



Abrasion Resistance and Cutting Edge Compounds

Making the Right Choice

Home Rubber and Ivanhoe



THE HOME RUBBER COMPANY





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Topics

- Types of Abrasion
- Basic Physical and Chemical Properties of Materials
- Materials that Work Best for Abrasion
- Designing for your Application
- Improving Abrasion Resistance

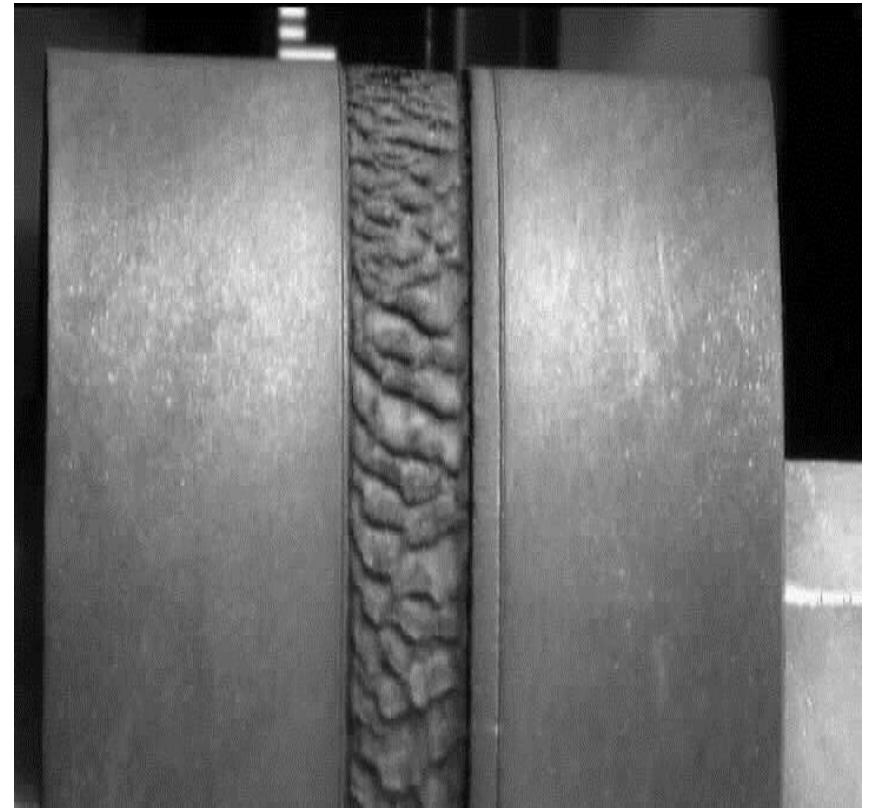


Types of Abrasion

- Abrasive Wear
- Rolling Abrasion
- Mar Abrasion
- Three-Body Wear
- Two-Body Abrasive Wear

Abrasive Wear

- Process of wearing away of material by friction
- Friction can also wear material by thermal heat
- Anything from commercial media (Silicone Carbide or Aluminum Oxide) to naturally occurring media such as (Dust or Sand)



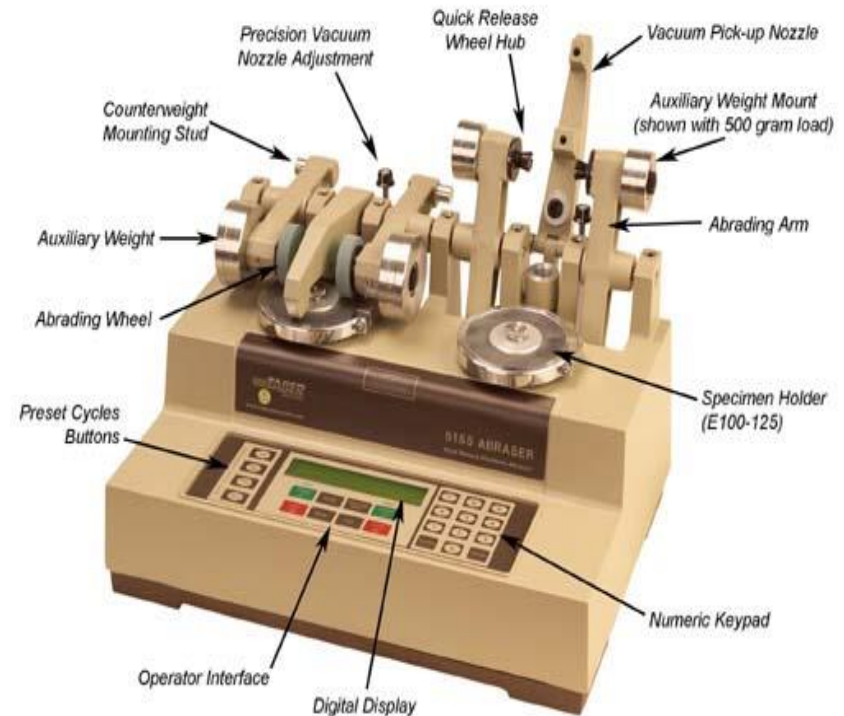


Abrasion Testers (Laboratory Setting)

- Taber Abrader
- Din Abrader
- NBS Abrader
- PICO Abrader
- Rotary Abrader
- Akron Abrader

Taber Abrader

- 4" Diameter Disk
- Dual Abrading Wheels
- Shows Abrasion at all angles relative to weave or grain
- 250 Gram Standards (more weight can be added)
- Results Measured in Material Loss (Change in weight, millimeters cubed)



DIN Abrader



- Mounted Holder
- Runs Along an Abrasive Drum
- 5 and 10 Newtons
- Resistance Measured by Loss
- Loss Measured in Cubic Millimeters

Chemical and Physicals

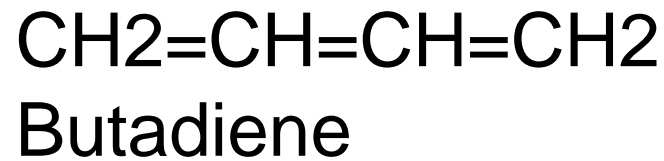
ASTM	Natural	Urethane	XNBR	SBR	Neoprene
Durometer	20-100	35-100	50-100	40-100	20-90
Max Tensile	4000	3000	3000	3500	4000
Max Temp.	-65 to 180	-65 to 212	-65 to 250	-65 to 225	-65 to 212
Abrasion	Excellent	Excellent	Excellent	Very Good	Very Good
Bio-diesel	Poor	Poor	Fair	Poor	Poor
Oil	Poor	Excellent	Excellent	Poor	Good
Ozone	Poor	Excellent	Fair	Fair	Good
Electrical	Excellent	Fair	Fair	Fair	Good
Tear	Very Good	Excellent	Very Good	Good	Good

Natural Rubber

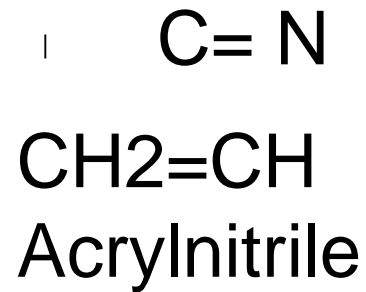


- Grades of Natural Rubber
- Smoke Sheet, Air Dried and Pale Crepes

XNBR Structure



+

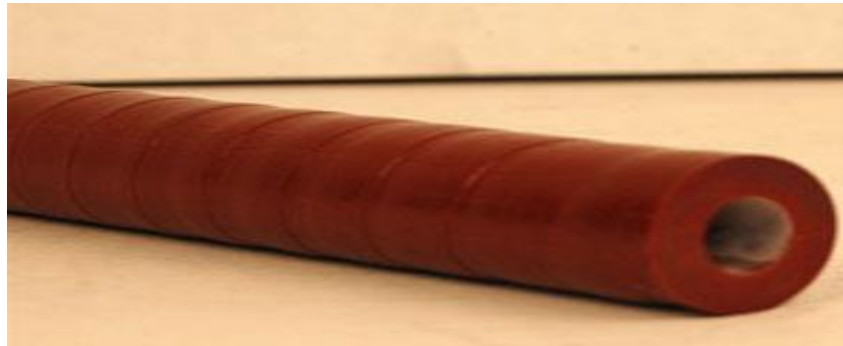


XNBR

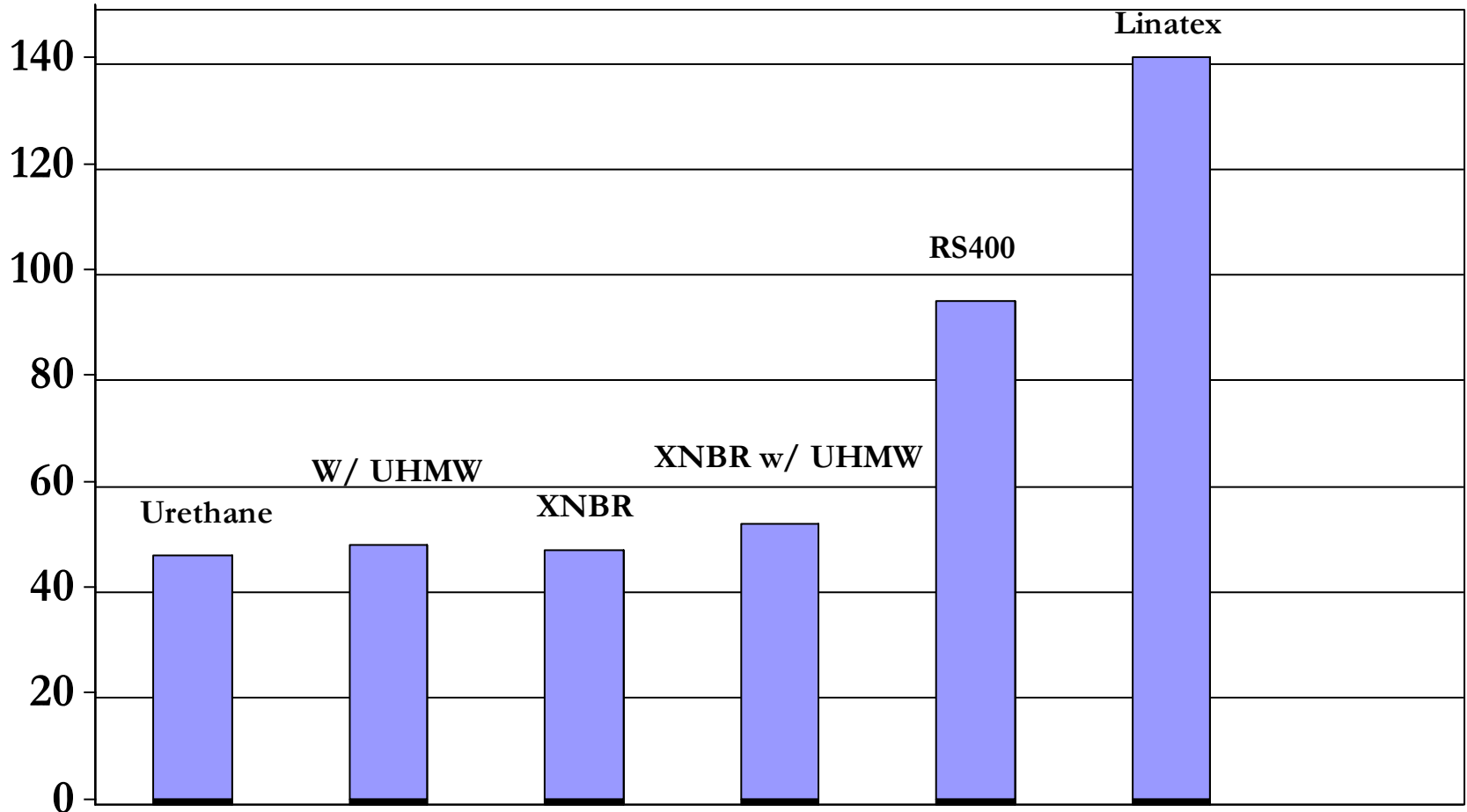
- Varying ACN Contents
- Are Polymerized with Addition of Carboxylic Acid Group on the Polymer Chain (Methacrylic or Acrylic)
- More cure sites for Zinc Oxide and Peroxide
- Retains Properties of Regular Nitrile but has much better Modulus, Tensile and Abrasion
- Used in Applications Requiring Oil Resistance as well as Toughness and HIGH Abrasion
- Addition of HNBR will Help with any Ozone or Heat Resistance

Urethanes

- Millable and Cast
- Peroxide cures give better heat resistance
- Sulfur cures are better for general purpose
- Best abrasion of all base polymers



DIN Abrader Results





Improving Abrasion Resistance

- Additives
- Mixing Process
- Fillers Loadings
- Types of Fillers
- Coupling Agents
- Reinforcing Resins

Mixing

- Dispersion of the filler
- Smaller particle size carbon blacks give better abrasion but are harder to disperse
- Adding the carbon black early to avoid diluting it with plasticizers and oils
- Avoid mixing two contrasting carbon blacks in same compound



Fillers

- Carbon blacks with higher surface area and better structure give you better abrasion
- Increasing the volume of carbon black will improve abrasion, but there is a threshold
- Finer blacks are better for abrasion but also create more heat on mill and conductivity in the hose
- Loads can vary based on type of carbon black



Coupling Agents and Additives

- Silane for any material using a silica filler
- Silicon Oils to reduce friction
- Molybdenum Disulfide in Urethanes

S-T-A-M-P-E-D

- “S” Size
- “T” Temperature
- “A” Application
- “M” Media
- “P” Pressure
- “E” Ends
- “D” Delivery



Size



Temperature



Application



Media



Ends



Delivery

Critical Information

- Will it see constant temperature (high or low)
- Environment
- Oil Resistant/ Bio-Diesel Resistant
- Exposure – Tube and Cover
- FDA, Military, NSF, 3A
- Flexibility



Your Application



- The more information you give us the better a product we can design for you
- Do not assume any application can not be solved.
- Call Home Rubber
- 800-257-9441

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