General Rubber Compounds

By: Jim Ward
BRP Manufacturing

Rubber products are generally composed of four major parts:

A. polymers (the 'rubber" portion)
B. processing oils
C. carbon blacks and/or fillers
D. curing agents

In combining these items, you obtain the general rubber products purchased within our industry. Polymer (rubber) selection is usually based upon application and material specifications. The following information may be used to assist you in selecting the right rubber for the application. Please remember that these are suggestions based upon historical uses; for proper consideration and accurate selections, please consult an applications engineer.

Natural Rubber (polyisoprene) NR & Synthetic Natural Rubber (polyisoprene) IR: Natural rubber was the "original" rubber product. Its first uses were in footwear, protective coverings, and tubing. It has excellent abrasion and tear resistance with very high tensile strengths. It has very poor heat, ozone, sunlight (UV), oil, and fuel resistance. Its temperature range is -40 to 180° Fahrenheit. Its most common usages are in mining and material conveyance (belting). Cost fluctuations due to availability and market controls of this product make it very price sensitive.

Synthetic natural rubber was developed during World War II to provide rubber products to the Allied countries while Japan controlled the Southeast Asian rubber plantations. As a laboratory product, it is generally higher in cost than NR.

SBR (styrene butadiene rubber) SBR: SBR was the first synthetic elastomer. It was also developed during WWII to replace the natural rubber used in tires. It has excellent abrasion resistance with good tensile strength. It has moderate heat resistance and may be compounded to offer some ozone resistance. It has very poor oil and fuel resistance. Its temperature range is -40 to 210° Fahrenheit. SBR was used to blend with other polymers to help reduce cost, but skyrocketing market costs and supply problems have minimized its use in today's market. It is still a key component in tires.

Neoprene (polychloroprene) CR: Neoprene was initially a trade name for one of the first synthetic polymers developed by DuPont. It is a good general all purpose elastomer with moderate oil and ozone resistance and good compression set. High content polychloroprene has excellent fungus resistance, flame retardance, and bonding characteristics to metal. It has a very limited fuel resistance. Its temperature range is -40 to 220° Fahrenheit. A wide range of Neoprene products are offered within the marketplace and used in many general applications including military, automotive and appliance. Neoprene is also used in the construction trade in high load bearing applications.

Buna "N" (acrylonitrile butadiene) NBR: Buna "N" (sometimes referred to as nitrile or NBR) is the least expensive polymer associated with fuel (gasoline) resistance. It has excellent fuel and oil resistance including petroleum based lubricating oils and transmission fluids, good compression set, low gas permeation rates, and good low temperature flexibility. It has a very poor ozone resistance. Its temperature range is -40 to 220° Fahrenheit. It is generally used where continuous exposure to gasoline or oil is needed. The development of alcohol blended fuels, flex fuels and biodiesel products may present application issues when considering Buna "N" in those type applications.

EPDM (ethylene propylene polymer) EP: EPDM may also be referred to as EPT, EP or some variation in ethylene propylene. EPDM is generally considered to be the most economic polymer with the widest environmental resistance. It has excellent low temperature, heat, coolant, water, steam, ozone, and sunlight (UV) resistance. It has virtually no resistance to oils or fuels. It is generally considered to be non-staining to painted surfaces. Its temperature range is -60 to 240° Fahrenheit. With a peroxide curing system, the temperature range is raised to 300° Fahrenheit and above. EPDM is commonly used in automotive and building applications, especially rubber roofing.

Butyl (isobutylene isoprene) IIR: Butyl rubber is noted for its extremely low air permeability with a good tear resistance; one of its first uses was in the manufacture of tire inner tubes. It is still used today in the patch kits of many cyclists. It has excellent water, steam, ozone, and alkali resistance. It has very poor oil and fuel resistance. Its temperature range is -40 to 240° Fahrenheit. Butyl rubber is also very popular in the rubber roofing industry.

HYPALON® (chlorosulfonated polyethylene) CSM: HYPALON® is another DuPont registered trademark rubber. As engine temperatures increased, HYPALON® filled a niche where higher temperature ranges were needed in Neoprene type applications. It has excellent ozone, oxidation, and sunlight (UV) resistance with moderate resistance to alkalis and acids. It has similar oil resistance to Neoprene, but at higher operating temperatures. Its temperature range is -40 to 240° Fahrenheit. With oil resistance in a wider temperature range come higher costs than with other oil resistant products.

Epichlorohydrin ECO, ECH: Epichlorohydrin is commonly referred to as ECO or ECH, the technical abbreviation assigned by ASTM standards. It has a wide temperature range with excellent resistance to oils and fuels. It also exhibits good ozone and sunlight resistance. Its temperature range is -60 to 240° Fahrenheit. Its high cost has prevented its use in many commercial applications, but it is extremely popular in automotive fuel applications.

Fluoroelastomer (fluorocarbon) FKM: The most common trade names in the fluoroelastomer products are VITON®, FLUOREL®, and DYNEON®. The fluorine content of this rubber product makes it almost universally applicable to any rubber application, but its cost dictates otherwise. It has excellent fuel, oil, and high temperature resistance as well as compression set, aging characteristics, and flame retardance. Its major shortcoming is its very poor low temperature characteristics. Its temperature range is 0 to 450° Fahrenheit. It is extremely popular in oil refining and electrical transformers where service costs outweigh the cost of material.

Silicone: Silicone rubber products cover a very wide range of chemical compositions; in most cases, temperature values determine the proper chemical composition. Silicone rubber is best noted for its broad temperature range, excellent ozone resistance, and excellent compression set. It has very poor tear strength as well as poor tensile strengths. It has a moderate oil resistance. Its temperature range is -80 to 500° Farenheit. One of the most common usages for silicone is in food processing. The broad range of silicone products contributes to a very wide price range.

Other Rubber Products and Trade Names

Carboxylated Nitrile (XNBR)
Highly Saturated Nitrile (HNBR)
Fluorosilicone (FVMQ)
Polyacrylate (ACM)
Ethylene Acrylate VAMAC® (AEM)
Chloropolyethylene (CM)
Polysulfide THIOKOL®