



What is HNBR Rubber?

By Manuel Valenzuela

HNBR (hydrogenated nitrile butadiene rubber) is a high-performance elastomer designed for applications that combine heat, oil, chemical exposure, and mechanical stress. To make HNBR, NBR is chemically hydrogenated to improve sour gas (H_2S), excessive heat, ozone and weathering resistance as well as durability in dynamic service, while retaining nitrile's inherent properties of resistance to oils and fuels.

These enhanced characteristics make HNBR an ideal material for many automotive, oil and gas, aerospace, and industrial sealing applications where sour gas is present and/or oil resistance, high temperatures and robust physical properties are critical.

Key Strengths of HNBR

- **Sour Gas (H_2S) resistance**, especially relevant in downhole applications
- **High tensile and tear strength**, elevating its ability to hold up well in dynamic seals
- **Good abrasion resistance** in dynamic applications
- **Oil and fuel resistance** is better than NBR under higher temperatures and harsh operating conditions
- **Ozone, weathering, and oxidation resistance** well above NBR
- **Hot water and steam resistance** to 300°F, when peroxide cured

Potential Limitations of HNBR

- **Flame**, HNBR burns and has poor flame resistance unless specially formulated
- **Heavy Swell** is caused by aromatic and chlorinated solvents, Toluene, benzene, and chlorinated hydrocarbons
- **HNBR is attacked** by Ketones, esters, and ethers, much the same way they attack NBR
- **Acid Degradation**, Strong and concentrated acids can degrade the material
- **Electrical insulation**, HNBR has poor electrical insulating properties unless specially formulated

Please Note: This overview of HNBR's strengths and limitations is for general reference. Performance and material properties depend on the specific compound and application.

HNBR Rubber's Characteristics

Table 1 – Physical Properties of HNBR*

Property	Typical Range	Test Method
Hardness	40 to 90 Shore A	ASTM D2240
Tensile Strength	1,500 to 3,500+ psi	ASTM D412
Elongation at Break	100% to 500%	ASTM D412
Compression Set, 22 hrs @ 302°F	25% to 30%	ASTM D395, Method B
Service Temperature Range	-40°F to +300°F	
IRM 901 Volume Change, 70 hrs @ 302°F	-5% to +5%	ASTM D471
IRM 903 Volume Change, 70 hrs @ 302°F	0% to +25%	ASTM D471
Heat Aging, 70 hrs @ 302°F: Tensile Change	As low as -30%	ASTM D573
Heat Aging, 70 hrs @ 302°F: Elongation Change	As low as -30%	ASTM D573
Heat Aging, 70 hrs @ 302°F: Hardness Change	+5 to +15 points	ASTM D573

Table 2 – Chemical Resistance Guide

Chemical	Resistance Capability
Mineral Oils & Greases	Excellent
Fuels	Excellent
Hydraulic Fluids	Excellent (petroleum-based), Poor to Fair (phosphate ester)
Aliphatic Hydrocarbons	Excellent
Aromatic Hydrocarbons	Poor to Fair
Alcohols	Good
Acids	Poor to Fair
Bases	Good

Table 3 – HNBR Characteristics

Category	Property	Performance
Mechanical	Abrasion Resistance	Excellent
	Impact Resistance	Excellent
	Rebound Rating	Good
	Tear Resistance	Excellent
	Flex Cracking Resistance	Good
Environmental	Chemical Resistance	Good
	Oil Resistance	Excellent
	Weather Resistance	Excellent
	Ozone Resistance	Excellent
	Oxidation Resistance	Excellent
	Sunlight Resistance	Good
Application Specific	Flame Resistance	Poor
	Minimum Service Temperatures	Good
	Maximum Service Temperatures	Very Good
	Gas Permeability	Good
	Radiation Resistance	Good

*These are typical ranges across a number of HNBR compounds. Actual performance depends on the manufacturer's ability to formulate and the specific compound selected for the application.

Common HNBR Applications

HNBR is often used where parts see heat, oil, and mechanical stress simultaneously:

- **Automotive systems and seals**, including timing belts, fluid transfer and power steering applications
- **Downhole Oil and Gas seals and gaskets** exposed to sour gas, crude oil, drilling fluids, and heat
- **Hydraulic and pneumatic seals**, including wipers and rod seals
- **Industrial gaskets and dynamic seals** in rotating and reciprocating equipment

WARCO's HNBR Rubber Products

WARCO's ability to formulate and compound HNBR Rubber includes producing:

- Calendered rolls and sheets
- Molded sheets & custom parts
- Extrusions, including cord, tubing, rectangles, wipers, P-seals, and custom profiles
- Spliced seals and large O-rings

Unlike many other rubber manufacturers that depend upon external laboratories, mixing and testing facilities, WARCO can develop compounds, in-house mix, and thoroughly test and process your rubber products in a single facility.

Our wealth of experience in material design and engineering, unique manufacturing processes, and tight control over each step of production, are among the key contributors to how WARCO remains America's Choice.

Have a specification or drawing that calls for HNBR? Send your requirements to sales@warco.com or [714-532-3355](tel:714-532-3355), and we'll identify one of our catalogued compounds or develop one and manufacture the part that you need.

Frequently Asked Questions

What is the shelf life of HNBR?

HNBR has a recommended shelf life of 15 years, however actual shelf life greatly depends on storage conditions. Keep parts cool and dry, away from sunlight and ozone sources, and thoroughly inspect them before installation. See our [guide](#) on how to store your rubber products.

How does HNBR compare to FKM?

Both materials resist oil, ozone, and weathering, and both handle more heat than most other rubber elastomers. FKM is the better choice for applications above 300°F and resistance against a wider range of chemicals, including solvents and acids. FKM also has better flame resistance. HNBR offers better abrasion resistance, better durability in dynamic service, better low-temperature flexibility than standard FKM, and better resistance to hot water and steam (when peroxide cured). See our [article](#) on HNBR vs FKM.

Can HNBR replace NBR directly?

HNBR generally resists the same oils and fuels as NBR, and can be a strong substitute. Before switching, confirm that the HNBR compound meets the original spec callout. While HNBR may cost more than NBR, this can be a worthwhile change when NBR is failing from heat, ozone, or wear.

When Do I Need Peroxide Cured HNBR?

HNBR rubber can be manufactured with a sulfur cure or a peroxide cure. While peroxide cure can potentially increase the cost, the product's heat resistance will improve and become resistant to hot water and steam.

What else is HNBR called, and how is it classified?

HNBR is also called HSN, or highly saturated nitrile, on some drawings. Under ASTM D2000, HNBR is typically classified as type and class DH. Read our ASTM D2000 guide to learn how to read its callout.