Thermax® N990CG in EPDM Water Gaskets

Plumbing systems typically contain rubber gaskets to prevent leaks at joints and fittings. EPDM is a popular material choice for water gaskets as it has excellent processing properties, water resistance, aging resistance, and heat resistance at a reasonable cost. These gaskets are regulated in some countries as part of food safety regulations. In the United States, NSF 61 is a standard for evaluating the health effects of drinking water system components. The standard lists a number of chemicals with drinking water concentration limits. Thermax® N990CG is a low PAH grade of N990 that is suitable for use in water gaskets.

The benefits of N990CG found in this study include:

- Compounds pass NSF 61 requirements
- Decrease in compound viscosity
- Excellent compression set and compressive stress relaxation performance
- Great heat aged property retention
- Higher loadability leading to potential cost reductions

The EPDM formulations can be found in Table 1. Thermax® N990CG replaced Spheron SO-LP (a low PAH furnace black) in the formulation at a 2:1 ratio. Mooney, MDR, tensile, hardness, compression set, compressive stress relaxation, heat aging, and NSF 61 testing was completed for all compounds. Mixing and testing were completed by Smithers in Akron, Ohio.

Table 1. EPDM formulations

Ingredient	Control	A	B	C
Vistalon 9301	100	100	100	100
Spheron SO-LP	70	56	35	0
N990CG	**0**	**28**	**70**	**140**
Sunpar 2280	15	15	15	15
ZnO Zoco 104	5	5	5	5
TMQ: Naugard Q	2	2	2	2
SR350	2	2	2	2
Dicup 40-KE	7.5	7.5	7.5	7.5
Total	201.5	215.5	236.5	271.5

All compounds met the NSF 61 requirements for organic substance concentration limits in water. Detailed results are not included in this report but are available upon request.

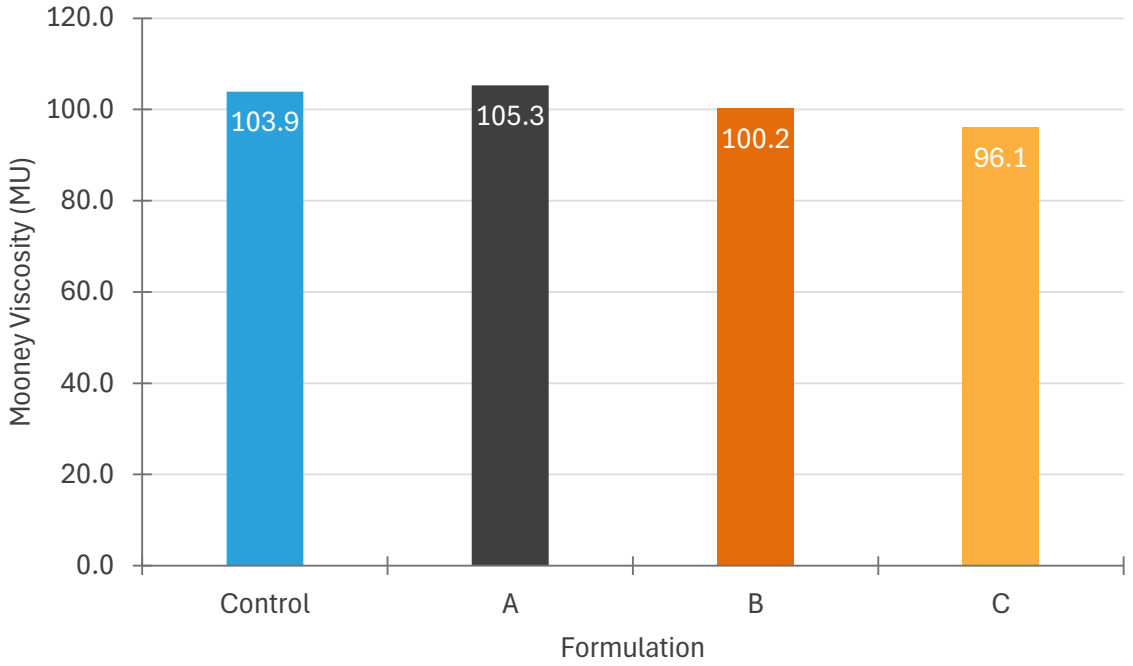

Figure 1. Mooney viscosity of the compounds measured according to ASTM D1646. A decrease in viscosity was observed as N990CG replaced the furnace black.

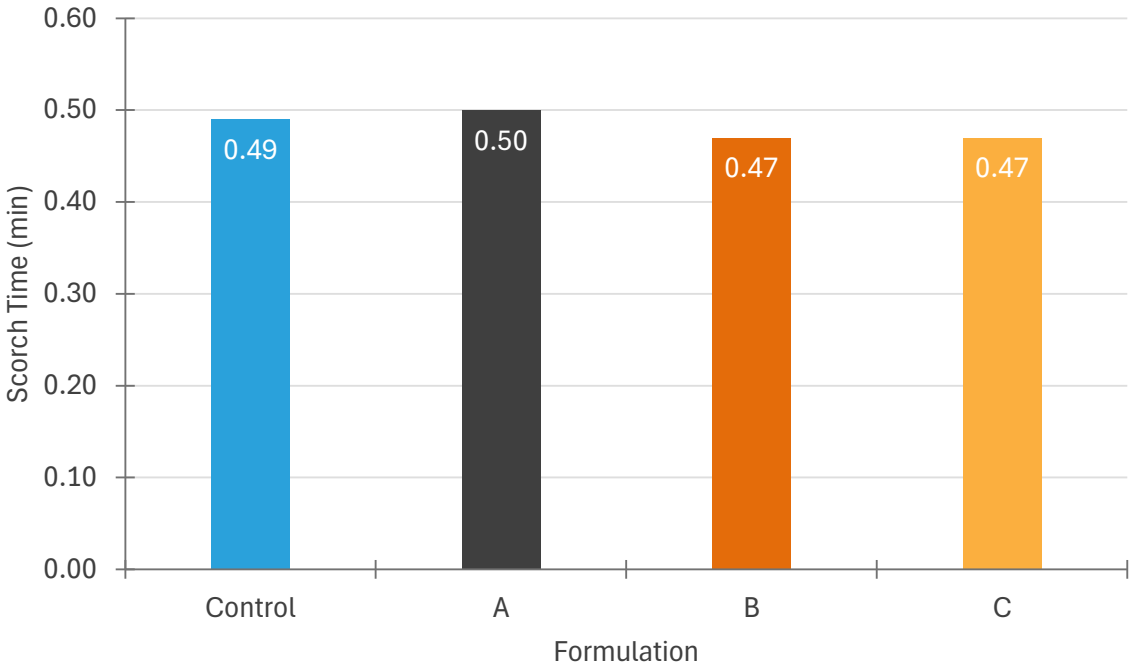

Figure 2. Scorch time, t'10, of the compounds measured according to ASTM D5289. There were no significant differences in scorch times.

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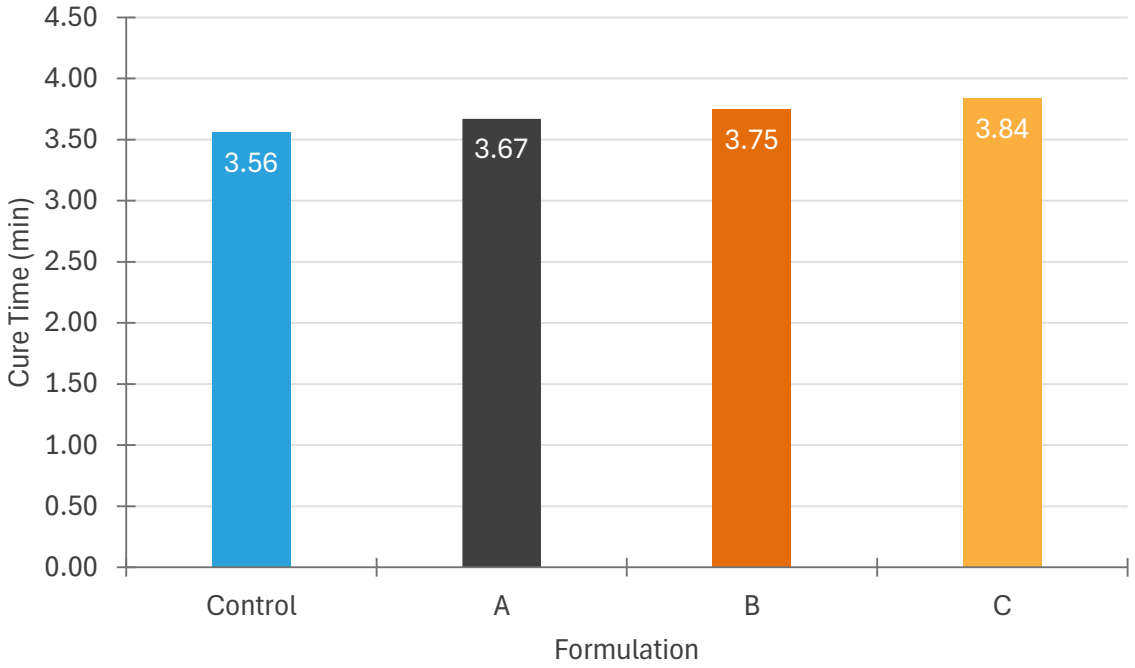

Figure 3. Cure time, t'90, of the compounds measured according to ASTM D5289. Cure time tended to increase as N990CG replaced the furnace black.

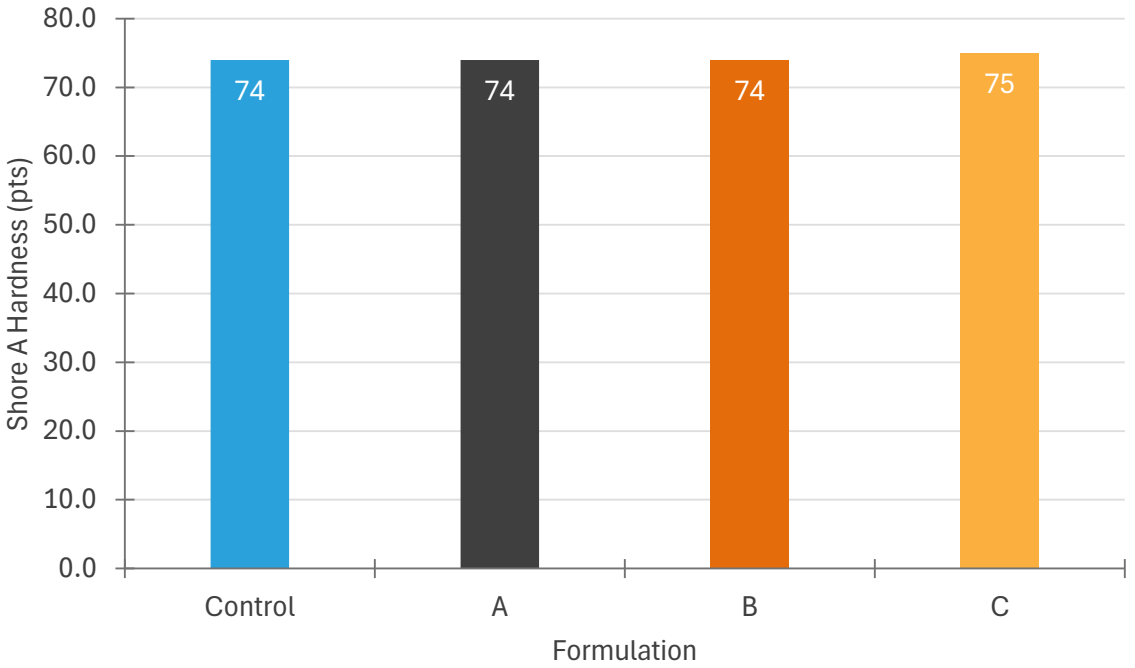

Figure 4. Shore A hardness of the compounds measured according to ASTM D2240. All compounds had hardness values of 75±3 pts.

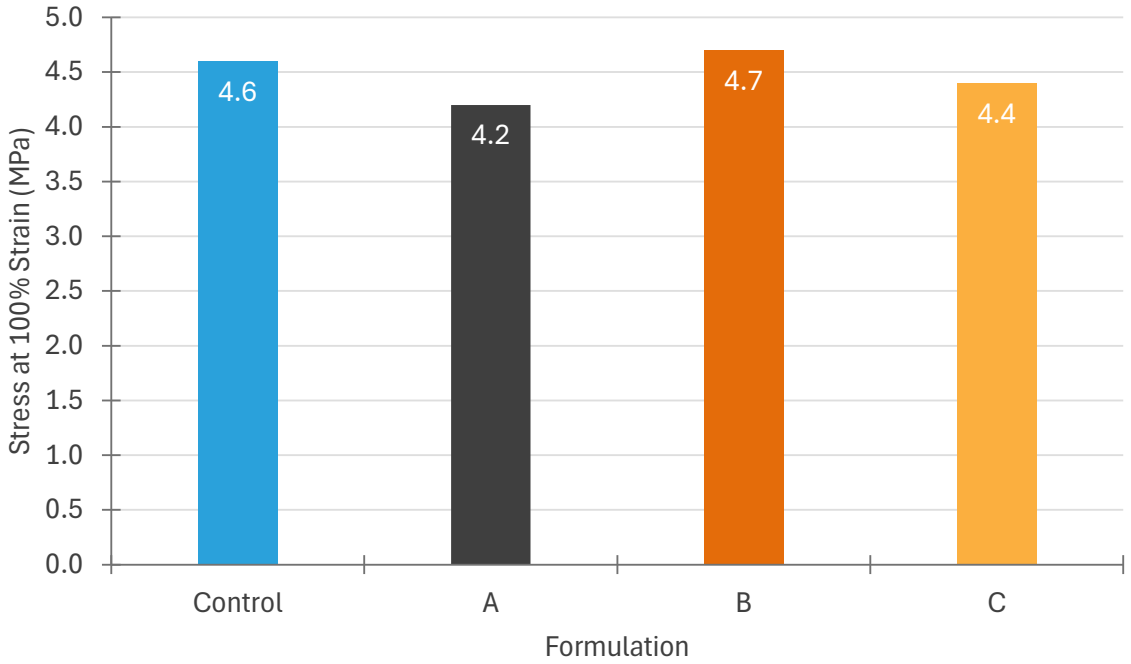

Figure 5. Stress at 100% strain of the compounds measured according to ASTM D412. There were no significant differences in 100% modulus.

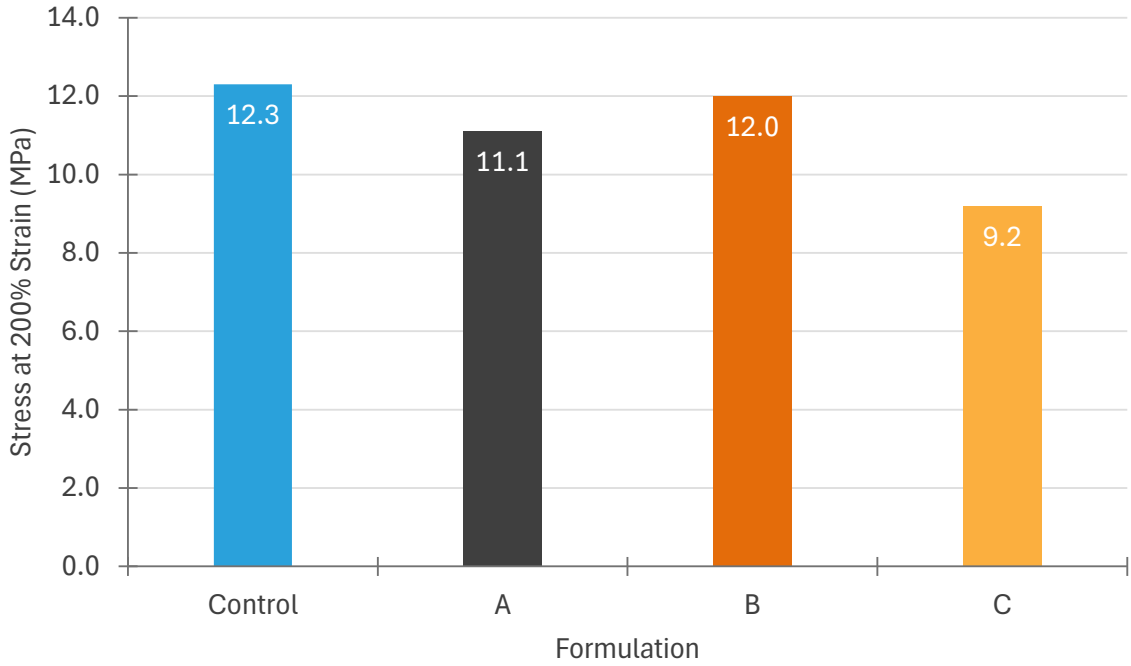

Figure 6. Stress at 200% strain of the compounds measured according to ASTM D412. Decrease in 300% modulus was observed for the compound in which N990CG fully replaced the furnace black.

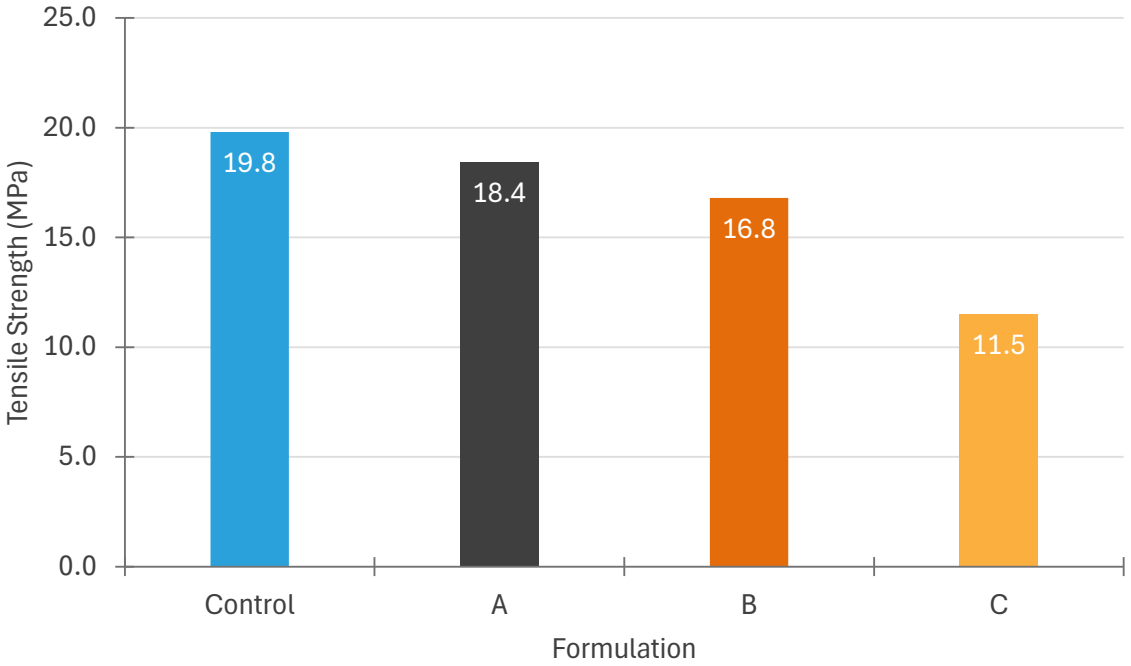

Figure 7. Tensile strength of the compounds measured according to ASTM D412. Tensile strength decreased as N990CG replaced the furnace black.

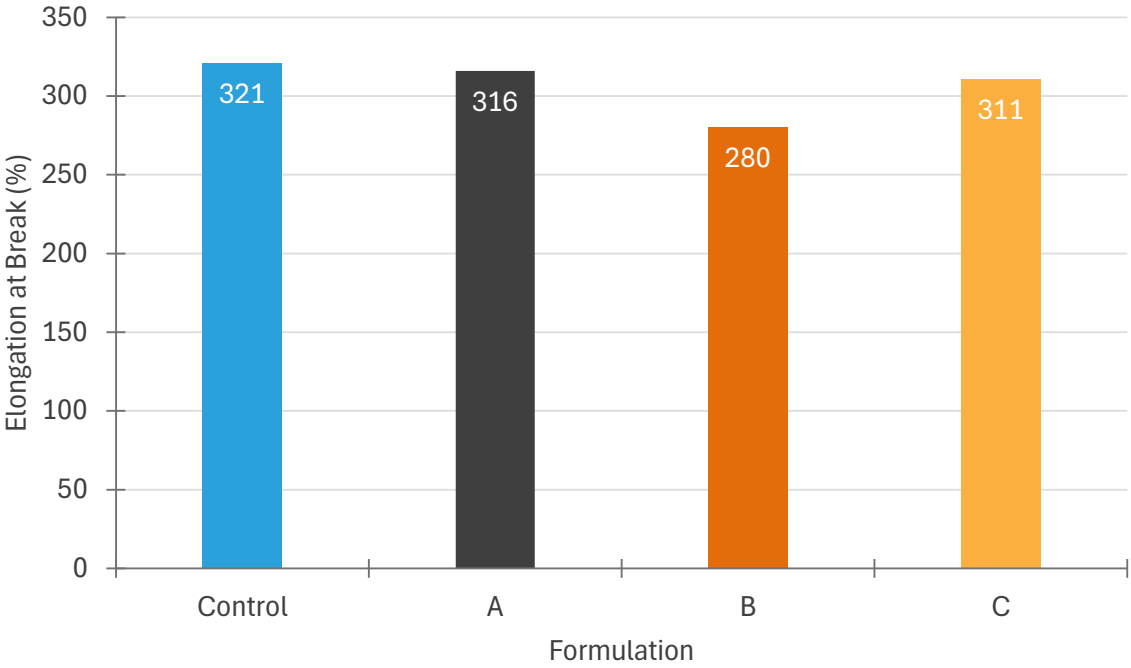

Figure 8. Elongation at break of the compounds measured according to ASTM D412. There were no significant differences in elongation.

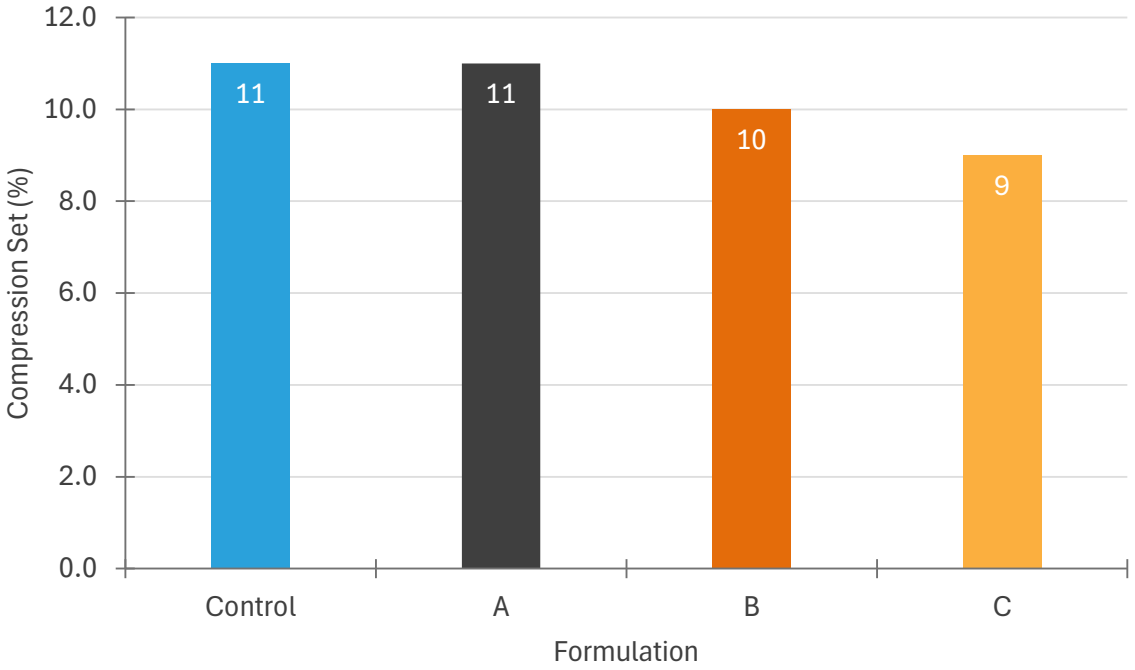

Figure 9. Compression set of the compounds measured after 22 hours at 70°C according to ASTM D395. Compression set slightly decreased as N990CG replaced the furnace black.

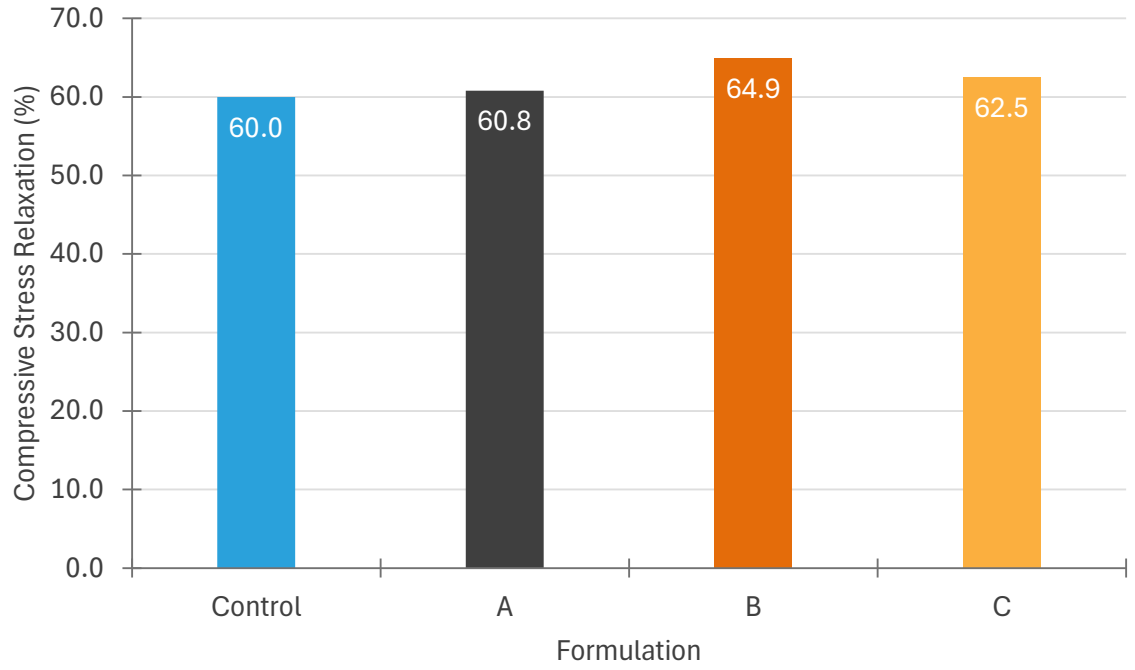

Figure 10. Percent force retained after 168 hours at 70°C measured according to ASTM D6147. Values were higher for the compounds containing N990CG.

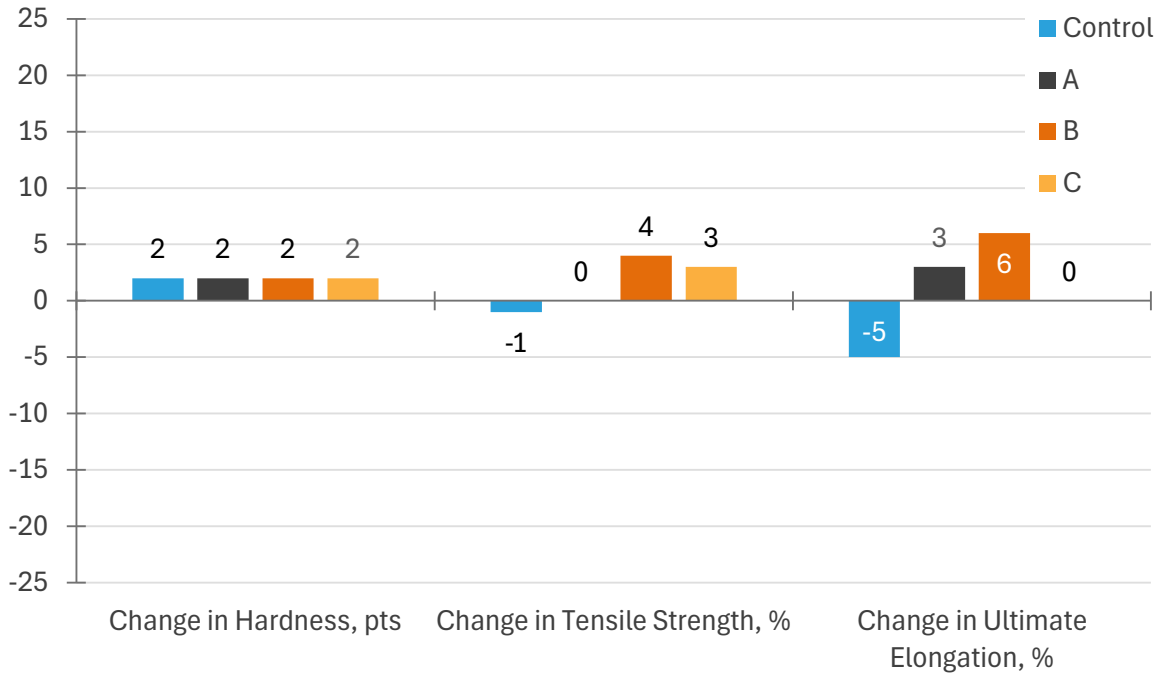

Figure 11. Oven aged properties of the compounds after 70 hours at 100C measured according to ASTM D573. All compounds had good aged properties. Properties were better maintained for the compound containing N990CG.