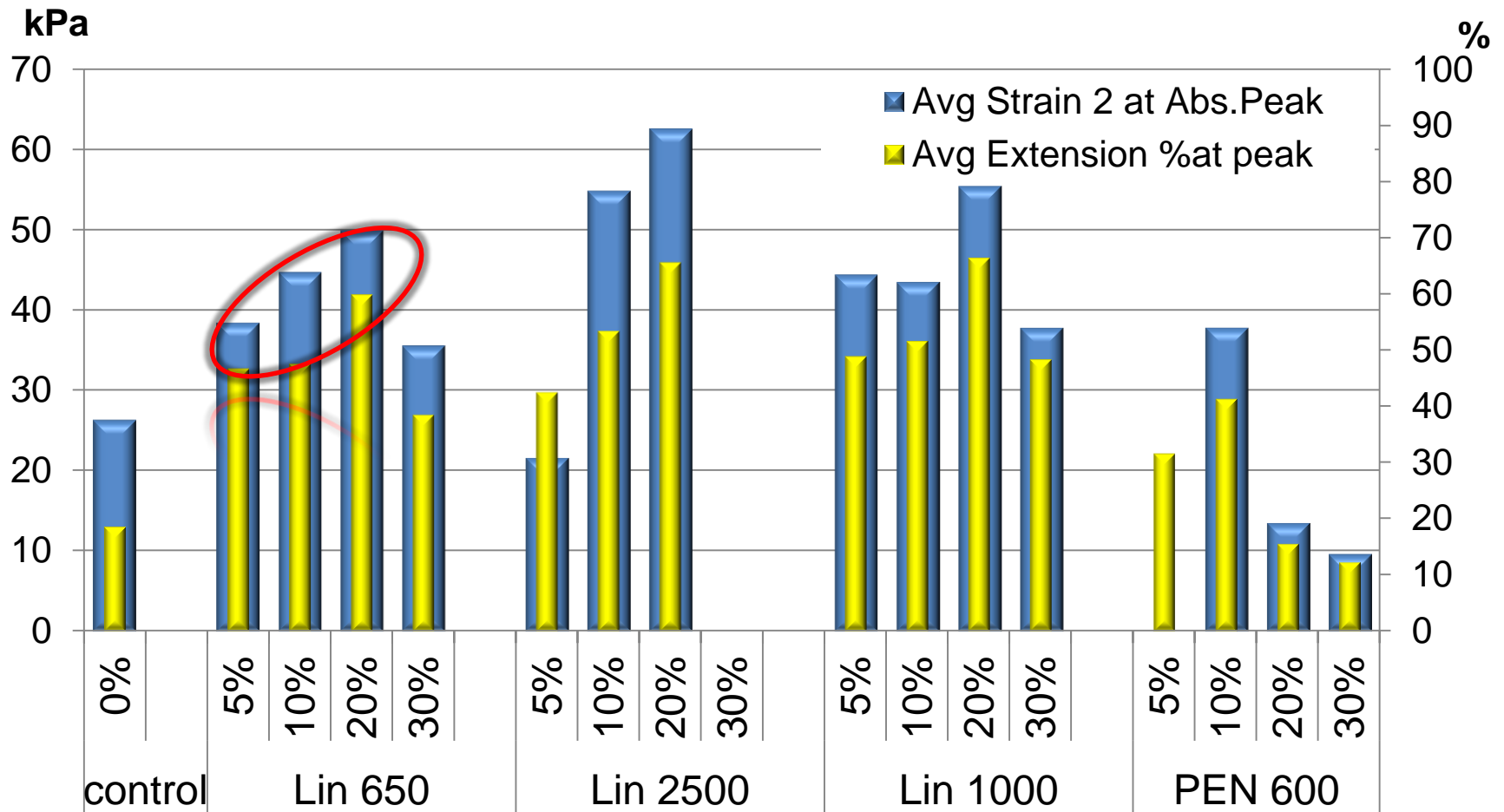


Flexibility and Tack in Soft Formulation



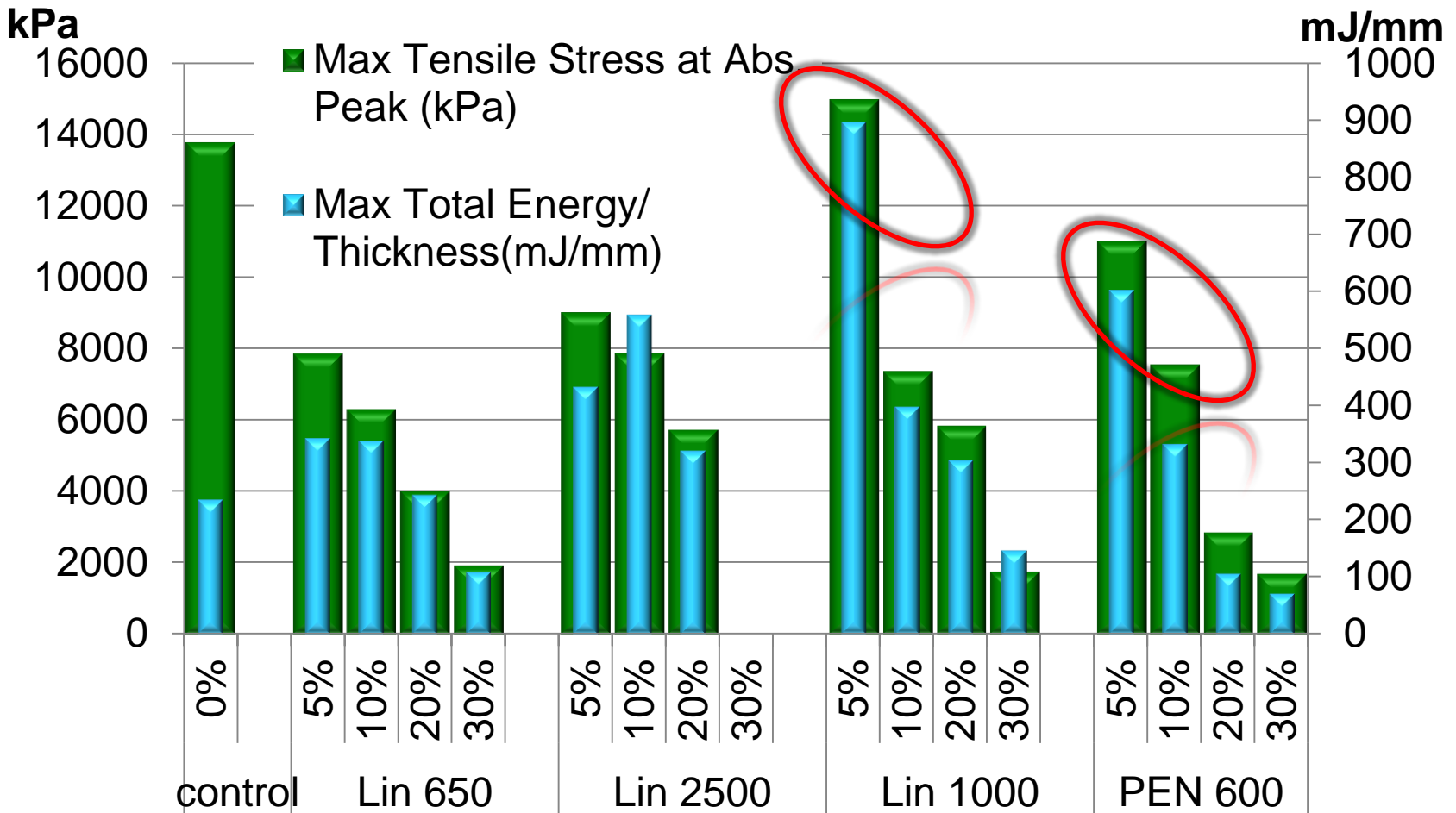
Elongation and Strain in Soft Formulation

More Flex

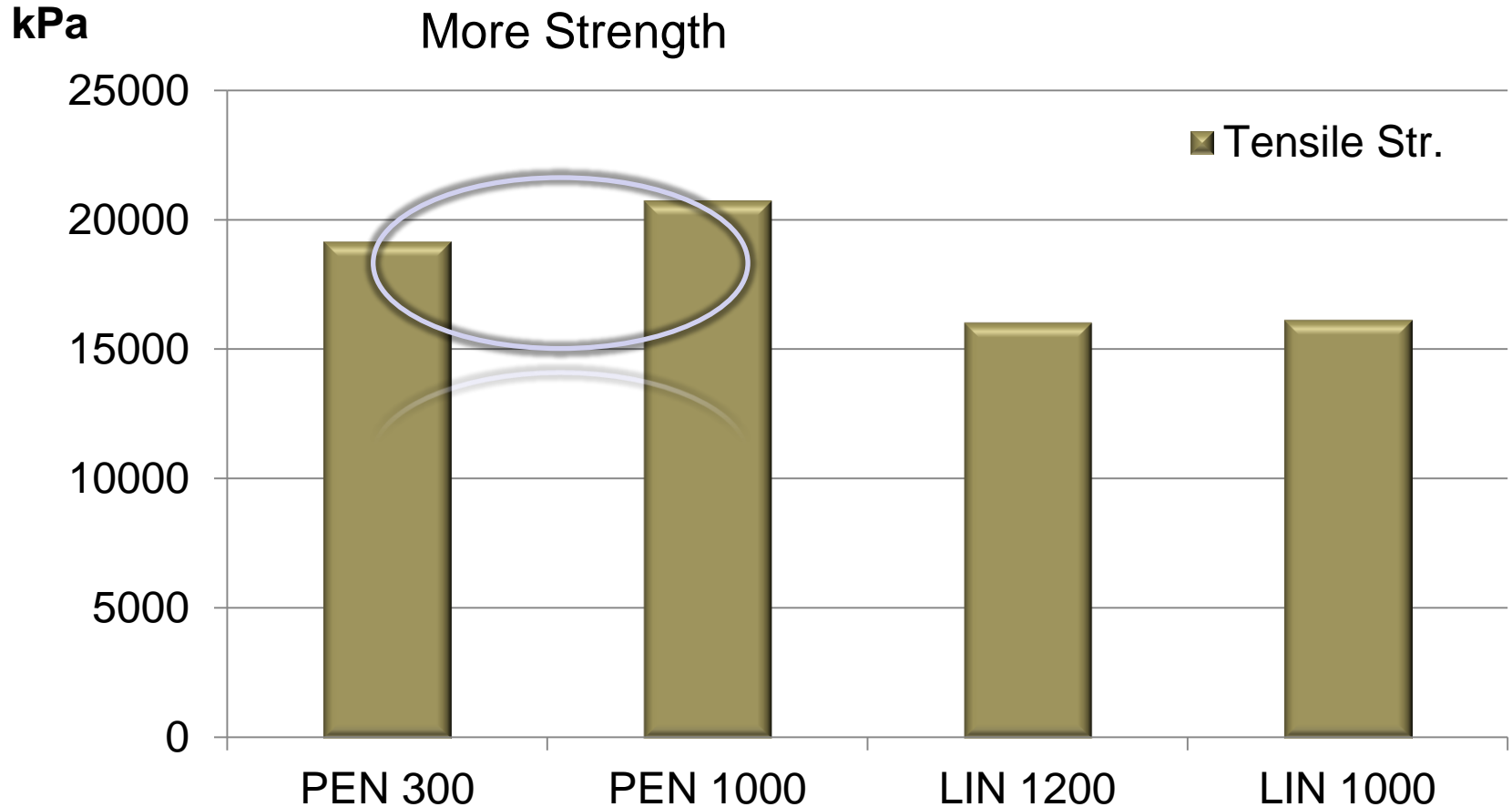


Stress and Energy in Soft Formulation

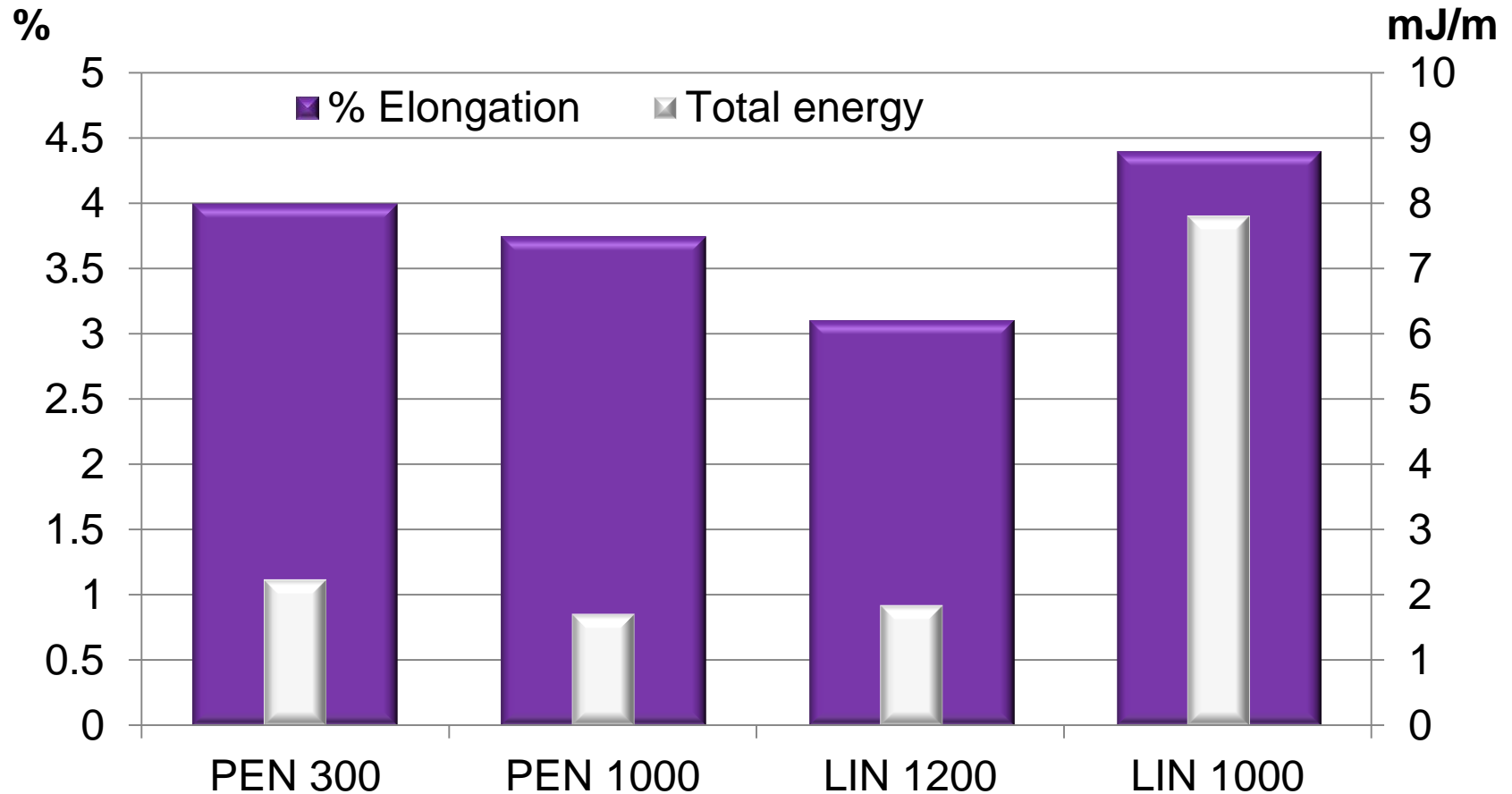
More Strength



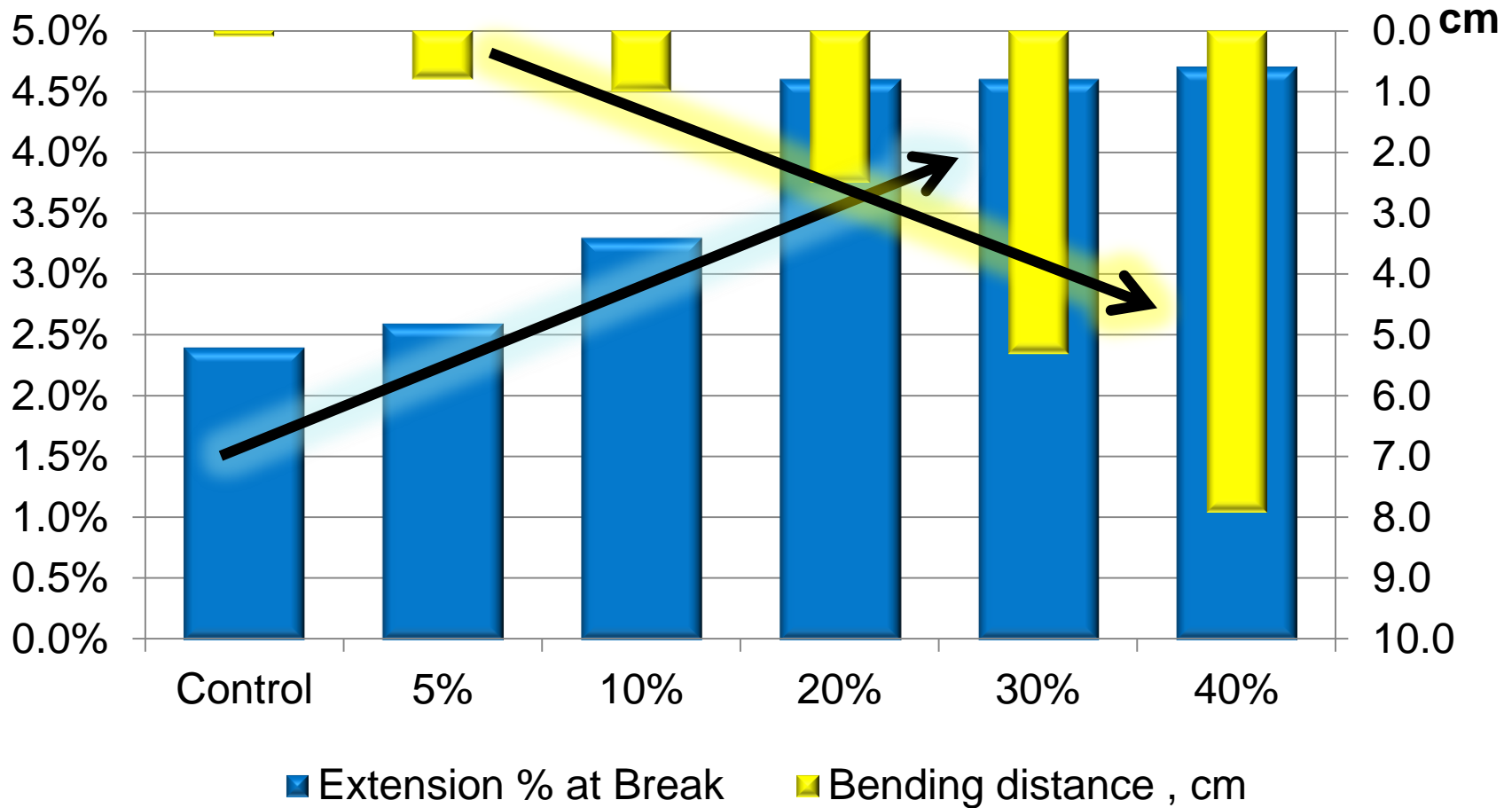
Tensile Strength In-House Hard Formulation



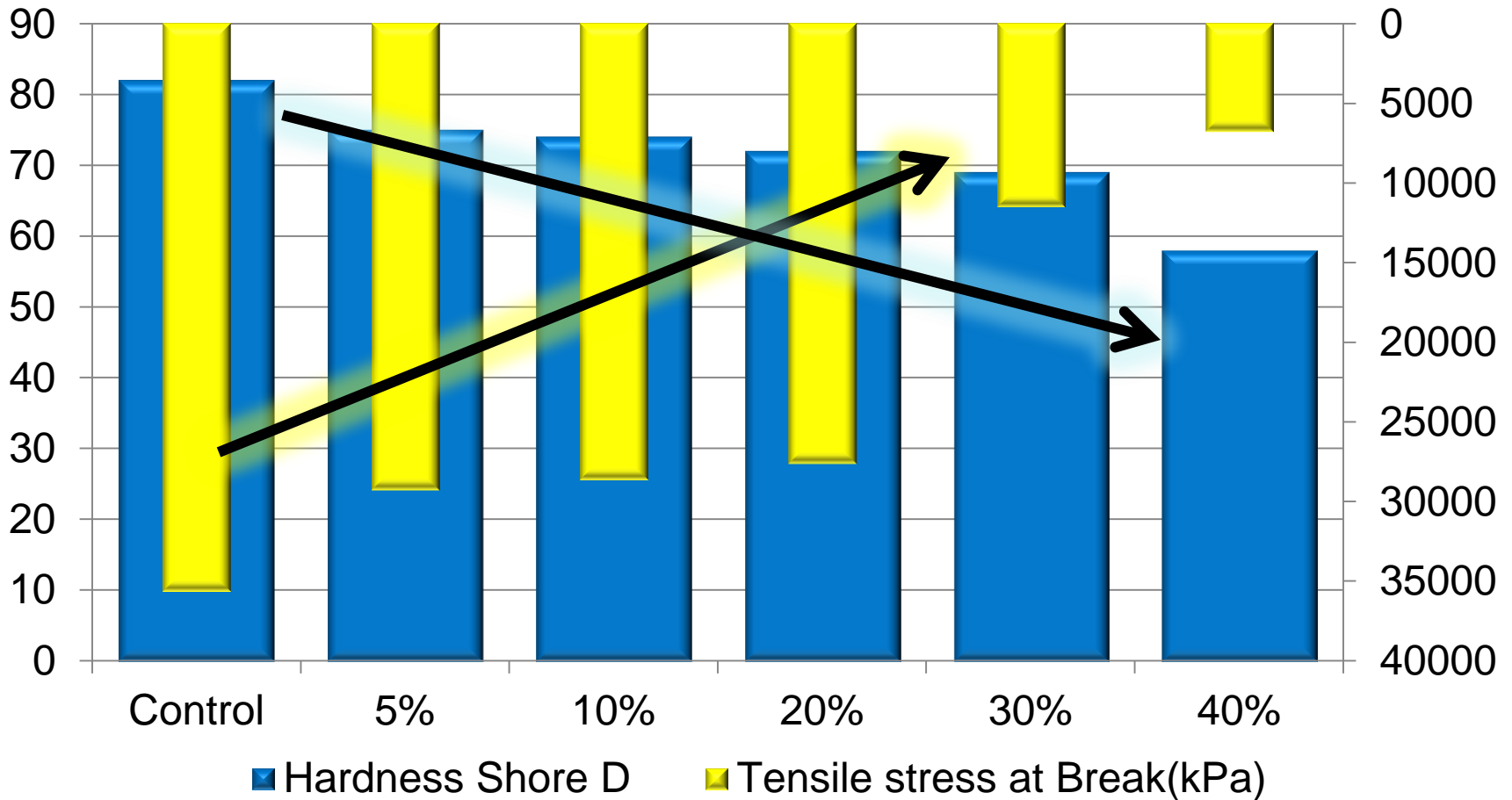
Elongation and Energy In-House Hard Formulation



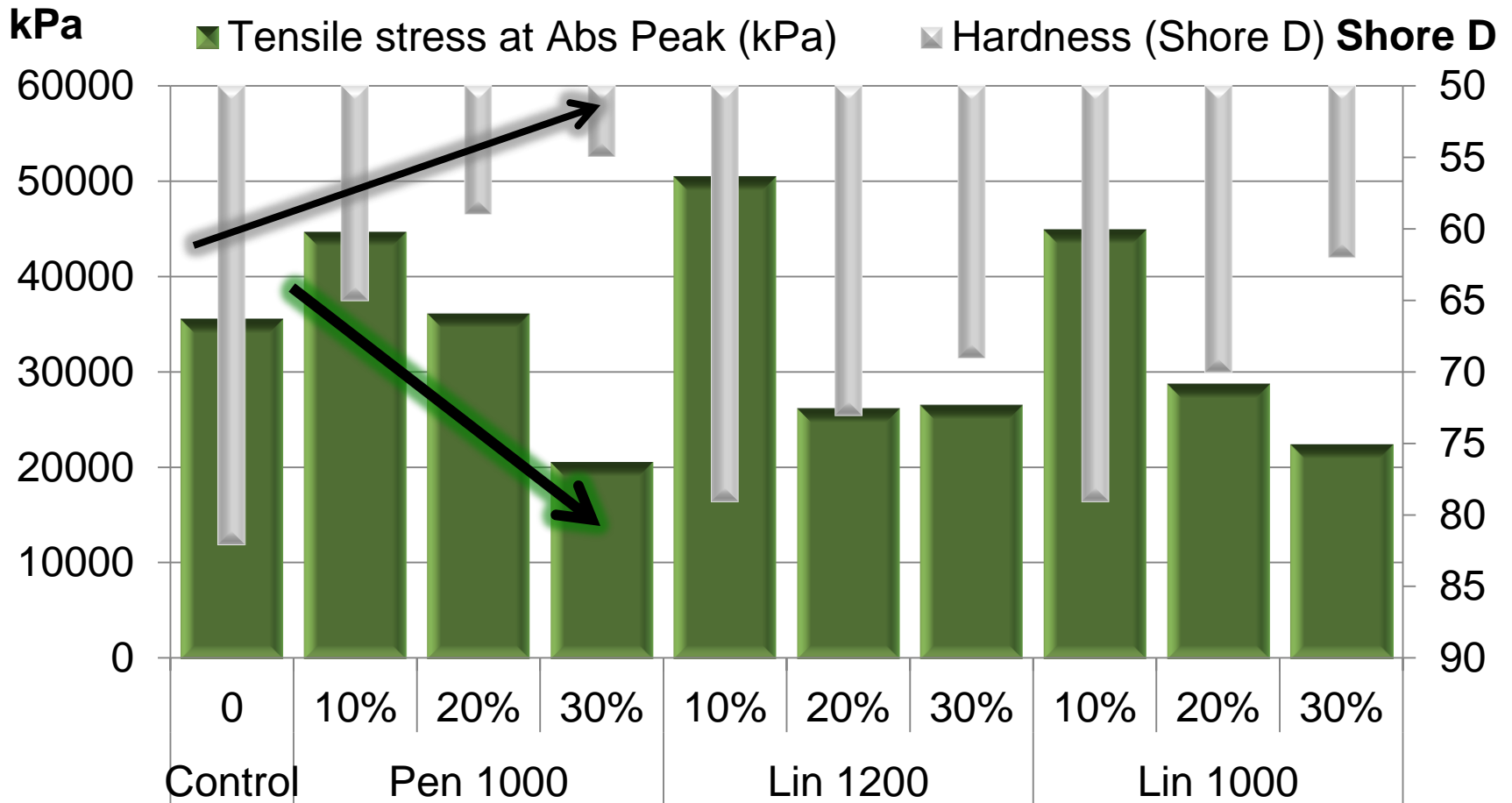
Elongation and Bending of PEN 300 in Commercial Formulation



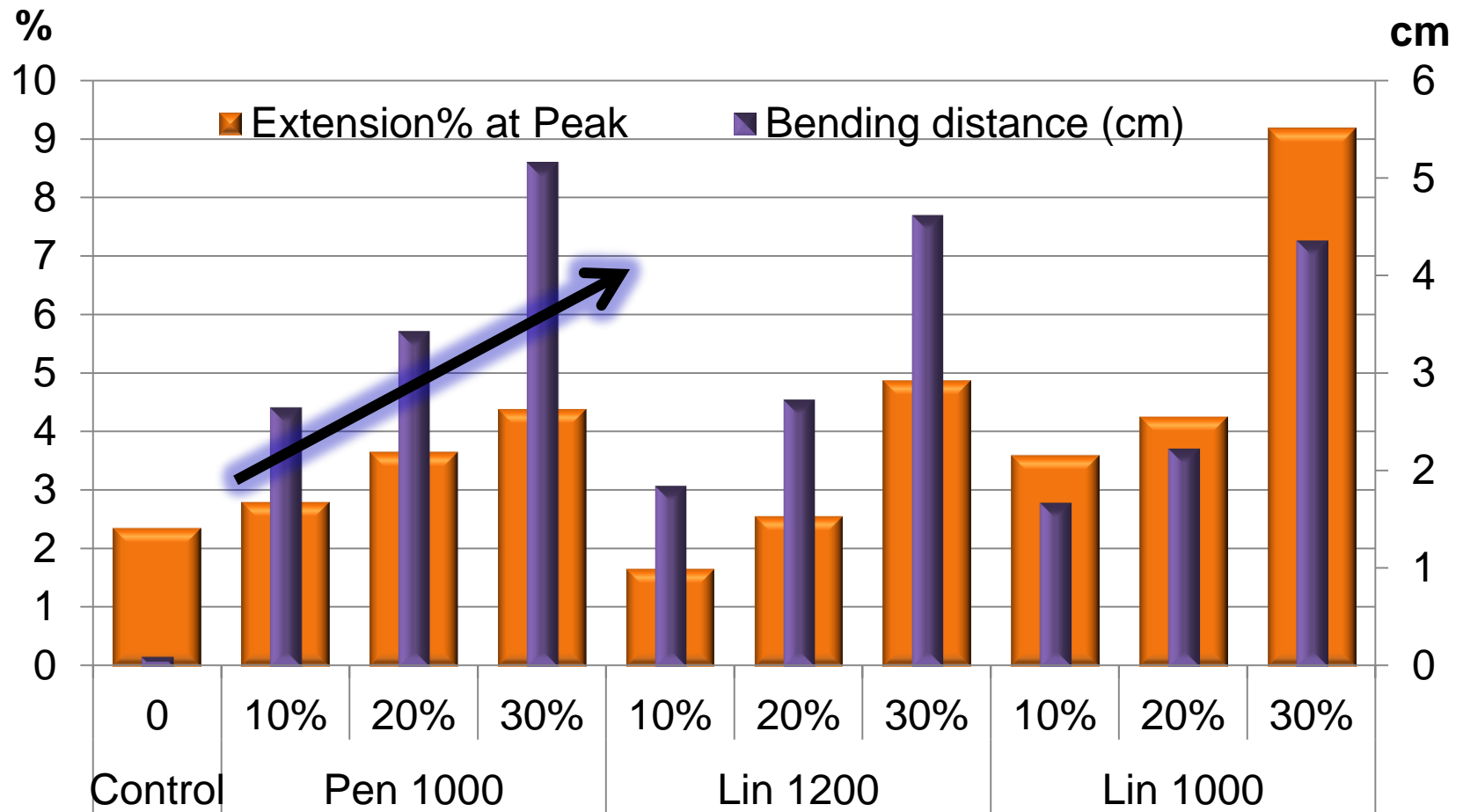
Stress and Hardness of PEN 300 in Commercial Formulation



Stress and Hardness in Commercial Formulation



Elongation and Bending vs. Use Level: Commercial Formulation



Summary

- Starting to have success adding flexibility and elongation to commercial formulation
- Hardness is compromised

Future Work

- More Formulation
- Minimize Hardness Loss



**Thank
you!**