



OLD URETHANE BALL HARDNESS RESEARCH REPORT

NOVEMBER 2023

PURPOSE

Identify whether old urethane balls exhibit hardness loss with use.

SUMMARY

Just like modern urethane balls, older urethane balls measure softer with use. On average our 8 samples tested 1.7 points softer after use, and all samples measured softer after use.

Manufacturer	Ball	Hardness Change
Manufacturer 1	Urethane 1	-3.0
Manufacturer 1	Urethane 2	-0.8
Manufacturer 2	Urethane 3	-1.3
Manufacturer 3	Urethane 4	-0.2
Manufacturer 3	Urethane 5	0.0
Manufacturer 4	Urethane 6	-3.9
Manufacturer 5	Urethane 7	-2.9
Manufacturer 5	Urethane 8	-1.5

DISCUSSION

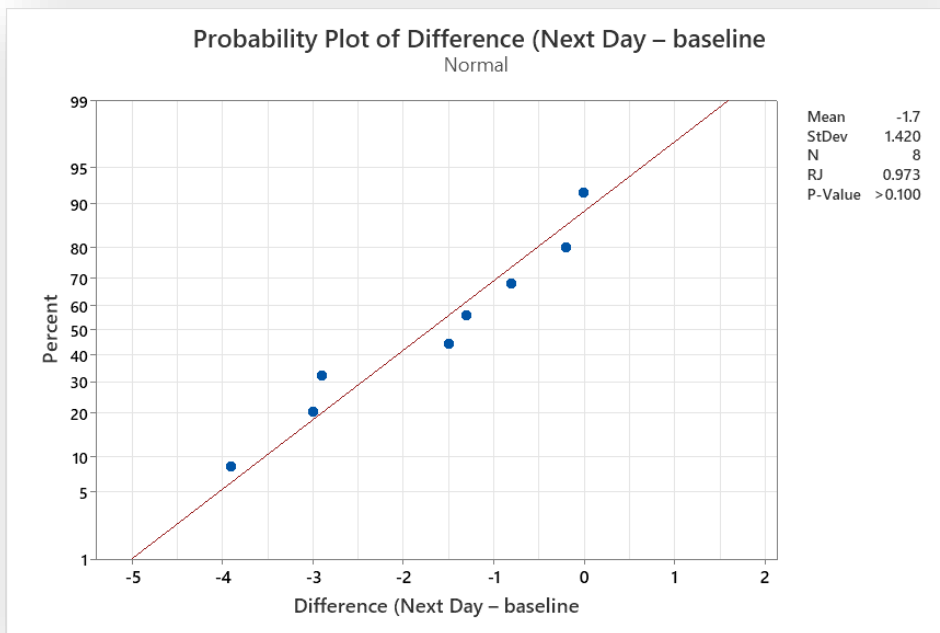
USBC equipment specifications team executed the same experiment performed on modern urethane balls to determine whether or not the old urethane balls exhibited the same softening with use that has been previously documented in modern urethanes.

The sample balls selected were known to be virgin samples, and each ball was resurfaced to the same 2000 grit finish used in the previous modern urethane testing with a sure spin sanding device. Each ball was then cleaned with IPA and tested for hardness for an unused baseline hardness reading. Next, each sample was thrown for a 10-shot baseline test. Immediately after, the test the balls were cleaned and retested for hardness. Finally, the balls were allowed to rest overnight in the testing lab, were cleaned again in the morning and retested for hardness. The following table shows the results.

Manufacturer	Ball	Ball name	Hardness Baseline	Hardness after 10 shots	Hardness, Next Day	Difference (Next Day – baseline)
Manufacturer 1	Urethane 1	Wine U-Dot	79.78	77.2	76.81	-3.0
Manufacturer 1	Urethane 2	U-Dot Vector One	78.77	76.54	77.93	-0.8
Manufacturer 2	Urethane 3	Thunderbolt	77.43	75.53	76.13	-1.3
Manufacturer 3	Urethane 4	Nail	82.72	82.63	82.53	-0.2
Manufacturer 3	Urethane 5	Black Hammer	78.87	78.65	78.88	0.0
Manufacturer 4	Urethane 6	Roto Star UC2	80.28	75.52	76.35	-3.9
Manufacturer 5	Urethane 7	Angle Plus	79.12	75.88	76.26	-2.9
Manufacturer 5	Urethane 8	Cobra	78.51	75.74	76.98	-1.5

Average: -1.7

Using the Ryan-Joiner test, the paired difference in hardness data can be considered normally distributed.



Next, applying a statistically appropriate paired-t test shows that the observed difference in hardness after use for older urethanes is at least 0.752 points softer.

Estimation for Paired Difference

Mean	StDev	SE Mean	95% Upper Bound for $\mu_{\text{difference}}$
-1.701	1.417	0.501	-0.752

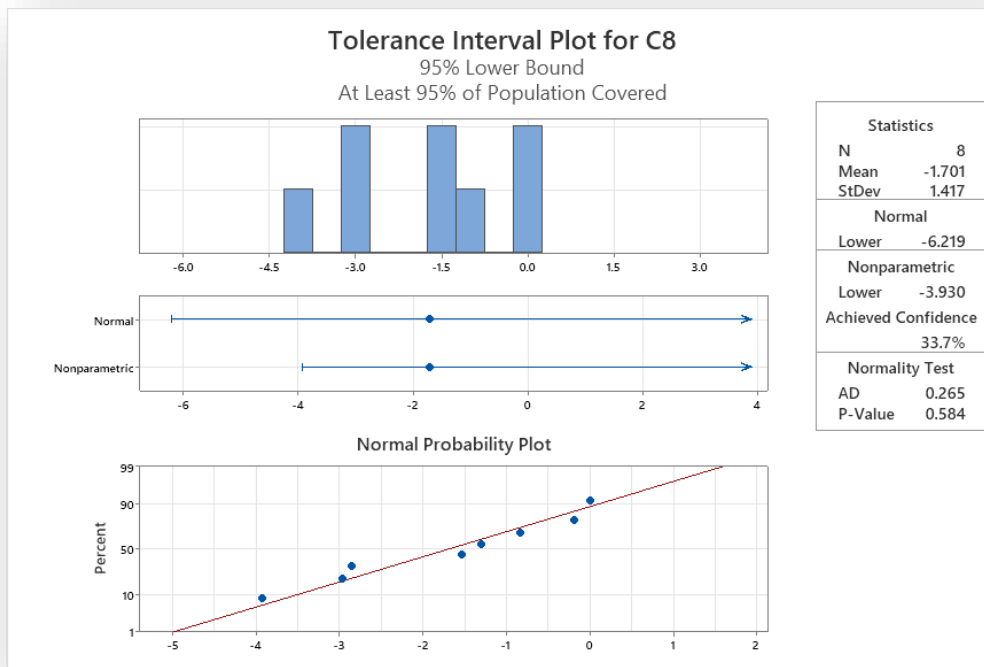
$\mu_{\text{difference}}$: population mean of (Hardness, Next Day - Hardness Baseline)

Test

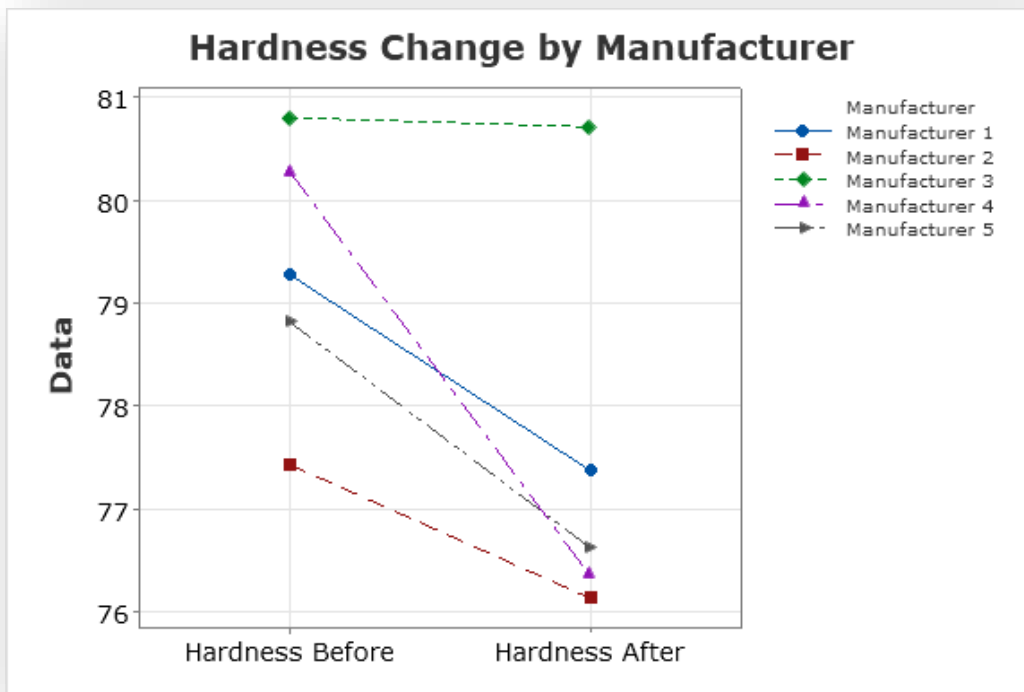
Null hypothesis $H_0: \mu_{\text{difference}} = 0$
 Alternative hypothesis $H_1: \mu_{\text{difference}} < 0$

T-Value	P-Value
-3.39	0.006

Using a conservative approach for an estimation of the distribution of all older urethanes, 5% may have a hardness decrease of 6.2 points.



Interestingly, stratifying the differences in hardness after use between manufacturers shows a contrast in the magnitude of change of hardness after use, similar to what was observed in research of modern urethanes. All manufacturers showed a decrease in hardness with use. The results are consistent comparing modern urethanes and urethanes produced several decades ago.



Conclusion

While it is true that urethane ball hardness changes with use is newly documented, there is no reason to believe it only applies to modern urethanes. We have data that shows urethane balls produced three decades ago exhibit the same differences as what we see in modern urethanes today.