

Elastomer Data

ASTM Elastomer Task Group

Summary of Industry Data Including PC-9 Matrix Oils

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Revised 07-16-01

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Elastomer Test Limits

- ◆ **ASTM is close to selection of reference fluids**
- ◆ **Matrix oils A B C E G & H have been added to these graphs**
- ◆ **This data set has been sorted a new way, to group the oils in 3 categories**
 - **Commercial**
 - » **Includes CH4, CD / SH, ACEA**
 - » **Group I, II, and IV base oils**
 - **Candidate PC-9**
 - » **Includes candidates and 6 Matrix oils**
 - **Reference fluids**
 - » **Includes TMC reference oils and variations of TMC 1006**
 - » **Oils L, I, J, K are variations of TMC 1006 in Group II stocks**

Elastomer Test Limits

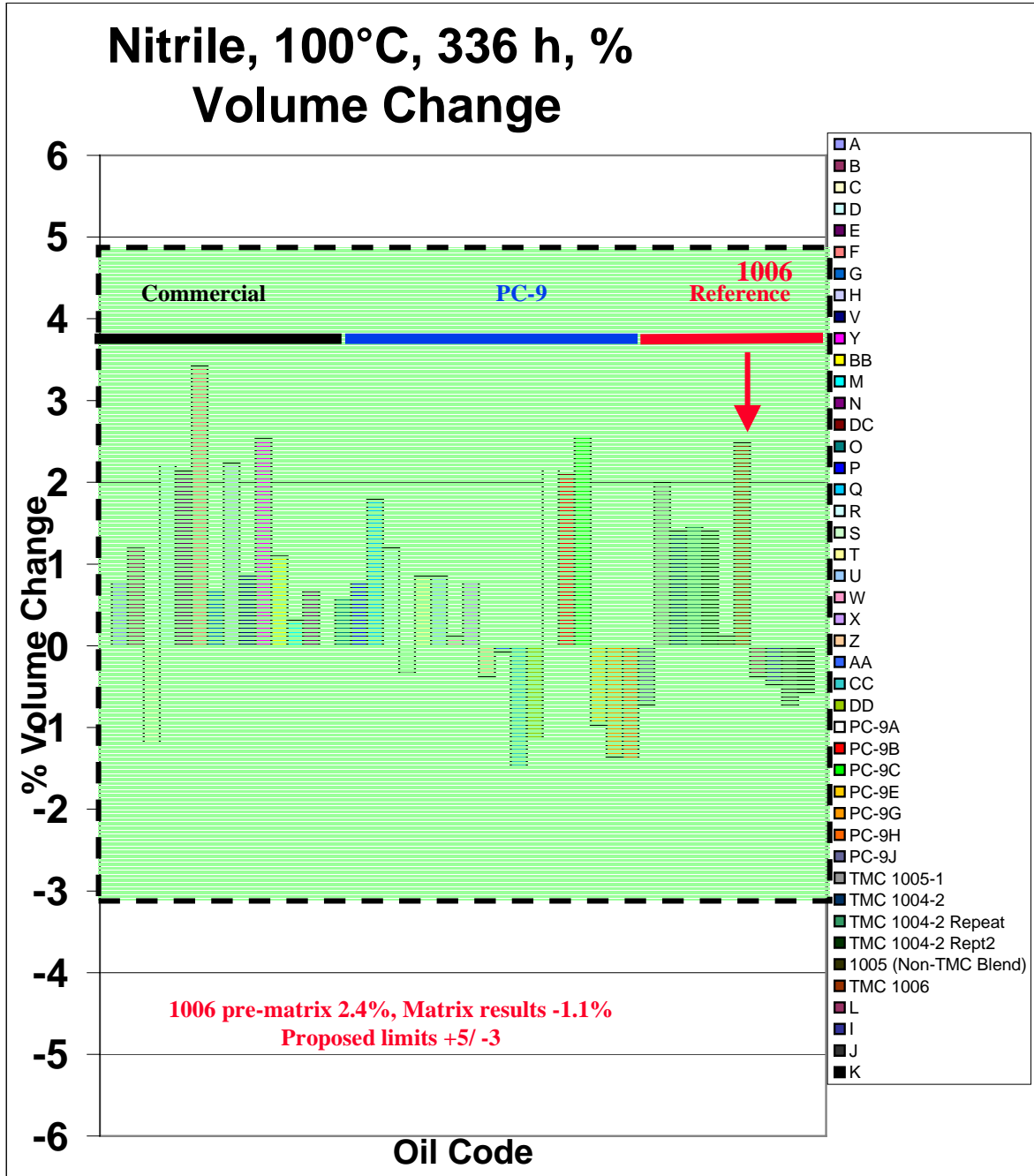
- ◆ **TMC 1006 (Service fluid 105) is proposed as reference for Nitrile, Silicone, & Fluorelastomer. Results of pre-matrix testing of TMC 1006 and the matrix (or round robin) tests of TMC 1006 are noted on each graph**
- ◆ **Reference oil has not been set for Polyacrylate.**
- ◆ **Proposed Elastomer test limits are written in red on each graph. Fixed limits are noted graphically by a dotted line.**

Nitrile

Nitrile, Elastomer Batch A21-35-2, 100°C, 336 Hours, All Data an Average of Three Samples

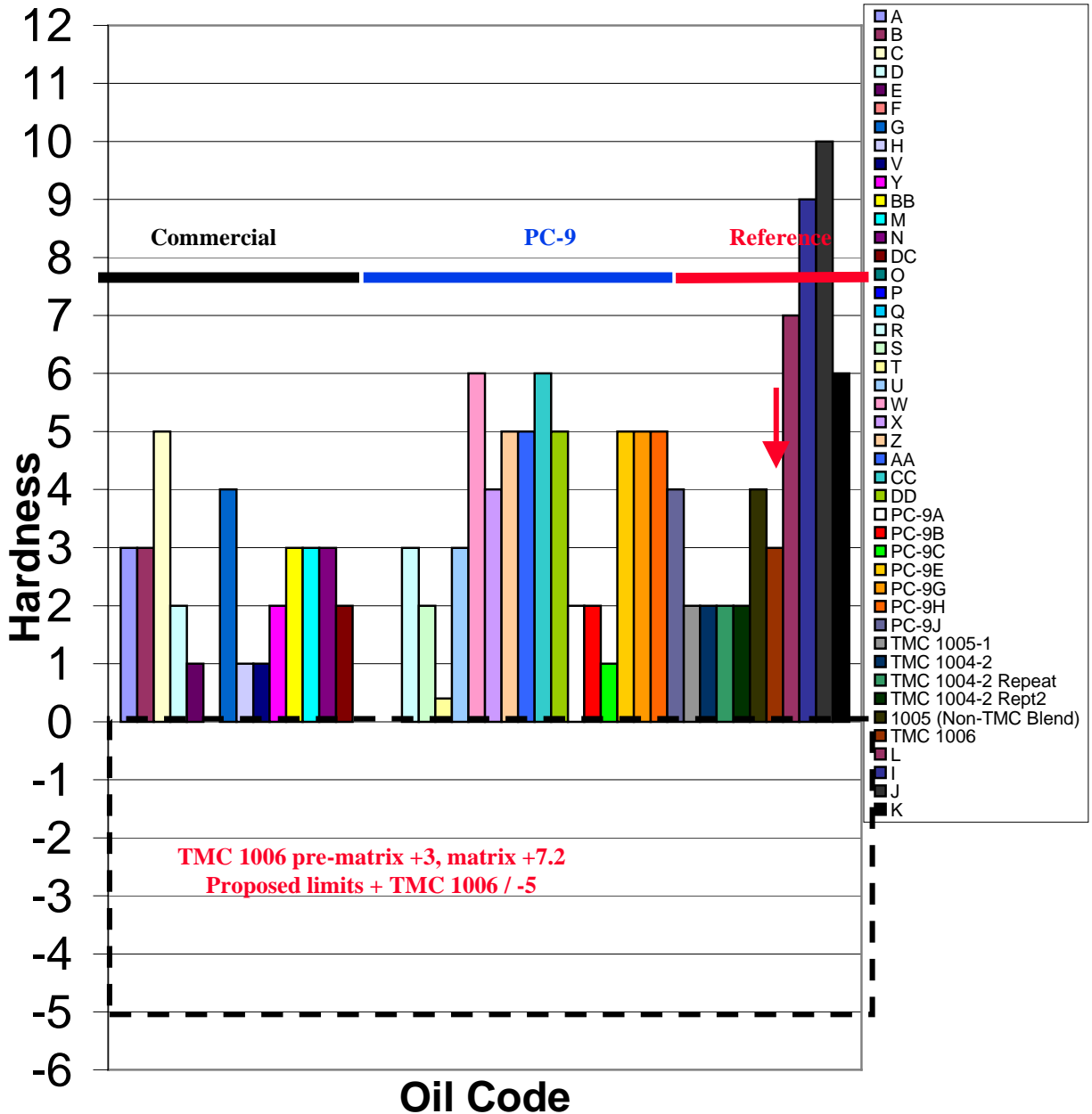
	Volume Change, %	Points Hardness Change	Tensile Strength Change, %	Elongation Change, %	Reversion	Oil Type
A	0.8	3	-7.6	-32.2	None	Commercial
B	1.2	3	-5.1	-34.0	None	Commercial
C	-1.2	5	-42.9	-53.2	None	Commercial
D	2.2	2	-4.7	-33.5	None	Commercial
E	2.1	1	-6.4	-39.2	None	Commercial
F	3.4	0	-0.2	-36.0	None	Commercial
G	0.7	4	-2.5	-33.2	None	Commercial
H	2.2	1	-16.6	-43.7	None	Commercial
V	0.9	1	-22.3	-29.6		Commercial
Y	2.5	2	-2.1	-22.7		Commercial
BB	1.1	3	2.2	-24.2		Commercial
M	0.3	3	1.5	-27.7	None	Commercial ACEA
N	0.7	3	4.6	-29.9	None	Commercial ACEA
DC	0.0	2	-4.0	-28.0		Commercial ACEB
O	0.6	0	4.4	-12.5	None	PC-9
P	0.8	0	-1.7	-13.7	None	PC-9
Q	1.8	0	-26.3	-31.5	None	PC-9
R	1.2	3	-5.8	-22.3	None	PC-9
S	-0.3	2	-5.8	-27.5	None	PC-9
T	0.9	0.4	-13.4	-35.9		PC-9
U	0.9	3	-18.2	-39.6		PC-9
W	0.1	6	-9.2	-34.7		PC-9
X	0.8	4	2.3	-29.8		PC-9
Z	-0.4	5	-5.1	-26.6		PC-9
AA	-0.1	5	-4.5	-31.9		PC-9
CC	-1.5	6	-4.0	-28.3		PC-9
DD	-1.1	5	0.6	-31.3		PC-9
PC-9A	2.16	2	-1.1	-25.8		PC-9
PC-9B	2.11	2	-12.3	-30.6		PC-9
PC-9C	2.56	1	1.8	-23.1		PC-9
PC-9E	-1.0	5	2.5	-27.4		PC-9
PC-9G	-1.4	5	-22.2	-42.1		PC-9
PC-9H	-1.4	5	-0.5	-28.6		PC-9
PC-9J	-0.7	4	0.7	-25.5		PC-9
TMC 1005-1	2.0	2	-1.6	-31.5	None	Reference
TMC 1004-2	1.4	2	-0.8	-31.5	None	Reference
TMC 1004-2 Repeat	1.5	2	-3.9	-38.5	None	Reference
TMC 1004-2 Rept2	1.4	2	8.8	-24.5	None	Reference
1005 (Non-TMC Blend)	0.1	4	-0.9	-29.4		Reference
TMC 1006	2.5	3	-37.4	-49.7	None	Reference
L	-0.4	7	-49.6	-67.2	None	Reference
I	-0.5	9	-59.4	-62.4	None	Reference
J	-0.7	10	-61.1	-63.6	None	Reference
K	-0.6	6	-47.1	-57.2	None	Reference

Nitriles



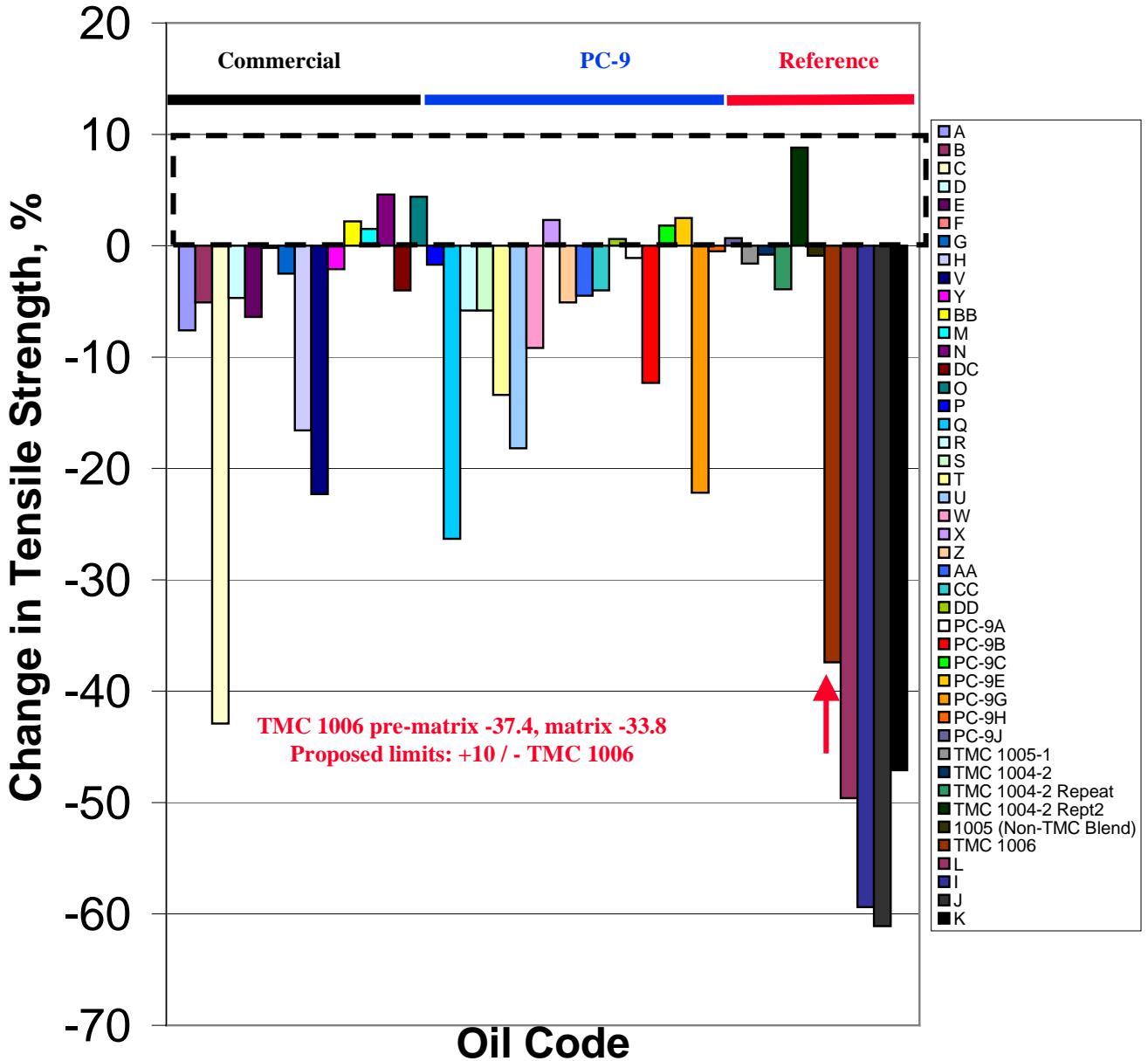
Nitriles

Nitrile, 100°C, 336 h, Hardness



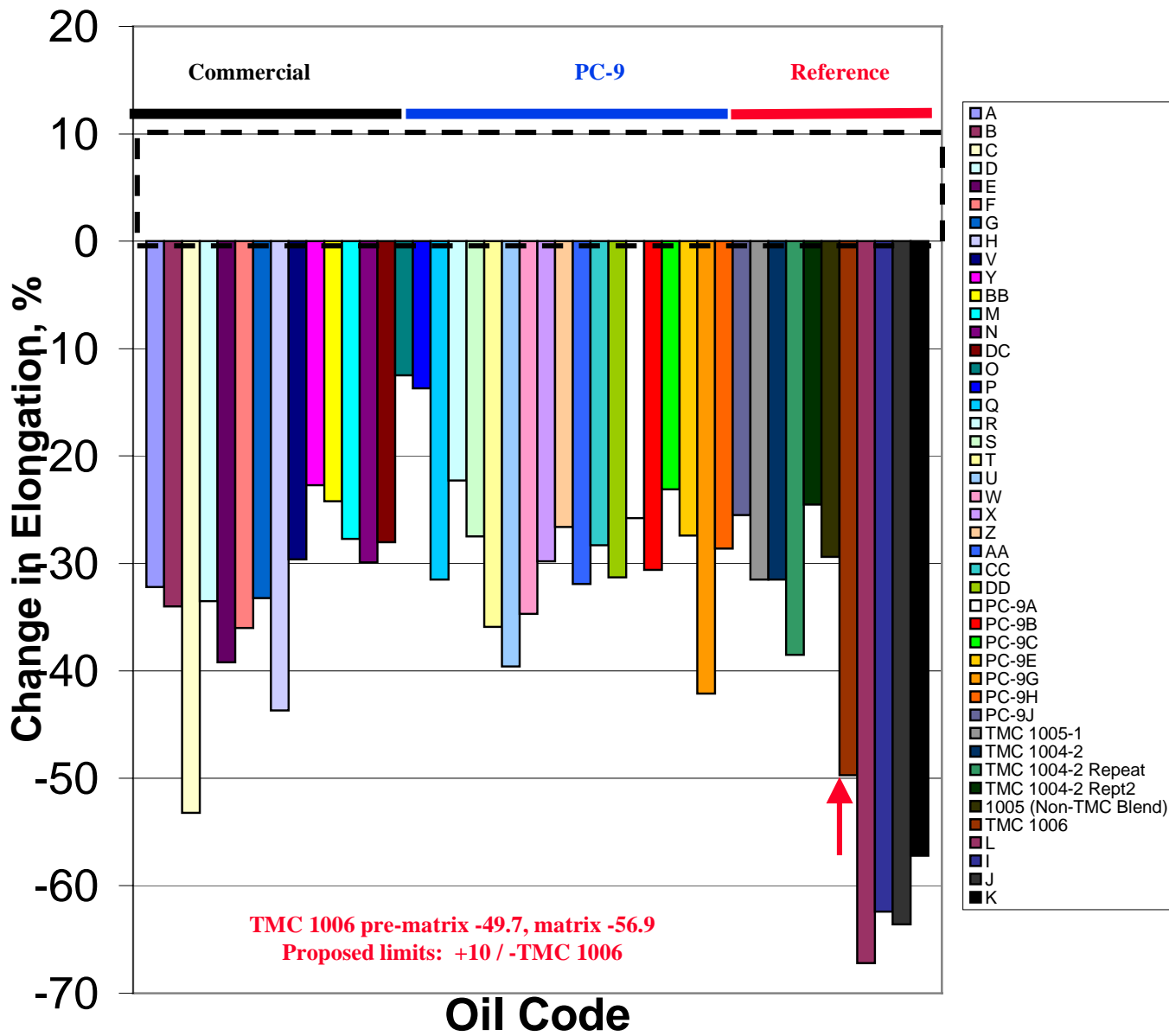
Nitriles

Nitrile, 100°C, 336 h, Change in Tensile Strength



Nitriles

**Nitrile, 100°C, 336 h,
Change in Elongation**

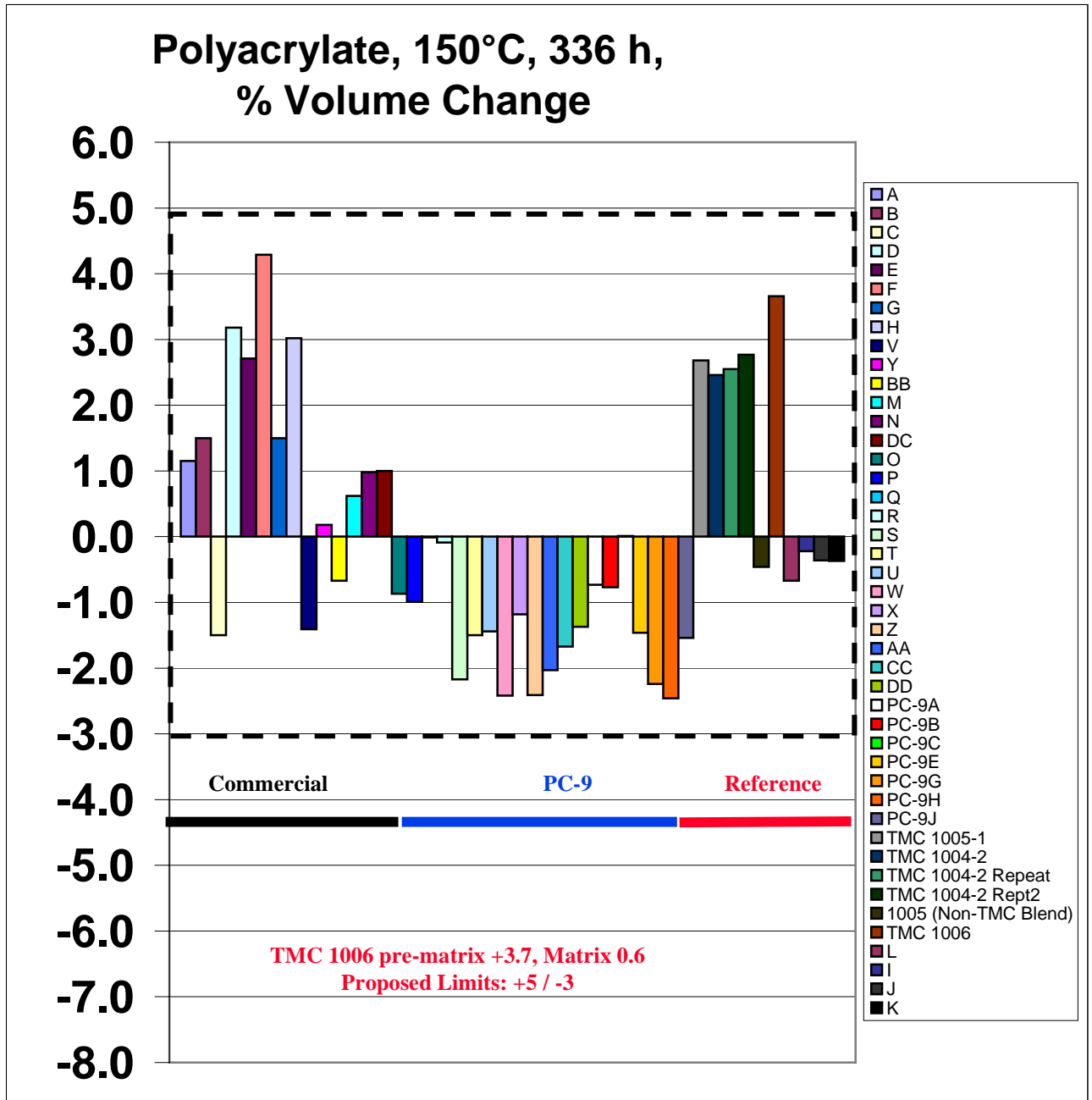


Polyacrylate

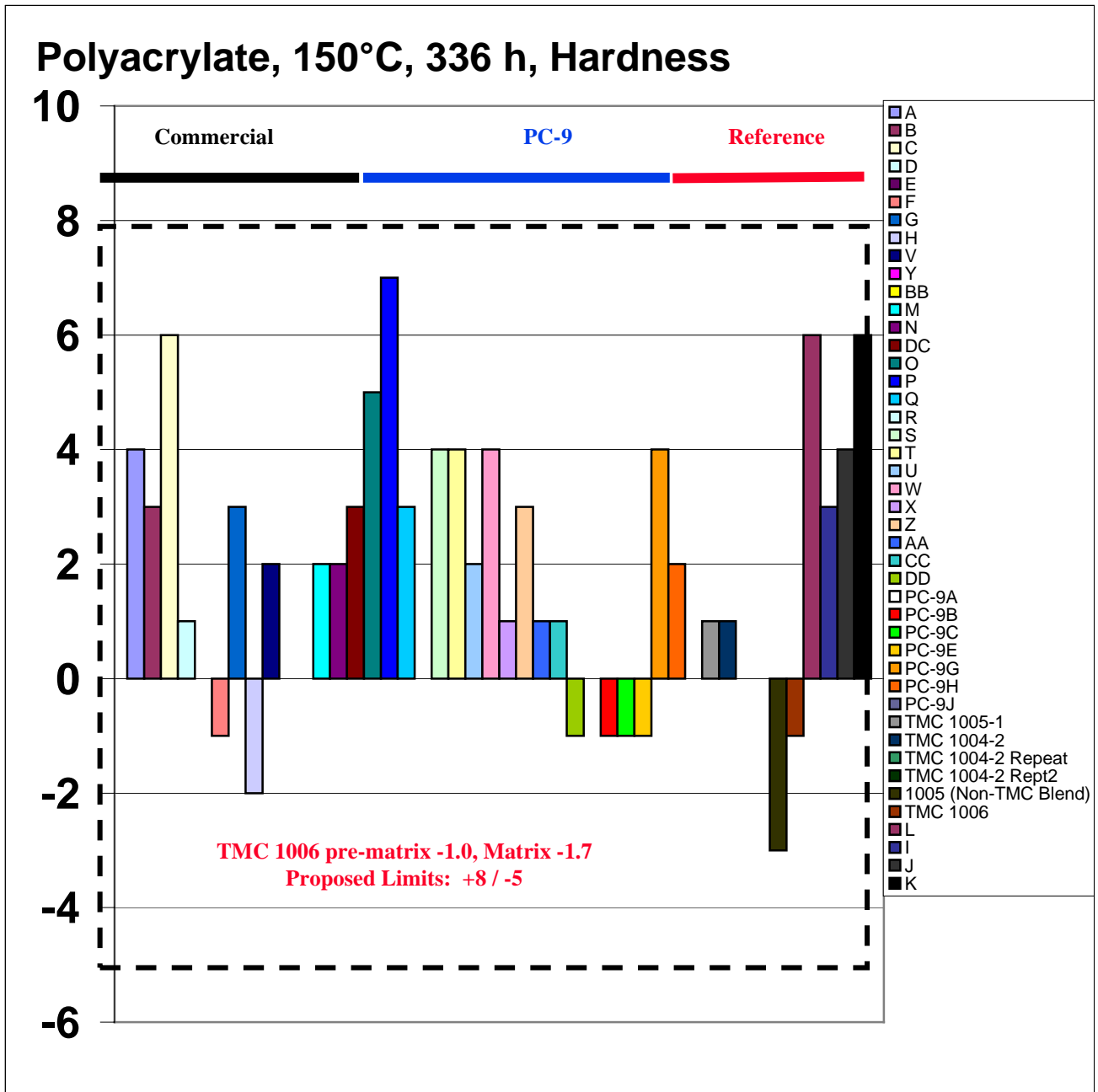
Polyacrylate, Elastomer Batch A21-35-1, 150°C, 336 Hours, All Data an Average of Three Samples

	Volume Change, %	Points Hardness Change	Tensile Strength Change, %	Elongation Change, %	Reversion	Oil Type
A	1.2	4	3.7	-19.6	None	Commercial
B	1.5	3	0.7	-17.3	None	Commercial
C	-1.5	6	-6.0	-25.3	None	Commercial
D	3.2	1	6.8	-14.2	None	Commercial
E	2.7	0	2.7	-17.8	None	Commercial
F	4.3	-1	-3.7	-26.0	None	Commercial
G	1.5	3	12.5	-20.3	None	Commercial
H	3.0	-2	8.1	-20.1	None	Commercial
V	-1.4	2	0.2	-22.0		Commercial
Y	0.2	0	-4.2	-14.8		Commercial
BB	-0.7	0	5.1	-8.1		Commercial
M	0.6	2	8.9	-12.0	Yes	Commercial ACEA
N	1.0	2	2.0	-0.7	Yes	Commercial ACEA
DC	1.0	3	1.0	-22.0		Commercial ACEB
O	-0.9	5	-14.6	-40.4		PC-9
P	-1.0	7	-13.4	-42.7		PC-9
Q	0.0	3	-14.7	-30.9		PC-9
R	-0.1	0	3.9	-4.1		PC-9
S	-2.2	4	1.4	-17.8		PC-9
T	-1.5	4	0.6	-29.2		PC-9
U	-1.4	2	3.7	-22.9		PC-9
W	-2.4	4	-4.0	-21.5		PC-9
X	-1.2	1	-3.6	-22.2		PC-9
Z	-2.4	3	3.9	-14.5		PC-9
AA	-2.0	1	7.7	-8.1		PC-9
CC	-1.7	1	5.7	-14.4		PC-9
DD	-1.4	-1	-2.3	-21.8		PC-9
PC-9A	-0.73	0	-2.8	-14.6		PC-9
PC-9B	-0.77	-1	5.8	-7.4		PC-9
PC-9C	0.01	-1	3.9	-10.3		PC-9
PC-9E	-1.5	-1	3.2	-7.7		PC-9
PC-9G	-2.2	4	3.4	-15.6		PC-9
PC-9H	-2.5	2	3.6	-13.3		PC-9
PC-9J	-1.5	0	1.9	-16.8		PC-9
TMC 1005-1	2.7	1	2.7	-18.3	None	Reference
TMC 1004-2	2.5	1	-3.8	-24.3	None	Reference
TMC 1004-2 Repeat	2.6	0	-1.5	-24.2	None	Reference
TMC 1004-2 Rept2	2.8	0	2.6	-1.8	None	Reference
1005 (Non-TMC Blend)	-0.5	-3	3.2	-13.8		Reference
TMC 1006	3.7	-1	-2.5	-15.2	None	Reference a
L	-0.7	6	9.1	-28.2	None	Reference a1
I	-0.2	3	11.1	-13.5	None	Reference b
J	-0.4	4	2.3	-15.3	None	Reference b
K	-0.4	6	3.5	-14.8	None	Reference b

Polyacrylate

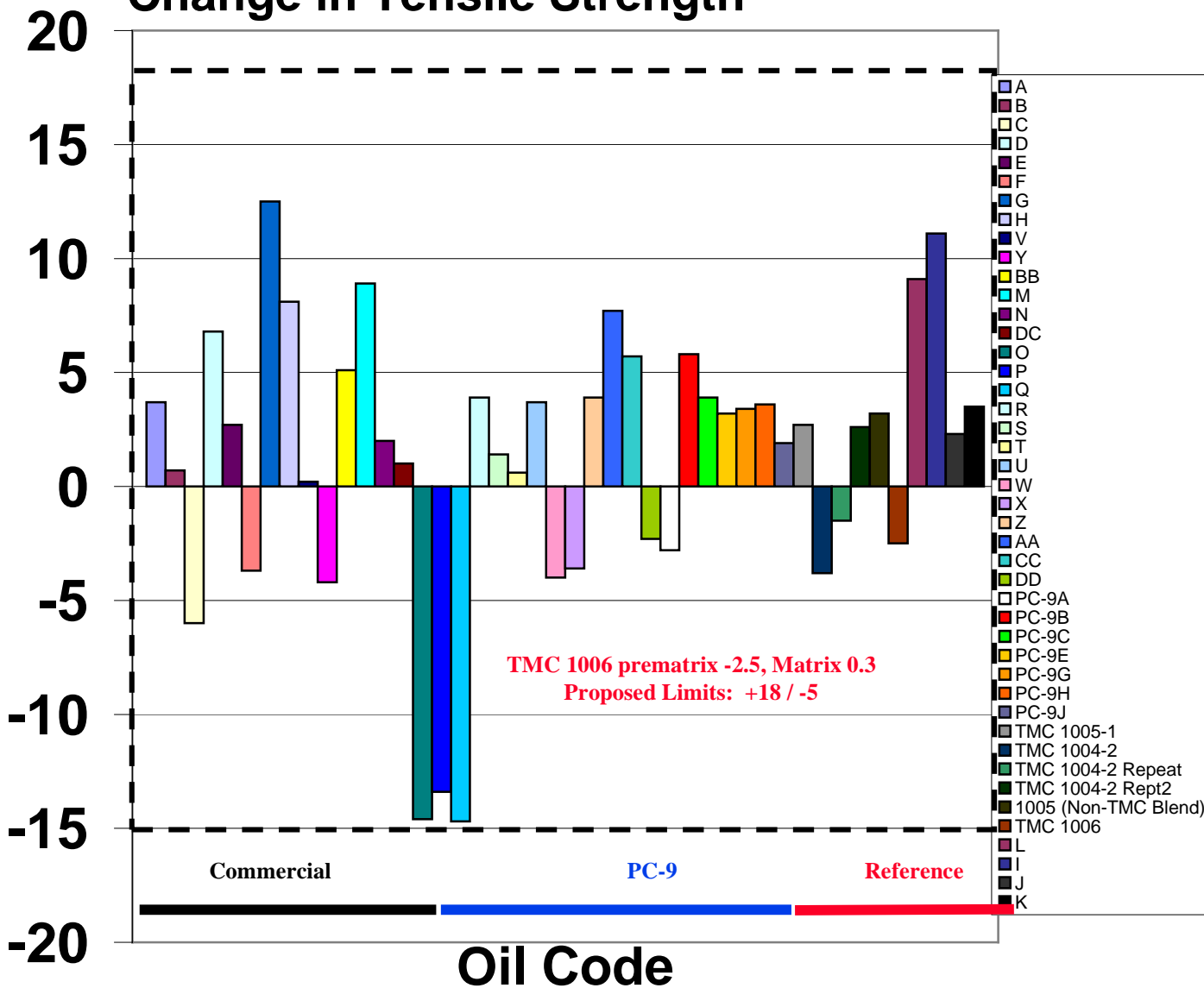


Polyacrylate



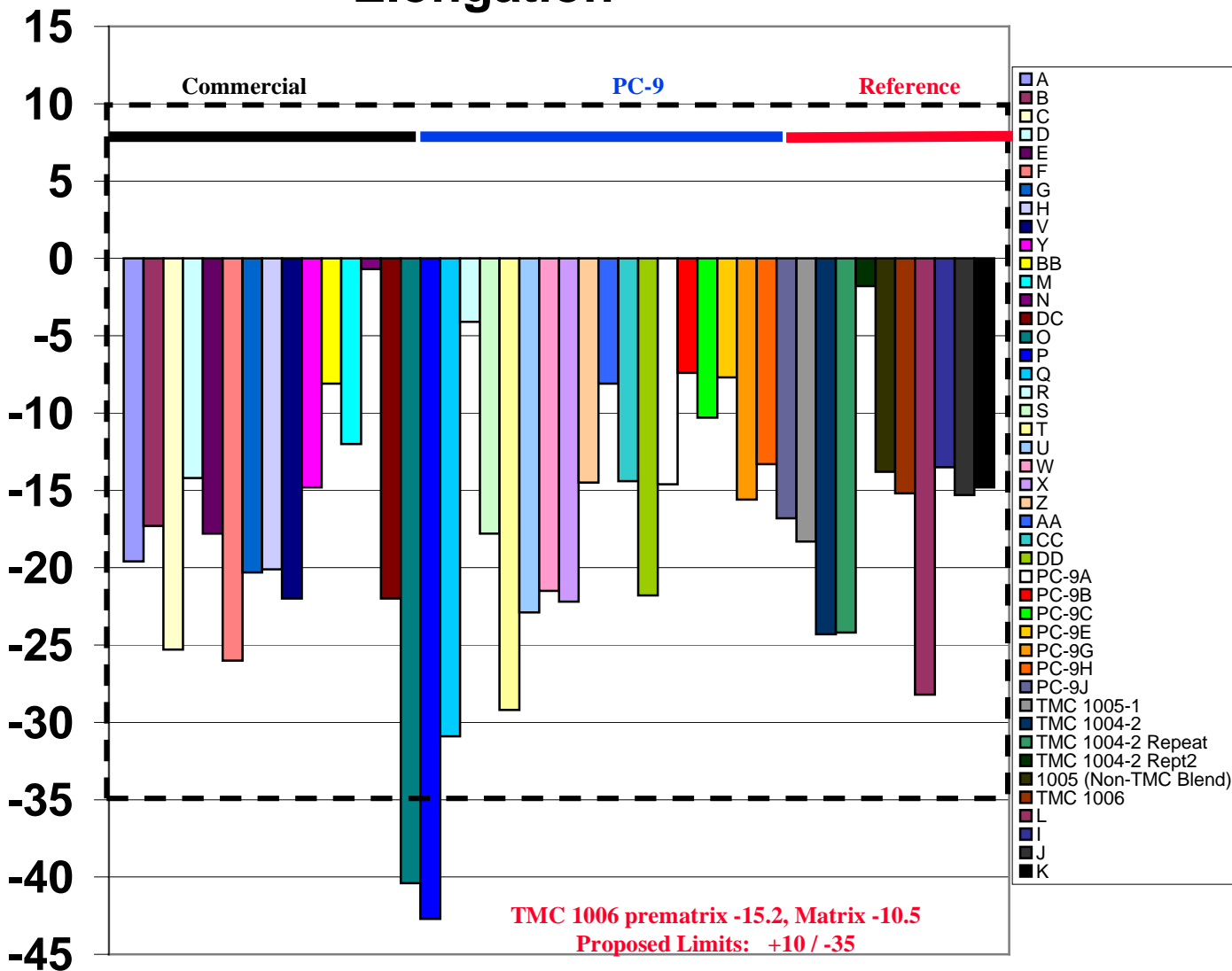
Polyacrylate

Polyacrylate, 150°C, 336 h,
Change in Tensile Strength



Polyacrylate

Polyacrylate, 150°C, 336 h, Change in Elongation

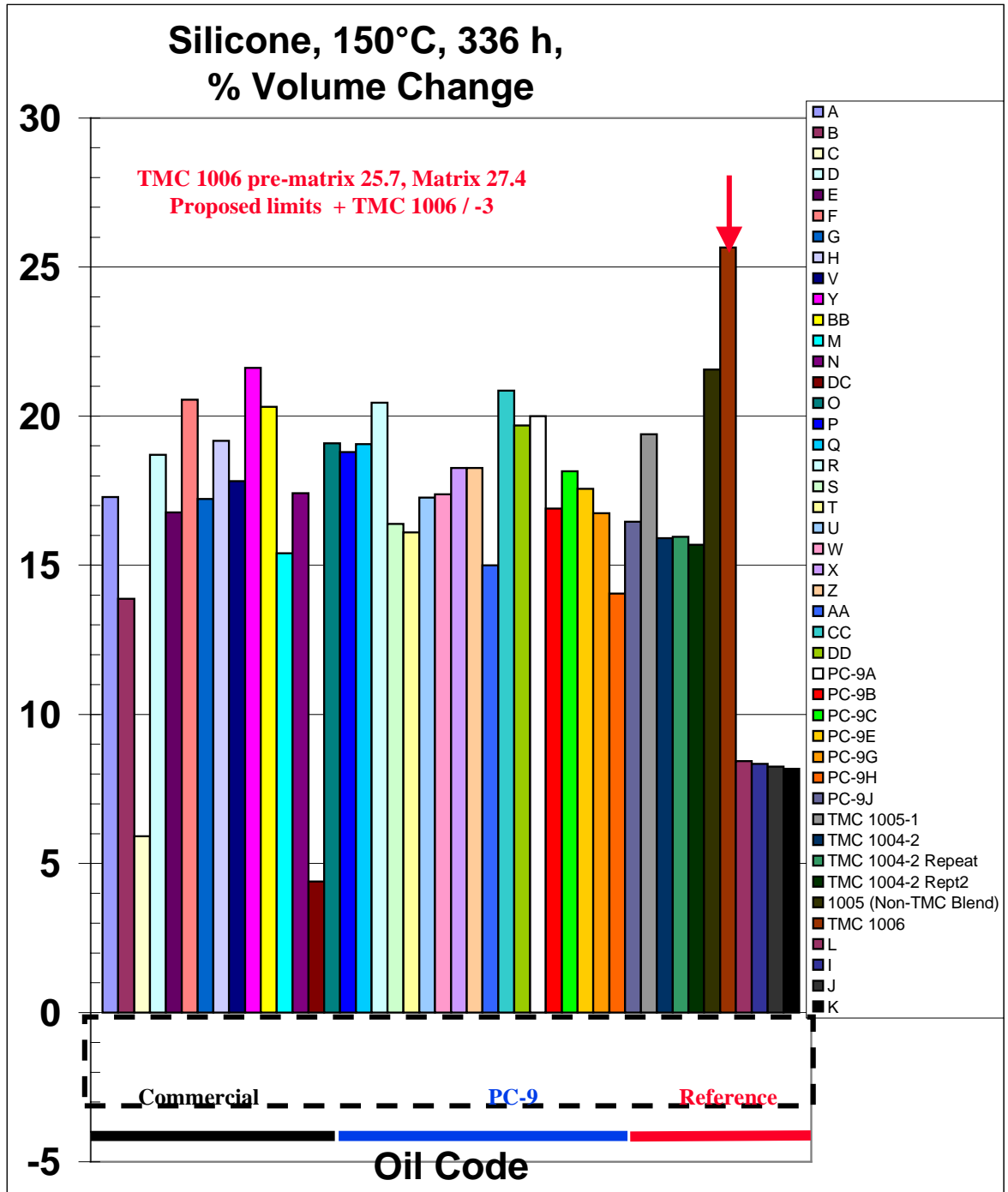


Silicone

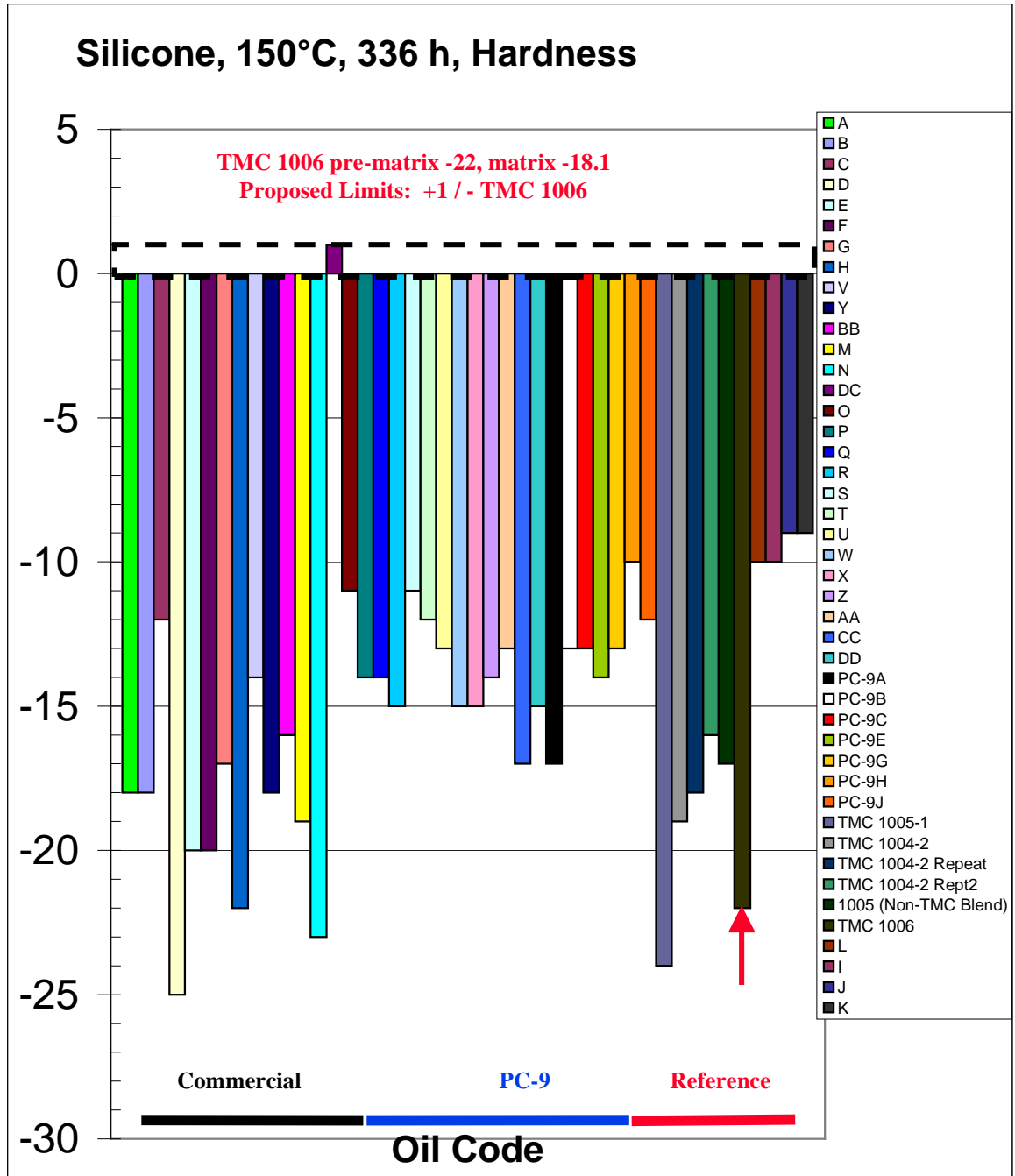
Silicone, Elastomer Batch 93-90-70, 150°C, 336 Hours, All Data an Average of Three Samples

	Volume Change, %	Points Hardness Change	Tensile Strength Change, %	Elongation Change, %	Reversion	Oil Type
A	17.3	-18	-31.4	0.5	None	Commercial
B	13.9	-18	-36.8	-8.4	None	Commercial
C	5.9	-12	-35.3	9.6	None	Commercial
D	18.7	-25	-43.7	25.6	None	Commercial
E	16.8	-20	-29.5	9.0	None	Commercial
F	20.6	-20	-18.8	2.3	None	Commercial
G	17.2	-17	-4.2	1.6	None	Commercial
H	19.2	-22	-36.7	11.0	None	Commercial
V	17.8	-14	-7.0	-30.7		Commercial
Y	21.6	-18	-24.4	-19.7		Commercial
BB	20.3	-16	-8.4	-9.3		Commercial
M	15.4	-19	-35.4	7.8	None	Commercial ACEA
N	17.4	-23	-44.6	9.2	None	Commercial ACEA
DC	4.4	1	-7.5	-31.8		Commercial ACEB
O	19.1	-11	-11.3	-8.6		PC-9
P	18.8	-14	-11.1	-14.0		PC-9
Q	19.1	-14	-5.8	-12.7		PC-9
R	20.5	-15	-11.2	-19.5		PC-9
S	16.4	-11	-4.7	-16.5		PC-9
T	16.1	-12	-8.0	-29.0		PC-9
U	17.3	-13	-2.3	-22.7		PC-9
W	17.4	-15	-2.3	-5.3		PC-9
X	18.3	-15	-6.9	-7.8		PC-9
Z	18.3	-14	-1.8	-6.1		PC-9
AA	15.0	-13	-4.6	-3.3		PC-9
CC	20.9	-17	-7.5	-7.5		PC-9
DD	19.7	-15	-3.9	-10.1		PC-9
PC-9A	20	-17	-17.5	-17		PC-9
PC-9B	16.9	-13	-10	-5.3		PC-9
PC-9C	18.15	-13	-10.5	-10.9		PC-9
PC-9E	17.6	-14	-1.8	-14.7		PC-9
PC-9G	16.7	-13	-15.9	-14.4		PC-9
PC-9H	14.1	-10	-3.4	-6.2		PC-9
PC-9J	16.5	-12	-6.3	-17.4		PC-9
TMC 1005-1	19.4	-24	-45.8	-13.6	None	Reference
TMC 1004-2	15.9	-19	-32.6	-4.9	None	Reference
TMC 1004-2 Repeat	16.0	-18	-30.0	-8.4	None	Reference
TMC 1004-2 Rept2	15.7	-16	-36.2	-13.4	None	Reference
1005 (Non-TMC Blend)	21.6	-17	-17.8	-21.6		Reference
TMC 1006	25.7	-22	-24.0	-6.7	None	Reference a
L	8.4	-10	-12.8	5.2	None	Reference a1
I	8.3	-10	-17.1	20.2	None	Reference b
J	8.3	-9	-59.3	-22.7	None	Reference b
K	8.2	-9	-31.2	-8.6	None	Reference b

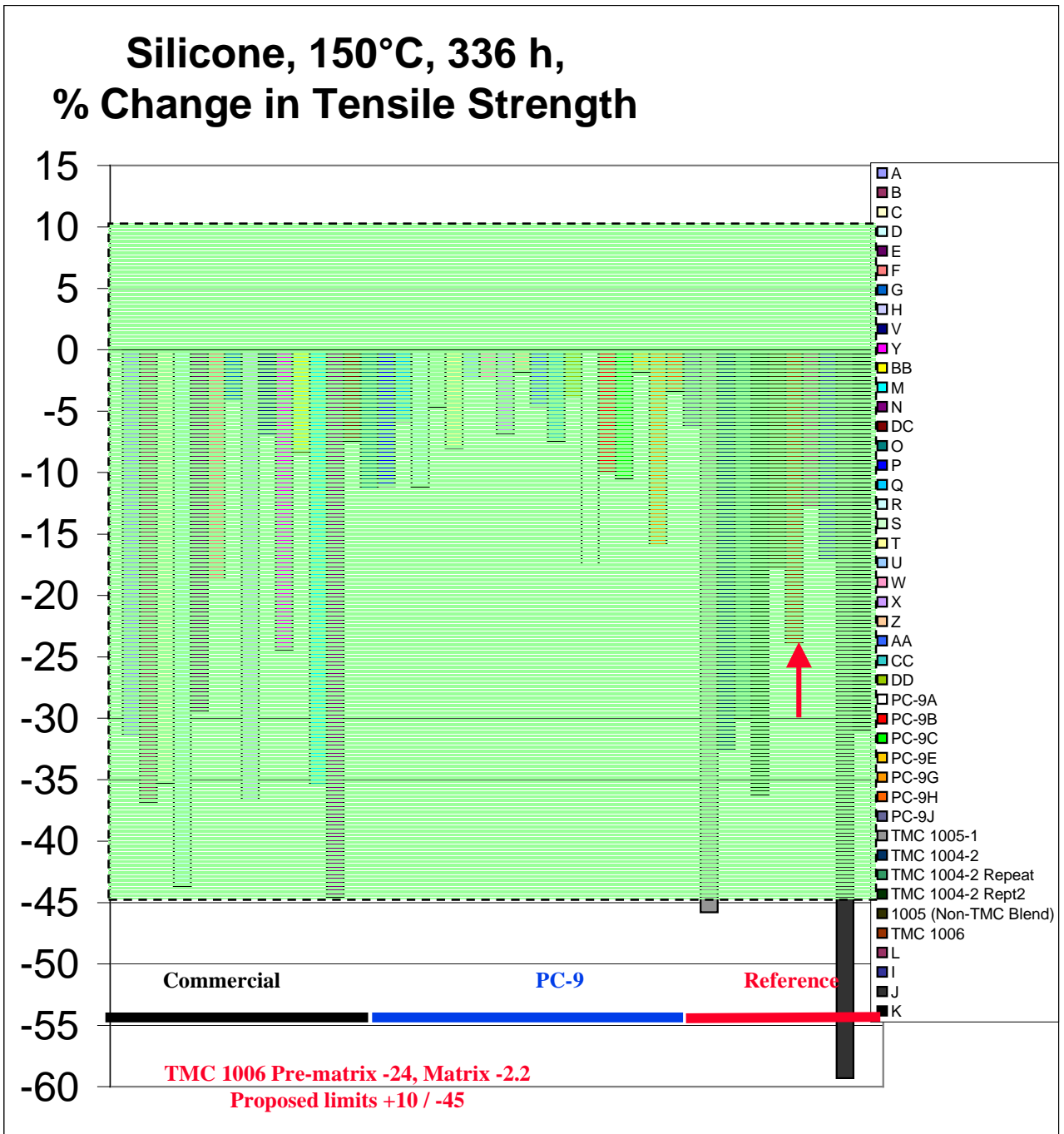
Silicone



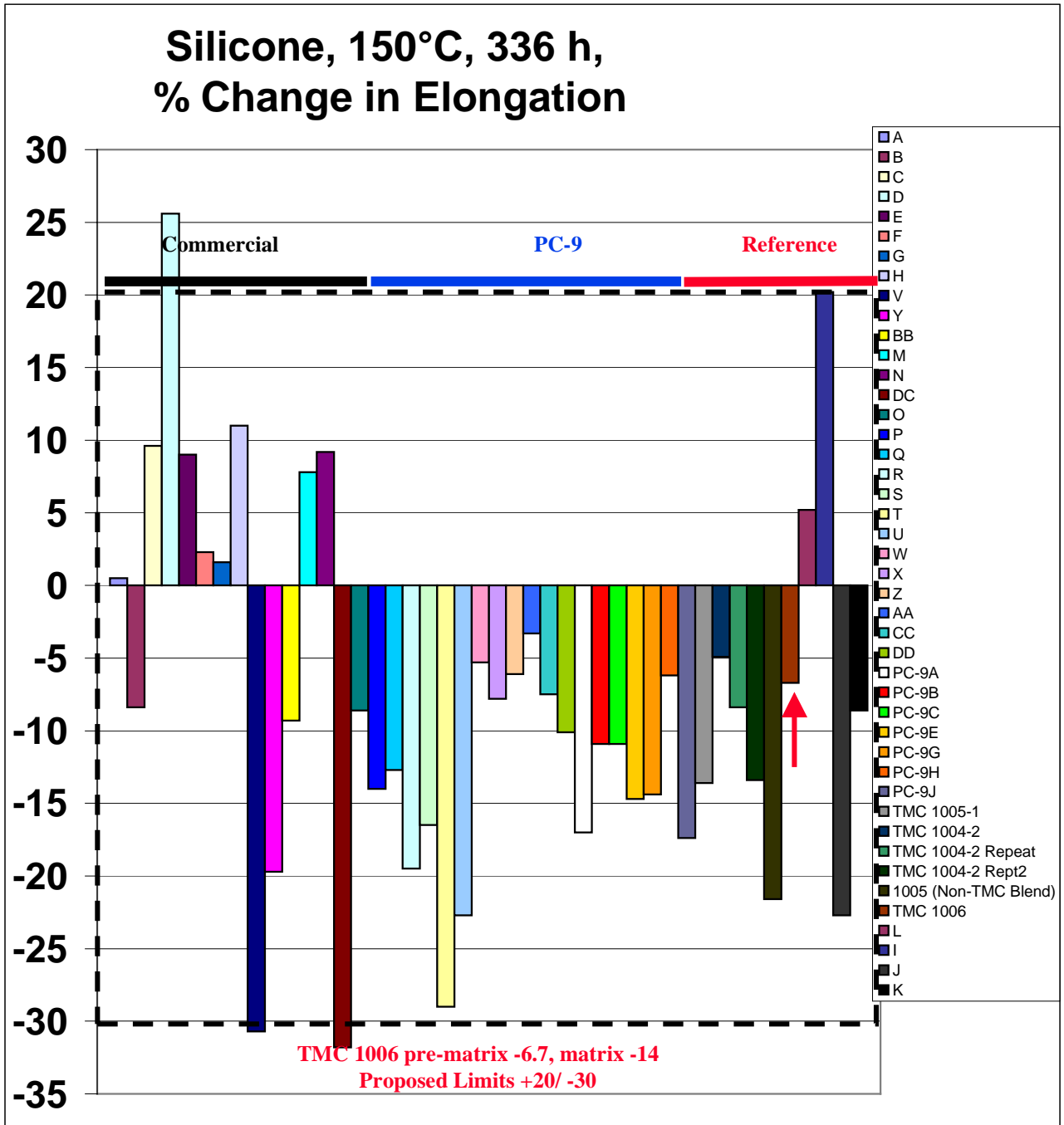
Silicone



Silicone



Silicone



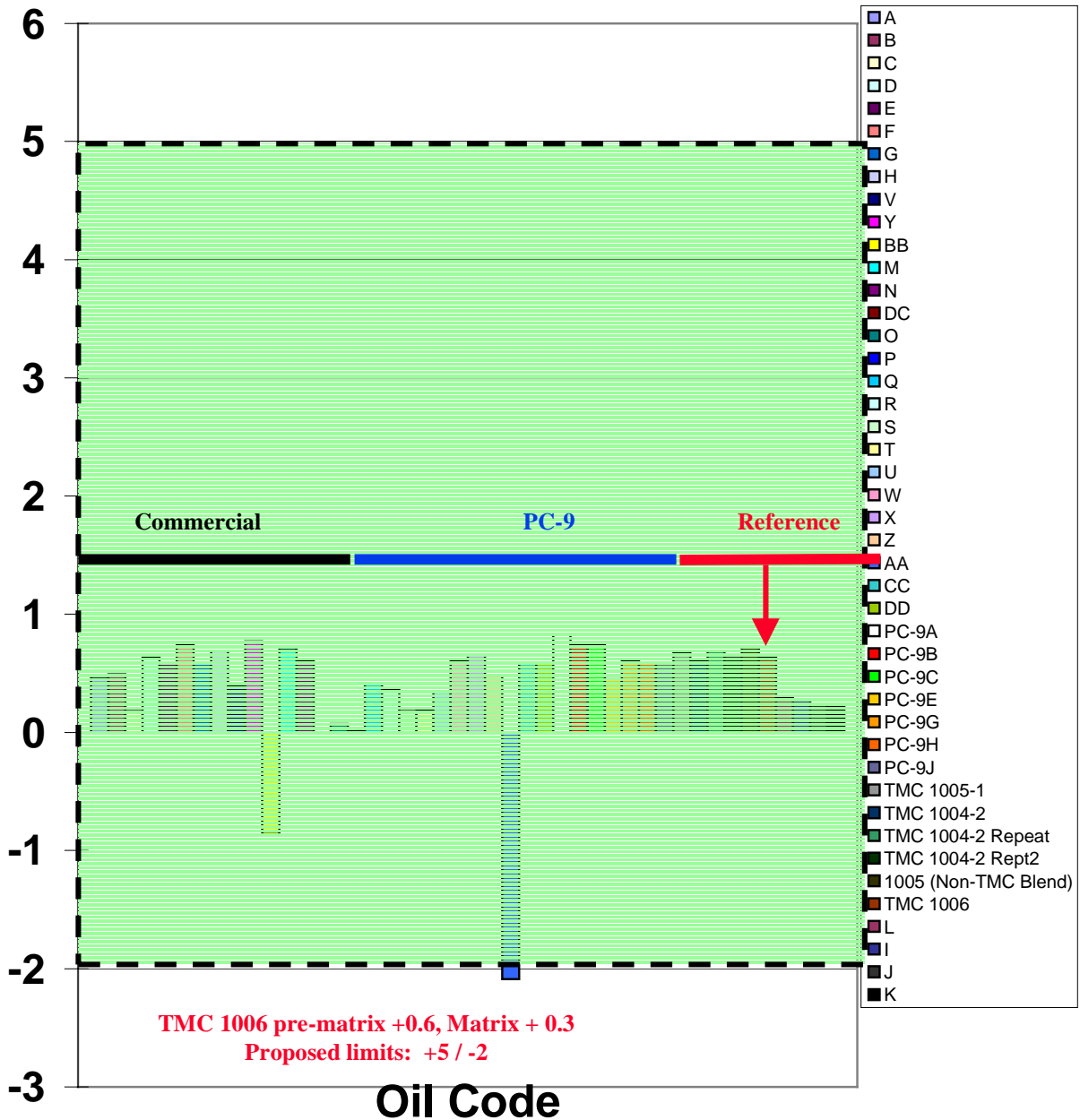
Fluoroelastomer

Fluoroelastomer, Elastomer Batch FC-2123, 150°C, 336 Hours, All Data an Average of Three Samples

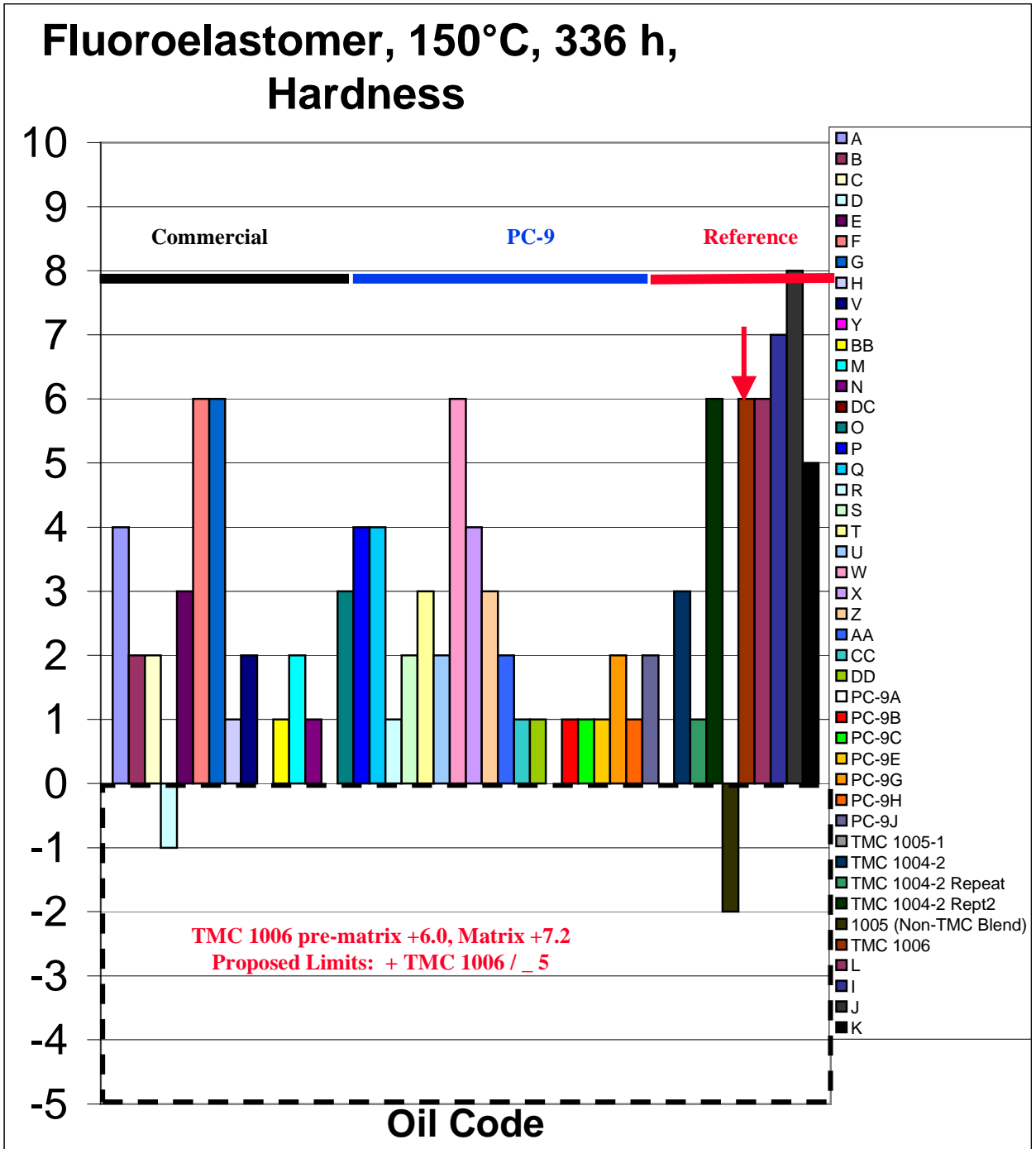
	Volume Change, %	Points Hardness Change	Tensile Strength Change, %	Elongation Change, %	Reversion	Oil Type
A	0.5	4	-47.0	-43.5	None	Commercial
B	0.5	2	-53.2	-53.5	None	Commercial
C	0.2	2	-55.4	-54.6	None	Commercial
D	0.6	-1	-30.9	-38.4	None	Commercial
E	0.6	3	-51.2	-55.1	None	Commercial
F	0.7	6	-53.4	-47.3	None	Commercial
G	0.6	6	-61.6	-54.8	None	Commercial
H	0.7	1	-35.1	-43.1	None	Commercial
V	0.4	2	-46.1	-48.7		Commercial
Y	0.8	0	-29.9	-30.9		Commercial
BB	-0.9	1	-58.0	-48.8		Commercial
M	0.7	2	-47.9	-42.6	None	Commercial ACEA
N	0.6	1	-43.8	-44.7	None	Commercial ACEA
DC	0.0	0	-34.0	-38.0		Commercial ACEB
O	0.1	3	-31.2	-39.4		PC-9
P	0.0	4	-31.8	-42.3		PC-9
Q	0.4	4	-37.8	-41.8		PC-9
R	0.4	1	-23.8	-45.6		PC-9
S	0.2	2	-23.6	-44.5		PC-9
T	0.2	3	-43.8	-56.3		PC-9
U	0.3	2	-43.8	-49.3		PC-9
W	0.6	6	-50.8	-40.2		PC-9
X	0.7	4	-46.2	-38.3		PC-9
Z	0.5	3	-42.5	-41.0		PC-9
AA	-2.1	2	-44.7	-45.2		PC-9
CC	0.6	1	-41.3	-39.3		PC-9
DD	0.6	1	-37.9	-39.7		PC-9
PC-9A	0.83	0	-41.5	-41.6		PC-9
PC-9B	0.74	1	-43.9	-47.1		PC-9
PC-9C	0.74	1	-45.3	-47		PC-9
PC-9E	0.5	1	-44.2	-40.6		PC-9
PC-9G	0.6	2	-41.4	-40.0		PC-9
PC-9H	0.6	1	-42.3	-39.6		PC-9
PC-9J	0.6	2	-44.1	-43.7		PC-9
TMC 1005-1	0.7	0	-39.7	-43.0	None	Reference
TMC 1004-2	0.6	3	-43.7	-48.7	None	Reference
TMC 1004-2 Repeat	0.7	1	-45.8	-55.9	None	Reference
TMC 1004-2 Rept2	0.6	6	-47.7	-45.1	None	Reference
1005 (Non-TMC Blend)	0.7	-2	-29.8	-36.7		Reference
TMC 1006	0.6	6	-68.8	-62.0	None	Reference a
L	0.3	6	-64.8	-61.4	None	Reference a1
I	0.3	7	-68.0	-70.0	None	Reference b
J	0.2	8	-67.6	-57.6	None	Reference b
K	0.2	5	-61.4	-54.6	None	Reference b

Fluoroelastomer

Fluoroelastomer, 150°C, 336 h,
% Volume Change

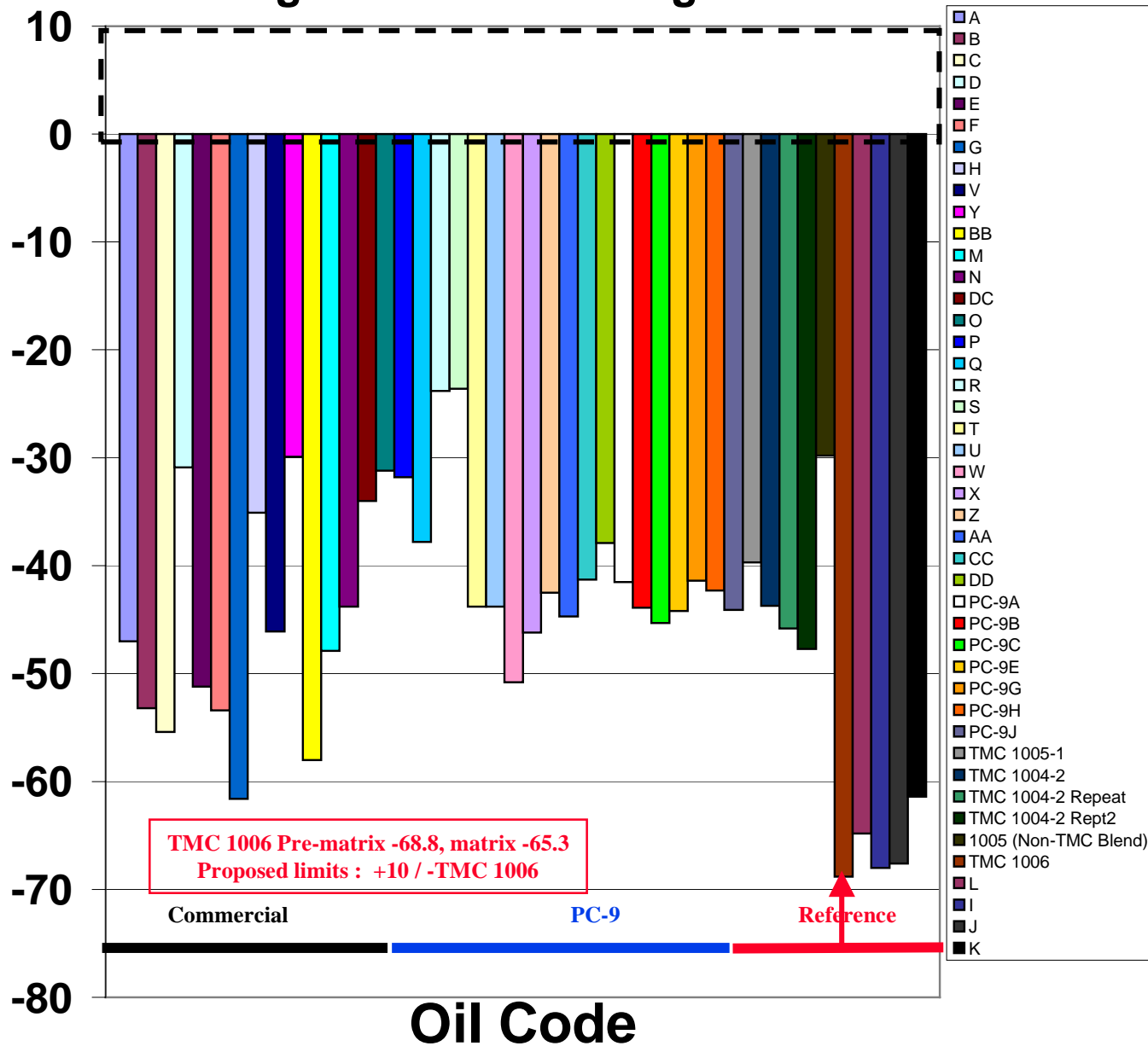


Fluoroelastomer



Fluoroelastomer

Fluoroelastomer, 150°C, 336 h,
Change in Tensile Strength



Fluoroelastomer

Fluoroelastomer, 150°C, 336 h,
Change in Elongation

