THERMAX versus Furnace Blacks

With a particle size approximately ten times that of N330 furnace black, N990 has the smallest surface area of all the blacks commonly used in compounding rubber. These characteristics result in a material with little tendency to interact with polymers or interfere with curing systems.

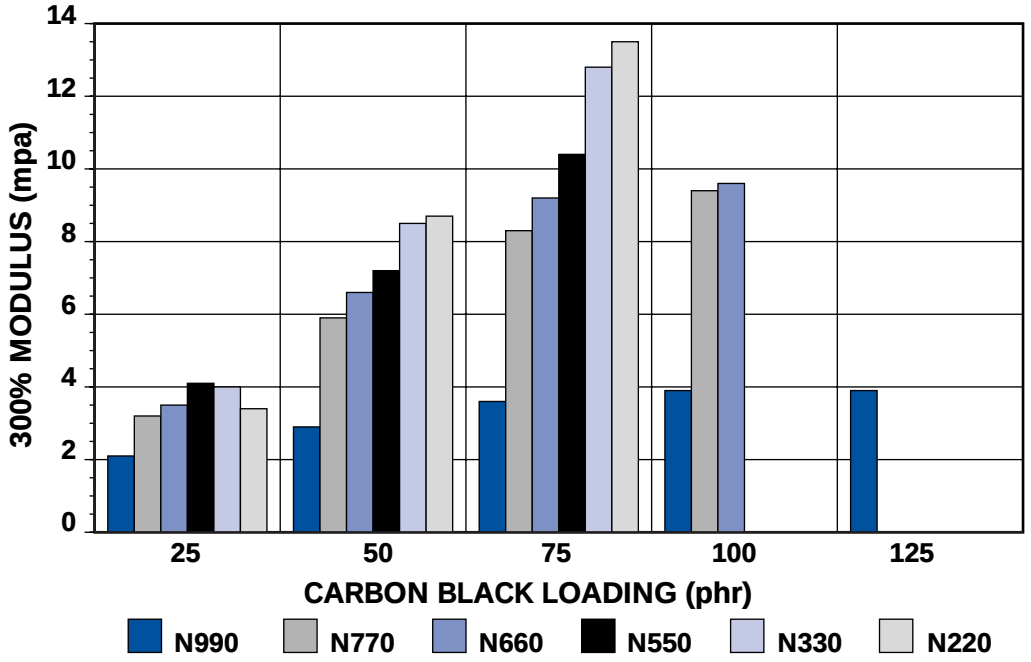
Although it is not a reinforcing black, it is useful to compare N990 with the furnace blacks in various rubber compounds such as butyl, natural; Neoprene W, nitrile and SBR (see Figures 1-5). As the black particle size increases, the following effects occur:

- modulus and tensile strength decline,
- hardness decreases,
- elongation increases, and
- tear strength decreases.

The level of carbon black used in this comparison is adequate for differentiating from the furnace blacks, but is not high enough to develop the optimum properties of thermal black loading. Note that the hardness of thermal black loaded natural rubber is similar at 125 phr to the hardness of the same compound containing 75 phr of furnace black. This is a graphic demonstration of the non-reinforcing properties of thermal black.

Figure 1a

N990 versus Furnace Blacks* in Butyl Rubber – Modulus

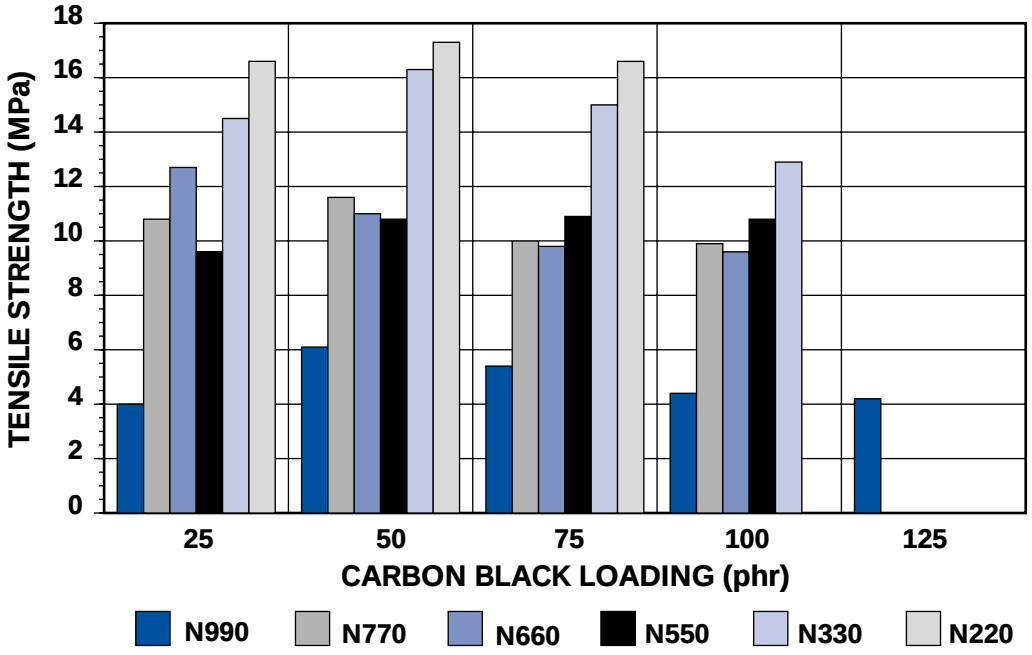


*Butyl Rubber cured 20 minutes at 171°C

Source – R.T. Vanderbilt
Formula – See Appendix III

Figure 1b

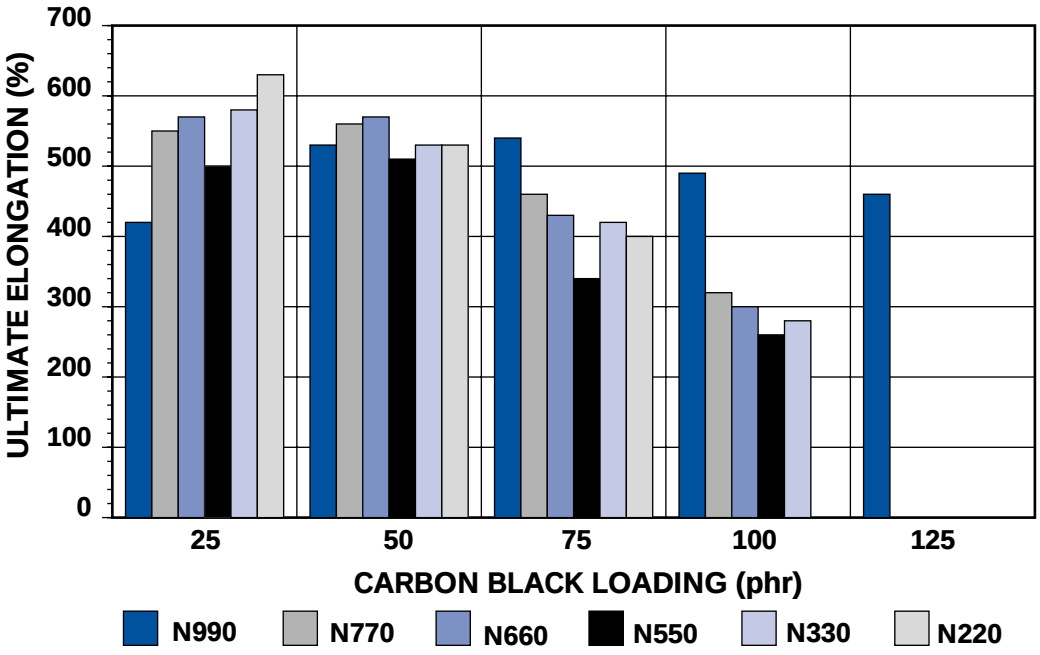
N990 versus Furnace Blacks* in Butyl Rubber – tensile strength



*Butyl Rubber cured 20 minutes @ 171C

Source – R.T. Vanderbilt
Formula – See Appendix III

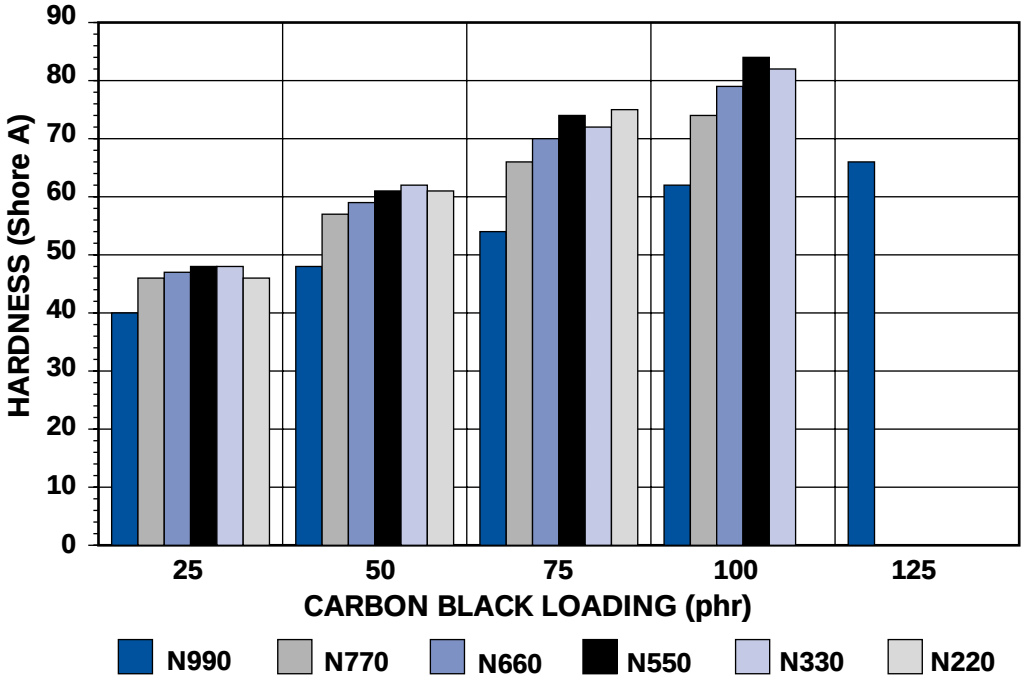
Figure 1c
N990 versus Furnace Blacks* in Butyl Rubber – ultimate elongation



*Butyl Rubber cured 20 minutes @ 171C

Source – R.T. Vanderbilt
Formula – See Appendix III

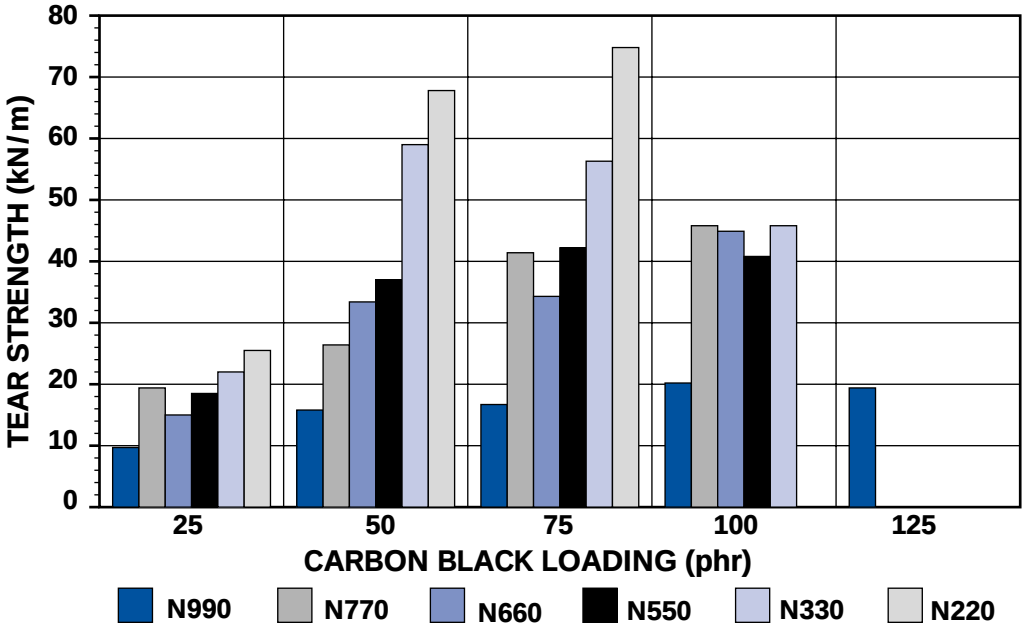
Figure 1d
N990 versus Furnace Blacks* in Butyl Rubber – hardness



*Butyl Rubber cured 20 minutes @ 171C

Source – R.T. Vanderbilt
Formula – See Appendix III

Figure 1e
N990 versus Furnace Blacks* in Butyl Rubber – tear strength

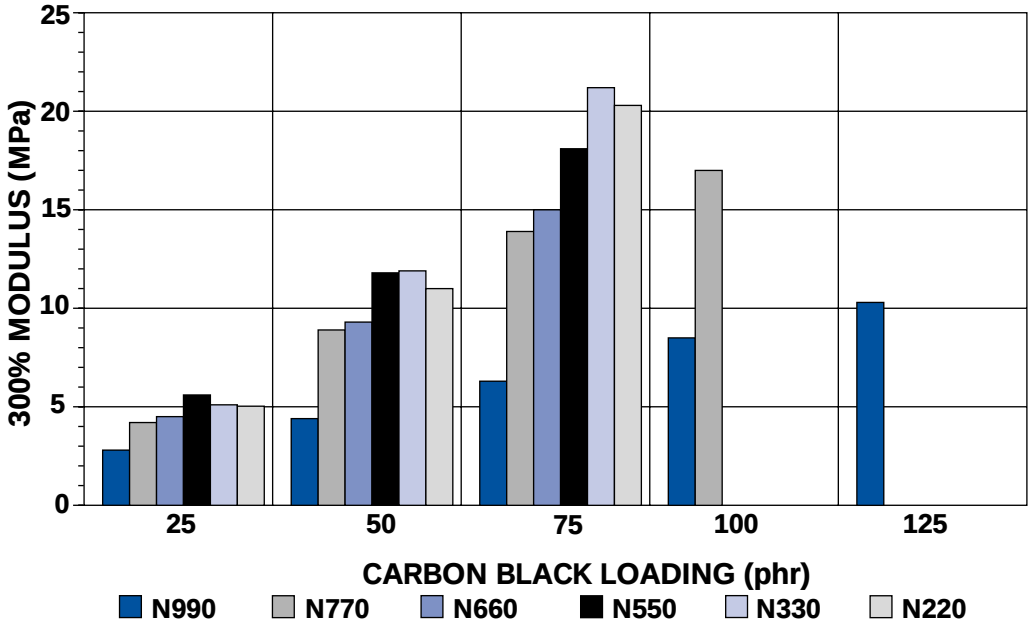


*Butyl Rubber cured 20 minutes @ 171C

Source – R.T. Vanderbilt
Formula – See Appendix III

Figure 2a

N990 versus Furnace Blacks* in Natural Rubber – Modulus

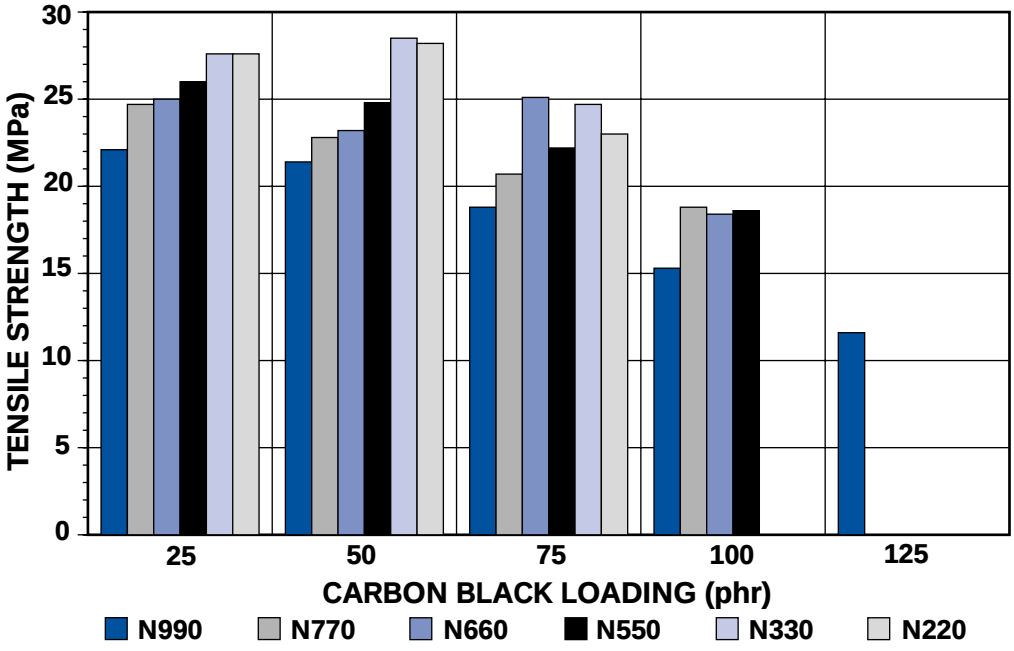


* - Natural Rubber Cured 10 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 2b

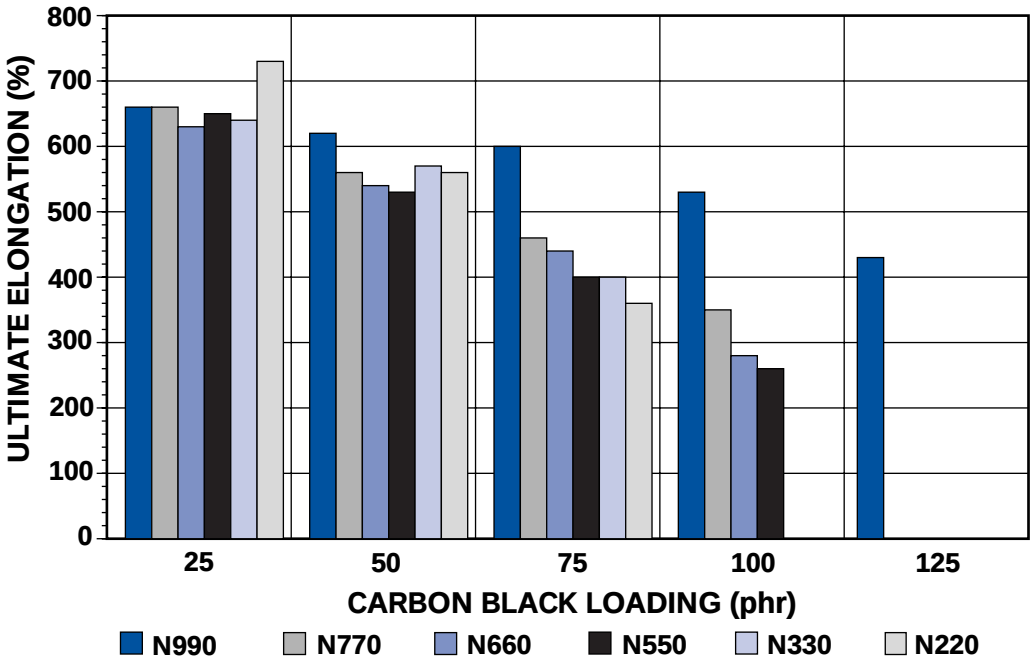
N990 versus Furnace Blacks* in Natural Rubber – tensile strength



* - Natural Rubber cured 10 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

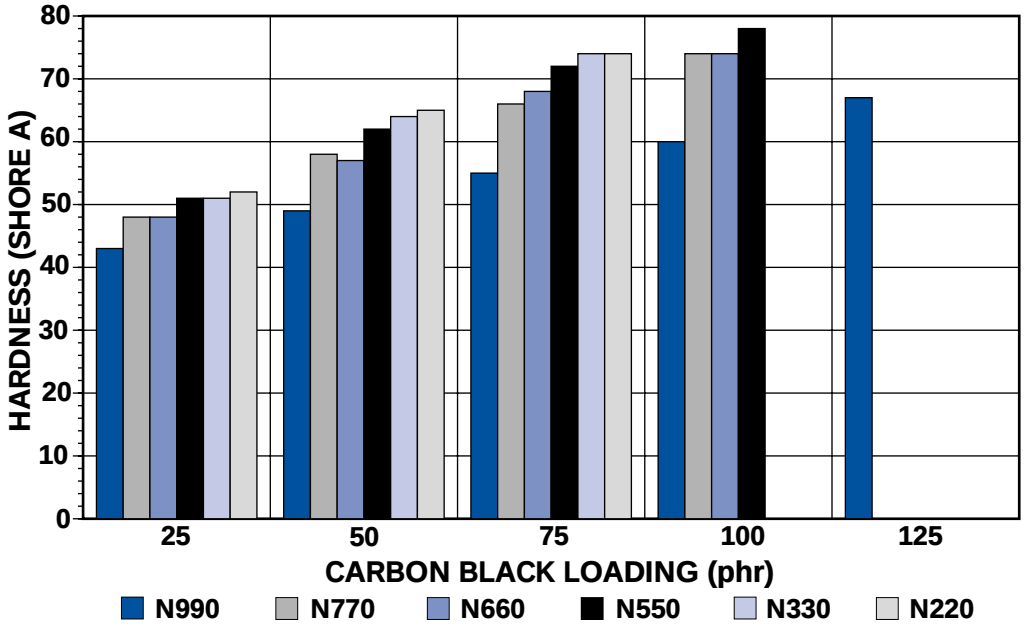
Figure 2c
N990 versus Furnace Blacks* in Natural Rubber – ultimate elongation



* - Natural Rubber cured 10 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

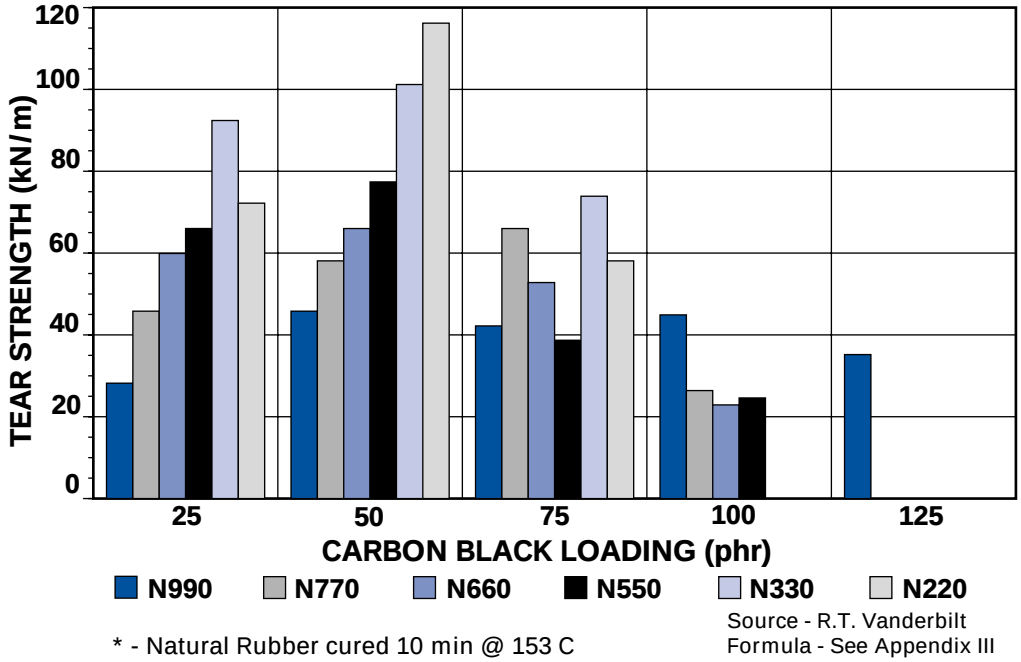
Figure 2d
N990 versus Furnace Blacks* in Natural Rubber – hardness



* - Natural Rubber cured 10 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 2e
N990 versus Furnace Blacks* in Natural Rubber – tear strength

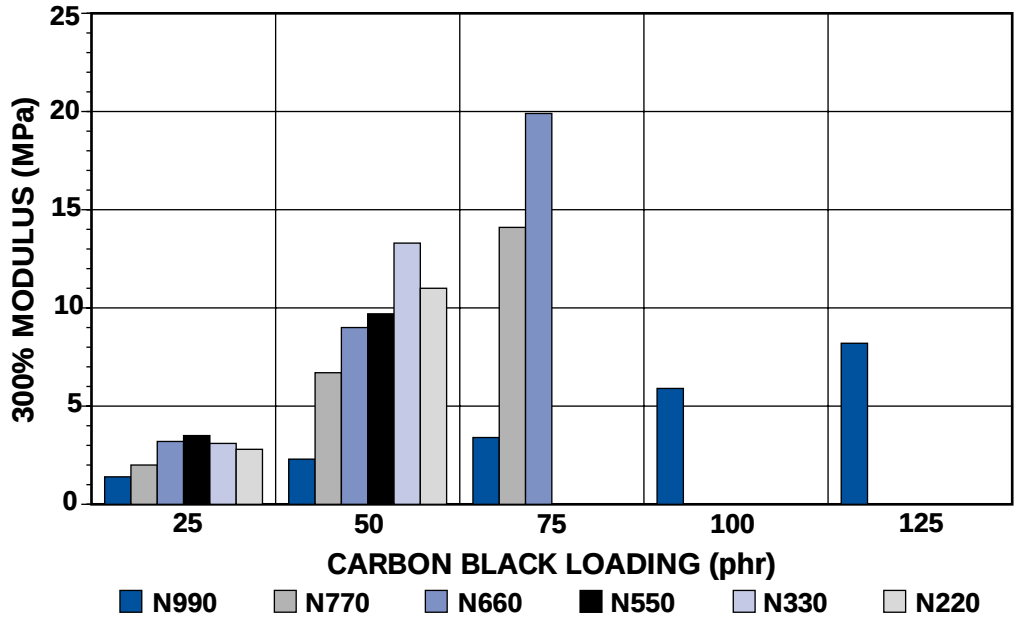


* - Natural Rubber cured 10 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 3a

N990 versus Furnace Blacks* in Chloroprene Rubber – Modulus

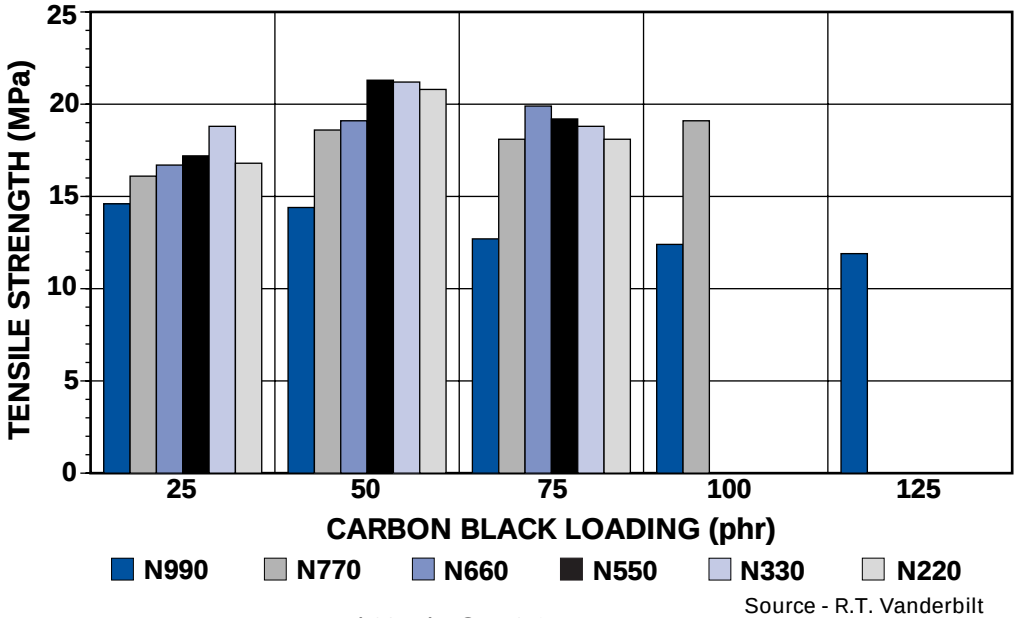


* - Neoprene W cured 20 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 3b

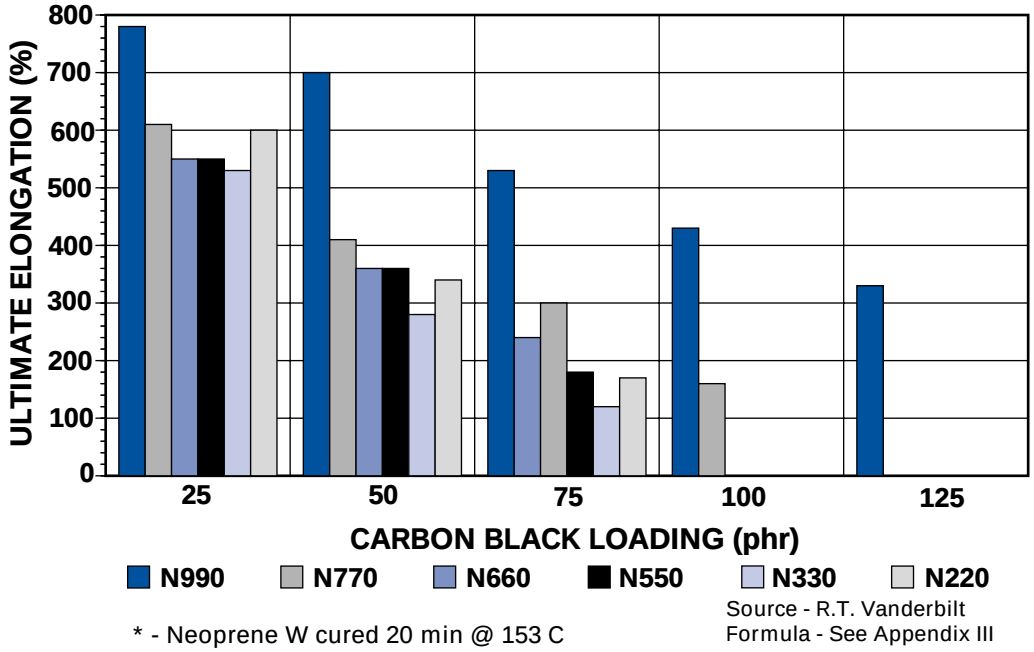
N990 versus Furnace Blacks* in Chloroprene Rubber – tensile strength



* - Neoprene W cured 20 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

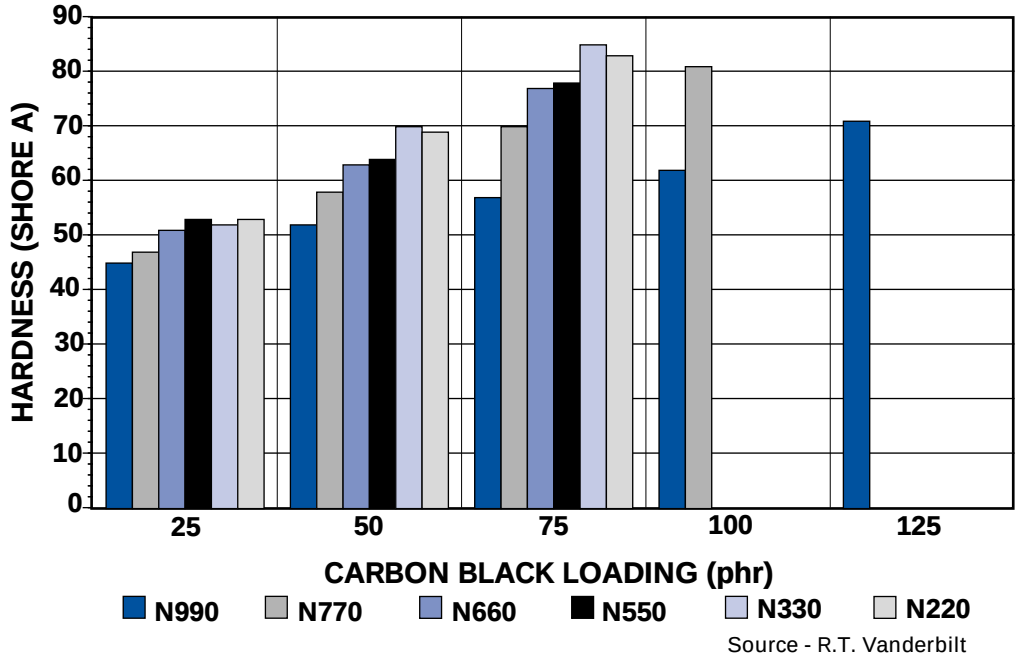
Figure 3c
N990 versus Furnace Blacks* in Chloroprene Rubber – Ultimate elongation



* - Neoprene W cured 20 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 3d
N990 versus Furnace Blacks* in Chloroprene Rubber – hardness

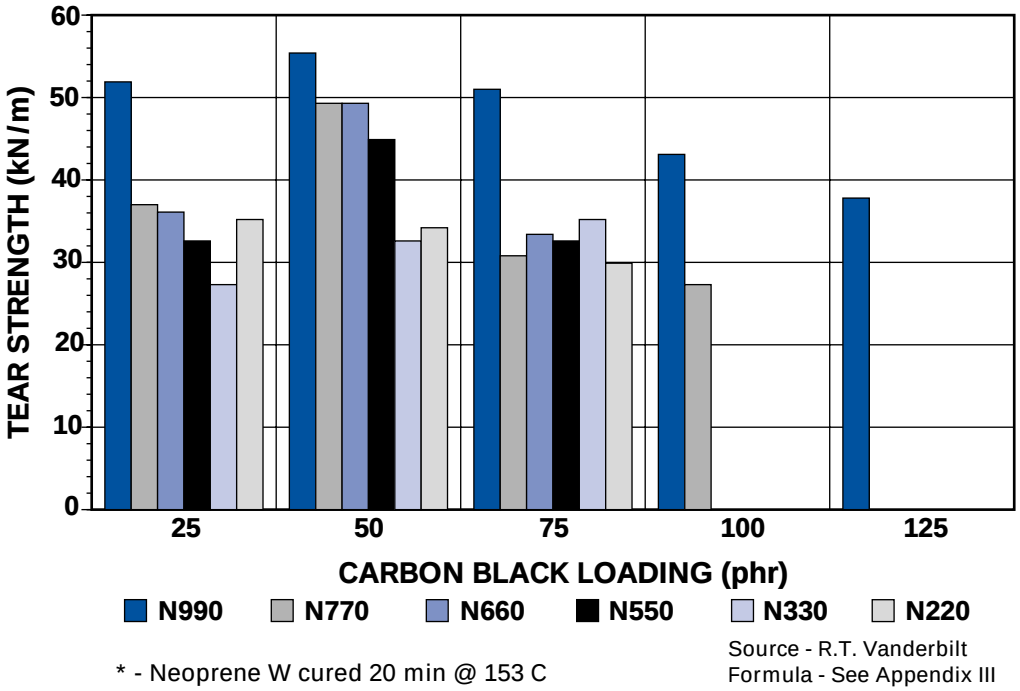


* - Neoprene W cured 20 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 3e

N990 versus Furnace Blacks * in Chloroprene Rubber – tear strength

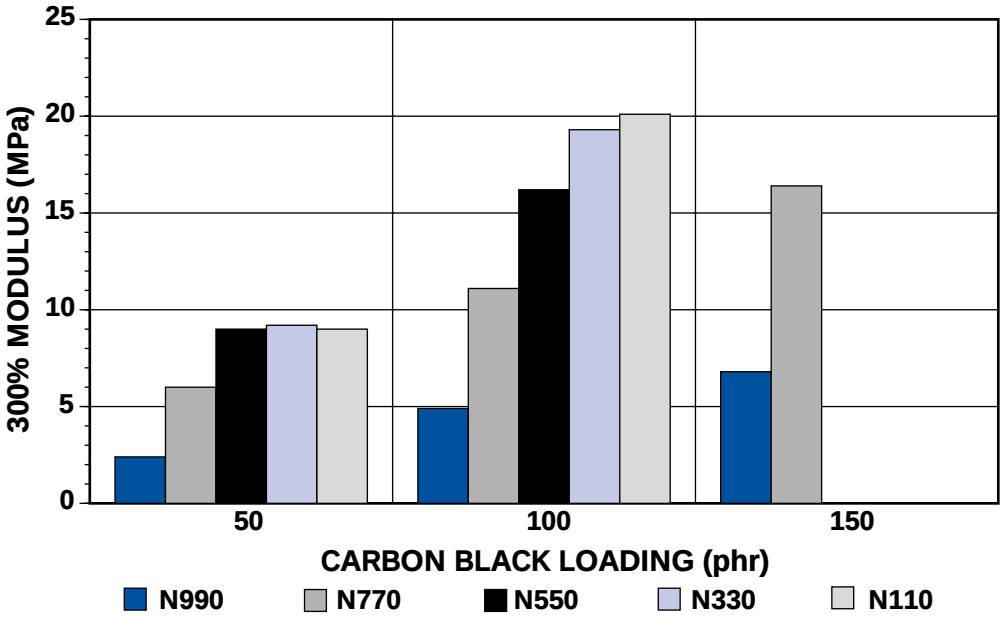


* - Neoprene W cured 20 min @ 153 C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 4a

N990 versus Furnace Blacks* in Nitrile Rubber – Modulus

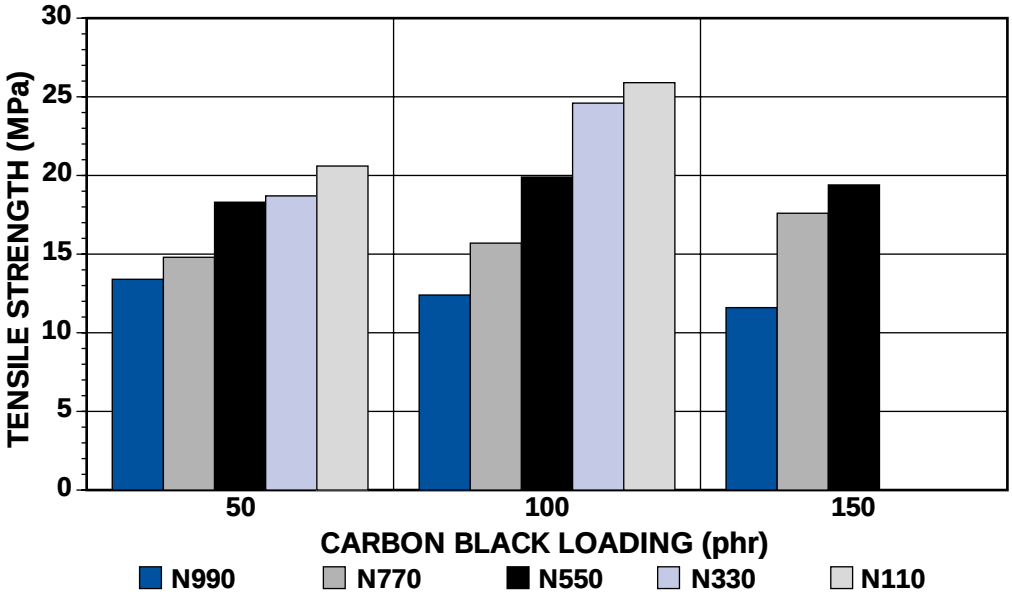


* - Nitrile Rubber cured 30 min @ 154C

Source - R.T.Vanderbilt
Formula - See Appendix III

Figure 4b

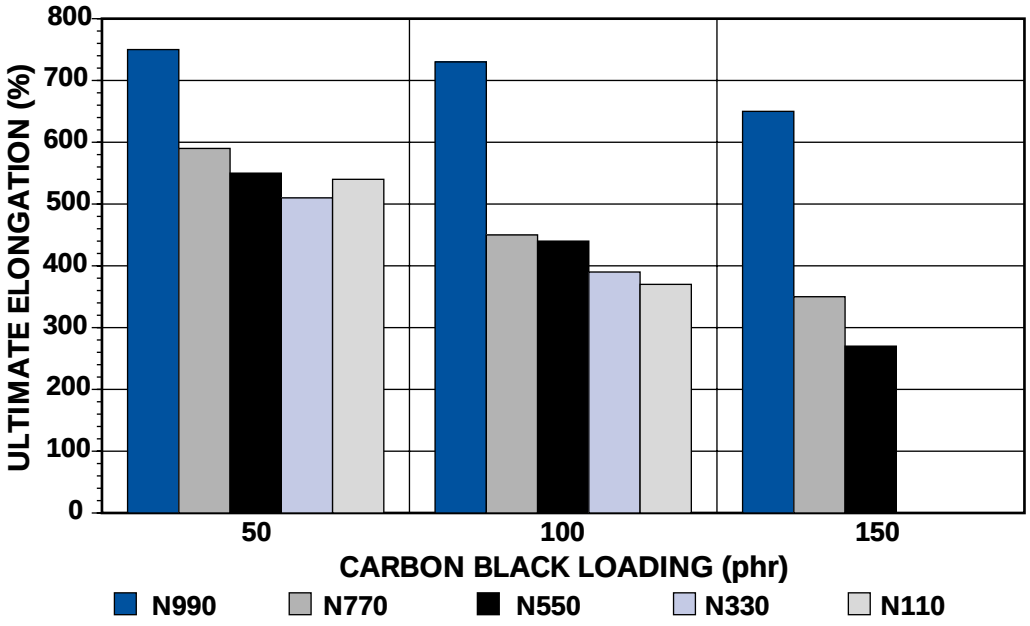
N990 versus Furnace Blacks* in Nitrile Rubber – Tensile Strength



* - Nitrile Rubber cured 30 min @ 154C

Source - R.T. Vanderbilt
Formula - See Appendix III

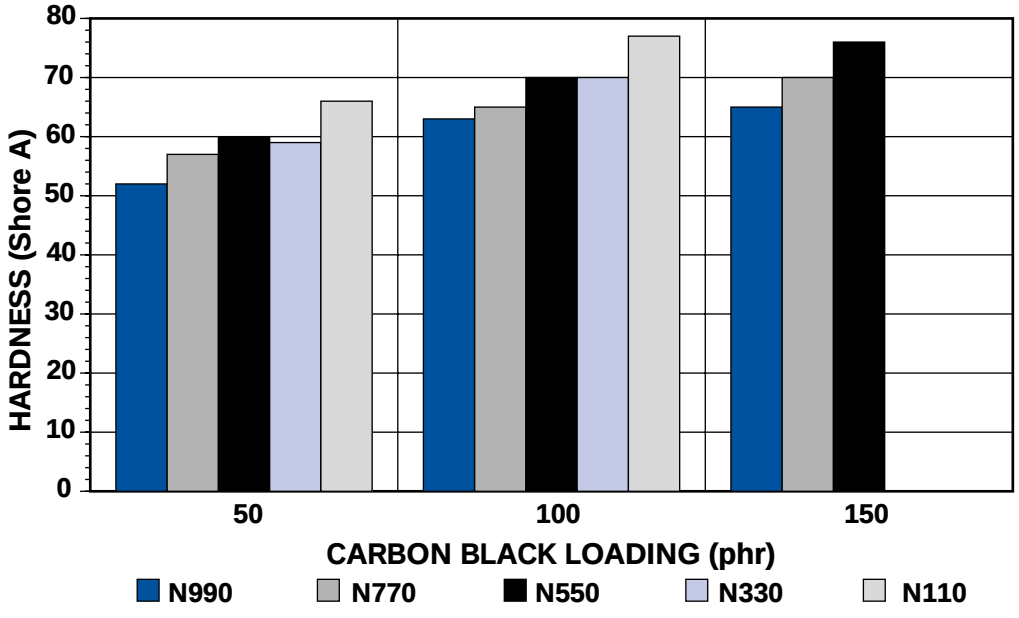
Figure 4c
N990 versus Furnace Blacks* in Nitrile Rubber – ultimate elongation



* - Nitrile Rubber cured 30 min @ 154C

Source - R.T. Vanderbilt
Formula - See Appendix III

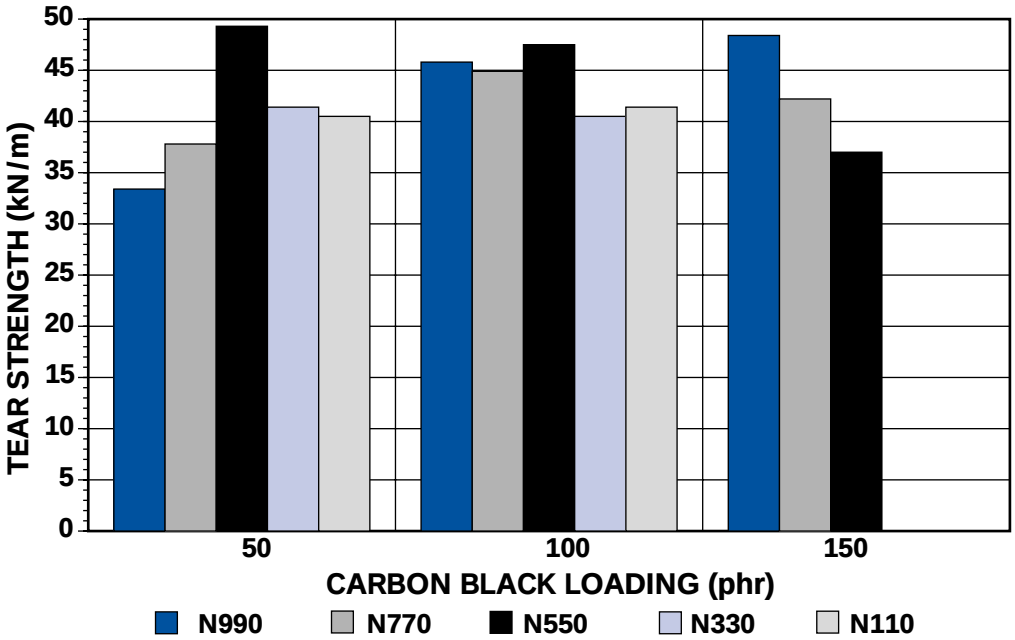
Figure 4d
N990 versus Furnace Blacks* in Nitrile Rubber – hardness



* - Nitrile Rubber cured 30 min @ 154C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 4e
N990 versus Furnace Blacks* in Nitrile Rubber – tear strength

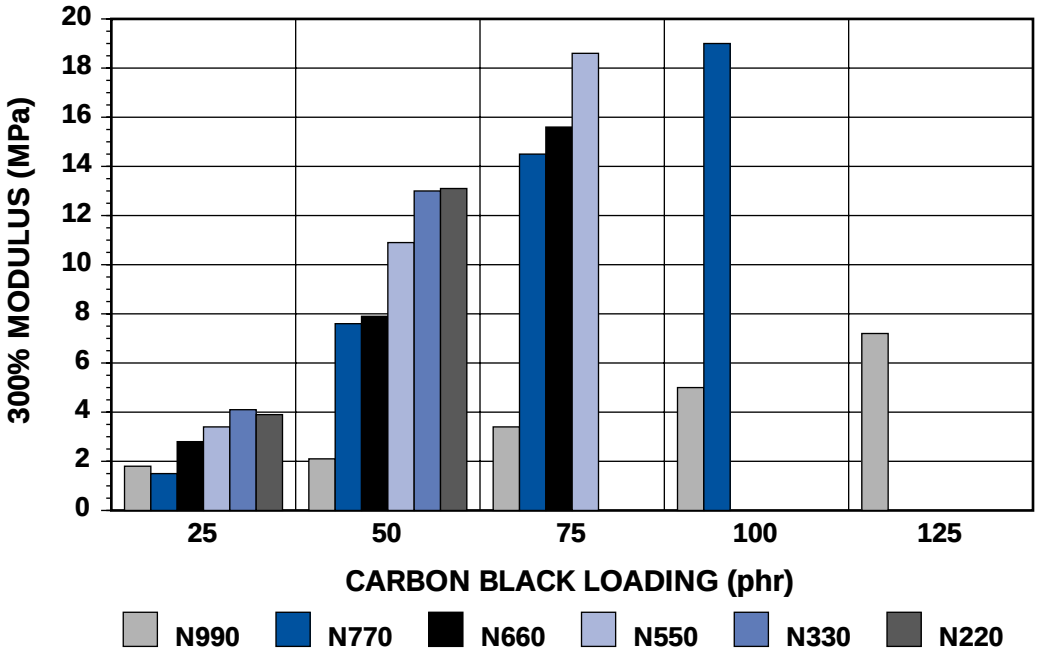


* - Nitrile Rubber cured 30 min @ 154C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 5a

N990 versus Furnace Blacks* in Styrene Butadiene Rubber – Modulus

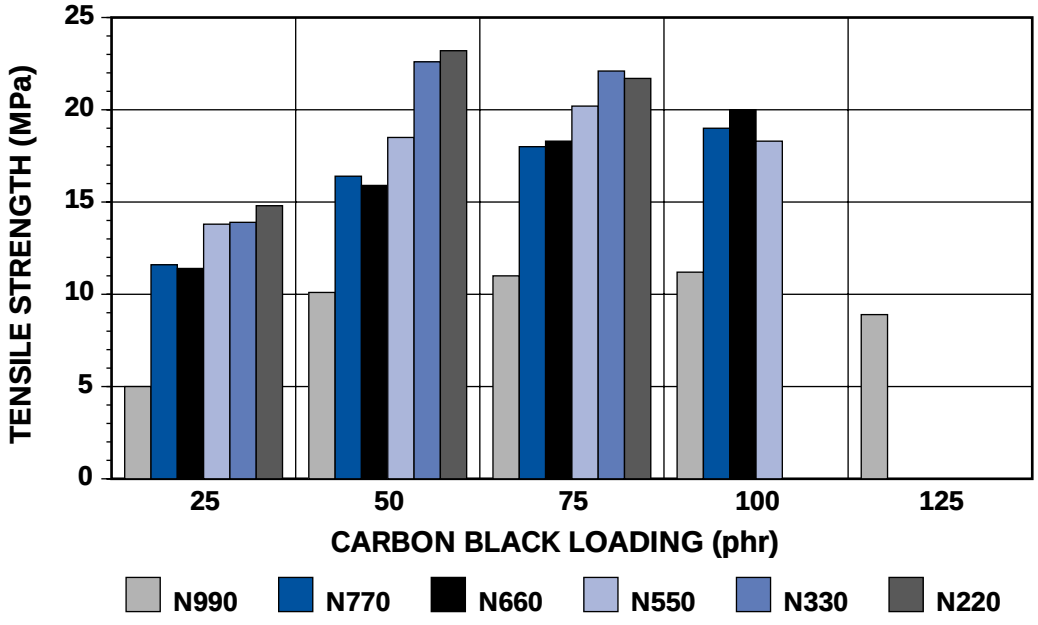


* - SBR cured 10 min @ 153C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 5b

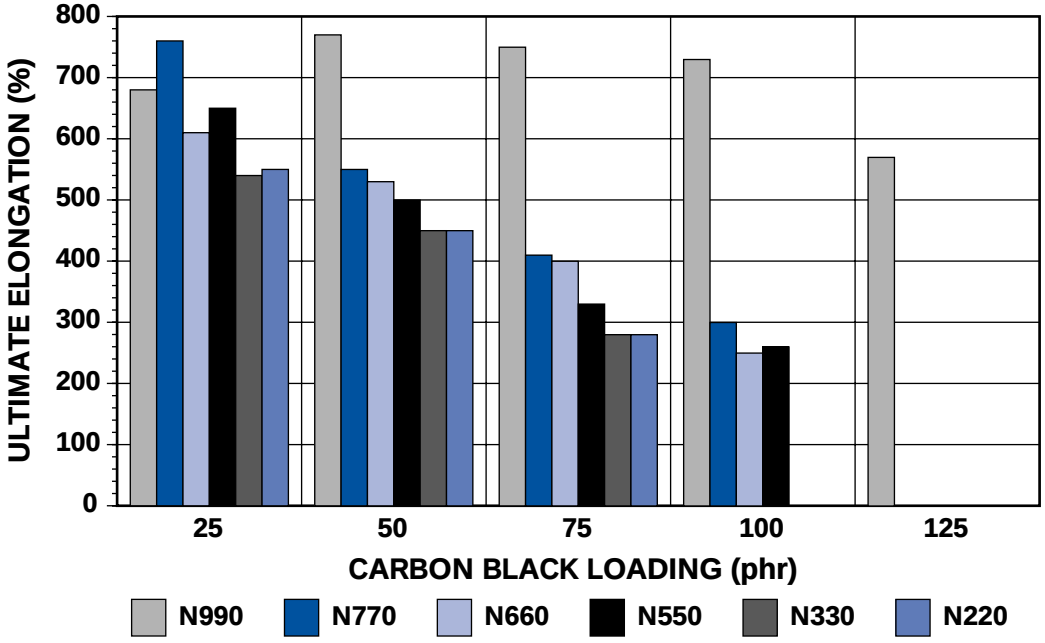
N990 versus Furnace Blacks* in Styrene Butadiene Rubber – tensile strength



* - SBR cured 10 min @ 153C

Source - R.T. Vanderbilt
Formula - See Appendix III

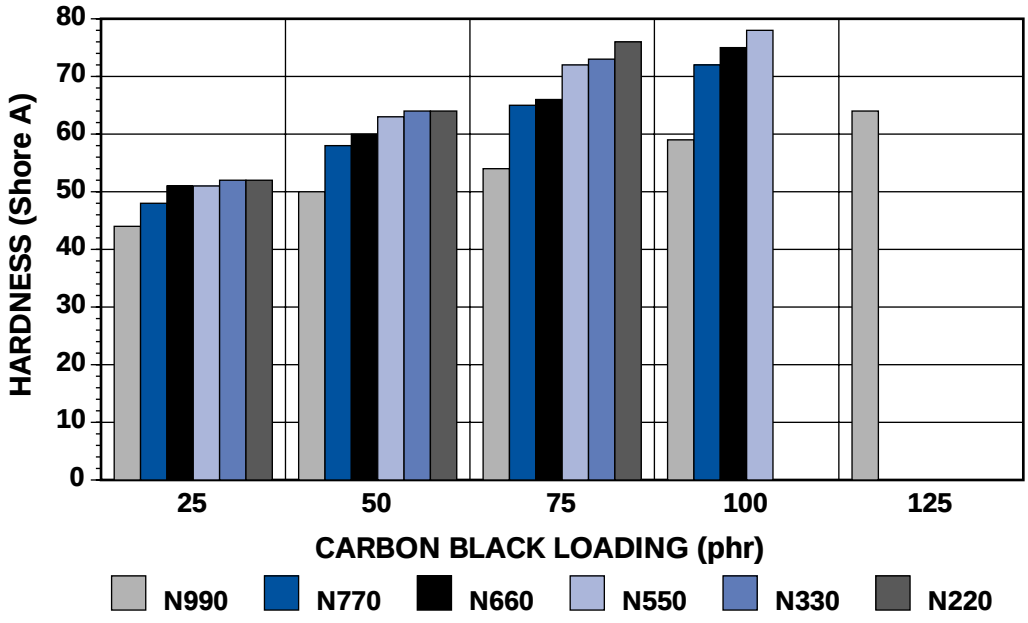
Figure 5c
N990 versus Furnace Blacks* in Styrene Butadiene Rubber – ULTIMATE ELONGATION



* - SBR cured 10 min @ 153C

Source - R.T. Vanderbilt
Formula - See Appendix III

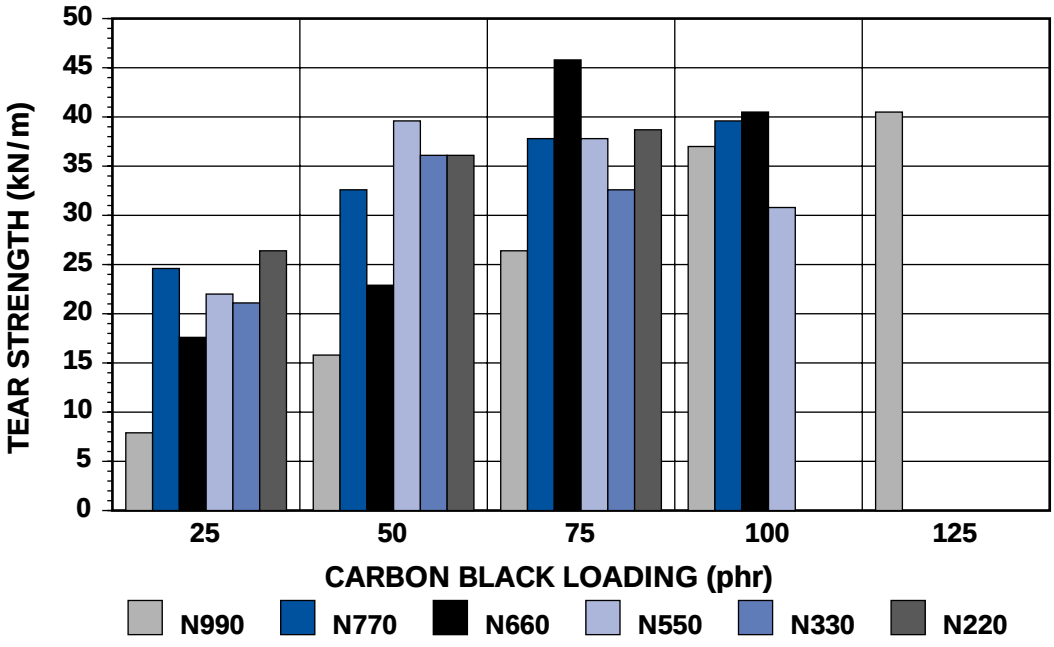
Figure 5d
N990 versus Furnace Blacks* in Styrene Butadiene Rubber – HARDNESS



* - SBR cured 10 min @ 153C

Source - R.T. Vanderbilt
Formula - See Appendix III

Figure 5e
N990 versus Furnace Blacks* in Styrene Butadiene Rubber – TEAR STRENGTH



* - SBR cured 10 min @ 153C

Source - R.T. Vanderbilt
Formula - See Appendix III